EVALUATION OF UNIT RISK FACTORS IN
SUPPORT OF THE HANFORD REMEDIAL
ACTION ENVIRONMENTAL IMPACT STATEMENT

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ABSTRACT

This report describes the generation of unit risk factors for use with the Graphical Information System being developed by Advanced Sciences, Inc., with support from Pacific Northwest Laboratory for the Hanford Remedial Action Environmental Impact Statement. Unit risk factors provide an estimate of risk per unit concentration of a pollutant in a medium. The risk is expressed as total cancer incidence for radionuclides and carcinogenic chemicals, and as a hazard index for noncarcinogenic chemicals. Unit risk factors are generated for five media: soil (per unit mass), soil (per unit area), air, groundwater, and surface water. The risk assessment is performed for the four standard scenarios defined in the Hanford Site Baseline Risk Assessment Methodology: industrial, recreational, residential, and agricultural. The pollutants considered include 47 chemicals and 101 radionuclides. Tables of all unit risk factors are included in the report.

SUMMARY

This report describes the generation of unit risk factors for use with the Graphical Information System (GIS) being developed by Advanced Sciences, Inc., with support from Pacific Northwest Laboratory for the Hanford Remedial Action Environmental Impact Statement. The GIS couples information on source inventory and environmental transport with unit risk factors to estimate the potential risk from contamination at all locations on the Hanford Site. The major components of the effort to generate the unit risk factors were: determination of pollutants to include in the study, definition of media of concern, and definition of exposure assessment scenarios, methods, and parameters.

The selection of pollutants was based on inventory lists provided by staff of Advanced Science, Inc. which indicated the pollutants likely to be encountered at the known waste sites, not including tank wastes. The final pollutants selected included 47 chemical pollutants and 101 radionuclides.

Unit risk factors have been generated for all 148 pollutants per unit initial concentration in five media: soil (per unit mass), soil (per unit area), air, groundwater, and surface water. Two soil media types were necessary to accommodate definition of pollutants as a source in soil (per unit mass of soil) and for the atmospheric transport pathway that involves deposition of pollutants to soil (per unit area). The groundwater and surface water media are included for estimation of risk from known water concentrations and for concentrations estimated using groundwater transport models. The air medium unit risk factors are needed for assessment of risk following atmospheric transport of pollutants.

The exposure scenarios defined in the Hanford Site Baseline Risk Assessment Methodology report (DOE 1993) were selected as the basis for the unit risk factor generation. These scenarios include the following:

Industrial Scenario: The industrial scenario is intended to represent potential exposures to workers in a commercial/industrial setting. The scenario involves mainly indoor activities, but outdoor activities, such as soil contact, are also included. The scenario is not intended to represent exposure of remediation workers, and the nonremediation workers are assumed to wear no protective clothing.

Recreational Scenario: The recreational scenario is intended to represent exposure to contamination in the Columbia River. The exposure pathways represent use of all media, with exposure parameters selected to represent the occasional use of the water, as opposed to continuous use for the residential scenario.

Residential Scenario: The residential scenario is intended to represent potential exposures to an individual who may take up residence on the Hanford Site in the future. The exposures are described as occurring continuously through the year (except for surface water recreational activities). Resident individuals are potentially exposed to all of the media.

Agricultural Scenario: The agricultural scenario is very similar to the residential scenario. The primary difference between the two scenarios is that the agricultural scenario includes production and consumption of animal products (meat and milk). The exposures are assumed to be continuous and include occasional surface-water and sediment-related recreational activities.

The endpoint in the exposure assessment analysis is expressed as risk of developing cancer (total incidence) for radionuclides and carcinogenic chemicals. For noncarcinogenic chemicals, the risk endpoint is the hazard quotient, which is the ratio of estimated intake to the reference dose or "safe" intake level. The cancer incidence and hazard quotient values are evaluated for all exposure pathways, pollutants, and scenarios. For a given pollutant, medium, and scenario, the hazard quotients are summed across exposure pathways to give a total hazard index. The unit risk values for carcinogens and radionuclides are also summed across exposure pathways to give summary unit risk values. These summed hazard index values and unit risk values are used by the GIS to produce maps of risk for the Hanford Site.

ABBREVIATIONS/ACRONYMS

ASI	Advanced Sciences, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	U.S. Department of Energy
FI	facility investigation
GIS	Graphical Integration System
HAZDK	Hazard Assessment Module, Chain Decay Version
HEAST	Health Effects Assessment Summary Tables
HRA-EIS	Hanford Remedial Action Environmental Impact Statement
HSBRAM	Hanford Site Baseline Risk Assessment Methodology
MEPAS	Multimedia Environmental Pollutant Assessment System
PF	pollutant-specific factor
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
SIF	summary intake factor
URF	unit risk factor

CONTENTS

ABSTRACT	iii
SUMMARY	v
ABBREVIATIONS/ACRONYMS	vii
1.0 INTRODUCTION	1.1
2.0 SCOPE OF UNIT RISK FACTORS ANALYSES	2.1
2.1 SCENARIOS AND MEDIA	2.1
2.1.1 Industrial Scenario	2.1
2.1.2 Recreational Scenario	2.2
2.1.3 Residential Scenario	2.2
2.1.4 Agricultural Scenario	2.2
2.2 EXPOSURE PATHWAYS	2.2
2.3 POLLUTANTS	2.7
2.4 RISK AND EXPOSED INDIVIDUAL REPRESENTATION	2.11
3.0 GENERATING UNIT RISK FACTORS	3.1
3.1 METHODS FOR UNIT RISK FACTOR EVALUATION	3.1
3.1.1 Radionuclide Unit Risk Factor Health Impact Analysis	3.2
3.1.2 Chemical Unit Risk Factor Health Impact Analysis	3.4
3.2 INDUSTRIAL SCENARIO SUMMARY INTAKE FACTOR EVALUATION	3.6
3.2.1 Medium: Soil (mass)	3.6
3.2.2 Medium: Soil (area)	3.7

3.2.3	Medium: Air	3.8
3.2.4	Medium: Groundwater	3.9
3.2.5	Medium: Surface Water	3.10
3.3	RECREATIONAL SCENARIO SUMMARY INTAKE FACTOR EVALUATION	3.10
3.3.1	Medium: Soil (mass)	3.11
3.3.2	Medium: Soil (area)	3.12
3.3.3	Medium: Air	3.12
3.3.4	Medium: Groundwater	3.13
3.3.5	Medium: Surface Water	3.14
3.4	RESIDENTIAL SCENARIO SUMMARY INTAKE FACTOR EVALUATION	3.16
3.4.1	Medium: Soil (mass)	3.16
3.4.2	Medium: Soil (area)	3.17
3.4.3	Medium: Air	3.18
3.4.4	Medium: Groundwater	3.19
3.4.5	Medium: Surface Water	3.20
3.5	AGRICULTURAL SCENARIO SUMMARY INTAKE FACTOR EVALUATION	3.23
3.5.1	Medium: Soil (mass)	3.23
3.5.2	Medium: Soil (area)	3.24
3.5.3	Medium: Air	3.25
3.5.4	Medium: Groundwater	3.26
3.5.5	Medium: Surface Water	3.28
3.6	POLLUTANT SPECIFIC PARAMETERS	3.31
3.6.1	Drinking Water Ingestion	3.31

3.6.2	Shower Dermal Contact	3.32
3.6.3	Shower Water Ingestion	3.32
3.6.4	Leafy Vegetable Ingestion	3.32
3.6.5	Other Vegetable Ingestion	3.33
3.6.6	Meat Ingestion	3.33
3.6.7	Milk Ingestion	3.33
3.6.8	Fish Ingestion	3.34
3.6.9	Swimming Water Ingestion	3.34
3.6.10	Swimming Dermal Contact	3.34
3.6.11	Shoreline Dermal Contact	3.34
3.6.12	Shoreline Sediment Ingestion	3.35
3.6.13	Soil Ingestion	3.35
3.6.14	Soil Dermal Contact	3.35
3.6.15	Indoor Inhalation of Volatile Pollutants	3.35
3.6.16	Air Inhalation	3.36
3.6.17	Soil Resuspension Inhalation	3.36
3.6.18	Swimming External	3.36
3.6.19	Boating External	3.36
3.6.20	Shoreline External	3.36
3.6.21	Soil External	3.37
3.6.22	Air External	3.37
4.0	UNIT RISK FACTOR RESULTS	4.1
5.0	REFERENCES	5.1

APPENDIX A - UNIT RISK FACTOR TABLES

APPENDIX B - POLLUTANT-SPECIFIC PARAMETERS

APPENDIX C - UNIT RISK FACTOR OUTPUT FILES

APPENDIX D - INPUT FILES: SIF, HIN, AND ID

TABLES

2.1	Exposure Pathways Included in Industrial Scenario URF Analyses	2.3
2.2	Exposure Pathways Included in Recreational Scenario URF Analyses	2.4
2.3	Exposure Pathways Included in Residential Scenario URF Analyses	2.5
2.4	Exposure Pathways Included in Agricultural Scenario URF Analyses	2.6
2.5	Chemicals Included in URF Analyses	2.9
2.6	Radionuclides Included in URF Analyses	2.10
2.7	Media Normalization Units	2.12
3.1	Industrial Scenario Summary Intake Factors: Soil (mass)	3.7
3.2	Industrial Scenario Summary Intake Factors: Soil (area)	3.8
3.3	Industrial Scenario Summary Intake Factors: Air	3.9
3.4	Industrial Scenario Summary Intake Factors: Groundwater and Surface Water	3.10
3.5	Recreational Scenario Summary Intake Factors: Soil (mass)	3.11
3.6	Recreational Scenario Summary Intake Factors: Soil (area)	3.12
3.7	Recreational Scenario Summary Intake Factors: Air	3.13
3.8	Recreational Scenario Summary Intake Factors: Groundwater	3.14
3.9	Recreational Scenario Summary Intake Factors: Surface Water	3.15
3.10	Residential Scenario Summary Intake Factors: Soil (mass)	3.17
3.11	Residential Scenario Summary Intake Factors: Soil (area)	3.18
3.12	Residential Scenario Summary Intake Factors: Air	3.19
3.13	Residential Scenario Summary Intake Factors: Groundwater	3.20

3.14 Residential Scenario Summary Intake Factors: Surface Water . . .	3.21
3.15 Agricultural Scenario Summary Intake Factors: Soil (mass) . . .	3.24
3.16 Agricultural Scenario Summary Intake Factors: Soil (area) . . .	3.25
3.17 Agricultural Scenario Summary Intake Factors: Air	3.26
3.18 Agricultural Scenario Summary Intake Factors: Groundwater . . .	3.28
3.19 Agricultural Scenario Summary Intake Factors: Surface Water . .	3.30
4.1 Industrial Scenario Noncarcinogenic Chemical URF Sums	4.2
4.2 Industrial Scenario Carcinogenic Chemical URF Sums	4.3
4.3 Industrial Scenario Radionuclide URF Sums	4.4
4.4 Recreational Scenario Noncarcinogenic Chemical URF Sums	4.6
4.5 Recreational Scenario Carcinogenic Chemical URF Sums	4.7
4.6 Recreational Scenario Radionuclide URF Sums	4.8
4.7 Residential Scenario Noncarcinogenic Chemical URF Sums	4.10
4.8 Residential Scenario Carcinogenic Chemical URF Sums	4.11
4.9 Residential Scenario Radionuclide URF Sums	4.12
4.10 Agricultural Scenario Noncarcinogenic Chemical URF Sums	4.14
4.11 Agricultural Scenario Carcinogenic Chemical URF Sums	4.15
4.12 Agricultural Scenario Radionuclide URF Sums	4.16

1.0 INTRODUCTION

The work presented in this report was performed in support of the Hanford Remedial Action Environmental Impact Statement (HRA-EIS). To provide visual display of risks from wastes at Hanford on a site-wide basis, a Graphical Integration System (GIS) was used by Advanced Sciences, Inc., (ASI) for the HRA-EIS. Pacific Northwest Laboratory (PNL) was asked to provide technical support to ASI for implementing the GIS by providing estimates of pollutant transport and risk assessments. This report describes the generation of unit risk factors (URF) to be used as the basis for the risk assessment in the GIS.

To successfully implement the GIS, the transport and risk assessment analyses were structured to take advantage of precalculated factors, thus allowing timely computation of results. This structuring required generating URFs to allow a significant reduction in computer computation efforts. The URFs give the human health risk from an exposure scenario per unit concentration of a pollutant in a defined transport medium. The URFs are then multiplied by calculated medium concentrations to obtain an estimate of risk. The URFs relate pollutant concentration in a medium to human health impact. The use of the URFs in the GIS can be represented by the following equation which includes transport from the source to the point of exposure in the environment.

$$\text{Risk} = \text{Source Term} \times \text{Unit Transport Factor} \times \text{Unit Risk Factor}$$

where

Risk = measure of human health impact appropriate for a given pollutant,

Source Term = quantity of the pollutant in the source configuration,

Unit Transport Factor = pre-calculated factor that relates the source term to the medium concentration for a particular transport pathway (e.g., groundwater) and pollutant,

Unit Risk Factor = pre-calculated factor that relates medium concentration to human health impact measure for a pollutant and transport pathway.

The Programmatic Environmental Impact Statement (PEIS) project^(a) used a similar approach to evaluating human health impacts. An important difference between the URFs for the two studies is that the PEIS URF values include the unit transport factors. Therefore, the URFs for the two studies are not comparable.

The URF analyses have been performed for the four exposure scenarios defined in the Hanford Site Baseline Risk Assessment Methodology (HSBRAM), published by the U.S. Department of Energy (DOE) (1993). The HSBRAM scenarios were developed for the Hanford Site as a guide to performing evaluations of risk related to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial investigations (RI) and the Resource Conservation and Recovery Act (RCRA) facility investigations (FI). Development of HSBRAM was necessary to satisfy requirements of the Tri-Party Agreement.

The four HSBRAM scenarios are referred to as industrial, recreational, residential, and agricultural. The URFs are calculated for each of these scenarios for an array of media, exposure pathways, and pollutants, as follows:

- Medium - soil (per unit mass), soil (per unit area), air, groundwater, and surface water
- Exposure pathway - 22 pathways defined, as appropriate for each scenario
- Pollutant - 47 chemicals and 101 radionuclides.

The URFs also depend on the pollutant type (i.e., radionuclide, chemical carcinogen, chemical non-carcinogen) and are evaluated appropriately for each

(a) Blaylock, B. P. September 1994 Draft. EMPEIS Methodology for Estimating Human Health Risks Associated with Environmental Restoration and Management. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

pollutant. All chemicals are evaluated for both carcinogenic and noncarcinogenic effects.

The URFs for the HRA-EIS GIS were generated using the most current version of the Multimedia Environmental Pollutant Assessment System (MEPAS) exposure assessment component. This component involves considering radioactive chain decay in all parts of the analysis and is referred to in this report as HAZDK (hazards evaluation, decay version, version date: 12 May 1994).

The scope of the URF analyses is described in Section 2.0, which indicates the media, exposure pathways, and pollutants for which URFs have been evaluated for each scenario. Details of the exposure pathway analyses are presented in Section 3.0, while Section 4.0 summarizes the URF results. Appendices of supporting information and detailed result tables are also included. Appendix A presents detailed tables of URFs for all exposure pathways. Appendix B presents the pollutant-specific parameters used in the analysis. Appendix C presents the URF output files. Appendix D describes use of the MEPAS exposure assessment component to generate URFs, with description of files and special input considerations.

2.0 SCOPE OF UNIT RISK FACTORS ANALYSES

This section describes the exposure scenarios, media, exposure pathways, and pollutants included in the URF analyses.

2.1 SCENARIOS AND MEDIA

The four HSBRAM scenarios are used as the basis for the URF evaluations. Each of these scenarios is evaluated for five transport media necessary for the GIS analysis: 1) soil defined per unit mass, 2) soil defined per unit area, 3) groundwater from wells, 4) surface water, and 5) air. These are the primary media for which pollutant concentrations are estimated or known for the grid cells in the GIS. Other media (biota and sediment) are identified in HSBRAM but are not specifically identified for representation in the HRA-EIS GIS. These other media are considered in the URF analyses, as appropriate to the scenario and exposure pathways. For example, ingestion of agricultural products (referred to as biota in HSBRAM) is included for use of contaminated water for irrigating crops. In such cases, the secondary media concentration is evaluated using mathematical models in MEPAS, and the risk from the secondary media is included in the URFs for the primary media.

2.1.1 Industrial Scenario

The industrial scenario is intended to represent potential exposures to workers in a commercial/industrial setting. Because the results of the analysis are to be applied to many locations on the Hanford Site, it is difficult to select or eliminate potential exposure pathways. For the present analysis, all exposure pathways identified in HSBRAM have been included and other pathways have been added that may be associated with the industrial scenario. The scenario involves mainly indoor activities, but outdoor activities (e.g., soil contact) are also included. The scenario is not intended to represent exposure of remediation workers and the nonremediation workers are

assumed to wear no protective clothing. Section 2.2 presents the pathways included in this scenario.

2.1.2 Recreational Scenario

The recreational scenario is intended to represent exposure to contamination in the Columbia River. The exposure pathways presented in HSBRAM are included together with pathways that may be expected to occur with the defined activities. For example, recreational swimming is suggested in HSBRAM for dermal contact with surface water. This pathway was included in the present analysis, along with boating and shoreline activities (included in HSBRAM as exposure to sediment). The exposure pathways represent use of all media, with exposure parameters selected to represent the occasional use of the water, as opposed to continuous use for residential exposures. Section 2.2 presents the pathways included in this scenario.

2.1.3 Residential Scenario

The residential scenario is intended to represent potential exposures to an individual who may take up residence on the Hanford Site in the future. The exposures are described as occurring continuously throughout the year (except for surface-water recreational activities). The pathways described in HSBRAM are included, plus a few other related pathways. Resident individuals are potentially exposed to all of the media. Exposure parameters are selected to represent the continuous exposure by each pathway. Section 2.2 presents the pathways included in the residential scenario.

2.1.4 Agricultural Scenario

Use of land for agricultural production is represented by this scenario, which is very similar to the residential scenario. The primary difference between the two scenarios is that the agricultural scenario includes production and consumption of animal products (meat and milk). The exposures are assumed to be continuous and include occasional surface-water- and sediment-

related recreational activities. Section 2.2 presents the pathways included in the agricultural scenario.

2.2 EXPOSURE PATHWAYS

A total of 22 exposure pathways are considered in the URF analyses. The pathways included in a specific analysis depend on the medium, scenario, and pollutant type (chemical or radionuclide). The exposure pathways appropriate to each analysis are indicated in Tables 2.1 through 2.4, for the industrial scenario, recreational scenario, residential scenario, and agricultural scenario, respectively. These tables also indicate which pathways apply to chemicals and which apply to radionuclides.

TABLE 2.1. Exposure Pathways Included in Industrial Scenario URF Analyses

<u>Medium</u>	<u>Exposure Pathway</u>	<u>Chemicals</u>	<u>Radionuclides</u>
Soil (mass)	Soil ingestion	Yes	Yes
	Soil dermal absorption	Yes	Yes
	Resuspended-soil inhalation	Yes	Yes
	External ground dose	No	Yes
Soil (area)	Soil ingestion	Yes	Yes
	Soil dermal contact	Yes	Yes
	Resuspended-soil inhalation	Yes	Yes
	External exposure	No	Yes
Air	Inhalation	Yes	Yes
	External exposure	No	Yes
Groundwater	Drinking-water ingestion	Yes	Yes
	Shower dermal absorption	Yes	Yes
	Shower-water ingestion	Yes	Yes
	Indoor inhalation of VOCs ^(a)	Yes	Rn222 Only
Surface water	Drinking-water ingestion	Yes	Yes
	Shower dermal absorption	Yes	Yes
	Shower-water ingestion	Yes	Yes
	Indoor inhalation of VOCs ^(a)	Yes	Rn222 Only

(a) VOCs = volatile organic compounds

TABLE 2.2. Exposure Pathways Included in Recreational Scenario URF Analyses

<u>Medium</u>	<u>Exposure Pathway</u>	<u>Chemicals</u>	<u>Radionuclides</u>
Soil (mass)	Soil ingestion	Yes	Yes
	Soil dermal absorption	Yes	Yes
	Resuspended-soil inhalation	Yes	Yes
	External ground dose	No	Yes
Soil (area)	Soil ingestion	Yes	Yes
	Soil dermal contact	Yes	Yes
	Resuspended-soil inhalation	Yes	Yes
	External ground dose	No	Yes
Air	Inhalation	Yes	Yes
	External air dose	No	Yes
Groundwater	Drinking- water ingestion	Yes	Yes
	Shower dermal absorption	Yes	Yes
	Shower-water ingestion	Yes	Yes
	Indoor inhalation of VOCs ^(a)	Yes	Rn222 Only
Surface water	Drinking-water ingestion	Yes	Yes
	Fish ingestion	Yes	Yes
	Swimming-water ingestion	Yes	Yes
	Swimming dermal absorption	Yes	Yes
	Swimming external dose	No	Yes
	Shoreline dermal absorption	Yes	Yes
	Shoreline sediment ingestion	Yes	Yes
	Shoreline external dose	No	Yes
	Boating external dose	No	Yes

(a) VOCs = volatile organic compounds

TABLE 2.3. Exposure Pathways Included in Residential Scenario URF Analyses

<u>Medium</u>	<u>Exposure Pathway</u>	<u>Chemicals</u>	<u>Radionuclides</u>
Soil (mass)	Soil ingestion	Yes	Yes
	Soil dermal absorption	Yes	Yes
	Resuspended-soil inhalation	Yes	Yes
	External ground dose	No	Yes
Soil (area)	Fruit ingestion	Yes	Yes
	Vegetable ingestion	Yes	Yes
	Soil dermal absorption	Yes	Yes
	Soil ingestion	Yes	Yes
	Resuspended-soil inhalation	Yes	Yes
	External ground dose	No	Yes
Air	Fruit ingestion	Yes	Yes
	Vegetable ingestion	Yes	Yes
	Inhalation	Yes	Yes
	External air dose	No	Yes
Groundwater	Drinking-water ingestion	Yes	Yes
	Shower dermal absorption	Yes	Yes
	Shower-water ingestion	Yes	Yes
	Fruit ingestion	Yes	Yes
	Vegetable ingestion	Yes	Yes
	Indoor inhalation of VOCs ^(a)	Yes	Rn222 Only
Surface water	Drinking-water ingestion	Yes	Yes
	Shower dermal absorption	Yes	Yes
	Shower-water ingestion	Yes	Yes
	Fruit ingestion	Yes	Yes
	Vegetable ingestion	Yes	Yes
	Fish ingestion	Yes	Yes
	Swimming-water ingestion	Yes	Yes
	Swimming dermal absorption	Yes	Yes
	Swimming external dose	No	Yes
	Shoreline dermal absorption	Yes	Yes
	Shoreline-sediment ingestion	Yes	Yes
	Shoreline external dose	No	Yes
	Boating external dose	No	Yes
	Indoor inhalation of VOCs ^(a)	Yes	Rn222 Only

(a) VOCs = volatile organic compounds

TABLE 2.4. Exposure Pathways Included in Agricultural Scenario URF Analyses

<u>Medium</u>	<u>Exposure Pathway</u>	<u>Chemicals</u>	<u>Radionuclides</u>
Soil (mass)	Soil ingestion	Yes	Yes
	Soil dermal absorption	Yes	Yes
	Resuspended-soil inhalation	Yes	Yes
	External ground dose	No	Yes
Soil (area)	Fruit ingestion	Yes	Yes
	Vegetable ingestion	Yes	Yes
	Meat ingestion	Yes	Yes
	Milk ingestion	Yes	Yes
	Soil dermal absorption	Yes	Yes
	Soil ingestion	Yes	Yes
	Resuspended-soil inhalation	Yes	Yes
	External ground dose	No	Yes
Air	Fruit ingestion	Yes	Yes
	Vegetable ingestion	Yes	Yes
	Meat ingestion	Yes	Yes
	Milk ingestion	Yes	Yes
	Inhalation	Yes	Yes
	External air dose	No	Yes
Groundwater	Drinking-water ingestion	Yes	Yes
	Shower dermal absorption	Yes	Yes
	Shower-water ingestion	Yes	Yes
	Fruit ingestion	Yes	Yes
	Vegetable ingestion	Yes	Yes
	Meat ingestion	Yes	Yes
	Milk ingestion	Yes	Yes
	Indoor inhalation of VOCs ^(a)	Yes	Rn222 Only

TABLE 2.4. (contd)

<u>Medium</u>	<u>Exposure Pathway</u>	<u>Chemicals</u>	<u>Radionuclides</u>
Surface water	Drinking-water ingestion	Yes	Yes
	Shower dermal absorption	Yes	Yes
	Shower-water ingestion	Yes	Yes
	Fruit ingestion	Yes	Yes
	Vegetable ingestion	Yes	Yes
	Meat ingestion	Yes	Yes
	Milk ingestion	Yes	Yes
	Fish ingestion	Yes	Yes
	Swimming-water ingestion	Yes	Yes
	Swimming dermal absorption	Yes	Yes
	Swimming external dose	No	Yes
	Shoreline dermal absorption	Yes	Yes
	Shoreline-sediment ingestion	Yes	Yes
	Shoreline external dose	No	Yes
	Boating external dose	No	Yes
	Indoor inhalation of VOCs ^(a)	Yes	Rn222 Only

(a) VOCs = volatile organic compounds

2.3 POLLUTANTS

The pollutants included in the analysis were selected based on lists provided by staff of Advanced Sciences, Inc. The list of chemicals is given in Table 2.5 and the list of radionuclides is given in Table 2.6. In some cases, the initial list included chemical compounds, such as ferric nitrate. For the URF analysis, such pollutants are evaluated as the compound, as well as the individual constituents. For example, ferric nitrate is evaluated as the compound, as ferric ion, and as nitrate ion. The chemical list indicates such representations.

TABLE 2.5. Chemicals Included in URF Analyses

<u>No.</u>	<u>Chemical Name</u>	<u>MEPAS CAS Number</u>
1	Aluminum fluoride	7784181
2	Aluminum nitrate	13473900
3	Aluminum (ionic)	7429905
4	Ammonium carbonate	506876
5	Ammonium nitrate	6484522
6	Beryllium (ionic)	7440417
7	Butyl phosphates	12788931
8	Cadmium (ionic)	7440439
9	Calcium carbonate	471341
10	Calcium (ionic)	7440702
11	Calcium nitrate	10124375
12	Carbon tetrachloride	56235
13	Chromium IV (ionic)	7440473
14	Copper sulfate	7758987
15	Copper (ionic)	7440508
16	Dibutyl phosphonate	1809184
17	Ferric nitrate	10421484
18	Ferrocyanide (ionic)	13943583
19	Ferrous nitrate	13520688
20	Fluoride (ionic)	7782414
21	Iron (as ferric ion)	15438310
22	Lead (ionic)	7439921
23	Magnesium (ionic)	7786303
24	Magnesium nitrate	10377603
25	Mercury (ionic)	7439976
26	Methyl isobutyl ketone	108101
27	Nickel (ionic)	7440020
28	Nitrate	14797558
29	Nitric acid	7697372
30	Nitrite	NITRITE
31	Oxalate (ionic)	144627
32	Phosphate (ionic)	7601549
33	Potassium (ionic)	7447407
34	Potassium borate	7632044
35	Silver (ionic)	7440224

TABLE 2.5. (contd)

<u>No.</u>	<u>Chemical Name</u>	<u>MEPAS CAS Number</u>
36	Sodium (ionic)	7647145
37	Sodium aluminate	1302427
38	Sodium dichromate	10588019
39	Sodium oxalate	62760
40	Sodium sulfamate	5329146
41	Sulfate (ionic)	12808798
42	Sulfuric acid	7664939
43	Tributyl phosphate	126738
44	Tributyl phosphonate	78466
45	Trichloroethylene	79016
46	Uranium (ionic)	7440611
47	Zinc (ionic)	7646857

TABLE 2.6. Radionuclides Included in URF Analyses

<u>No.</u>	<u>Radionuclide</u>	<u>No.</u>	<u>Radionuclide</u>	<u>No.</u>	<u>Radionuclide</u>
1	Ac225	35	I129	69	Sb122
2	Ac227	36	K40	70	Sb124
3	Ag110m	37	Kr85	71	Sc46
4	Am241	38	Mn54	72	Se75
5	Am243	39	Mo93	73	Se79
6	Au195	40	Na22	74	Sm147
7	Ba133	41	Nb93m	75	Sm151
8	Be10	42	Nb94	76	Sn113
9	Be7	43	Nb95	77	Sn123
10	Bi210	44	Ni59	78	Sr85
11	C14	45	Ni63	79	Sr90
12	Ca44	45	Np237	80	Ta182
13	Cd109	47	Np239	81	Tc99
14	Ce144	48	Pa231	82	Th227
15	Cf250	49	Pa233	83	Th228
16	Cf252	50	Pb210	84	Th229
17	Cl36	51	Pb212	85	Th230
18	Cm243	52	Pm147	86	Th231
19	Cm244	53	Po210	87	Th232
20	Cm245	54	Pu238	88	Th234
21	Cm246	55	Pu239	89	Tl204
22	Cm248	56	Pu240	90	Tm170
23	Co57	57	Pu241	91	U232
24	Co58	58	Pu242	92	U233
25	Co60	59	Ra223	93	U234
26	Cs134	60	Ra224	94	U235
27	Cs137	61	Ra225	95	U236
28	Es254	62	Ra226	96	U238
29	Eu152	63	Ra228	97	V49
30	Eu154	64	Re187	98	Y88
31	Eu155	65	Rn222	99	Y90
32	Fe55	66	Ru103	100	Zn65
33	Ge68	67	Ru106	101	Zr93
34	H3	68	S35		

2.4 RISK AND EXPOSED INDIVIDUAL REPRESENTATION

The URF analyses are intended to provide estimates of health impacts per unit concentration in a medium. The health impact measure for carcinogenic chemicals and radionuclides is the lifetime cancer incidence from intake received during a defined exposure duration. For noncarcinogenic chemicals the health impact measure is the hazard index, which is the ratio of the average daily intake to the reference dose (evaluated for ingestion and inhalation intake routes).

For each pollutant, the health impacts are added across all exposure pathways for a given scenario and medium (see exposure pathway lists in Section 2.2). This addition is performed by adding URFs, as presented in Section 4.0. Because health impacts need to be added to exposure pathways, it is necessary to ensure that all exposure pathways (for a given scenario and medium) are evaluated in a consistent manner with respect to representation of the individual and exposure duration. To ensure this consistency, some of the exposure conditions recommended in HSB RAM have been modified slightly. All URF analyses are based on exposure of an adult. The use of a "composite adult" is included for those exposure pathways for which HSB RAM recommends such an approach. The composite adult is evaluated using child parameter values for 6 years followed by adult parameter values for 24 years, giving a total exposure duration of 30 years. This approach is used for all pollutant types.

The industrial scenario involves an adult worker exposed for 20 years. All other scenarios involve a 30-year exposure duration.

The URFs involve normalizing a pollutant to unit concentration in each of the five media. Table 2.7 indicates the units of normalization.

TABLE 2.7. Media Normalization Units

<u>Medium</u>	<u>Chemicals</u>	<u>Radionuclides</u>
Soil (mass)	mg/kg	pCi/kg
Soil (area)	mg/m ²	pCi/m ²
Air	mg/m ³	pCi/m ³
Groundwater	mg/L	pCi/L
Surface water	mg/L	pCi/L

3.0 GENERATING UNIT RISK FACTORS

This section presents the methods used in generating the URFs. The general equation that describes the method used to perform the analyses using MEPAS is presented in the next section. Details of the analyses for each scenario are provided in the following sections.

3.1 METHODS FOR UNIT RISK FACTOR EVALUATION

The URFs for the HRA-EIS GIS were generated using the most current version of the MEPAS exposure assessment component, HAZDK. The general method for implementation of HAZDK is described in this section.

The URFs are evaluated using equations and parameters for each exposure pathway. The equations are structured to take advantage of the summary intake factor (SIF) concept presented in the HSBRAM report (DOE 1993). The concept of SIFs involves structuring the intake equations for each exposure pathway in such a way that pollutant-independent parameters are separated from the pollutant-specific parameters and the initial media concentration. Each exposure pathway model can then be described as the product of three factors: a media concentration, an SIF independent of pollutant, and a factor composed of all pollutant-specific parameters. As an example, the drinking water exposure pathway can be described as follows:

$$\text{Intake or Exposure} = C_{mi} \text{ PF}_{mix} \text{ SIF}_{smyx} \quad (1)$$

where Intake = average daily intake of chemical pollutants (mg/kg•d)
Exposure = total intake or exposure received over the exposure duration (pCi or hr)
 C_{mi} = concentration of pollutant i, of type y, in medium m (mg or pCi per unit quantity of medium L, kg, m³, or m²)

PF_{mix} = pollutant-specific factor for medium m, pollutant i, and exposure pathway x (units specific to analysis)

SIF_{smyx} = summary intake factor for scenario s, medium m, pollutant type y, and exposure pathway x (units specific to analysis).

The SIF values are evaluated for each toxicity type: nc (noncarcinogenic chemicals), cc (carcinogenic chemicals), and ra (radionuclides). The appropriate SIF is used for each pollutant for the exposure pathway of concern.

The program HAZDK allows the user to define SIF values for each exposure pathway. The pollutant-specific parameters are taken from the MEPAS database and combined with the SIF values and unit media concentrations to provide the unit risk factors.

The following sections define details of methods for evaluation of URFs. Section 3.1.1 identifies the methods used to estimate the health impacts from radionuclide intake or exposure evaluated by Equation (1). Section 3.1.2 provides similar information for chemicals. Sections 3.2 through 3.5 define the SIFs for each scenario (industrial, recreational, residential, and agricultural, respectively). Section 3.6 identifies pollutant-specific parameters and analyses applied to each exposure pathway.

3.1.1 Radionuclide Unit Exposure Risk Health Impact Analysis

The average daily intake and lifetime radiation doses are used to estimate the URFs for the health impact measure appropriate to the pollutant. The cancer incidence risk for radionuclides is evaluated as follows for inhalation exposure pathways:

$$URF_{ih} = Intake_{ih} SF_{ih} \quad (2)$$

The following equation is used to evaluate cancer incidence risk for the ingestion exposure pathways:

$$URF_{ig} = Intake_{ig} SF_{ig} \quad (3)$$

- where URF_{ih} = unit risk factor for an inhalation pathway for radionuclide i (risk per unit medium concentration)
- URF_{ig} = unit risk factor for an ingestion pathway for radionuclide i (risk per unit medium concentration)
- $Intake_{ih}$ = inhalation intake for radionuclide i for the inhalation pathway of interest (pCi)
- $Intake_{ig}$ = ingestion intake for radionuclide i for the ingestion pathway of interest (pCi)
- SF_{ih} = inhalation slope factor for radionuclide i (risk/pCi)
- SF_{ig} = ingestion slope factor for radionuclide i (risk/pCi).

For exposure pathways involving external radiation exposure, the URFs are evaluated as follows:

$$URF_{ix} = Exposure_{ix} SF_{ix} \quad (4)$$

- where URF_{ix} = unit risk factor for an external radiation exposure pathway for radionuclide i (risk per unit medium concentration)
- $Exposure_{ix}$ = exposure time for radionuclide i for the external radiation exposure pathway of interest (hr)
- SF_{ix} = external exposure slope factor for radionuclide i (risk/hr per pCi/unit medium quantity).

The external slope factors provided in HEAST (EPA 1993) are for use with contaminated soil (pCi/kg soil). For external exposure to air and water, slope factors are generated from radiation dose factors and the default health effects conversion factor of $6.2E-4$ risk per rem. For example, the air-immersion effective slope factor is evaluated as follows:

$$SF_{ia} = 6.2E-4 DF_{ia} \quad (5)$$

where SF_{ia} = air immersion slope factor for radionuclide i (risk/hr per pCi/m³)

DF_{ia} = air immersion dose rate factor for radionuclide i (rem/hr per pCi/m³)

$6.2E-4$ = cancer incidence conversion factor (risk/rem).

3.1.2 Chemical Unit Risk Factor Health Impact Analysis

The intake parameter for chemical exposures is the average daily intake for a chemical by either ingestion or inhalation. For carcinogenic chemicals the intake is the average over the lifetime of the individual (70 years), and for noncarcinogenic chemicals it is the average over the exposure duration (20 years for the industrial scenario and 30 years for other scenarios). The lifetime risk of cancer incidence from chemical-ingestion exposures is evaluated as follows:

$$URF_{ig} = Intake_{ig} SF_{ig} \quad (6)$$

where URF_{ig} = unit risk factor for chemical carcinogen i from an ingestion exposure pathway g (risk/unit medium concentration)

$Intake_{ig}$ = average daily intake of chemical i from ingestion pathway g (mg/kg/d)

SF_{ig} = ingestion slope factor for chemical i (risk per mg/kg/d).

The lifetime cancer incidence risk for inhalation is evaluated in a similar manner as follows:

$$URF_{ih} = Intake_{ih} SF_{ih} \quad (7)$$

where URF_{ih} = unit risk factor for chemical carcinogen i from an inhalation exposure pathway h (risk/unit medium concentration)

$Intake_{ih}$ = average daily intake of chemical i from inhalation pathway h (mg/kg/d)

SF_{ih} = inhalation slope factor for chemical i (risk per mg/kg/d).

The health impact parameter for noncarcinogenic chemicals is the hazard index, evaluated as follows for ingestion pathways:

$$URF_{ig} = Intake_{ig} / RfD_{ig} \quad (8)$$

where URF_{ig} = unit risk factor for chemical noncarcinogen i from an ingestion exposure pathway g (hazard index/unit medium concentration)

$Intake_{ig}$ = average daily intake of chemical i from ingestion pathway g (mg/kg/d)

RfD_{ig} = ingestion reference dose for chemical i (mg/kg/d).

The hazard index for inhalation is evaluated in a similar manner as follows:

$$URF_{ih} = Intake_{ih} / RfD_{ih} \quad (9)$$

where URF_{ih} = unit risk factor for chemical noncarcinogen i from an inhalation exposure pathway h (hazard index/unit medium concentration)

$Intake_{ih}$ = average daily intake of chemical i from inhalation pathway h (mg/kg/d)

RfD_{ih} = inhalation reference dose for chemical i (mg/kg/d).

Dermal exposures are evaluated as equivalent to ingestion exposures with correction for the fractional absorption of the chemical in the gastrointestinal tract. This correction is indicated in Section 3.6 in the definition of the pollutant-specific factors (PFs).

3.2 INDUSTRIAL SCENARIO SUMMARY INTAKE FACTOR EVALUATION

The industrial exposure scenario is based on worker exposures over a 20-year exposure duration. All pathways for this scenario are, therefore, evaluated for continuous exposure for 20 years to a worker with a body weight of 70 kg. Evaluation of the URFs for the industrial scenario is described in the following sections for each exposure pathway for each medium.

3.2.1 Medium: Soil (mass)

Existing contamination in soil is represented by pollutant concentrations defined per unit mass of soil. Unit risk factors for this medium (soil per unit mass) are evaluated for four exposure pathways: ingestion of soil, dermal contact with soil, inhalation of suspended soil, and external dose from soil.

The soil-ingestion pathway is evaluated for a daily soil-ingestion rate of 50 mg/d with exposure occurring 146 days per year. The soil dermal contact pathway is evaluated for one contact event per day, a skin contact area of 5000 cm², a soil adherence factor of 0.2 mg/cm², and exposure occurring 146 days per year. Resuspension of soil with subsequent inhalation is evaluated using the mass-loading method with an assumed soil air concentration of 50 $\mu\text{m}/\text{m}^3$. The inhalation rate is set to 20 m³/d and exposure is assumed to occur 250 days per year (consistent with the HSB RAM air-inhalation pathway). External exposure is assumed to occur 8 hours a day for 146 days per year for 20 years. A shielding factor of 0.8 is applied as per HSB RAM recommendations. The SIF values for these pathways are presented in Table 3.1 for each pollutant type.

TABLE 3.1. Industrial Scenario Summary Intake Factors: Soil (mass)

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Soil: ingestion	NC	2.86E-7	kg/(kg d)
	CC	8.16E-8	kg/(kg d)
	RA	1.46E-1	kg
Soil: dermal	NC	5.71E-6	kg/(kg d)
	CC	1.63E-6	kg/(kg d)
	RA	2.92E+0	kg
Soil: resuspension	NC	9.79E-9	kg/(kg d)
	CC	2.80E-9	kg/(kg d)
	RA	5.00E-3	kg
Soil: external	RA	1.87E+4	h

(a) NC = noncarcinogenic chemicals
 CC = carcinogenic chemicals
 RA = radionuclides

3.2.2 Medium: Soil (area)

Contamination deposited onto soil from atmospheric transport and deposition is modeled as a concentration per unit area of soil. The URFs for this medium are evaluated for the same pathways as the soil per unit mass medium analyses.

The exposure parameters are the same as those defined for the soil (mass) medium, except for the resuspension pathway. This pathway is evaluated using the resuspension factor approach. However, the analysis is set up to give an air concentration (of soil) equivalent to 50 $\mu\text{m}/\text{m}^3$ above a contaminated area with uniform distribution of material in soil to a depth of 4 cm with a soil density of 1.5 g/cm^3 . The effective resuspension factor is $8.33\text{E}-10 \text{ m}^{-1}$. The SIF values for each pathway for this medium are given in Table 3.2 for each pollutant type.

TABLE 3.2. Industrial Scenario Summary Intake Factors: Soil (area)

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Soil: ingestion	NC	4.76E-9	m ² /(kg d)
	CC	1.36E-9	m ² /(kg d)
	RA	2.44E-3	m ²
Soil: dermal	NC	9.52E-8	m ² ev/(kg d)
	CC	2.72E-8	m ² ev/(kg d)
	RA	4.87E-2	m ² ev
Soil: resuspension	NC	1.63E-10	m ² /(kg d)
	CC	4.66E-11	m ² /(kg d)
	RA	8.34E-5	m ²
Soil: external	RA	1.87E+4	h

(a) NC = noncarcinogenic chemicals
 CC = carcinogenic chemicals
 RA = radionuclides

3.2.3 Medium: Air

The URF evaluation for air as the contaminated medium is based on a constant air concentration over the exposure duration of 20 years. Exposure pathways considered are air inhalation and external dose from air (radionuclides only). The air inhalation rate is set to 20 m³ for a worker and external exposure occurs for 8 hours per day. Inhalation occurs 250 days per year and external exposure occurs for 146 days per year. The SIF values for each pathway for this medium are given in Table 3.3 for each pollutant type.

TABLE 3.3. Industrial Scenario Summary Intake Factors: Air

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Inhalation	NC	1.96E-1	m ³ /(kg d)
	CC	5.59E-2	m ³ /(kg d)
	RA	1.00E+5	m ³
Air external dose	RA	2.34E+4	hr

(a) NC = noncarcinogenic chemicals
 CC = carcinogenic chemicals
 RA = radionuclides

3.2.4 Medium: Groundwater

Use of contaminated groundwater in the industrial area includes drinking water and showering for 250 days per year. The exposure pathways involved in these uses are drinking water, dermal absorption of shower-water, ingestion of shower water, and indoor inhalation of volatile compounds. Workers are assumed to drink 1 L of contaminated water and take 1 shower of 10-min duration per day. The inhalation rate is 20 m³/d, and the indoor air volatilization factor is 0.5 for volatile chemicals and 0.1 for Rn222. Dermal exposure is evaluated for a skin area of 20,000 cm² and inadvertent ingestion involves intake of 0.01 L per shower. The SIF values for this medium are the same as those given in Table 3.4 for each pollutant type and exposure pathway.

TABLE 3.4. Industrial Scenario Summary Intake Factors: Groundwater and Surface Water

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Water ingestion	NC	9.79E-3	L/(kg d)
	CC	2.80E-3	L/(kg d)
	RA	5.00E+3	L
Dermal absorption of water	NC	3.33E-2	L h/(kg d cm)
	CC	9.51E-3	L h/(kg d cm)
	RA	1.70E+4	l h/cm
Ingestion of shower water	NC	9.98E-5	L/(kg d)
	CC	2.85E-5	L/(kg d)
	RA	5.10E+1	L
Indoor inhalation	NC	9.79E-2	L/(kg d)
	CC	2.80E-2	L/(kg d)
	RA	1.00E+4	L

(a) NC = noncarcinogenic chemicals
 CC = carcinogenic chemicals
 RA = radionuclides

3.2.5 Medium: Surface Water

Uses of contaminated surface water in the industrial area are the same as those for groundwater, i.e., drinking water and showering for 250 days per year. The SIF values for this medium are the same as those given in Table 3.4 for each pollutant type and exposure pathway.

3.3 RECREATIONAL SCENARIO SUMMARY INTAKE FACTOR EVALUATION

The recreational exposure scenario is based on exposure of an adult over a 30-year exposure duration. Some of the pathways are evaluated based on exposure of an adult for 30 years while some are based on exposure of a child for 6 years and an adult for 24 years. Evaluation of URFs for the recreational scenario is described in the following sections for each exposure pathway for each medium.

3.3.1 Medium: Soil (mass)

Unit risk factors for this medium (soil per unit mass) are evaluated for four exposure pathways: ingestion of soil, dermal contact with soil, resuspension and inhalation of soil, and external dose from soil. Exposure occurs 7 days per year for 30 years.

The soil-ingestion pathway is evaluated for a daily soil-ingestion rate of 200 mg/d for a child (6 years) and 100 mg/d for an adult (24 years). The soil dermal contact pathway is evaluated for one contact event per day, a skin contact area of 2500 cm² for a child (6 years) and 5000 cm² for an adult (24 years), and a soil adherence factor of 0.2 mg/cm². Resuspension of soil with subsequent inhalation is evaluated using the mass-loading method with an assumed soil/air concentration of 50 µm/m³. The inhalation rate is set to 20 m³/d, and the exposure duration is 30 years (as an adult). External exposure is assumed to occur 8 hours a day. A shielding factor of 0.8 is applied as per HSB RAM recommendations. The SIF values for this medium are given in Table 3.5 for each pollutant type and exposure pathway.

TABLE 3.5. Recreational Scenario Summary Intake Factors: Soil (mass)

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Soil: ingestion	NC	6.98E-8	kg/(kg d)
	CC	3.00E-8	kg/(kg d)
	RA	2.52E-2	kg
Soil: dermal absorption	NC	3.39E-7	kg/(kg d)
	CC	1.45E-7	kg/(kg d)
	RA	1.89E-1	kg
Soil: resuspension	NC	3.39E-10	kg/(kg d)
	CC	1.45E-10	kg/(kg d)
	RA	1.89E-4	kg
Soil: external	RA	1.34E+3	h

(a) NC = noncarcinogenic chemicals
CC = carcinogenic chemicals
RA = radionuclides

3.3.2 Medium: Soil (area)

Contamination deposited onto soil from atmospheric transport and deposition is modeled as a concentration per unit area of soil. The recreational scenario URFs for this medium are evaluated for the same pathways as the soil-per-unit-mass medium analyses.

The exposure parameters are the same as those defined for the soil (mass) medium, except for the resuspension pathway. This pathway is evaluated using the resuspension factor approach with the analysis set up to give an air concentration equivalent to $50 \mu\text{m}/\text{m}^3$ of soil in air. The effective resuspension factor is $8.33\text{E}-10 \text{ m}^{-1}$. The SIF values for each pathway for this medium are given in Table 3.6 for each pollutant type.

TABLE 3.6. Recreational Scenario Summary Intake Factors: Soil (area)

Exposure Pathway	Type ^(a)	SIF Value	Units
Soil: ingestion	NC	1.17E-9	$\text{m}^2/(\text{kg d})$
	CC	5.00E-10	$\text{m}^2/(\text{kg d})$
	RA	4.20E-4	m^2
Soil: dermal	NC	5.66E-9	$\text{m}^2 \text{ ev}/(\text{kg d})$
	CC	2.43E-9	$\text{m}^2 \text{ ev}/(\text{kg d})$
	RA	3.15E+3	$\text{m}^2 \text{ ev}$
Soil: resuspension	NC	4.57E-12	$\text{m}^2/(\text{kg d})$
	CC	1.96E-12	$\text{m}^2/(\text{kg d})$
	RA	3.50E-6	m^2
Soil: external	RA	1.35E+3	h

(a) NC = noncarcinogenic chemicals
CC = carcinogenic chemicals
RA = radionuclides

3.3.3 Medium: Air

The recreational scenario URF evaluation for air as the contaminated medium is based on a constant air concentration over the exposure duration of 30 years. Exposure pathways considered are air inhalation and external dose

from air (radionuclides only). The air inhalation rate is set to 20 m³ for an adult, and external exposure occurs for 24 hours per day. Inhalation and external exposure occurs for 7 days per year. The SIF values for each pathway for this medium are given in Table 3.7 for each pollutant type.

TABLE 3.7. Recreational Scenario Summary Intake Factors: Air

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Inhalation	NC	1.96E-1	m ³ /(kg d)
	CC	5.59E-2	m ³ /(kg d)
	RA	1.00E+5	m ³
Air external dose	RA	2.34E+4	hr

(a) NC = noncarcinogenic chemicals
 CC = carcinogenic chemicals
 RA = radionuclides

3.3.4 Medium: Groundwater

Use of contaminated groundwater in recreational activities includes drinking water and showering 7 days per year. The exposure pathways involved in these uses are drinking water, dermal absorption of shower water, ingestion of shower water, and indoor inhalation of volatile compounds. Individuals are assumed to drink 2 L of contaminated water and take 1 shower of 10-min duration per day. The inhalation rate is 20 m³/d, and the indoor air volatilization factor is 0.5 for volatile chemicals and 0.1 for Rn222. Dermal exposure is evaluated for a skin area of 20,000 cm², and inadvertent ingestion involves intake of 0.01 L per shower. The SIF values for each pathway for this medium are given in Table 3.8 for each pollutant type.

TABLE 3.8. Recreational Scenario Summary Intake Factors: Groundwater

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Water: ingestion	NC	5.49E-4	L/(kg d)
	CC	2.35E-4	L/(kg d)
	RA	4.21E+2	L
Water: dermal absorption	NC	9.33E-4	L h/(kg d cm)
	CC	4.00E-4	L h/(kg d cm)
	RA	7.15E+2	L h/cm
Ingestion of shower water	NC	4.66E-7	L/(kg d)
	CC	2.00E-7	L/(kg d)
	RA	3.58E-1	L
Indoor inhalation	NC	2.74E-2	L/(kg d)
	CC	1.18E-3	L/(kg d)
	RA	4.21E+2	L

(a) NC = noncarcinogenic chemicals
 CC = carcinogenic chemicals
 RA = radionuclides

3.3.5 Medium: Surface Water

Unit risk factors for surface water are evaluated in the recreational scenario for ingesting drinking water and ingesting fish and exposure related to aquatic recreational activities (swimming, boating, and shoreline activities). Drinking water ingestion and recreational activities are assumed to occur 7 days per year and fish ingestion is assumed to occur 365 days per year. The exposed individual is assumed to drink 2 L of contaminated water per day. The exposure time for each recreational activity is 2.6 hr/d (boating, swimming, and shoreline activities). Dermal exposure while swimming is evaluated for a skin area of 20,000 cm². Dermal exposure to shoreline sediment is evaluated for a skin area of 2500 cm² (6 years as a child) and 5000 cm² (24 years as an adult). Inadvertent ingestion of shoreline sediment is based on an ingestion rate of 200 mg/d for 6 years (child) and 100 mg/d for 24 years (adult). The exposed individual catches enough fish from the contaminated surface water body to ingest 27 g/d edible fish each day of the year.

The SIF values for each pathway for this medium are given in Table 3.9 for each pollutant type.

TABLE 3.9. Recreational Scenario Summary Intake Factors: Surface Water

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Water ingestion	NC	5.49E-4	L/(kg d)
	CC	2.35E-4	L/(kg d)
	RA	4.21E+2	L
Fish ingestion	NC	3.86E-4	L/(kg d)
	CC	1.65E-4	L/(kg d)
	RA	2.96E+2	L
Swimming: dermal absorption	NC	1.43E-2	L h/(kg d cm)
	CC	6.11E-3	L h/(kg d cm)
	RA	1.09E+4	L h/cm
Swimming: water ingestion	NC	7.13E-5	L/(kg d)
	CC	3.06E-5	L/(kg d)
	RA	5.47E+1	L
Swimming: external dose	RA	5.47E+2	h
Shoreline: dermal absorption	NC	3.39E-7	kg ev/(kg d)
	CC	1.45E-7	kg ev/(kg d)
	RA	2.50E-2	kg
Shoreline: sediment ingestion	NC	6.98E-8	kg/(kg d)
	CC	2.99E-8	kg/(kg d)
	RA	2.52E-2	kg
Shoreline: external dose	RA	2.74E+2	h
Boating: external dose	RA	1.09E+2	h

(a) NC = noncarcinogenic chemicals
 CC = carcinogenic chemicals
 RA = radionuclides

3.4 RESIDENTIAL SCENARIO SUMMARY INTAKE FACTOR EVALUATION

The residential exposure scenario is based on exposures over a 30-year exposure duration to an individual residing onsite. The individual is assumed to consume homegrown vegetables and fruit 356 days per year and to be involved in aquatic recreational activities 7 days per year. Fish from surface water are also caught and consumed. Evaluation of URFs for the residential scenario is described in the following sections for each exposure pathway for each medium.

3.4.1 Medium: Soil (mass)

Exposure pathways included for soil (per unit mass) are soil ingestion, soil dermal absorption, soil resuspension and inhalation, and external exposure to ground contamination.

The soil-ingestion pathway is evaluated for a daily soil-ingestion rate of 200 mg/d for a child (6 years) and 100 mg/d for an adult (24 years). The soil-dermal contact pathway is evaluated for one contact event per day, a skin contact area of 2500 cm² for a child (6 years) and 5000 cm² for an adult (24 years), AND a soil adherence factor of 0.2 mg/cm². Resuspension of soil with subsequent inhalation is evaluated using the mass-loading method with an assumed soil/air concentration of 50 $\mu\text{m}/\text{m}^3$. The inhalation rate is set to 20 m³/d and the exposure duration is 30 years (as an adult). External exposure is assumed to occur 24 hours a day. A shielding factor of 0.8 is applied as per HSB RAM recommendations. All pathways occur 365 days per year, except soil dermal contact, which occurs only 180 days per year.

The SIF values for this medium are given in Table 3.10 for each pollutant type and exposure pathway.

TABLE 3.10. Residential Scenario Summary Intake Factors: Soil (mass)

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Soil: ingestion	NC	3.64E-6	kg/(kg d)
	CC	1.56E-6	kg/(kg d)
	RA	1.32E+0	kg
Soil: dermal absorption	NC	8.71E-6	kg/(kg d)
	CC	3.73E-6	kg/(kg d)
	RA	4.86E+0	kg
Soil: resuspension	NC	1.43E-8	kg/(kg d)
	CC	6.12E-9	kg/(kg d)
	RA	1.10E-2	kg
Soil: external	RA	2.10E+5	h

(a) NC = noncarcinogenic chemicals
 CC = carcinogenic chemicals
 RA = radionuclides

3.4.2 Medium: Soil (area)

Contamination deposited onto soil from atmospheric transport and deposition is modeled as a concentration per unit area of soil. The residential scenario URFs for this medium are evaluated for the same pathways as the soil per unit mass medium analyses and fruit and vegetable ingestion.

The exposure parameters are the same as those defined for the soil (mass) medium, except for the resuspension pathway. This pathway is evaluated using the resuspension factor approach with the analysis set up to give an air concentration equivalent to $50 \mu\text{m}/\text{m}^3$ of soil in air. The effective resuspension factor is $8.33\text{E}-10 \text{ m}^{-1}$. The vegetable ingestion pathway is modelled in the HAZDK analyses as "leafy vegetables" with an ingestion rate of 80 g/d (as recommended in HSBAM). The fruit ingestion pathway is modelled in the HAZDK analyses as "other vegetables" with an ingestion rate of 42 g/d (as recommended in HSBAM). The SIF values for this medium are given in Table 3.11 for each pathway for each pollutant type.

TABLE 3.11. Residential Scenario Summary Intake Factors: Soil (area)

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Soil: ingestion	NC	6.07E-8	m ² /(kg d)
	CC	2.60E-8	m ² /(kg d)
	RA	2.19E-2	m ²
Soil: dermal	NC	1.45E-7	m ² ev/(kg d)
	CC	6.22E-8	m ² ev/(kg d)
	RA	8.10E-2	m ² ev
Soil: resuspension and ingestion	NC	2.38E-10	m ² /(kg d)
	CC	1.02E-10	m ² /(kg d)
	RA	1.83E-4	m ²
Vegetable: ingestion	NC	1.14E-3	kg/(kg d)
	CC	4.90E-4	kg/(kg d)
	RA	8.77E+2	kg
Fruit: ingestion	NC	6.00E-4	kg/(kg d)
	CC	2.57E-4	kg/(kg d)
	RA	4.60E+2	kg
Soil: external	RA	2.10E+5	h

(a) NC = noncarcinogenic chemicals
 CC = carcinogenic chemicals
 RA = radionuclides

3.4.3 Medium: Air

Unit risk factors for air are evaluated for inhalation, external exposure from submersion in cloud, and consumption of fruits and vegetables. The air inhalation rate is set to 20 m³ for an adult and external exposure is assumed to occur for 24 hours per day. Inhalation and external exposure occurs for 365 days per year. The vegetable ingestion pathway is modelled in the HAZDK analyses as "leafy vegetables" with an ingestion rate of 80 g/d (as recommended in HSB RAM). The fruit ingestion pathway is modelled in the HAZDK analyses as "other vegetables" with an ingestion rate of 42 g/d (as recommended in HSB RAM). All pathways occur 365 days per year, except soil dermal

contact which occurs only 180 days per year. The SIF values for each pathway for this medium are given in Table 3.12 for each pollutant type.

TABLE 3.12. Residential Scenario Summary Intake Factors: Air

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Inhalation	NC	2.86E-1	m ³ /(kg d)
	CC	1.22E-1	m ³ /(kg d)
	RA	2.19E+5	m ³
Air external dose	RA	2.63E+5	hr
Vegetable ingestion	NC	1.14E-3	kg/(kg d)
	CC	4.90E-4	kg/(kg d)
	RA	8.77E+2	kg
Fruit ingestion	NC	6.00E-4	kg/(kg d)
	CC	2.57E-4	kg/(kg d)
	RA	4.60E+2	kg

(a) NC = noncarcinogenic chemicals
 CC = carcinogenic chemicals
 RA = radionuclides

3.4.4 Medium: Groundwater

Use of contaminated groundwater in the residential scenario includes drinking water, showering, and ingesting fruits and vegetables 365 days per year. The exposure pathways involved in these uses are drinking water, dermal absorption of shower water, ingestion of shower water, indoor inhalation of volatile compounds, and ingestion of homegrown fruit and vegetables. Individuals are assumed to drink 2 L of contaminated water and take 1 shower of 10-min duration per day. The inhalation rate is 15 m³/d and the indoor air volatilization factor is 0.5 for volatile chemicals and 0.1 for Rn222. Dermal exposure is evaluated for a skin area of 20,000 cm² and inadvertent ingestion involves intake of 0.01 L of water per shower. The vegetable ingestion pathway is modelled in the HAZDK analyses as "leafy vegetables" with an ingestion rate of 80 g/d (as recommended in HSBAM). The fruit ingestion

pathway is modelled as "other vegetables" with an ingestion rate of 42 g/d. All pathways occur 365 days per year. The SIF values for each pathway for this medium are given in Table 3.13 for each pollutant type.

TABLE 3.13. Residential Scenario Summary Intake Factors: Groundwater

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Water: ingestion	NC	2.86E-2	L/(kg d)
	CC	1.22E-2	L/(kg d)
	RA	2.19E+4	L
Water: dermal absorption	NC	4.86E-2	L h/(kg d cm)
	CC	2.08E-2	L h/(kg d cm)
	RA	3.73E+4	L h/cm
Shower water: ingestion	NC	1.46E-4	L/(kg d)
	CC	6.24E-5	L/(kg d)
	RA	1.12E+2	L
Indoor inhalation	NC	1.07E-1	L/(kg d)
	CC	4.59E-2	L/(kg d)
	RA	1.64E+4	L
Vegetable ingestion	NC	1.14E-3	kg/(kg d)
	CC	4.90E-4	kg/(kg d)
	RA	8.77E+2	kg
Fruit ingestion	NC	6.00E-4	kg/(kg d)
	CC	2.57E-4	kg/(kg d)
	RA	4.60E+2	kg

(a) NC = noncarcinogenic chemicals
 CC = carcinogenic chemicals
 RA = radionuclides

3.4.5 Medium: Surface Water

Unit risk factors for surface water are evaluated in the residential scenario for ingesting drinking water and fish, showering, exposure related to aquatic recreational activities, and ingesting fruit and vegetables. All exposure pathways are assumed to occur 365 days per year except recreational pathways that occur 7 days per year. The exposed individual is assumed to

drink 2 L of contaminated water per day. The inhalation rate is 15 m³/d, and the indoor air volatilization factor is 0.5 for volatile chemicals and 0.1 for Rn222. Dermal exposure is evaluated for a skin area of 20,000 cm², and inadvertent ingestion involves intake of 0.01 L of water per shower. The exposure time for each recreational activity is 2.6 hr/d (boating, swimming, and shoreline activities). Dermal exposure while swimming is evaluated for a skin area of 20,000 cm². Dermal exposure to shoreline sediment is evaluated for a skin area of 2500 cm² (6 years as a child) and 5000 cm² (24 years as an adult). Inadvertent ingestion of shoreline sediment is based on an ingestion rate of 200 mg/d for 6 years (child) and 100 mg/d for 24 years (adult). The vegetable ingestion pathway is modelled in the HAZDK analyses as "leafy vegetables" with an ingestion rate of 80 g/d (as recommended in HSB RAM). The fruit ingestion pathway is modelled as "other vegetables" with an ingestion rate of 42 g/d. The exposed individual catches enough fish from the contaminated surface-water body to ingest 27 g/d edible fish each day of the year.

The SIF values for each pathway for this medium are given in Table 3.14 for each pollutant type.

TABLE 3.14. Residential Scenario Summary Intake Factors: Surface Water

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Water ingestion	NC	2.86E-2	L/(kg d)
	CC	1.22E-2	L/(kg d)
	RA	2.19E+4	L
Water: dermal absorption	NC	4.86E-2	L h/(kg d cm)
	CC	2.08E-2	L h/(kg d cm)
	RA	3.73E+4	L h/cm
Shower water: ingestion	NC	1.46E-4	L/(kg d)
	CC	6.24E-5	L/(kg d)
	RA	1.12E+2	L
Indoor inhalation	NC	1.07E-1	L/(kg d)
	CC	4.59E-2	L/(kg d)
	RA	1.64E+4	L

TABLE 3.14. (contd)

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Fish ingestion	NC	3.86E-4	L/(kg d)
	CC	1.65E-4	L/(kg d)
	RA	2.96E+2	L
Swimming: dermal absorption	NC	1.43E-2	L h/(kg d cm)
	CC	6.11E-3	L h/(kg d cm)
	RA	1.09E+4	L h/cm
Swimming: water ingestion	NC	7.13E-5	L/(kg d)
	CC	3.06E-5	L/(kg d)
	RA	5.47E+1	L
Swimming: external dose	RA	5.47E+2	h
Shoreline: dermal absorption	NC	3.39E-7	kg ev/(kg d)
	CC	1.45E-7	kg ev/(kg d)
	RA	2.50E-2	kg ev
Shoreline: sediment ingestion	NC	6.98E-8	kg/(kg d)
	CC	2.99E-8	kg/(kg d)
	RA	2.52E-2	kg
Shoreline: external dose	RA	1.09E+2	h
Boating: external dose	RA	2.74E+2	h
Vegetable ingestion	NC	1.14E-3	kg/(kg d)
	CC	4.90E-4	kg/(kg d)
	RA	8.77E+2	kg
Fruit ingestion	NC	6.00E-4	kg/(kg d)
	CC	2.57E-4	kg/(kg d)
	RA	4.60E+2	kg

(a) NC = noncarcinogenic chemicals
 CC = carcinogenic chemicals
 RA = radionuclides

3.5 AGRICULTURAL SCENARIO SUMMARY INTAKE FACTOR EVALUATION

The agricultural exposure scenario is based on exposures over a 30-year exposure duration. Evaluation of URFs for the agricultural scenario is described in the following sections for each exposure pathway for each medium.

3.5.1 Medium: Soil (mass)

The agricultural scenario exposure pathways for soil (per unit mass) are soil ingestion, soil dermal absorption, soil resuspension and inhalation, and external exposure to ground contamination.

The soil ingestion pathway is evaluated for a soil ingestion rate of 200 mg/d for a child (6 years) and 100 mg/d for an adult (24 years). The soil dermal contact pathway is evaluated for one contact event per day, a skin contact area of 2500 cm² for a child (6 years) and 5000 cm² for an adult (24 years), a soil adherence factor of 0.2 mg/cm². Resuspension of soil with subsequent inhalation is evaluated using the mass-loading method with an assumed soil/air concentration of 50 $\mu\text{m}/\text{m}^3$. The inhalation rate is set to 20 m³/d, and the exposure duration is 30 years (as an adult). External exposure is assumed to occur 24 hours a day. A shielding factor of 0.8 is applied as per HSB RAM recommendations. All pathways occur 365 days per year, except soil dermal contact, which occurs only 180 days per year.

The SIF values for this medium are given in Table 3.15 for each pollutant type and exposure pathway.

TABLE 3.15. Agricultural Scenario Summary Intake Factors: Soil (mass)

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Soil: ingestion	NC	3.64E-6	kg/(kg d)
	CC	1.56E-6	kg/(kg d)
	RA	1.32E+0	kg
Soil: dermal absorption	NC	8.71E-6	kg/(kg d)
	CC	3.73E-6	kg/(kg d)
	RA	4.86E+0	kg
Soil: resuspension and inhalation	NC	1.43E-8	kg/(kg d)
	CC	6.12E-9	kg/(kg d)
	RA	1.10E-2	kg
Soil: external	RA	2.10E+5	h

(a) NC = noncarcinogenic chemicals
 CC = carcinogenic chemicals
 RA = radionuclides

3.5.2 Medium: Soil (area)

Contamination deposited onto soil from atmospheric transport and deposition is modeled as a concentration per unit area of soil. The agricultural scenario URFs for this medium are evaluated for the same pathways as the soil per unit mass medium analyses plus ingestion of fruit, vegetables, meat, and milk.

The exposure parameters are the same as those defined for the soil (mass) medium, except for the resuspension pathway. This pathway is evaluated using the resuspension factor approach with the analysis set up to give an air concentration equivalent to $50 \mu\text{m}/\text{m}^3$ of soil in air. The effective resuspension factor is $8.33\text{E}-10 \text{ m}^{-1}$. The vegetable ingestion pathway is modelled in the HAZDK analyses as "leafy vegetables" with an ingestion rate of 80 g/d (as recommended in HSB RAM). The fruit ingestion pathway is modelled as "other vegetables" with an ingestion rate of 42 g/d. The SIF values for each pathway for this medium are given in Table 3.16 for each pollutant type.

TABLE 3.16. Agricultural Scenario Summary Intake Factors: Soil (area)

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Soil: ingestion	NC	6.07E-8	m ² /(kg d)
	CC	2.60E-8	m ² /(kg d)
	RA	2.19E-2	m ²
Soil: dermal	NC	1.45E-7	m ² ev/(kg d)
	CC	6.22E-8	m ² ev/(kg d)
	RA	8.10E-2	m ² ev
Soil: resuspension	NC	2.38E-10	m ² /(kg d)
	CC	1.02E-10	m ² /(kg d)
	RA	1.83E-4	m ²
Soil: external	RA	2.10E+5	h
Vegetable ingestion	NC	1.14E-3	kg/(kg d)
	CC	4.90E-4	kg/(kg d)
	RA	8.77E+2	kg
Fruit ingestion	NC	6.00E-4	kg/(kg d)
	CC	2.57E-4	kg/(kg d)
	RA	4.60E+2	kg
Meat ingestion	NC	1.07E-3	kg/(kg d)
	CC	4.59E-4	kg/(kg d)
	RA	8.22E+2	kg
Milk ingestion	NC	4.29E-3	L/(kg d)
	CC	1.84E-3	L/(kg d)
	RA	3.29E+3	L

(a) NC = noncarcinogenic chemicals
 CC = carcinogenic chemicals
 RA = radionuclides

3.5.3 Medium: Air

Agricultural scenario URFs for air are evaluated for inhalation, external exposure from submersion in a cloud, and consumption of fruits, vegetables, meat, and milk. The air inhalation rate is set to 20 m³ for an adult and external exposure occurs for 24 hours per day. Inhalation and external exposure occurs for 365 days per year. The vegetable ingestion

pathway is modelled in the HAZDK analyses as "leafy vegetables" with an ingestion rate of 80 g/d (as recommended in HSB RAM). The fruit ingestion pathway is modelled as "other vegetables" with an ingestion rate of 42 g/d. The ingestion rate for meat is 75 g/d, and the ingestion rate for milk is 300 g/d. All pathways occur 365 days per year, except soil dermal contact which occurs only 180 days per year. The SIF values medium are given in Table 3.17 for each pathway for this for each pollutant type.

TABLE 3.17. Agricultural Scenario Summary Intake Factors: Air

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Inhalation	NC	2.86E-1	m ³ /(kg d)
	CC	1.22E-1	m ³ /(kg d)
	RA	2.19E+5	m ³
Air external dose	RA	2.63E+5	hr
Vegetable ingestion	NC	1.14E-3	kg/(kg d)
	CC	4.90E-4	kg/(kg d)
	RA	8.77E+2	kg
Fruit ingestion	NC	6.00E-4	kg/(kg d)
	CC	2.57E-4	kg/(kg d)
	RA	4.60E+2	kg
Meat ingestion	NC	1.07E-3	kg/(kg d)
	CC	4.59E-4	kg/(kg d)
	RA	8.22E+2	kg
Milk ingestion	NC	4.29E-3	L/(kg d)
	CC	1.84E-3	L/(kg d)
	RA	3.29E+3	L

(a) NC = noncarcinogenic chemicals
 CC = carcinogenic chemicals
 RA = radionuclides

3.5.4 Medium: Groundwater

Use of contaminated groundwater in the agricultural scenario includes drinking water, showering, and ingesting fruits, vegetables, meat, and milk

365 days per year. The exposure pathways involved in these uses are drinking water, dermal absorption of shower water, ingestion of shower water, indoor inhalation of volatile compounds, and ingestion of homegrown fruit, vegetables, meat, and milk. Individuals are assumed to drink 2 L of contaminated water and take 1 shower of 10-min duration per day. The inhalation rate is 15 m³/d, and the indoor air volatilization factor is 0.5 for volatile chemicals and 0.1 for Rn222. Dermal exposure is evaluated for a skin area of 20,000 cm² and inadvertent ingestion involves intake of 0.01 L of water per shower. The vegetable ingestion pathway is modelled in the HAZDK analyses as "leafy vegetables" with an ingestion rate of 80 g/d (as recommended in HSB RAM). The fruit ingestion pathway is modelled as "other vegetables" with an ingestion rate of 42 g/d. The ingestion rate for meat is 75 g/d, and the ingestion rate for milk is 300 g/d. All pathways occur 365 days per year. The SIF values for each pathway for this medium are given in Table 3.18 for each pollutant type.

TABLE 3.18. Agricultural Scenario Summary Intake Factors: Groundwater

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Water: ingestion	NC	2.86E-2	L/(kg d)
	CC	1.22E-2	L/(kg d)
	RA	2.19E+4	L
Water: dermal absorption	NC	4.89E-2	L h/(kg d cm)
	CC	2.08E-2	L h/(kg d cm)
	RA	3.73E+4	L h/cm
Shower water: ingestion	NC	1.46E-4	L/(kg d)
	CC	6.24E-5	L/(kg d)
	RA	1.12E+2	L
Indoor inhalation	RA	1.07E-1	L/(kg d)
	CC	4.59E-2	L/(kg d)
	RA	1.64E+4	L
Vegetable ingestion	NC	1.14E-3	kg/(kg d)
	CC	4.90E-4	kg/(kg d)
	RA	8.77E+2	kg
Fruit ingestion	NC	6.00E-4	kg/(kg d)
	CC	2.57E-4	kg/(kg d)
	RA	4.60E+2	kg
Meat ingestion	NC	1.07E-3	kg/(kg d)
	CC	4.59E-4	kg/(kg d)
	RA	8.22E+2	kg
Milk ingestion	NC	4.29E-3	L/(kg d)
	CC	1.84E-3	L/(kg d)
	RA	3.29E+3	L

(a) NC = noncarcinogenic chemicals
 CC = carcinogenic chemicals
 RA = radionuclides

3.5.5 Medium: Surface Water

Unit risk factors for surface water are evaluated in the agricultural scenario for ingesting drinking water and fish, showering, exposure related to aquatic recreational activities, and ingesting fruit, vegetables, meat, and

milk. All exposure pathways are assumed to occur 365 days per year except aquatic recreational pathways that occur 7 days per year.

The exposed individual is assumed to drink 2 L of contaminated water per day. The inhalation rate is 15 m³/d, and the indoor air volatilization factor is 0.5 for volatile chemicals and 0.1 for Rn222. Dermal exposure is evaluated for a skin area of 20,000 cm² and inadvertent ingestion involves intake of 0.01 L of water per shower. The exposure time for aquatic recreational activities is 2.6 hr/d each (boating, swimming, and shoreline activities). Dermal exposure while swimming is evaluated for a skin area of 20,000 cm². Dermal exposure to shoreline sediment is evaluated for a skin area of 2500 cm² (6 years as a child) and 5000 cm² (24 years as an adult). Inadvertent ingestion of shoreline sediment is based on an ingestion rate of 200 mg/d for 6 years (child) and 100 mg/d for 24 years (adult). The vegetable ingestion pathway is modelled in the HAZDK analyses as "leafy vegetables" with an ingestion rate of 80 g/d (as recommended in HSB RAM). The fruit ingestion pathway is modelled as "other vegetables" with an ingestion rate of 42 g/d. The ingestion rate for meat is 75 g/d, and the ingestion rate for milk is 300 g/d. The exposed individual catches enough fish from the contaminated surface-water body to ingest 27 g/d edible fish each day of the year. The SIF values for each pathway for this medium are given in Table 3.19 for each pollutant type.

TABLE 3.19. Agricultural Scenario Summary Intake Factors: Surface Water

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Water ingestion	NC	2.86E-2	L/(kg d)
	CC	1.22E-2	L/(kg d)
	RA	2.19E+4	L
Water: dermal absorption	NC	4.86E-2	L h/(kg d cm)
	CC	2.08E-2	L h/(kg d cm)
	RA	3.73E+4	L
Shower water: ingestion	NC	1.46E-4	L/(kg d)
	CC	6.24E-5	L/(kg d)
	RA	1.12E+2	L
Indoor inhalation	NC	1.07E-1	L/(kg d)
	CC	4.59E-2	L/(kg d)
	RA	1.64E+4	L
Fish ingestion	NC	3.86E-4	L/(kg d)
	CC	1.65E-4	L/(kg d)
	RA	2.96E+2	L
Swimming: dermal absorption	NC	1.43E-2	L h/(kg d cm)
	CC	6.11E-3	L h/(kg d cm)
	RA	1.09E+4	L h/cm
Swimming: water ingestion	NC	7.13E-5	L/(kg d)
	CC	3.06E-5	L/(kg d)
	RA	5.47E+1	L
Swimming: external dose	RA	5.47E+2	h
Shoreline: dermal absorption	NC	3.39E-7	kg ev/(kg d)
	CC	1.45E-7	kg ev/(kg d)
	RA	2.50E-2	kg ev
Shoreline: sediment ingestion	NC	6.98E-8	kg/(kg d)
	CC	2.99E-8	kg/(kg d)
	RA	2.52E-2	kg
Shoreline: external dose	RA	1.09 E+2	h
Boating: external dose	RA	2.74E+2	h
Vegetable ingestion	NC	1.14E-3	kg/(kg d)
	CC	4.90E-4	kg/(kg d)
	RA	8.77E+2	kg

TABLE 3.19. (contd)

<u>Exposure Pathway</u>	<u>Type^(a)</u>	<u>SIF Value</u>	<u>Units</u>
Fruit ingestion	NC	6.00E-4	kg/(kg d)
	CC	2.57E-4	kg/(kg d)
	RA	4.60E+2	kg
Meat ingestion	NC	1.07E-3	kg/(kg d)
	CC	4.59E-4	kg/(kg d)
	RA	8.22E+2	kg
Milk ingestion	NC	4.29E-3	L/(kg d)
	CC	1.84E-3	L/(kg d)
	RA	3.29E+3	L

(a) NC = noncarcinogenic chemicals
 CC = carcinogenic chemicals
 RA = radionuclides

3.6 POLLUTANT SPECIFIC PARAMETERS

The evaluation of the URFs involves multiplying the SIF times a pollutant-specific factor (PF) as indicated in Equation (1). This section discusses the PFs required for each exposure pathway. These pollutant specific parameters are evaluated the same way for all scenarios. Therefore, the exposure pathways are discussed independently of the scenarios.

3.6.1 Drinking Water Ingestion

The drinking water ingestion pathway has two pollutant-specific considerations: the water-purification factor and decay during transport from either the water pumping station or the location of domestic use. The URF calculations did not make use of the water-purification factor; i.e., the water concentration was not reduced due to treatment. The transport time was set to 0.5 day for drinking water and all domestic use analyses. The decay is evaluated as an exponential reduction in concentration during the transport period, based on the half-time for the pollutant in confined water systems (no

volatilization loss). For radionuclides the half-time is the radiological half-life.

3.6.2 Shower Dermal Contact

The shower dermal contact pathway involves dermal contact with water while showering using domestic water. The water concentration is evaluated as described for drinking water in Section 3.6.1. The daily intake estimation requires the skin permeability constant (cm/hr) to estimate the transfer from the skin surface to the blood as described in Appendix B. In addition, it is necessary to divide the intake estimate by the gastrointestinal absorption factor to convert the dermal intake to an equivalent ingestion intake. The permeability constant and the gastrointestinal absorption factor are also described in Appendix B.

3.6.3 Shower Water Ingestion

The shower water ingestion pathway involves inadvertent ingestion of water while showering using domestic water. The water concentration is evaluated as described for drinking water in Section 3.6.1. There are no other pollutant-specific parameters or considerations.

3.6.4 Leafy Vegetable Ingestion

The leafy vegetable-ingestion exposure pathway is used to represent the ingestion of home grown vegetables. The PF includes estimating the vegetable concentration from the contaminated medium of concern. This medium may be air, soil (from air deposition), or irrigation water (groundwater or surface water). The methods for estimating plant concentration from the contaminated media are presented in Whelan et al. (1987) and Droppo et al. (1989). The pollutant-specific parameters involved in this analysis are the soil-to-plant concentration ratio and the atmospheric deposition velocity. Numerical values for these parameters are presented in Appendix B for each pollutant included in the analyses.

3.6.5 Other Vegetable Ingestion

The "other vegetable" ingestion pathway represents vegetable and fruit crops for which the edible portion is not associated with the leaves of the plant. This pathway is used to represent the HSB RAM fruit-ingestion exposure pathway. As for the leafy vegetable ingestion pathway, the methods for estimation of plant concentration from the contaminated media are presented in Whelan et al. (1987) and Droppo et al. (1989). The pollutant-specific parameters are the same as for the leafy vegetable pathway and are described in Appendix B.

3.6.6 Meat Ingestion

Evaluation of URFs for the meat-ingestion pathway requires estimating pollutant concentration in meat from animals that ingested contaminated feeds and water. This pathway is used to represent the HSB RAM beef-ingestion exposure pathway. As for the leafy vegetable-ingestion pathway, the methods for estimation of meat concentration from the contaminated media are presented in Whelan et al. (1987) and Droppo et al. (1989). The pollutant-specific parameters are the soil-to-plant (animal feed) concentration ratio, the animal feed-to-meat transfer factor, and the atmospheric deposition velocity. These parameters are described in Appendix B.

3.6.7 Milk Ingestion

The milk-ingestion pathway in HAZDK is used to represent the HSB RAM dairy exposure pathway. The analysis requires estimation of pollutant concentration in cow milk, and is performed in a similar manner to the meat pathway analysis, presented in Whelan et al. (1987) and Droppo et al. (1989). The pollutant-specific parameters are the soil-to-plant (animal feed) concentration ratio, the animal feed-to-milk transfer factor, and the atmospheric deposition velocity. These parameters are described in Appendix B.

3.6.8 Fish Ingestion

The fish-ingestion pathway requires estimating the concentration of pollutants in edible portions of fish, based on the concentration in surface water. This estimation is performed using the fish bioaccumulation factor, which is the ratio of pollutant concentration in fish to that in the water. This parameter is described in Appendix B.

3.6.9 Swimming Water Ingestion

Inadvertent ingestion of water while swimming involves direct ingestion of surface water. No pollutant-specific parameters are required.

3.6.10 Swimming Dermal Contact

Direct contact with surface water while swimming will result in absorption of pollutant through the skin. The absorption estimate requires a value for the skin permeability constant for each pollutant. In addition, the intake estimate must be divided by the gastrointestinal absorption factor to convert the dermal intake to an equivalent ingestion intake. The permeability constant and the gastrointestinal absorption factor are described in Appendix B.

3.6.11 Shoreline Dermal Contact

The shoreline exposure pathways all require estimation of the pollutant concentration in sediment based on the concentration in surface water. This transfer is estimated using the model of Soldat (1974) as described in Whelan et al. (1987). This model estimates the average sediment concentration over a user-defined exposure duration. The transfer of pollutants from the sediment to the individual also requires a value for the skin absorption fraction for the pollutant. The skin absorption fraction is the fraction of pollutant on skin that is absorbed into the blood. This parameter is described in Appendix B.

3.6.12 Shoreline Sediment Ingestion

The inadvertent ingestion of sediment while participating in shoreline recreational activities requires an estimate of the shoreline sediment concentration. This is evaluated as described in Section 3.6.11. no other pollutant-specific consideration is required.

3.6.13 Soil Ingestion

Inadvertent ingestion of soil involves direct ingestion of the contaminated soil. The soil concentration is defined at the start of the exposure duration. It is necessary to account for the time variation of soil concentration due to loss by volatilization and radioactive decay. The volatilization loss is estimated using the environmental half-time parameter for soil. The time-integral of soil concentration is evaluated over the exposure duration to determine the average soil concentration present. The environmental half-time is described in Appendix B.

3.6.14 Soil Dermal Contact

Pollutant-specific considerations for dermal absorption from soil involve the skin-absorption fraction and the same considerations for loss by volatilization and radioactive decay as described in Section 3.6.13. The skin-absorption fraction gives the fraction of pollutant on the skin that is absorbed into the blood. The skin-absorption fraction and the environmental half-time are described in Appendix B.

3.6.15 Indoor Inhalation of Volatile Pollutants

There are no pollutant-specific considerations for the inhalation pathway, other than the volatilization factor, which is included in the summary intake factors. The analysis does involve review of the Henry's Law constant and molecular weight to determine if the pollutant should be considered volatile. A pollutant is considered volatile if the Henry's Law constant is greater than $1E-5$ (atm m³/g-mole) and the molecular weight is less than 200. Radon 222 is the only radionuclide considered to be volatile.

Values for the Henry's Law constant and molecular weights are given for organic compounds in Appendix B.

3.6.16 Air Inhalation

There are no pollutant-specific considerations for inhaling air.

3.6.17 Soil Resuspension Inhalation

The inhalation of resuspended soil involves estimating the average soil concentration present over the exposure duration. This analysis involves the same considerations for loss by volatilization and radioactive decay as described in Section 3.6.13. There are no other pollutant-specific considerations for this pathway. The environmental half-time is described in Appendix B.

3.6.18 Swimming External

There are no pollutant-specific considerations for external exposure to radionuclides while swimming. The radiation dose factors are included in the external exposure slope factors.

3.6.19 Boating External

There are no pollutant-specific considerations for external exposure to radionuclides while boating. The radiation dose factors are included in the external exposure slope factors.

3.6.20 Shoreline External

This pathway requires an estimate of the average radionuclide concentration in shoreline sediment over the exposure duration, just as for the other pathways involving shoreline sediment as described in Section 3.6.11. There are no other pollutant-specific considerations for external exposure to radionuclides on the shoreline. The radiation dose factors are included in the external exposure slope factors.

3.6.21 Soil External

External exposure to radionuclides in soil requires estimating the average concentration in soil over the exposure duration, as described in Section 3.6.13. There are no other pollutant-specific considerations for external exposure to radionuclides in soil. The radiation dose factors are included in the external exposure slope factors.

3.6.22 Air External

There are no pollutant-specific considerations for external exposure to radionuclides in air. The radiation dose factors are included in the external exposure slope factors.

4.0 UNIT RISK FACTOR RESULTS

Results of the unit risk factor analyses are summarized in this section. The summary tables present the URF values for each scenario, medium, and pollutant, summed over exposure pathways. Tables 4.1-4.3 provide the industrial scenario URFs, Tables 4.4-4.6 provide the recreational scenario URFs, Tables 4.7-4.9 provide the residential scenario URFs, and Tables 4.10-4.12 provide the agricultural scenario URFs. The results presented in any table are all for the same type of pollutant. Three tables are provided for each scenario, one for each of the three pollutant types: noncarcinogenic chemicals, carcinogenic chemicals, and radionuclides.

The units for the URFs are health impacts normalized to unit medium pollutant concentration. The health impact for radionuclides and carcinogenic chemicals is lifetime cancer incidence. For noncarcinogenic chemicals, the impact is the hazard index (ratio of average daily intake to reference dose). The medium concentration units convention is defined in Table 2.7.

The complete set of URFs for specific exposure pathways is provided in Appendix A.

TABLE 4.1. Industrial Scenario Noncarcinogenic Chemical URF Sums

Chemical Name	Unit Risk Factors Summed over Exposure Pathways for Each Medium				
	Soil (mass)	Soil (area)	Air	Groundwater	Surface Water
Aluminum fluoride	2.09E-04	1.92E-05	4.45E+00	3.21E+00	3.21E+00
Aluminum nitrate	7.88E-06	7.22E-07	1.78E+00	1.19E-01	1.19E-01
Aluminum (ionic)	7.35E-04	6.74E-05	1.40E+02	2.45E+01	2.45E+01
Ammonium carbonate	7.53E-06	6.91E-07	4.89E+00	2.46E-01	2.46E-01
Ammonium nitrate	3.34E-06	3.07E-07	2.17E+00	1.10E-01	1.10E-01
Beryllium (ionic)	2.86E-04	2.62E-05	0.00E+00	3.29E+00	3.29E+00
Butyl phosphates	9.11E-05	8.35E-06	2.97E+00	1.50E-01	1.50E-01
Cadmium (ionic)	2.88E-03	2.64E-04	3.91E+02	2.10E+01	2.10E+01
Calcium carbonate	1.16E-06	1.06E-07	7.53E-01	3.78E-02	3.78E-02
Calcium (ionic)	1.85E-08	1.70E-09	1.15E-02	5.83E-04	5.83E-04
Calcium nitrate	8.50E-07	7.79E-08	5.29E-01	2.67E-02	2.67E-02
Carbon tetrachloride	2.05E-05	0.00E+00	2.80E+02	1.55E+02	1.55E+02
Chromium IV (ionic)	1.74E-02	1.59E-03	3.43E+05	3.29E+00	3.29E+00
Copper sulfate	2.53E-05	2.32E-06	1.15E+01	8.22E-01	8.22E-01
Copper (ionic)	9.91E-04	9.09E-05	1.96E+01	3.29E+01	3.29E+01
Dibutyl phosphonate	4.63E-05	4.24E-06	1.51E+00	7.60E-02	7.60E-02
Ferric nitrate	1.00E-05	9.20E-07	6.52E+00	3.28E-01	3.28E-01
Ferrocyanide (ionic)	2.00E-06	1.84E-07	1.30E+00	6.55E-02	6.55E-02
Ferrous nitrate	1.53E-05	1.41E-06	8.51E+00	4.40E-01	4.40E-01
Fluoride (ionic)	5.02E-06	4.61E-07	3.26E+00	1.64E-01	1.64E-01
Iron (as ferric ion)	1.40E-06	1.28E-07	2.28E+01	7.80E-03	7.80E-03
Lead (ionic)	2.47E-04	2.26E-05	4.55E+02	7.00E+00	7.00E+00
Magnesium (ionic)	1.46E-07	1.33E-08	2.80E+00	1.98E-04	1.98E-04
Magnesium nitrate	1.58E-07	1.45E-08	1.03E-01	5.18E-03	5.18E-03
Mercury (ionic)	2.02E-03	1.85E-04	2.28E+03	3.82E+01	3.82E+01
Methyl isobutyl ketone	4.63E-06	1.18E-06	3.91E+00	2.16E+00	2.16E+00
Nickel (ionic)	2.00E-05	1.83E-06	0.00E+00	4.93E-01	4.93E-01
Nitrate	1.89E-07	1.73E-08	1.22E-01	6.15E-03	6.15E-03
Nitric acid	8.60E-06	7.89E-07	5.59E+00	2.81E-01	2.81E-01
Nitrite	8.86E-06	8.12E-07	5.76E+00	2.89E-01	2.89E-01
Oxalate (ionic)	2.37E-06	2.17E-07	2.80E+01	3.28E-02	3.28E-02
Phosphate (ionic)	2.04E-06	1.86E-07	2.80E+01	2.14E-02	2.14E-02
Potassium (ionic)	5.90E-10	5.42E-11	3.84E-04	1.92E-05	1.92E-05
Potassium borate	3.34E-06	3.07E-07	2.17E+00	1.10E-01	1.10E-01
Silver (ionic)	8.20E-05	7.52E-06	3.91E+01	2.04E+00	2.04E+00
Sodium (ionic)	1.00E-09	9.20E-11	6.52E-04	3.28E-05	3.28E-05
Sodium aluminate	2.02E-05	1.85E-06	4.55E+00	3.06E-01	3.06E-01
Sodium dichromate	1.74E-02	1.59E-03	3.43E+05	3.29E+00	3.29E+00
Sodium oxalate	6.26E-06	5.74E-07	2.80E+01	1.64E-01	1.64E-01
Sodium sulfamate	1.51E-06	1.38E-07	9.79E-01	4.91E-02	4.91E-02
Sulfate (ionic)	1.44E-07	1.32E-08	2.80E+00	1.39E-04	1.39E-04
Sulfuric acid	4.30E-05	3.94E-06	2.80E+01	1.41E+00	1.41E+00
Tributyl phosphate	4.51E-06	0.00E+00	1.12E+01	6.18E-01	6.18E-01
Tributyl phosphonate	5.01E-05	0.00E+00	1.63E+00	8.17E-02	8.17E-02
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	1.40E-04	1.29E-05	1.40E+02	3.49E+00	3.49E+00
Zinc (ionic)	1.02E-06	9.38E-08	6.52E-01	3.28E-02	3.28E-02

TABLE 4.2. Industrial Scenario Carcinogenic Chemical URF Sums

Chemical Name	Unit Risk Factors Summed over Exposure Pathways for Each Medium				
	Soil (mass)	Soil (area)	Air	Groundwater	Surface Water
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	1.77E-06	1.63E-07	4.70E-01	2.03E-02	2.03E-02
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	2.59E-06	2.38E-07	3.52E-01	1.89E-02	1.89E-02
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	5.33E-10	0.00E+00	2.96E-03	1.87E-03	1.87E-03
Chromium IV (ionic)	1.02E-05	9.31E-07	2.29E+00	1.92E-01	1.92E-01
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	2.35E-09	2.15E-10	4.70E-02	0.00E+00	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	1.02E-05	9.31E-07	2.29E+00	1.92E-01	1.92E-01
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	1.77E-10	0.00E+00	0.00E+00	2.44E-05	2.44E-05
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	7.24E-11	0.00E+00	7.27E-04	4.18E-04	4.18E-04
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE 4.3. Industrial Scenario Radionuclide URF Sums

Radionuclide	Unit Risk Factors Summed over Exposure Pathways for Each Medium				
	Soil (mass)	Soil (area)	Air	Groundwater	Surface Water
AC225	2.76E-12	9.19E-13	2.40E-04	3.06E-07	3.06E-07
AC227	2.79E-08	2.16E-09	8.81E-03	1.50E-04	1.50E-04
AG110M	9.79E-10	2.35E-10	6.94E-06	2.43E-08	2.43E-08
AM241	6.80E-09	6.27E-10	3.20E-03	4.02E-05	4.02E-05
AM243	7.84E-09	7.22E-10	3.20E-03	4.02E-05	4.02E-05
AU195	2.61E-11	6.78E-12	8.08E-07	3.29E-09	3.29E-09
BA133	1.01E-09	1.14E-10	3.63E-07	6.09E-09	6.09E-09
BE10	5.60E-12	5.13E-13	2.20E-05	1.60E-08	1.60E-08
BE7	3.37E-12	1.07E-12	2.75E-08	1.54E-10	1.54E-10
BI210	5.13E-12	3.87E-15	8.01E-06	7.75E-09	7.75E-09
C14	2.84E-13	2.59E-14	6.41E-10	4.53E-09	4.53E-09
CA45	5.94E-15	1.58E-15	5.11E-07	5.03E-09	5.03E-09
CD109	6.77E-13	1.38E-13	6.51E-06	4.21E-08	4.21E-08
CE144	1.70E-11	3.95E-12	3.40E-05	4.27E-08	4.27E-08
CF250	3.08E-09	3.37E-10	1.63E-02	2.98E-05	2.98E-05
CF252	2.39E-09	7.51E-11	9.74E-03	1.39E-05	1.39E-05
CL36	6.51E-12	5.96E-13	1.40E-07	9.06E-09	9.06E-09
CM243	5.03E-09	3.97E-10	2.60E-03	2.74E-05	2.74E-05
CM244	3.75E-09	2.75E-10	2.20E-03	2.19E-05	2.19E-05
CM245	7.19E-09	6.63E-10	3.20E-03	4.13E-05	4.13E-05
CM246	7.07E-09	6.48E-10	3.20E-03	4.13E-05	4.13E-05
CM248	2.61E-08	2.39E-09	1.20E-02	1.53E-04	1.53E-04
CO57	2.16E-11	5.08E-12	8.22E-07	2.92E-09	2.92E-09
CO58	9.84E-11	3.05E-11	9.90E-07	8.04E-09	8.04E-09
CO60	6.48E-09	8.67E-10	1.50E-05	7.54E-08	7.54E-08
CS134	1.65E-09	2.93E-10	2.81E-06	2.06E-07	2.06E-07
CS137	3.42E-09	3.39E-10	1.90E-06	1.41E-07	1.41E-07
ES254	8.47E-09	1.23E-10	2.55E-03	4.02E-06	4.02E-06
EU152	4.81E-09	5.23E-10	1.10E-05	2.74E-08	2.74E-08
EU154	4.40E-09	5.18E-10	1.40E-05	3.71E-08	3.71E-08
EU155	4.24E-11	5.78E-12	1.80E-06	5.41E-09	5.41E-09
FE55	1.04E-14	1.71E-15	8.41E-08	1.41E-09	1.41E-09
GE68	4.95E-10	1.14E-10	3.26E-06	4.39E-09	4.39E-09
H3	1.03E-16	3.25E-17	7.81E-09	2.71E-10	2.71E-10
I129	3.76E-11	3.44E-12	1.20E-05	9.55E-07	9.55E-07
K40	1.15E-09	1.06E-10	7.63E-07	5.53E-08	5.53E-08
KR85	8.38E-12	9.48E-13	2.77E-11	0.00E+00	0.00E+00
MN54	3.82E-10	8.65E-11	5.39E-07	5.61E-09	5.61E-09
MO93	4.98E-11	4.56E-12	1.76E-06	8.84E-09	8.84E-09
NA22	2.87E-09	4.75E-10	5.01E-07	3.42E-08	3.42E-08
NB93M	1.49E-13	1.62E-14	1.90E-06	7.94E-10	7.94E-10
NB94	1.15E-08	1.06E-09	2.10E-05	1.14E-08	1.14E-08
NB95	3.85E-11	1.26E-11	5.18E-07	3.32E-09	3.32E-09
NI59	2.17E-14	1.99E-15	7.01E-08	4.59E-10	4.59E-10
NI63	5.22E-14	4.91E-15	1.80E-07	1.21E-09	1.21E-09
NP237	9.44E-09	9.21E-10	2.90E-03	4.86E-05	4.86E-05
NP239	2.29E-13	7.62E-14	1.61E-07	4.11E-09	4.11E-09
PA231	2.03E-08	2.28E-09	3.60E-03	1.16E-04	1.16E-04
PA233	7.00E-10	1.57E-12	8.63E-07	4.95E-09	4.95E-09
PB210	1.80E-10	1.82E-11	4.00E-04	3.31E-06	3.31E-06
PB212	1.03E-12	3.42E-13	5.01E-06	1.33E-08	1.33E-08
PM147	1.00E-13	1.66E-14	3.00E-06	3.45E-09	3.45E-09
PO210	1.89E-12	5.22E-13	2.60E-04	9.50E-07	9.50E-07
PU238	6.03E-09	5.26E-10	3.90E-03	3.48E-05	3.48E-05
PU239	6.74E-09	6.18E-10	3.80E-03	3.92E-05	3.92E-05
PU240	6.74E-09	6.17E-10	3.80E-03	3.92E-05	3.92E-05
PU241	1.27E-10	1.36E-11	2.30E-05	7.46E-07	7.46E-07
PU242	6.37E-09	5.84E-10	3.60E-03	3.70E-05	3.70E-05

TABLE 4.3. (contd)

Radionuclide	Unit Risk Factors Summed over Exposure Pathways for Each Medium				
	Soil (mass)	Soil (area)	Air	Groundwater	Surface Water
RA223	1.16E-12	3.87E-13	3.10E-04	3.22E-07	3.22E-07
RA224	3.03E-09	5.50E-14	1.20E-04	1.77E-07	1.77E-07
RA225	4.80E-10	9.50E-14	1.50E-04	2.61E-07	2.61E-07
RA226	1.28E-08	1.18E-09	3.00E-04	6.59E-07	6.59E-07
RA228	8.90E-09	1.34E-09	3.15E-04	4.53E-06	4.53E-06
RE187	1.06E-15	9.70E-17	3.38E-09	2.97E-11	2.97E-11
RN222	8.03E-13	9.31E-16	9.02E-08	1.31E-08	1.31E-08
RU103	2.48E-11	8.07E-12	8.45E-07	4.57E-09	4.57E-09
RU106	1.04E-10	2.26E-11	4.40E-05	4.87E-08	4.87E-08
S35	3.27E-15	9.85E-16	1.90E-08	1.11E-09	1.11E-09
SB122	1.59E-12	5.30E-13	3.44E-07	8.83E-09	8.83E-09
SB124	1.65E-10	5.19E-11	2.22E-06	1.45E-08	1.45E-08
SC46	2.43E-10	7.37E-11	2.72E-06	9.24E-09	9.24E-09
SE75	4.09E-11	1.16E-11	6.05E-07	2.91E-08	2.91E-08
SE79	1.03E-12	9.43E-14	6.11E-07	2.72E-08	2.72E-08
SM147	1.15E-09	1.05E-10	7.21E-04	6.51E-06	6.51E-06
SM151	4.59E-13	4.33E-14	8.71E-07	3.08E-09	3.08E-09
SN113	1.64E-13	4.70E-14	9.43E-07	4.42E-09	4.42E-09
SN123	1.99E-12	5.58E-13	2.02E-06	2.62E-08	2.62E-08
SR85	3.82E-11	1.19E-11	1.05E-07	3.86E-09	3.86E-09
SR90	9.31E-11	7.71E-12	6.21E-06	1.85E-07	1.85E-07
TA182	1.99E-10	5.69E-11	4.31E-06	8.83E-09	8.83E-09
TC99	2.37E-13	2.17E-14	8.31E-07	6.55E-09	6.55E-09
TH227	5.00E-10	6.19E-13	4.90E-04	6.12E-07	6.12E-07
TH228	2.36E-08	5.96E-10	7.81E-03	1.93E-05	1.93E-05
TH229	3.28E-08	3.10E-09	7.71E-03	1.79E-04	1.79E-04
TH230	4.68E-09	4.32E-10	2.90E-03	2.65E-05	2.65E-05
TH231	3.81E-13	3.48E-16	4.91E-08	1.45E-09	1.45E-09
TH232	2.56E-08	3.47E-09	2.80E-03	1.48E-04	1.48E-04
TH234	8.33E-11	1.72E-13	3.20E-06	2.01E-08	2.01E-08
TL204	5.62E-13	8.29E-14	1.30E-07	8.54E-09	8.54E-09
TM170	1.41E-12	3.96E-13	1.63E-06	1.71E-08	1.71E-08
U232	5.78E-10	1.66E-09	6.01E-03	5.01E-07	5.01E-07
U233	1.49E-10	1.54E-11	2.70E-03	1.46E-07	1.46E-07
U234	1.44E-10	1.31E-11	2.60E-03	1.45E-07	1.45E-07
U235	6.54E-10	6.02E-11	2.50E-03	1.39E-07	1.39E-07
U236	1.38E-10	1.27E-11	2.50E-03	1.36E-07	1.36E-07
U238	3.77E-10	4.12E-11	5.21E-03	1.98E-07	1.98E-07
V49	4.73E-16	1.06E-16	2.14E-08	1.94E-10	1.94E-10
Y88	4.83E-10	1.40E-10	1.77E-06	3.34E-07	3.34E-07
Y90	2.66E-14	8.86E-15	5.51E-07	1.42E-08	1.42E-08
ZN65	2.05E-10	4.96E-11	1.61E-06	4.27E-08	4.27E-08
ZR93	1.29E-12	1.23E-13	6.51E-07	8.02E-09	8.02E-09

TABLE 4.4. Recreational Scenario Noncarcinogenic Chemical URF Sums

Chemical Name	Unit Risk Factors Summed over Exposure Pathways for Each Medium				
	Soil (mass)	Soil (area)	Air	Groundwater	Surface Water
Aluminum fluoride	2.53E-05	3.38E-06	1.24E-01	1.57E-01	6.60E-01
Aluminum nitrate	9.46E-06	1.26E-06	4.98E-01	5.84E-02	2.46E-01
Aluminum (ionic)	1.75E-04	2.34E-05	3.91E-01	1.37E+00	1.23E+01
Ammonium carbonate	1.76E-06	2.35E-07	1.37E-01	1.37E-02	2.69E-02
Ammonium nitrate	7.84E-07	1.05E-07	6.08E-02	6.12E-03	1.20E-02
Beryllium (ionic)	2.76E-05	3.68E-06	0.00E+00	1.47E-01	2.34E+00
Butyl phosphates	6.21E-06	8.28E-07	8.30E-02	8.37E-03	8.76E-02
Cadmium (ionic)	2.77E-04	3.69E-05	1.10E+01	1.14E+00	1.58E+02
Calcium carbonate	2.71E-07	3.62E-08	2.11E-02	2.12E-03	4.15E-03
Calcium (ionic)	4.20E-09	5.60E-10	3.22E-04	3.25E-05	6.57E-05
Calcium nitrate	1.93E-07	2.57E-08	1.48E-02	1.49E-03	3.01E-03
Carbon tetrachloride	9.32E-07	0.00E+00	7.82E+00	4.73E+00	8.40E+01
Chromium IV (ionic)	6.15E-04	6.69E-05	9.61E+03	1.47E-01	1.62E+01
Copper sulfate	5.90E-06	7.87E-07	3.22E-01	4.59E-02	9.12E-02
Copper (ionic)	2.35E-04	3.14E-05	5.48E-01	1.84E+00	6.79E+01
Dibutyl phosphonate	3.15E-06	4.20E-07	4.21E-02	4.24E-03	4.66E-02
Ferric nitrate	2.35E-06	3.14E-07	1.83E-01	1.83E-02	3.59E-02
Ferrocyanide (ionic)	4.70E-07	6.27E-08	3.65E-02	3.67E-03	7.19E-03
Ferrous nitrate	3.19E-06	4.27E-07	2.38E-01	2.43E-02	5.33E-02
Fluoride (ionic)	1.17E-06	1.56E-07	9.13E-02	9.16E-03	8.23E-02
Iron (as ferric ion)	9.57E-08	1.18E-08	6.37E-01	4.30E-04	5.94E-01
Lead (ionic)	5.19E-05	6.91E-06	1.27E+01	3.92E-01	2.84E+01
Magnesium (ionic)	6.25E-09	7.11E-10	7.82E-02	1.10E-05	4.08E-04
Magnesium nitrate	3.71E-08	4.95E-09	2.88E-03	2.90E-04	5.68E-04
Mercury (ionic)	2.93E-04	3.91E-05	6.37E+01	1.99E+00	1.30E+03
Methyl isobutyl ketone	2.10E-07	8.10E-08	1.10E-01	6.60E-02	1.91E-02
Nickel (ionic)	3.83E-06	5.11E-07	0.00E+00	2.75E-02	1.99E+00
Nitrate	4.40E-08	5.88E-09	3.42E-03	3.44E-04	3.62E+01
Nitric acid	2.01E-06	2.69E-07	1.56E-01	1.57E-02	1.65E+03
Nitrite	2.07E-06	2.76E-07	1.61E-01	1.61E-02	3.17E-02
Oxalate (ionic)	2.83E-07	3.65E-08	7.82E-01	1.83E-03	3.59E-03
Phosphate (ionic)	2.01E-07	2.56E-08	7.82E-01	1.19E-03	5.87E+01
Potassium (ionic)	1.38E-10	1.85E-11	1.07E-05	1.08E-06	7.58E-04
Potassium borate	7.84E-07	1.05E-07	6.08E-02	6.12E-03	1.29E-02
Silver (ionic)	1.54E-05	2.06E-06	1.10E+00	1.12E-01	4.32E-01
Sodium (ionic)	2.35E-10	3.14E-11	1.83E-05	1.83E-06	1.33E-04
Sodium aluminate	2.42E-06	3.23E-07	1.27E-01	1.50E-02	1.53E-01
Sodium dichromate	6.15E-04	6.69E-05	9.61E+03	1.47E-01	1.62E+01
Sodium oxalate	1.21E-06	1.61E-07	7.82E-01	9.16E-03	1.80E-02
Sodium sulfamate	3.52E-07	4.70E-08	2.74E-02	2.75E-03	5.39E-03
Sulfate (ionic)	5.83E-09	6.54E-10	7.82E-02	7.75E-06	4.09E-03
Sulfuric acid	1.01E-05	1.34E-06	7.82E-01	7.86E-02	1.54E-01
Tributyl phosphate	2.05E-07	0.00E+00	3.13E-01	3.30E-02	1.51E+01
Tributyl phosphonate	3.40E-06	0.00E+00	4.56E-02	4.57E-03	1.61E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	2.58E-05	3.44E-06	3.91E+00	1.89E-01	6.89E+00
Zinc (ionic)	2.36E-07	3.15E-08	1.83E-02	1.84E-03	3.21E+00

TABLE 4.5. Recreational Scenario Carcinogenic Chemical URF Sums

Chemical Name	Unit Risk Factors Summed over Exposure Pathways for Each Medium				
	Soil (mass)	Soil (area)	Air	Groundwater	Surface Water
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	2.55E-07	3.40E-08	1.95E-02	1.35E-03	2.14E-02
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	3.73E-07	4.97E-08	1.47E-02	1.53E-03	1.93E-01
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	3.63E-11	0.00E+00	1.24E-04	9.41E-05	3.27E-03
Chromium IV (ionic)	1.83E-06	2.44E-07	9.17E-02	1.29E-02	8.13E-01
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	1.22E-10	1.32E-11	1.97E-03	0.00E+00	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	1.83E-06	2.44E-07	9.17E-02	1.29E-02	8.13E-01
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	1.21E-11	0.00E+00	0.00E+00	1.96E-06	8.90E-04
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	4.93E-12	0.00E+00	3.05E-05	1.89E-05	3.84E-05
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE 4.6. Recreational Scenario Radionuclide URF Sums

Radionuclide	Unit Risk Factors Summed over Exposure Pathways for Each Medium				
	Soil (mass)	Soil (area)	Air	Groundwater	Surface Water
AC225	1.32E-13	1.69E-09	1.01E-05	1.63E-08	1.06E-07
AC227	1.81E-09	1.65E-04	3.70E-04	6.36E-06	3.99E-06
AG110M	4.69E-11	1.15E-10	2.96E-07	2.01E-09	5.58E-08
AM241	4.36E-10	5.69E-05	1.34E-04	1.74E-06	1.83E-05
AM243	5.16E-10	5.78E-05	1.34E-04	1.74E-06	1.84E-05
AU195	1.25E-12	8.54E-13	3.40E-08	2.76E-10	8.08E-09
BA133	5.69E-11	8.02E-11	1.58E-08	5.09E-10	1.14E-07
BE10	4.05E-13	2.19E-09	9.22E-07	1.28E-09	3.74E-09
BE7	1.61E-13	2.46E-13	1.23E-09	1.27E-11	2.33E-10
BI210	3.49E-13	1.50E-11	3.36E-07	6.40E-10	7.87E-09
C14	3.35E-14	3.26E-11	2.69E-11	3.80E-10	1.23E-06
CA45	5.75E-16	7.87E-12	2.14E-08	4.20E-10	1.22E-08
CD109	3.70E-14	5.36E-09	2.73E-07	3.43E-09	4.72E-07
CE144	8.15E-13	1.70E-09	1.43E-06	3.10E-09	9.21E-07
CF250	1.61E-10	2.20E-05	6.82E-04	1.53E-06	1.07E-05
CF252	1.51E-10	3.88E-06	4.09E-04	7.25E-07	5.33E-06
CL36	4.94E-13	4.85E-11	5.88E-09	7.59E-10	2.80E-08
CM243	3.27E-10	3.13E-05	1.09E-04	1.19E-06	1.44E-05
CM244	2.42E-10	2.24E-05	9.24E-05	9.54E-07	1.20E-05
CM245	4.65E-10	5.99E-05	1.34E-04	1.79E-06	1.83E-05
CM246	4.56E-10	5.93E-05	1.34E-04	1.79E-06	1.83E-05
CM248	1.69E-09	2.19E-04	5.04E-04	6.59E-06	6.93E-05
CO57	1.03E-12	4.08E-12	3.46E-08	2.45E-10	5.80E-08
CO58	4.71E-12	4.98E-12	4.32E-08	6.73E-10	1.62E-07
CO60	3.28E-10	5.30E-10	6.35E-07	6.33E-09	1.77E-06
CS134	7.91E-11	2.54E-10	1.21E-07	1.72E-08	2.44E-05
CS137	2.22E-10	6.66E-10	8.09E-08	1.18E-08	1.68E-05
ES254	5.97E-10	1.27E-06	1.07E-04	2.10E-07	7.13E-07
EU152	2.83E-10	1.62E-08	4.64E-07	1.59E-09	2.17E-07
EU154	2.41E-10	1.76E-08	5.91E-07	2.19E-09	2.15E-07
EU155	2.13E-12	1.81E-09	7.57E-08	3.22E-10	5.58E-09
FE55	9.89E-16	2.21E-11	3.53E-09	1.17E-10	1.60E-07
GE68	2.37E-11	9.80E-12	1.38E-07	3.68E-10	8.80E-07
H3	1.14E-17	2.86E-14	3.28E-10	2.27E-11	4.23E-11
I129	5.47E-12	3.91E-09	5.04E-07	8.02E-08	2.82E-05
K40	8.30E-11	3.23E-10	3.22E-08	4.64E-09	3.30E-06
KR85	4.74E-13	8.45E-14	5.17E-12	0.00E+00	3.56E-10
MN54	1.83E-11	2.22E-11	2.40E-08	4.67E-10	1.50E-07
MO93	3.60E-12	4.84E-11	7.40E-08	7.42E-10	8.18E-09
NA22	1.38E-10	8.22E-11	2.47E-08	2.87E-09	3.46E-07
NB93M	8.18E-15	4.06E-11	7.98E-08	6.49E-11	8.97E-09
NB94	8.27E-10	1.42E-09	8.85E-07	9.22E-10	5.52E-07
NB95	1.85E-12	3.39E-12	2.30E-08	2.75E-10	4.13E-08
NI59	2.74E-15	4.22E-11	2.94E-09	3.85E-11	2.75E-09
NI63	6.44E-15	9.63E-11	7.56E-09	1.01E-10	7.25E-09
NP237	6.23E-10	7.03E-05	1.22E-04	2.09E-06	1.70E-05
NP239	1.09E-14	8.38E-14	7.04E-09	3.44E-10	7.00E-08
PA231	1.30E-09	2.24E-04	1.51E-04	4.92E-06	1.75E-06
PA233	4.49E-11	1.42E-13	3.65E-08	4.15E-10	4.11E-09
PB210	2.18E-11	5.55E-07	1.68E-05	2.78E-07	1.99E-05
PB212	4.92E-14	7.43E-13	2.10E-07	1.12E-09	1.74E-07
PM147	4.46E-15	6.93E-10	1.26E-07	2.10E-10	2.46E-09
PO210	1.18E-13	1.68E-08	1.09E-05	7.15E-08	2.23E-05
PU238	3.88E-10	4.64E-05	1.64E-04	1.51E-06	1.67E-05
PU239	4.35E-10	5.62E-05	1.60E-04	1.70E-06	1.75E-05
PU240	4.34E-10	5.62E-05	1.60E-04	1.70E-06	1.75E-05
PU241	8.24E-12	1.32E-06	9.66E-07	3.21E-08	2.77E-07
PU242	4.10E-10	5.31E-05	1.51E-04	1.60E-06	1.68E-05

TABLE 4.6. (contd)

Radionuclide	Unit Risk Factors Summed over Exposure Pathways for Each Medium				
	Soil (mass)	Soil (area)	Air	Groundwater	Surface Water
RA223	5.64E-14	8.78E-11	1.30E-05	2.66E-08	1.36E-06
RA224	1.48E-10	1.08E-11	5.04E-06	1.47E-08	8.06E-07
RA225	3.70E-11	2.63E-10	6.30E-06	2.15E-08	1.08E-06
RA226	9.23E-10	2.61E-07	1.26E-05	5.30E-08	3.07E-06
RA228	6.60E-10	9.04E-06	1.32E-05	3.78E-07	1.96E-05
RE187	1.57E-16	2.34E-13	1.42E-10	2.49E-12	2.13E-10
RN222	4.84E-14	7.40E-12	6.76E-09	8.19E-10	1.97E-09
RU103	1.19E-12	2.15E-12	3.62E-08	3.83E-10	2.89E-08
RU106	4.99E-12	2.08E-10	1.85E-06	4.04E-09	2.91E-07
S35	1.94E-16	2.50E-13	7.98E-10	9.25E-11	4.89E-08
SB122	7.63E-14	6.94E-14	1.52E-08	7.41E-10	1.19E-07
SB124	7.89E-12	6.82E-12	9.62E-08	1.21E-09	1.83E-07
SC46	1.17E-11	7.58E-11	1.17E-07	7.25E-10	6.15E-08
SE75	1.96E-12	9.55E-12	2.60E-08	2.44E-09	2.97E-07
SE79	1.52E-13	1.56E-10	2.56E-08	2.28E-09	2.74E-07
SM147	7.33E-11	9.53E-06	3.02E-05	2.78E-07	1.88E-07
SM151	2.91E-14	3.49E-09	3.65E-08	1.52E-10	9.06E-10
SN113	8.03E-15	5.43E-12	4.00E-08	3.68E-10	7.73E-07
SN123	9.66E-14	1.26E-11	8.46E-08	2.20E-09	4.62E-06
SR85	1.83E-12	1.99E-12	5.21E-09	3.23E-10	1.40E-08
SR90	7.47E-12	5.20E-09	2.60E-07	1.53E-08	5.59E-07
TA182	9.51E-12	2.86E-11	1.84E-07	7.28E-10	1.51E-05
TC99	3.48E-14	3.91E-11	3.49E-08	5.49E-10	6.61E-09
TH227	3.33E-11	8.19E-09	2.06E-05	2.67E-08	1.35E-07
TH228	1.73E-09	5.48E-06	3.28E-04	8.21E-07	1.85E-06
TH229	2.13E-09	2.66E-04	3.23E-04	7.58E-06	4.47E-06
TH230	2.99E-10	3.91E-05	1.22E-04	1.12E-06	6.40E-07
TH231	1.86E-14	1.63E-13	2.08E-09	1.21E-10	1.20E-08
TH232	1.65E-09	2.31E-04	1.18E-04	6.22E-06	2.40E-06
TH234	5.30E-12	7.20E-12	1.34E-07	1.68E-09	1.20E-07
TL204	3.19E-14	1.00E-11	5.46E-09	7.16E-10	5.12E-08
TM170	6.83E-14	5.46E-11	6.85E-08	1.41E-09	2.60E-08
U232	4.02E-11	2.05E-05	2.52E-04	2.89E-08	1.39E-06
U233	6.24E-12	3.32E-07	1.13E-04	9.49E-09	2.49E-07
U234	6.03E-12	9.53E-08	1.09E-04	9.45E-09	2.48E-07
U235	4.29E-11	1.30E-07	1.05E-04	9.22E-09	2.67E-07
U236	5.78E-12	9.06E-08	1.05E-04	8.89E-09	2.32E-07
U238	1.93E-11	8.65E-08	2.18E-04	1.43E-08	4.40E-07
V49	4.52E-17	6.04E-13	8.98E-10	1.62E-11	1.32E-10
Y88	2.32E-11	2.16E-08	7.89E-08	1.49E-08	5.52E-08
Y90	1.29E-15	9.22E-14	2.31E-08	1.18E-09	2.51E-08
ZN65	9.85E-12	4.07E-11	6.84E-08	3.58E-09	6.30E-06
ZR93	8.52E-14	1.06E-08	2.73E-08	3.74E-10	1.03E-08

TABLE 4.7. Residential Scenario Noncarcinogenic Chemical URF Sums

Chemical Name	Unit Risk Factors Summed over Exposure Pathways for Each Medium				
	Soil (mass)	Soil (area)	Air	Groundwater	Surface Water
Aluminum fluoride	1.10E-03	1.46E-04	4.27E+01	1.05E+01	1.11E+01
Aluminum nitrate	4.11E-04	5.50E-05	3.95E+01	3.93E+00	4.12E+00
Aluminum (ionic)	9.13E-03	1.24E-03	3.92E+02	9.58E+01	1.07E+02
Ammonium carbonate	9.17E-05	1.22E-05	1.09E+01	9.59E-01	9.72E-01
Ammonium nitrate	4.08E-05	5.43E-06	4.82E+00	4.25E-01	4.31E-01
Beryllium (ionic)	1.08E-03	1.49E-04	2.97E+01	9.61E+00	1.18E+01
Butyl phosphates	1.87E-04	8.19E-04	6.58E+00	9.02E-01	9.81E-01
Cadmium (ionic)	1.08E-02	5.66E-03	8.68E+02	8.03E+01	2.37E+02
Calcium carbonate	1.41E-05	1.88E-06	1.67E+00	1.48E-01	1.50E-01
Calcium (ionic)	2.17E-07	2.89E-08	2.55E-02	2.26E-03	2.30E-03
Calcium nitrate	9.97E-06	1.33E-06	1.17E+00	1.04E-01	1.06E-01
Carbon tetrachloride	2.81E-05	0.00E+00	4.08E+02	2.09E+02	2.93E+02
Chromium IV (ionic)	2.60E-02	3.47E-03	5.01E+05	9.61E+00	2.57E+01
Copper sulfate	3.06E-04	4.08E-05	2.92E+01	3.20E+00	3.25E+00
Copper (ionic)	1.22E-02	1.34E-02	5.24E+02	1.33E+02	1.99E+02
Dibutyl phosphonate	9.51E-05	3.88E-04	3.35E+00	4.46E-01	4.89E-01
Ferric nitrate	1.22E-04	1.63E-05	1.45E+01	1.28E+00	1.30E+00
Ferrocyanide (ionic)	2.45E-05	3.26E-06	2.89E+00	2.55E-01	2.59E-01
Ferrous nitrate	1.62E-04	2.17E-05	1.89E+01	1.69E+00	1.71E+00
Fluoride (ionic)	6.11E-05	2.69E-05	7.23E+00	6.47E-01	7.20E-01
Iron (as ferric ion)	4.53E-06	6.15E-07	3.33E+01	2.99E-02	6.23E-01
Lead (ionic)	2.66E-03	3.88E-04	7.70E+02	2.74E+01	5.54E+01
Magnesium (ionic)	2.77E-07	1.92E-07	4.08E+00	8.30E-04	1.23E-03
Magnesium nitrate	1.93E-06	2.58E-07	2.28E-01	2.02E-02	2.04E-02
Mercury (ionic)	1.37E-02	1.12E-02	3.82E+03	1.40E+02	1.43E+03
Methyl isobutyl ketone	6.35E-06	3.22E-04	5.75E+00	3.08E+00	3.09E+00
Nickel (ionic)	1.91E-04	6.77E-05	7.43E+00	1.94E+00	3.90E+00
Nitrate	2.29E-06	2.64E-04	2.72E-01	1.30E-01	3.63E-01
Nitric acid	1.05E-04	1.21E-02	1.24E+01	5.91E+00	1.66E+03
Nitrite	1.08E-04	1.44E-05	1.28E+01	1.13E+00	1.14E+00
Oxalate (ionic)	1.42E-05	1.90E-06	4.13E+01	1.28E-01	1.30E-01
Phosphate (ionic)	9.98E-06	1.08E-04	4.11E+01	1.26E-01	5.88E+01
Potassium (ionic)	7.19E-09	1.62E-08	8.52E-04	8.12E-05	8.38E-04
Potassium borate	4.08E-05	8.04E-05	4.82E+00	4.56E-01	4.63E-01
Silver (ionic)	7.67E-04	1.06E-04	8.68E+01	7.78E+00	8.10E+00
Sodium (ionic)	1.22E-08	4.22E-09	1.45E-03	1.29E-04	2.60E-04
Sodium aluminate	1.05E-04	1.43E-05	1.01E+01	1.00E+00	1.14E+00
Sodium dichromate	2.60E-02	3.47E-03	5.01E+05	9.61E+00	2.57E+01
Sodium oxalate	6.29E-05	8.38E-06	4.33E+01	6.39E-01	6.48E-01
Sodium sulfamate	1.83E-05	2.45E-06	2.17E+00	1.92E-01	1.95E-01
Sulfate (ionic)	2.55E-07	3.31E-07	4.08E+00	6.59E-04	4.74E-03
Sulfuric acid	5.23E-04	6.98E-05	6.21E+01	5.48E+00	5.55E+00
Tributyl phosphate	6.19E-06	0.00E+00	1.65E+01	2.28E+00	1.73E+01
Tributyl phosphonate	1.03E-04	0.00E+00	4.45E+00	3.30E-01	1.93E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	1.28E-03	2.37E-04	2.54E+02	1.31E+01	1.98E+01
Zinc (ionic)	1.22E-05	2.94E-05	1.45E+00	1.39E-01	3.35E+00

TABLE 4.8. Residential Scenario Carcinogenic Chemical URF Sums

Chemical Name	Unit Exposure Factors Summed over Exposure Pathways for Each Medium				
	Soil (mass)	Soil (area)	Air	Groundwater	Surface Water
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	9.97E-06	1.38E-06	1.30E+00	8.85E-02	1.09E-01
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	1.46E-05	7.64E-06	1.17E+00	1.08E-01	3.20E-01
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	1.10E-09	0.00E+00	6.50E-03	4.63E-03	7.87E-03
Chromium IV (ionic)	7.96E-05	1.17E-05	7.57E+00	8.45E-01	2.26E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	5.14E-09	6.85E-10	1.03E-01	0.00E+00	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	7.96E-05	1.17E-05	7.57E+00	8.45E-01	2.26E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	3.66E-10	0.00E+00	9.40E-06	1.35E-04	1.02E-03
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	1.49E-10	0.00E+00	1.59E-03	8.32E-04	8.68E-04
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE 4.9. Residential Scenario Radionuclide URF Sums

Radionuclide	Unit Risk Factors Summed over Exposure Pathways for Each Medium				
	Soil (mass)	Soil (area)	Air	Groundwater	Surface Water
AC225	2.01E-11	1.15E-11	5.27E-04	9.00E-07	1.00E-06
AC227	6.65E-08	7.31E-09	1.93E-02	3.34E-04	3.37E-04
AG110M	7.34E-09	2.66E-09	1.59E-05	1.38E-07	1.92E-07
AM241	1.17E-08	1.56E-09	7.04E-03	9.26E-05	1.11E-04
AM243	2.27E-08	3.07E-09	7.06E-03	9.42E-05	1.13E-04
AU195	1.96E-10	7.67E-11	1.85E-06	1.90E-08	2.68E-08
BA133	8.90E-09	1.58E-09	9.64E-07	3.55E-08	1.49E-07
BE10	4.96E-11	6.66E-12	4.84E-05	8.81E-08	9.06E-08
BE7	2.52E-11	1.21E-11	6.70E-08	8.37E-10	1.06E-09
BI210	3.41E-11	3.96E-14	3.29E-05	1.03E-06	1.04E-06
C14	2.86E-12	3.82E-13	6.78E-07	7.04E-08	1.30E-06
CA45	2.96E-14	2.40E-13	1.22E-06	2.88E-08	4.06E-08
CD109	2.19E-12	2.51E-12	1.51E-05	2.37E-07	7.05E-07
CE144	1.27E-10	4.44E-11	7.52E-05	2.05E-07	1.12E-06
CF250	5.12E-09	9.65E-10	3.58E-02	8.96E-05	9.97E-05
CF252	4.99E-09	1.85E-10	2.15E-02	4.94E-05	5.45E-05
CL36	7.25E-11	1.37E-09	5.12E-07	5.97E-07	6.24E-07
CM243	1.19E-08	1.27E-09	5.78E-03	6.68E-05	8.12E-05
CM244	6.47E-09	6.19E-10	4.86E-03	5.26E-05	6.46E-05
CM245	1.34E-08	1.80E-09	7.07E-03	9.66E-05	1.15E-04
CM246	1.21E-08	1.61E-09	7.04E-03	9.49E-05	1.13E-04
CM248	4.47E-08	5.96E-09	2.64E-02	3.50E-04	4.19E-04
CO57	1.62E-10	5.77E-11	1.87E-06	1.68E-08	7.46E-08
CO58	7.38E-10	3.43E-10	2.40E-06	4.49E-08	2.07E-07
CO60	5.14E-08	1.11E-08	3.49E-05	4.42E-07	2.20E-06
CS134	1.24E-08	3.44E-09	1.09E-05	1.20E-06	2.56E-05
CS137	3.46E-08	5.20E-09	7.40E-06	8.29E-07	1.76E-05
ES254	8.81E-08	1.22E-09	5.79E-03	2.38E-05	2.44E-05
EU152	4.42E-08	7.48E-09	2.45E-05	9.87E-08	3.15E-07
EU154	3.77E-08	7.04E-09	3.12E-05	1.37E-07	3.50E-07
EU155	3.32E-10	7.30E-11	4.01E-06	2.01E-08	2.55E-08
FE55	4.95E-14	1.35E-14	2.14E-07	8.04E-09	1.68E-07
GE68	3.71E-09	1.30E-09	7.31E-06	2.55E-08	9.05E-07
H3	5.92E-16	2.79E-16	2.52E-08	1.25E-09	1.27E-09
I129	3.50E-10	1.49E-10	4.80E-05	5.63E-06	3.38E-05
K40	1.30E-08	1.80E-09	2.94E-06	3.50E-07	3.65E-06
KR85	7.42E-11	1.32E-11	2.69E-10	0.00E+00	3.56E-10
MN54	2.87E-09	9.84E-10	1.37E-06	3.23E-08	1.82E-07
MO93	5.59E-10	7.56E-11	4.08E-06	5.34E-08	6.08E-08
NA22	2.16E-08	5.65E-09	2.05E-06	2.00E-07	5.43E-07
NB93M	8.65E-13	1.51E-13	4.18E-06	4.50E-09	1.34E-08
NB94	1.29E-07	1.73E-08	4.64E-05	6.37E-08	6.15E-07
NB95	2.89E-10	1.42E-10	1.25E-06	1.77E-08	5.87E-08
NI59	1.36E-13	7.70E-14	1.63E-07	2.70E-09	5.41E-09
NI63	3.20E-13	1.90E-13	4.22E-07	7.13E-09	1.43E-08
NP237	2.76E-08	4.54E-09	6.40E-03	1.12E-04	1.28E-04
NP239	1.71E-12	8.57E-13	3.76E-07	1.85E-08	8.82E-08
PA231	3.44E-08	6.91E-09	7.94E-03	2.60E-04	2.61E-04
PA233	7.02E-09	1.77E-11	1.79E-05	1.06E-06	1.06E-06
PB210	1.10E-09	1.65E-10	9.68E-04	2.05E-05	4.01E-05
PB212	7.69E-12	3.85E-12	1.10E-05	5.85E-08	2.31E-07
PM147	1.79E-13	5.01E-14	6.61E-06	1.32E-08	1.56E-08
PO210	5.15E-12	2.91E-12	5.85E-04	4.73E-06	2.69E-05
PU238	1.04E-08	1.28E-09	8.58E-03	8.05E-05	9.71E-05
PU239	1.15E-08	1.55E-09	8.36E-03	9.00E-05	1.07E-04
PU240	1.15E-08	1.54E-09	8.36E-03	9.00E-05	1.07E-04
PU241	2.15E-10	3.59E-11	7.82E-05	3.46E-06	3.73E-06
PU242	1.09E-08	1.46E-09	7.92E-03	8.50E-05	1.02E-04

TABLE 4.9. (contd)

Radionuclide	Unit Risk Factors Summed over Exposure Pathways for Each Medium				
	Soil (mass)	Soil (area)	Air	Groundwater	Surface Water
RA223	8.46E-12	4.23E-12	6.83E-04	1.58E-06	2.91E-06
RA224	2.32E-08	6.03E-13	2.64E-04	8.11E-07	1.60E-06
RA225	5.53E-09	1.08E-12	3.32E-04	1.34E-06	2.41E-06
RA226	1.44E-07	1.92E-08	7.63E-04	9.54E-06	1.26E-05
RA228	1.00E-07	1.72E-08	7.98E-04	2.68E-05	4.60E-05
RE187	8.17E-15	2.34E-14	8.06E-09	1.82E-10	3.93E-10
RN222	6.03E-12	9.89E-15	9.13E-05	5.91E-06	5.91E-06
RU103	1.86E-10	9.08E-11	1.96E-06	2.48E-08	5.33E-08
RU106	7.80E-10	2.58E-10	9.75E-05	2.79E-07	5.66E-07
S35	2.36E-14	1.34E-13	6.29E-08	6.30E-09	5.51E-08
SB122	1.19E-11	5.97E-12	8.13E-07	4.03E-08	1.59E-07
SB124	1.24E-09	5.85E-10	5.28E-06	8.06E-08	2.62E-07
SC46	1.83E-09	8.30E-10	6.29E-06	4.78E-08	1.09E-07
SE75	3.07E-10	1.31E-10	1.95E-06	1.66E-07	4.60E-07
SE79	9.35E-12	2.70E-12	1.95E-06	1.59E-07	4.31E-07
SM147	1.94E-09	2.59E-10	1.58E-03	1.46E-05	1.48E-05
SM151	8.69E-13	1.25E-13	1.92E-06	8.77E-09	9.63E-09
SN113	1.22E-12	5.28E-13	2.17E-06	2.49E-08	7.97E-07
SN123	1.49E-11	6.29E-12	4.95E-06	1.49E-07	4.77E-06
SR85	2.86E-10	1.35E-10	3.42E-07	2.16E-08	3.53E-08
SR90	1.06E-09	3.71E-10	1.78E-05	1.17E-06	1.72E-06
TA182	1.49E-09	6.42E-10	9.74E-06	4.92E-08	1.52E-05
TC99	1.82E-12	1.57E-11	1.97E-06	4.44E-08	5.05E-08
TH227	4.53E-09	5.45E-12	1.07E-03	1.60E-06	1.74E-06
TH228	2.43E-07	6.10E-09	1.71E-02	4.33E-05	4.51E-05
TH229	7.19E-08	1.15E-08	1.69E-02	3.96E-04	4.01E-04
TH230	7.87E-09	1.12E-09	6.47E-03	6.49E-05	6.56E-05
TH231	2.84E-12	3.89E-15	5.42E-05	3.50E-06	3.51E-06
TH232	4.30E-08	2.92E-08	6.25E-03	3.30E-04	3.33E-04
TH234	8.23E-10	1.93E-12	9.10E-06	2.23E-07	3.41E-07
TL204	4.19E-12	9.94E-13	4.76E-07	4.99E-08	1.00E-07
TM170	1.05E-11	4.46E-12	3.90E-06	9.52E-08	1.20E-07
U232	4.17E-09	2.60E-08	1.32E-02	2.24E-06	3.62E-06
U233	3.37E-10	5.75E-11	5.94E-03	1.53E-06	1.77E-06
U234	3.25E-10	4.58E-11	5.70E-03	6.13E-07	8.54E-07
U235	6.12E-09	8.20E-10	5.54E-03	4.09E-06	4.35E-06
U236	3.12E-10	4.38E-11	5.48E-03	5.77E-07	8.02E-07
U238	1.90E-09	3.55E-10	1.15E-02	7.94E-06	8.37E-06
V49	2.33E-15	1.02E-15	5.10E-08	1.11E-09	1.23E-09
Y88	3.62E-09	1.58E-09	4.49E-06	7.96E-07	8.50E-07
Y90	1.99E-13	9.95E-14	1.25E-06	6.44E-08	8.83E-08
ZN65	1.54E-09	5.68E-10	4.48E-06	2.49E-07	6.55E-06
ZR93	2.35E-12	3.93E-13	1.46E-06	2.18E-08	3.20E-08

TABLE 4.10. Agricultural Scenario Noncarcinogenic Chemical URF Sums

Chemical Name	Unit Risk Factors Summed over Exposure Pathways for Each Medium				
	Soil (mass)	Soil (area)	Air	Groundwater	Surface Water
Aluminum fluoride	1.10E-03	1.46E-04	4.27E+01	1.05E+01	1.11E+01
Aluminum nitrate	4.11E-04	5.50E-05	3.95E+01	3.93E+00	4.12E+00
Aluminum (ionic)	9.13E-03	1.24E-03	4.85E+02	1.02E+02	1.13E+02
Ammonium carbonate	9.17E-05	1.22E-05	1.09E+01	9.59E-01	9.72E-01
Ammonium nitrate	4.08E-05	5.43E-06	4.82E+00	4.25E-01	4.31E-01
Beryllium (ionic)	1.08E-03	1.49E-04	3.00E+01	9.64E+00	1.19E+01
Butyl phosphates	1.87E-04	8.19E-04	6.58E+00	9.02E-01	9.82E-01
Cadmium (ionic)	1.08E-02	6.33E-03	1.01E+03	8.99E+01	2.46E+02
Calcium carbonate	1.41E-05	1.88E-06	1.67E+00	1.48E-01	1.50E-01
Calcium (ionic)	2.17E-07	2.89E-08	2.55E-02	2.26E-03	2.30E-03
Calcium nitrate	9.97E-06	1.33E-06	1.17E+00	1.04E-01	1.06E-01
Carbon tetrachloride	2.81E-05	0.00E+00	4.08E+02	2.10E+02	2.93E+02
Chromium IV (ionic)	2.60E-02	3.48E-03	5.01E+05	1.12E+01	2.73E+01
Copper sulfate	3.06E-04	4.08E-05	2.92E+01	3.20E+00	3.25E+00
Copper (ionic)	1.22E-02	2.06E-02	9.33E+02	1.64E+02	2.30E+02
Dibutyl phosphonate	9.51E-05	3.88E-04	3.35E+00	4.46E-01	4.89E-01
Ferric nitrate	1.22E-04	1.63E-05	1.45E+01	1.28E+00	1.30E+00
Ferrocyanide (ionic)	2.45E-05	3.26E-06	2.89E+00	2.55E-01	2.59E-01
Ferrous nitrate	1.62E-04	2.17E-05	1.89E+01	1.69E+00	1.71E+00
Fluoride (ionic)	6.11E-05	6.04E-05	1.59E+01	1.26E+00	1.33E+00
Iron (as ferric ion)	4.53E-06	6.24E-07	3.34E+01	3.37E-02	6.27E-01
Lead (ionic)	2.66E-03	3.89E-04	7.83E+02	2.83E+01	5.62E+01
Magnesium (ionic)	2.77E-07	3.09E-07	4.09E+00	1.24E-03	1.64E-03
Magnesium nitrate	1.93E-06	2.58E-07	2.28E-01	2.02E-02	2.04E-02
Mercury (ionic)	1.37E-02	1.10E-01	5.67E+03	3.24E+02	1.62E+03
Methyl isobutyl ketone	6.35E-06	3.22E-04	5.75E+00	3.08E+00	3.09E+00
Nickel (ionic)	1.91E-04	8.40E-05	1.14E+01	2.23E+00	4.19E+00
Nitrate	2.29E-06	1.98E-03	1.43E+00	5.55E-01	3.68E+01
Nitric acid	1.05E-04	9.07E-02	6.54E+01	2.54E+01	1.68E+03
Nitrite	1.08E-04	1.44E-05	1.28E+01	1.13E+00	1.14E+00
Oxalate (ionic)	1.42E-05	1.90E-06	4.13E+01	1.28E-01	1.30E-01
Phosphate (ionic)	9.98E-06	5.71E-04	4.36E+01	3.93E-01	5.91E+01
Potassium (ionic)	7.19E-09	4.33E-08	1.86E-03	1.58E-04	9.15E-04
Potassium borate	4.08E-05	1.10E-04	6.88E+00	6.03E-01	6.10E-01
Silver (ionic)	7.67E-04	1.16E-04	3.59E+02	2.65E+01	2.68E+01
Sodium (ionic)	1.22E-08	2.25E-08	9.75E-03	7.09E-04	8.39E-04
Sodium aluminate	1.05E-04	1.43E-05	1.10E+01	1.06E+00	1.20E+00
Sodium dichromate	2.60E-02	3.48E-03	5.01E+05	1.12E+01	2.73E+01
Sodium oxalate	6.29E-05	8.38E-06	4.33E+01	6.39E-01	6.48E-01
Sodium sulfamate	1.83E-05	2.45E-06	2.17E+00	1.92E-01	1.95E-01
Sulfate (ionic)	2.55E-07	2.17E-06	4.10E+00	2.27E-03	6.35E-03
Sulfuric acid	5.23E-04	6.98E-05	6.21E+01	5.48E+00	5.55E+00
Tributyl phosphate	6.19E-06	0.00E+00	1.65E+01	2.30E+00	1.73E+01
Tributyl phosphonate	1.03E-04	0.00E+00	4.51E+00	3.33E-01	1.93E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	1.28E-03	2.43E-04	2.67E+02	1.41E+01	2.08E+01
Zinc (ionic)	1.22E-05	1.83E-04	4.41E+00	3.87E-01	3.60E+00

TABLE 4.11. Agricultural Scenario Carcinogenic Chemical URF Sums

Chemical Name	Unit Risk Factors Summed over Exposure Pathways for Each Medium				
	Soil (mass)	Soil (area)	Air	Groundwater	Surface Water
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	9.97E-06	1.38E-06	1.30E+00	8.88E-02	1.09E-01
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	1.46E-05	8.54E-06	1.36E+00	1.21E-01	3.33E-01
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	1.10E-09	0.00E+00	6.50E-03	4.63E-03	7.87E-03
Chromium IV (ionic)	7.96E-05	1.22E-05	9.56E+00	9.85E-01	2.40E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	5.14E-09	6.85E-10	1.03E-01	0.00E+00	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	7.96E-05	1.22E-05	9.56E+00	9.85E-01	2.40E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	3.66E-10	0.00E+00	9.76E-06	1.36E-04	1.02E-03
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	1.49E-10	0.00E+00	1.59E-03	8.32E-04	8.68E-04
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE 4.12. Agricultural Scenario Radionuclide URF Sums

Radionuclide	Unit Risk Factors Summed over Exposure Pathways for Each Medium				
	Soil (mass)	Soil (area)	Air	Groundwater	Surface Water
AC225	2.01E-11	1.15E-11	5.27E-04	9.00E-07	1.00E-06
AC227	6.65E-08	7.31E-09	1.93E-02	3.34E-04	3.37E-04
AG110M	7.34E-09	2.66E-09	2.06E-05	4.61E-07	5.14E-07
AM241	1.17E-08	1.56E-09	7.04E-03	9.26E-05	1.11E-04
AM243	2.27E-08	3.07E-09	7.06E-03	9.43E-05	1.13E-04
AU195	1.96E-10	7.68E-11	1.85E-06	1.97E-08	2.75E-08
BA133	8.90E-09	1.58E-09	9.86E-07	3.70E-08	1.51E-07
BE10	4.96E-11	6.66E-12	4.84E-05	8.86E-08	9.11E-08
BE7	2.52E-11	1.21E-11	6.70E-08	8.40E-10	1.06E-09
BI210	3.41E-11	3.96E-14	3.55E-05	1.21E-06	1.22E-06
C14	2.86E-12	3.82E-13	3.08E-06	1.20E-07	1.35E-06
CA45	2.96E-14	5.78E-13	1.71E-06	6.21E-08	7.38E-08
CD109	2.19E-12	2.80E-12	1.55E-05	2.65E-07	7.34E-07
CE144	1.27E-10	4.44E-11	7.52E-05	2.07E-07	1.12E-06
CF250	5.12E-09	9.84E-10	3.58E-02	9.05E-05	1.01E-04
CF252	4.99E-09	1.89E-10	2.15E-02	5.00E-05	5.50E-05
CL36	7.25E-11	8.68E-09	2.14E-06	2.17E-06	2.20E-06
CM243	1.19E-08	1.27E-09	5.78E-03	6.69E-05	8.12E-05
CM244	6.47E-09	6.19E-10	4.86E-03	5.26E-05	6.46E-05
CM245	1.34E-08	1.80E-09	7.07E-03	9.67E-05	1.15E-04
CM246	1.21E-08	1.61E-09	7.04E-03	9.49E-05	1.13E-04
CM248	4.47E-08	5.96E-09	2.64E-02	3.50E-04	4.19E-04
CO57	1.62E-10	5.78E-11	1.95E-06	2.24E-08	8.02E-08
CO58	7.38E-10	3.43E-10	2.58E-06	5.83E-08	2.20E-07
CO60	5.14E-08	1.11E-08	3.69E-05	5.92E-07	2.35E-06
CS134	1.24E-08	3.44E-09	2.69E-05	2.33E-06	2.67E-05
CS137	3.46E-08	5.22E-09	1.85E-05	1.61E-06	1.84E-05
ES254	8.81E-08	1.22E-09	5.80E-03	2.48E-05	2.54E-05
EU152	4.42E-08	7.48E-09	2.45E-05	1.00E-07	3.16E-07
EU154	3.77E-08	7.04E-09	3.12E-05	1.39E-07	3.53E-07
EU155	3.32E-10	7.30E-11	4.01E-06	2.05E-08	2.59E-08
FE55	4.95E-14	1.42E-14	2.26E-07	9.05E-09	1.69E-07
GE68	3.71E-09	1.61E-09	3.34E-05	2.48E-06	3.36E-06
H3	5.92E-16	2.79E-16	3.74E-08	1.47E-09	1.49E-09
I129	3.50E-10	3.18E-10	1.49E-04	1.26E-05	4.08E-05
K40	1.30E-08	1.91E-09	7.30E-06	6.80E-07	3.98E-06
KR85	7.42E-11	1.32E-11	2.69E-10	0.00E+00	3.56E-10
MN54	2.87E-09	9.84E-10	1.39E-06	3.37E-08	1.83E-07
MO93	5.59E-10	7.61E-11	4.45E-06	8.05E-08	8.80E-08
NA22	2.16E-08	5.66E-09	1.48E-05	1.09E-06	1.44E-06
NB93M	8.65E-13	2.21E-13	4.39E-06	2.06E-08	2.95E-08
NB94	1.29E-07	1.73E-08	4.94E-05	2.90E-07	8.42E-07
NB95	2.89E-10	1.42E-10	1.90E-06	6.65E-08	1.07E-07
NI59	1.36E-13	9.98E-14	1.69E-07	3.11E-09	5.82E-09
NI63	3.20E-13	2.46E-13	4.37E-07	8.20E-09	1.54E-08
NP237	2.76E-08	4.54E-09	6.40E-03	1.12E-04	1.28E-04
NP239	1.71E-12	8.57E-13	3.78E-07	1.87E-08	8.84E-08
PA231	3.44E-08	6.91E-09	7.95E-03	2.60E-04	2.61E-04
PA233	7.02E-09	1.77E-11	1.92E-05	1.15E-06	1.15E-06
PB210	1.10E-09	1.67E-10	9.79E-04	2.13E-05	4.09E-05
PB212	7.69E-12	3.85E-12	1.10E-05	5.85E-08	2.31E-07
PM147	1.79E-13	5.08E-14	6.62E-06	1.35E-08	1.58E-08
PO210	5.15E-12	2.96E-12	5.88E-04	4.91E-06	2.71E-05
PU238	1.04E-08	1.28E-09	8.58E-03	8.05E-05	9.72E-05
PU239	1.15E-08	1.55E-09	8.36E-03	9.00E-05	1.07E-04
PU240	1.15E-08	1.54E-09	8.36E-03	9.00E-05	1.07E-04
PU241	2.15E-10	3.59E-11	7.82E-05	3.46E-06	3.73E-06
PU242	1.09E-08	1.46E-09	7.92E-03	8.50E-05	1.02E-04

TABLE 4.12. (contd)

Radionuclide	Unit Risk Factors Summed over Exposure Pathways for Each Medium				
	Soil (mass)	Soil (area)	Air	Groundwater	Surface Water
RA223	8.46E-12	4.23E-12	6.84E-04	1.62E-06	2.96E-06
RA224	2.32E-08	6.03E-13	2.64E-04	8.20E-07	1.61E-06
RA225	5.53E-09	1.08E-12	3.33E-04	1.39E-06	2.45E-06
RA226	1.44E-07	1.92E-08	7.77E-04	1.05E-05	1.36E-05
RA228	1.00E-07	1.72E-08	8.20E-04	2.83E-05	4.75E-05
RE187	8.17E-15	3.53E-14	8.60E-09	2.23E-10	4.33E-10
RN222	6.03E-12	9.91E-15	1.03E-04	6.71E-06	6.71E-06
RU103	1.86E-10	9.08E-11	1.96E-06	2.50E-08	5.35E-08
RU106	7.80E-10	2.58E-10	9.75E-05	2.82E-07	5.69E-07
S35	2.36E-14	9.27E-13	2.42E-07	1.96E-08	6.85E-08
SB122	1.19E-11	5.97E-12	8.14E-07	4.03E-08	1.59E-07
SB124	1.24E-09	5.85E-10	5.30E-06	8.18E-08	2.63E-07
SC46	1.83E-09	8.30E-10	6.32E-06	5.06E-08	1.11E-07
SE75	3.07E-10	1.31E-10	3.17E-06	2.52E-07	5.47E-07
SE79	9.35E-12	4.40E-12	3.20E-06	2.48E-07	5.20E-07
SM147	1.94E-09	2.59E-10	1.58E-03	1.46E-05	1.48E-05
SM151	8.69E-13	1.26E-13	1.92E-06	8.86E-09	9.72E-09
SN113	1.22E-12	5.37E-13	2.31E-06	3.63E-08	8.09E-07
SN123	1.49E-11	6.35E-12	5.77E-06	2.18E-07	4.84E-06
SR85	2.86E-10	1.35E-10	3.94E-07	2.52E-08	3.89E-08
SR90	1.06E-09	4.26E-10	2.06E-05	1.38E-06	1.92E-06
TA182	1.49E-09	6.42E-10	9.74E-06	4.94E-08	1.52E-05
TC99	1.82E-12	4.20E-11	2.66E-06	9.76E-08	1.04E-07
TH227	4.53E-09	5.45E-12	1.07E-03	1.65E-06	1.79E-06
TH228	2.43E-07	6.10E-09	1.71E-02	4.33E-05	4.51E-05
TH229	7.19E-08	1.15E-08	1.69E-02	3.96E-04	4.01E-04
TH230	7.87E-09	1.12E-09	6.48E-03	6.59E-05	6.66E-05
TH231	2.84E-12	3.89E-15	5.55E-05	3.59E-06	3.60E-06
TH232	4.30E-08	2.92E-08	6.27E-03	3.32E-04	3.34E-04
TH234	8.23E-10	1.93E-12	9.61E-06	2.57E-07	3.76E-07
TL204	4.19E-12	9.99E-13	7.60E-07	7.17E-08	1.22E-07
TM170	1.05E-11	4.47E-12	3.93E-06	9.70E-08	1.22E-07
U232	4.17E-09	2.60E-08	1.32E-02	2.34E-06	3.72E-06
U233	3.37E-10	5.78E-11	5.94E-03	1.62E-06	1.86E-06
U234	3.25E-10	4.60E-11	5.70E-03	6.48E-07	8.89E-07
U235	6.12E-09	8.20E-10	5.54E-03	4.22E-06	4.48E-06
U236	3.12E-10	4.40E-11	5.48E-03	6.09E-07	8.35E-07
U238	1.90E-09	3.55E-10	1.15E-02	9.03E-06	9.46E-06
V49	2.33E-15	1.07E-15	5.31E-08	1.26E-09	1.37E-09
Y88	3.62E-09	1.58E-09	4.49E-06	7.97E-07	8.50E-07
Y90	1.99E-13	9.95E-14	1.25E-06	6.44E-08	8.83E-08
ZN65	1.54E-09	5.94E-10	9.96E-06	6.60E-07	6.96E-06
ZR93	2.35E-12	4.28E-13	1.67E-06	3.81E-08	4.83E-08

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APPENDIX A

UNIT RISK FACTOR TABLES

APPENDIX A

UNIT RISK FACTOR TABLES

This appendix presents unit risk factor values for all exposure pathways used as the basis for the summary tables in Section 4. Each table presents URF values for one scenario, one exposure medium, all exposure pathways appropriate to the scenario and medium, and all pollutants (chemical or radionuclide). Two tables are presented for chemicals: one for noncarcinogenic effects, and one for carcinogenic effects. Each of these two table types contains the same list of pollutants. A zero value for a URF in one of these tables indicates that there was no toxicity value for the pollutant for that particular type of exposure. For example, if there were no inhalation reference doses for a pollutant, there would be zero values for inhalation pathways for the pollutant in the non-carcinogenic effects table. The content of the tables in the order of presentation is as follows:

<u>Table Number</u>	<u>Scenario</u>	<u>Medium</u>	<u>Pollutant Type</u>
A.1	Industrial	Soil (mass)	Noncarcinogens
A.2	Industrial	Soil (mass)	Carcinogens
A.3	Industrial	Soil (mass)	Radionuclides
A.4	Industrial	Soil (area)	Noncarcinogens
A.5	Industrial	Soil (area)	Carcinogens
A.6	Industrial	Soil (area)	Radionuclides
A.7	Industrial	Air	Noncarcinogens
A.8	Industrial	Air	Carcinogens
A.9	Industrial	Air	Radionuclides
A.10	Industrial	Groundwater	Noncarcinogens
A.11	Industrial	Groundwater	Carcinogens
A.12	Industrial	Groundwater	Radionuclides
A.13	Industrial	Surface Water	Noncarcinogens
A.14	Industrial	Surface Water	Carcinogens
A.15	Industrial	Surface Water	Radionuclides
A.16	Recreational	Soil (mass)	Noncarcinogens
A.17	Recreational	Soil (mass)	Carcinogens
A.18	Recreational	Soil (mass)	Radionuclides

<u>Table Number</u>	<u>Scenario</u>	<u>Medium</u>	<u>Pollutant Type</u>
A.19	Recreational	Soil (area)	Noncarcinogens
A.20	Recreational	Soil (area)	Carcinogens
A.21	Recreational	Soil (area)	Radionuclides
A.22	Recreational	Air	Noncarcinogens
A.23	Recreational	Air	Carcinogens
A.24	Recreational	Air	Radionuclides
A.25	Recreational	Groundwater	Noncarcinogens
A.26	Recreational	Groundwater	Carcinogens
A.27	Recreational	Groundwater	Radionuclides
A.28	Recreational	Surface Water	Noncarcinogens
A.29	Recreational	Surface Water	Carcinogens
A.30	Recreational	Surface Water	Radionuclides
A.31	Residential	Soil (mass)	Noncarcinogens
A.32	Residential	Soil (mass)	Carcinogens
A.33	Residential	Soil (mass)	Radionuclides
A.34	Residential	Soil (area)	Noncarcinogens
A.35	Residential	Soil (area)	Carcinogens
A.36	Residential	Soil (area)	Radionuclides
A.37	Residential	Air	Noncarcinogens
A.38	Residential	Air	Carcinogens
A.39	Residential	Air	Radionuclides
A.40	Residential	Groundwater	Noncarcinogens
A.41	Residential	Groundwater	Carcinogens
A.42	Residential	Groundwater	Radionuclides
A.43	Residential	Surface Water	Noncarcinogens
A.44	Residential	Surface Water	Carcinogens
A.45	Residential	Surface Water	Radionuclides
A.46	Agricultural	Soil (mass)	Noncarcinogens
A.47	Agricultural	Soil (mass)	Carcinogens
A.48	Agricultural	Soil (mass)	Radionuclides
A.49	Agricultural	Soil (area)	Noncarcinogens
A.50	Agricultural	Soil (area)	Carcinogens
A.51	Agricultural	Soil (area)	Radionuclides
A.52	Agricultural	Air	Noncarcinogens
A.53	Agricultural	Air	Carcinogens
A.54	Agricultural	Air	Radionuclides
A.55	Agricultural	Groundwater	Noncarcinogens
A.56	Agricultural	Groundwater	Carcinogens
A.57	Agricultural	Groundwater	Radionuclides
A.58	Agricultural	Surface Water	Noncarcinogens
A.59	Agricultural	Surface Water	Carcinogens
A.60	Agricultural	Surface Water	Radionuclides

TABLE A.1. Noncarcinogenic Chemical URFs for Industrial Scenario, Soil (mass)

<u>Chemical Name</u>	<u>Soil Ingest</u>	<u>Soil Dermal</u>	<u>Soil Resusp</u>	<u>Soil Extern</u>
Aluminum fluoride	6.97E-05	1.39E-04	2.22E-07	0.00E+00
Aluminum nitrate	2.60E-05	5.19E-05	8.90E-07	0.00E+00
Aluminum (ionic)	7.14E-04	1.43E-05	6.99E-07	0.00E+00
Ammonium carbonate	7.14E-06	1.43E-07	2.45E-07	0.00E+00
Ammonium nitrate	3.17E-06	6.35E-08	1.09E-07	0.00E+00
Beryllium (ionic)	5.71E-05	2.29E-04	0.00E+00	0.00E+00
Butyl phosphates	4.33E-06	8.66E-05	1.48E-07	0.00E+00
Cadmium (ionic)	5.71E-04	2.29E-03	1.96E-05	0.00E+00
Calcium carbonate	1.10E-06	2.20E-08	3.76E-08	0.00E+00
Calcium (ionic)	1.68E-08	1.12E-09	5.76E-10	0.00E+00
Calcium nitrate	7.72E-07	5.15E-08	2.64E-08	0.00E+00
Carbon tetrachloride	9.75E-07	1.95E-05	3.34E-08	0.00E+00
Chromium IV (ionic)	5.71E-05	1.14E-04	1.72E-02	0.00E+00
Copper sulfate	2.38E-05	9.52E-07	5.76E-07	0.00E+00
Copper (ionic)	9.52E-04	3.81E-05	9.79E-07	0.00E+00
Dibutyl phosphonate	2.20E-06	4.40E-05	7.53E-08	0.00E+00
Ferric nitrate	9.52E-06	1.90E-07	3.26E-07	0.00E+00
Ferrocyanide (ionic)	1.90E-06	3.81E-08	6.52E-08	0.00E+00
Ferrous nitrate	1.24E-05	2.48E-06	4.25E-07	0.00E+00
Fluoride (ionic)	4.76E-06	9.52E-08	1.63E-07	0.00E+00
Iron (as ferric ion)	2.20E-07	4.40E-08	1.14E-06	0.00E+00
Lead (ionic)	2.04E-04	2.04E-05	2.28E-05	0.00E+00
Magnesium (ionic)	5.71E-09	2.29E-10	1.40E-07	0.00E+00
Magnesium nitrate	1.50E-07	3.01E-09	5.15E-09	0.00E+00
Mercury (ionic)	9.52E-04	9.52E-04	1.14E-04	0.00E+00
Methyl isobutyl ketone	2.20E-07	4.40E-06	7.54E-09	0.00E+00
Nickel (ionic)	1.43E-05	5.71E-06	0.00E+00	0.00E+00
Nitrate	1.79E-07	3.57E-09	6.12E-09	0.00E+00
Nitric acid	8.16E-06	1.63E-07	2.80E-07	0.00E+00
Nitrite	8.40E-06	1.68E-07	2.88E-07	0.00E+00
Oxalate (ionic)	9.52E-07	1.90E-08	1.40E-06	0.00E+00
Phosphate (ionic)	6.21E-07	1.55E-08	1.40E-06	0.00E+00
Potassium (ionic)	5.60E-10	1.12E-11	1.92E-11	0.00E+00
Potassium borate	3.17E-06	6.35E-08	1.09E-07	0.00E+00
Silver (ionic)	5.71E-05	2.29E-05	1.96E-06	0.00E+00
Sodium (ionic)	9.52E-10	1.90E-11	3.26E-11	0.00E+00
Sodium aluminate	6.64E-06	1.33E-05	2.28E-07	0.00E+00
Sodium dichromate	5.71E-05	1.14E-04	1.72E-02	0.00E+00
Sodium oxalate	4.76E-06	9.52E-08	1.40E-06	0.00E+00
Sodium sulfamate	1.43E-06	2.86E-08	4.89E-08	0.00E+00
Sulfate (ionic)	4.02E-09	8.05E-11	1.40E-07	0.00E+00
Sulfuric acid	4.08E-05	8.16E-07	1.40E-06	0.00E+00
Tributyl phosphate	2.14E-07	4.29E-06	7.34E-09	0.00E+00
Tributyl phosphonate	2.38E-06	4.76E-05	8.15E-08	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	9.52E-05	3.81E-05	6.99E-06	0.00E+00
Zinc (ionic)	9.52E-07	3.81E-08	3.26E-08	0.00E+00

TABLE A.2. Carcinogenic Chemical URFs for Industrial Scenario, Soil (mass)

Chemical Name	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	3.51E-07	1.40E-06	2.35E-08	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	5.14E-07	2.06E-06	1.76E-08	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	2.54E-11	5.07E-10	3.54E-13	0.00E+00
Chromium IV (ionic)	3.35E-06	6.70E-06	1.15E-07	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	2.35E-09	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	3.35E-06	6.70E-06	1.15E-07	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	8.47E-12	1.69E-10	0.00E+00	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	3.44E-12	6.88E-11	1.39E-13	0.00E+00
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.3. Radionuclide URFs for Industrial Scenario, Soil (mass)

<u>Radionuclide</u>	<u>Soil Ingest</u>	<u>Soil Dermal</u>	<u>Soil Resusp</u>	<u>Soil Extern</u>
AC225	4.91E-15	7.87E-14	2.37E-14	2.65E-12
AC227	5.22E-11	2.54E-08	4.49E-10	1.96E-09
AG110M	3.39E-14	6.26E-15	1.70E-14	9.79E-10
AM241	3.45E-11	6.60E-09	1.58E-10	1.03E-11
AM243	3.52E-11	6.70E-09	1.60E-10	9.40E-10
AU195	3.47E-15	2.16E-17	1.46E-15	2.61E-11
BA133	9.84E-14	7.73E-15	1.01E-14	1.01E-09
BE10	4.22E-13	2.54E-13	1.10E-12	3.82E-12
BE7	4.61E-17	8.20E-18	1.42E-17	3.37E-12
BI210	5.85E-13	8.11E-13	4.36E-13	3.30E-12
C14	1.31E-13	3.78E-15	3.20E-17	1.49E-13
CA45	4.66E-15	4.55E-16	8.22E-16	3.98E-22
CD109	1.06E-13	3.98E-13	2.98E-14	1.43E-13
CE144	5.08E-14	1.12E-13	9.54E-14	1.67E-11
CF250	1.19E-10	2.46E-09	5.01E-10	4.20E-12
CF252	9.71E-11	1.80E-09	4.84E-10	6.63E-12
CL36	2.63E-13	5.62E-15	7.01E-15	6.23E-12
CM243	2.77E-11	4.53E-09	1.30E-10	3.41E-10
CM244	2.34E-11	3.62E-09	1.10E-10	6.39E-14
CM245	3.51E-11	6.88E-09	1.60E-10	1.13E-10
CM246	3.50E-11	6.87E-09	1.60E-10	5.75E-14
CM248	1.33E-10	2.54E-08	6.00E-10	4.69E-14
CO57	4.52E-15	2.42E-16	2.19E-15	2.16E-11
CO58	3.27E-15	1.39E-16	6.86E-16	9.84E-11
CO60	7.75E-13	4.68E-14	2.65E-13	6.48E-09
CS134	8.90E-13	1.94E-14	2.08E-14	1.65E-09
CS137	3.28E-12	7.26E-14	7.62E-14	3.42E-09
ES254	2.80E-11	5.18E-10	1.26E-10	7.80E-09
EU152	1.92E-13	1.82E-12	3.45E-13	4.81E-09
EU154	2.20E-13	1.91E-12	3.52E-13	4.40E-09
EU155	2.21E-14	1.82E-13	3.02E-14	4.22E-11
FE55	7.64E-15	1.96E-15	8.14E-16	0.00E+00
GE68	7.26E-15	9.79E-17	9.25E-15	4.95E-10
H3	9.72E-17	1.41E-18	4.81E-18	0.00E+00
I129	2.78E-11	4.53E-13	6.00E-13	8.74E-12
K40	1.61E-12	3.62E-14	3.80E-14	1.15E-09
KR85	0.00E+00	0.00E+00	1.32E-19	8.38E-12
MN54	9.93E-15	1.08E-15	1.64E-15	3.82E-10
MO93	2.57E-13	3.23E-15	8.82E-14	4.95E-11
NA22	1.85E-13	4.06E-15	4.48E-15	2.87E-09
NB93M	1.37E-14	4.54E-15	5.96E-14	7.09E-14
NB94	3.07E-13	1.52E-13	1.05E-12	1.15E-08
NB95	6.60E-16	1.17E-16	1.77E-16	3.85E-11
NI59	1.33E-14	4.89E-15	3.50E-15	0.00E+00
NI63	3.27E-14	1.11E-14	8.39E-15	0.00E+00
NP237	3.22E-11	8.15E-09	1.45E-10	1.11E-09
NP239	6.40E-17	3.63E-18	3.73E-18	2.29E-13
PA231	1.35E-11	2.00E-08	1.81E-10	5.71E-11
PA233	1.14E-13	1.15E-18	3.37E-14	7.00E-10
PB210	9.71E-11	5.52E-11	2.06E-11	6.78E-12
PB212	7.41E-17	3.33E-17	2.19E-17	1.03E-12
PM147	8.51E-15	6.13E-14	2.82E-14	2.40E-15
PO210	5.97E-13	9.38E-13	3.55E-13	1.68E-15
PU238	3.21E-11	5.80E-09	1.95E-10	5.97E-14
PU239	3.36E-11	6.52E-09	1.90E-10	3.62E-14
PU240	3.36E-11	6.52E-09	1.90E-10	5.75E-14
PU241	5.27E-13	1.25E-10	1.16E-12	1.83E-14
PU242	3.21E-11	6.16E-09	1.80E-10	4.90E-14

TABLE A.3. (contd)

<u>Radionuclide</u>	<u>Soil Ingest</u>	<u>Soil Dermal</u>	<u>Soil Resusp</u>	<u>Soil Extern</u>
RA223	2.11E-14	4.08E-15	3.49E-14	1.10E-12
RA224	1.65E-12	2.75E-13	1.61E-12	3.03E-09
RA225	5.67E-12	1.46E-11	8.88E-12	4.51E-10
RA226	1.77E-11	9.99E-12	1.50E-11	1.28E-08
RA228	1.30E-10	4.07E-11	1.96E-11	8.71E-09
RE187	8.61E-16	2.72E-17	1.69E-16	0.00E+00
RN222	8.81E-14	1.89E-14	8.01E-15	6.88E-13
RU103	1.03E-15	7.45E-17	3.26E-16	2.48E-11
RU106	1.01E-13	1.45E-14	1.60E-13	1.04E-10
S35	5.55E-16	1.28E-17	1.64E-17	2.69E-15
SB122	1.56E-16	1.45E-18	9.07E-18	1.59E-12
SB124	5.04E-15	1.51E-16	1.31E-15	1.65E-10
SC46	3.87E-15	3.60E-15	2.24E-15	2.43E-10
SE75	2.01E-14	4.72E-16	7.12E-16	4.09E-11
SE79	7.88E-13	1.81E-14	3.05E-14	1.92E-13
SM147	2.34E-12	1.11E-09	3.60E-11	0.00E+00
SM151	1.49E-14	4.03E-13	4.04E-14	7.90E-16
SN113	2.89E-15	2.92E-16	1.07E-15	1.60E-13
SN123	1.94E-14	6.92E-16	2.57E-15	1.97E-12
SR85	1.44E-15	5.56E-17	6.40E-17	3.82E-11
SR90	5.63E-12	7.49E-13	3.32E-13	8.64E-11
TA182	5.64E-15	1.32E-15	4.89E-15	1.99E-10
TC99	1.90E-13	4.53E-15	4.15E-14	1.28E-15
TH227	3.52E-12	7.35E-11	2.24E-11	4.01E-10
TH228	1.26E-11	3.23E-09	3.91E-10	2.00E-08
TH229	1.59E-11	3.08E-08	3.89E-10	1.62E-09
TH230	1.90E-12	4.53E-09	1.45E-10	2.67E-13
TH231	4.47E-15	1.72E-15	2.02E-16	3.75E-13
TH232	2.18E-12	2.54E-08	1.40E-10	2.86E-11
TH234	4.44E-13	5.37E-14	1.22E-13	8.27E-11
TL204	6.60E-14	9.62E-16	1.73E-15	4.93E-13
TM170	1.22E-14	3.00E-15	2.08E-15	1.39E-12
U232	5.52E-12	8.65E-11	3.04E-10	1.82E-10
U233	2.34E-12	1.13E-11	1.35E-10	9.35E-14
U234	2.34E-12	1.11E-11	1.30E-10	6.40E-14
U235	2.39E-12	1.02E-11	1.25E-10	5.16E-10
U236	2.19E-12	1.05E-11	1.25E-10	5.12E-14
U238	4.23E-12	9.98E-12	2.60E-10	1.03E-10
V49	3.62E-16	4.13E-17	6.98E-17	0.00E+00
Y88	1.15E-14	1.15E-12	1.84E-15	4.82E-10
Y90	2.49E-16	4.25E-18	1.47E-17	2.63E-14
ZN65	5.98E-14	2.36E-15	3.86E-15	2.05E-10
ZR93	2.49E-14	1.23E-12	3.27E-14	1.57E-16

TABLE A.4. Noncarcinogenic Chemical URFs for Industrial Scenario, Soil (area)

Chemical Name	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
Aluminum fluoride	6.39E-06	1.28E-05	2.04E-08	0.00E+00
Aluminum nitrate	2.38E-06	4.76E-06	8.15E-08	0.00E+00
Aluminum (ionic)	6.55E-05	1.31E-06	6.40E-08	0.00E+00
Ammonium carbonate	6.55E-07	1.31E-08	2.24E-08	0.00E+00
Ammonium nitrate	2.91E-07	5.82E-09	9.96E-09	0.00E+00
Beryllium (ionic)	5.24E-06	2.10E-05	0.00E+00	0.00E+00
Butyl phosphates	3.97E-07	7.94E-06	1.36E-08	0.00E+00
Cadmium (ionic)	5.24E-05	2.10E-04	1.79E-06	0.00E+00
Calcium carbonate	1.01E-07	2.01E-09	3.45E-09	0.00E+00
Calcium (ionic)	1.54E-09	1.03E-10	5.27E-11	0.00E+00
Calcium nitrate	7.08E-08	4.72E-09	2.42E-09	0.00E+00
Carbon tetrachloride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium IV (ionic)	5.24E-06	1.05E-05	1.57E-03	0.00E+00
Copper sulfate	2.18E-06	8.73E-08	5.27E-08	0.00E+00
Copper (ionic)	8.73E-05	3.49E-06	8.96E-08	0.00E+00
Dibutyl phosphonate	2.01E-07	4.03E-06	6.90E-09	0.00E+00
Ferric nitrate	8.73E-07	1.75E-08	2.99E-08	0.00E+00
Ferrocyanide (ionic)	1.75E-07	3.49E-09	5.98E-09	0.00E+00
Ferrous nitrate	1.14E-06	2.28E-07	3.90E-08	0.00E+00
Fluoride (ionic)	4.37E-07	8.73E-09	1.49E-08	0.00E+00
Iron (as ferric ion)	2.01E-08	4.03E-09	1.04E-07	0.00E+00
Lead (ionic)	1.87E-05	1.87E-06	2.08E-06	0.00E+00
Magnesium (ionic)	5.24E-10	2.10E-11	1.28E-08	0.00E+00
Magnesium nitrate	1.38E-08	2.76E-10	4.72E-10	0.00E+00
Mercury (ionic)	8.73E-05	8.73E-05	1.04E-05	0.00E+00
Methyl isobutyl ketone	5.62E-08	1.12E-06	1.92E-09	0.00E+00
Nickel (ionic)	1.31E-06	5.24E-07	0.00E+00	0.00E+00
Nitrate	1.64E-08	3.27E-10	5.60E-10	0.00E+00
Nitric acid	7.48E-07	1.50E-08	2.56E-08	0.00E+00
Nitrite	7.70E-07	1.54E-08	2.64E-08	0.00E+00
Oxalate (ionic)	8.73E-08	1.75E-09	1.28E-07	0.00E+00
Phosphate (ionic)	5.69E-08	1.42E-09	1.28E-07	0.00E+00
Potassium (ionic)	5.14E-11	1.03E-12	1.76E-12	0.00E+00
Potassium borate	2.91E-07	5.82E-09	9.96E-09	0.00E+00
Silver (ionic)	5.24E-06	2.10E-06	1.79E-07	0.00E+00
Sodium (ionic)	8.73E-11	1.75E-12	2.99E-12	0.00E+00
Sodium aluminate	6.09E-07	1.22E-06	2.08E-08	0.00E+00
Sodium dichromate	5.24E-06	1.05E-05	1.57E-03	0.00E+00
Sodium oxalate	4.37E-07	8.73E-09	1.28E-07	0.00E+00
Sodium sulfamate	1.31E-07	2.62E-09	4.48E-09	0.00E+00
Sulfate (ionic)	3.69E-10	7.38E-12	1.28E-08	0.00E+00
Sulfuric acid	3.74E-06	7.48E-08	1.28E-07	0.00E+00
Tributyl phosphate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	8.73E-06	3.49E-06	6.40E-07	0.00E+00
Zinc (ionic)	8.73E-08	3.49E-09	2.99E-09	0.00E+00

TABLE A.5. Carcinogenic Chemical URFs for Industrial Scenario, Soil (area)

<u>Chemical Name</u>	<u>Soil Ingest</u>	<u>Soil Dermal</u>	<u>Soil Resusp</u>	<u>Soil Extern</u>
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	3.22E-08	1.29E-07	2.15E-09	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	4.72E-08	1.89E-07	1.61E-09	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium IV (ionic)	3.07E-07	6.14E-07	1.05E-08	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	2.15E-10	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	3.07E-07	6.14E-07	1.05E-08	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.6. Radionuclide URFs for Industrial Scenario, Soil (area)

Radionuclide	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
AC225	1.63E-15	2.62E-14	7.89E-15	8.83E-13
AC227	4.54E-12	1.93E-09	3.60E-11	1.92E-10
AG110M	8.13E-15	1.50E-15	4.09E-15	2.35E-10
AM241	3.18E-12	6.08E-10	1.45E-11	9.48E-13
AM243	3.22E-12	6.14E-10	1.47E-11	8.96E-11
AU195	9.00E-16	5.60E-18	3.78E-16	6.78E-12
BA133	1.11E-14	8.75E-16	1.14E-15	1.14E-10
BE10	3.87E-14	2.32E-14	1.01E-13	3.50E-13
BE7	1.47E-17	2.61E-18	4.53E-18	1.07E-12
BI210	2.13E-16	2.30E-16	2.13E-16	3.21E-15
C14	1.20E-14	3.47E-16	2.93E-18	1.36E-14
CA45	1.24E-15	1.21E-16	2.19E-16	1.06E-22
CD109	2.15E-14	8.11E-14	6.07E-15	2.90E-14
CE144	1.18E-14	2.59E-14	2.21E-14	3.89E-12
CF250	1.30E-11	2.69E-10	5.48E-11	4.60E-13
CF252	3.06E-12	5.66E-11	1.52E-11	2.09E-13
CL36	2.41E-14	5.15E-16	6.42E-16	5.71E-13
CM243	2.19E-12	3.58E-10	1.03E-11	2.69E-11
CM244	1.71E-12	2.65E-10	8.04E-12	4.67E-15
CM245	3.23E-12	6.35E-10	1.47E-11	1.04E-11
CM246	3.21E-12	6.30E-10	1.47E-11	5.27E-15
CM248	1.22E-11	2.32E-09	5.50E-11	4.30E-15
CO57	1.06E-15	5.68E-17	5.14E-16	5.08E-12
CO58	1.01E-15	4.31E-17	2.12E-16	3.05E-11
CO60	1.04E-13	6.26E-15	3.55E-14	8.67E-10
CS134	1.58E-13	3.44E-15	3.70E-15	2.93E-10
CS137	3.26E-13	7.21E-15	7.57E-15	3.39E-10
ES254	8.23E-13	1.62E-11	3.56E-12	1.02E-10
EU152	2.09E-14	1.98E-13	3.75E-14	5.23E-10
EU154	2.60E-14	2.26E-13	4.15E-14	5.18E-10
EU155	3.01E-15	2.49E-14	4.12E-15	5.75E-12
FE55	1.25E-15	3.22E-16	1.33E-16	0.00E+00
GE68	1.68E-15	2.26E-17	2.14E-15	1.14E-10
H3	3.05E-17	4.42E-19	1.51E-18	0.00E+00
I129	2.54E-12	4.15E-14	5.50E-14	8.01E-13
K40	1.47E-13	3.32E-15	3.48E-15	1.06E-10
KR85	0.00E+00	0.00E+00	1.49E-20	9.48E-13
MN54	2.25E-15	2.43E-16	3.71E-16	8.65E-11
MO93	2.40E-14	4.48E-16	1.01E-14	4.53E-12
NA22	3.08E-14	6.73E-16	7.43E-16	4.75E-10
NB93M	1.49E-15	4.94E-16	6.48E-15	7.70E-15
NB94	2.81E-14	1.39E-14	9.63E-14	1.06E-09
NB95	2.16E-16	3.83E-17	5.79E-17	1.26E-11
NI59	1.22E-15	4.48E-16	3.21E-16	0.00E+00
NI63	3.07E-15	1.05E-15	7.89E-16	0.00E+00
NP237	2.96E-12	7.47E-10	1.33E-11	1.58E-10
NP239	2.13E-17	1.21E-18	1.24E-18	7.62E-14
PA231	2.16E-12	2.21E-09	2.38E-11	4.49E-11
PA233	2.57E-16	2.24E-19	7.65E-17	1.57E-12
PB210	8.75E-12	6.35E-12	2.38E-12	6.89E-13
PB212	2.47E-17	1.11E-17	7.29E-18	3.42E-13
PM147	1.41E-15	1.01E-14	4.66E-15	3.98E-16
PO210	1.65E-13	2.59E-13	9.80E-14	4.66E-16
PU238	2.80E-12	5.06E-10	1.70E-11	5.21E-15
PU239	3.08E-12	5.98E-10	1.74E-11	3.32E-15
PU240	3.08E-12	5.97E-10	1.74E-11	5.27E-15
PU241	6.07E-14	1.33E-11	1.91E-13	8.49E-15
PU242	2.95E-12	5.65E-10	1.65E-11	4.49E-15

TABLE A.6. (contd)

Radionuclide	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
RA223	7.00E-15	1.36E-15	1.16E-14	3.67E-13
RA224	1.34E-15	1.67E-16	1.45E-15	5.20E-14
RA225	7.37E-15	4.06E-15	7.92E-15	7.56E-14
RA226	3.35E-12	2.19E-12	1.85E-12	1.17E-09
RA228	6.92E-12	1.09E-10	1.40E-11	1.21E-09
RE187	7.90E-17	2.49E-18	1.55E-17	0.00E+00
RN222	1.63E-16	8.29E-17	3.21E-17	6.53E-16
RU103	3.35E-16	2.42E-17	1.06E-16	8.07E-12
RU106	2.19E-14	3.14E-15	3.47E-14	2.25E-11
S35	1.67E-16	3.86E-18	4.93E-18	8.09E-16
SB122	5.19E-17	4.83E-19	3.02E-18	5.30E-13
SB124	1.59E-15	4.75E-17	4.12E-16	5.19E-11
SC46	1.17E-15	1.09E-15	6.77E-16	7.37E-11
SE75	5.71E-15	1.34E-16	2.02E-16	1.16E-11
SE79	7.22E-14	1.66E-15	2.80E-15	1.76E-14
SM147	2.14E-13	1.01E-10	3.30E-12	0.00E+00
SM151	1.40E-15	3.80E-14	3.80E-15	7.45E-17
SN113	8.28E-16	8.38E-17	3.06E-16	4.58E-14
SN123	5.44E-15	1.94E-16	7.20E-16	5.52E-13
SR85	4.50E-16	1.74E-17	2.00E-17	1.19E-11
SR90	4.49E-13	5.93E-14	2.65E-14	7.18E-12
TA182	1.62E-15	3.78E-16	1.40E-15	5.69E-11
TC99	1.74E-14	4.15E-16	3.81E-15	1.17E-16
TH227	1.59E-15	1.27E-13	3.13E-14	4.59E-13
TH228	3.14E-13	8.17E-11	9.89E-12	5.04E-10
TH229	2.01E-12	2.82E-09	3.69E-11	2.44E-10
TH230	1.82E-13	4.15E-10	1.33E-11	3.09E-12
TH231	4.08E-18	1.59E-18	1.87E-19	3.42E-16
TH232	5.83E-12	2.42E-09	2.49E-11	1.02E-09
TH234	9.18E-16	1.11E-16	2.52E-16	1.71E-13
TL204	9.75E-15	1.42E-16	2.55E-16	7.28E-14
TM170	3.42E-15	8.41E-16	5.83E-16	3.91E-13
U232	1.33E-12	2.00E-10	4.96E-11	1.41E-09
U233	2.15E-13	2.65E-12	1.24E-11	1.54E-13
U234	2.14E-13	1.01E-12	1.19E-11	5.86E-15
U235	2.19E-13	1.21E-12	1.15E-11	4.73E-11
U236	2.01E-13	9.63E-13	1.15E-11	4.69E-15
U238	4.23E-13	9.19E-13	2.39E-11	1.60E-11
V49	8.09E-17	9.22E-18	1.56E-17	0.00E+00
Y88	3.33E-15	3.34E-13	5.35E-16	1.40E-10
Y90	8.31E-17	1.42E-18	4.89E-18	8.77E-15
ZN65	1.44E-14	5.69E-16	9.31E-16	4.96E-11
ZR93	2.77E-15	1.13E-13	5.10E-15	2.52E-15

TABLE A.7. Noncarcinogenic Chemical URFs for Industrial Scenario, Air

<u>Chemical Name</u>	<u>Air Inhal</u>	<u>Air Extern</u>
Aluminum fluoride	4.45E+00	0.00E+00
Aluminum nitrate	1.78E+01	0.00E+00
Aluminum (ionic)	1.40E+01	0.00E+00
Ammonium carbonate	4.89E+00	0.00E+00
Ammonium nitrate	2.17E+00	0.00E+00
Beryllium (ionic)	0.00E+00	0.00E+00
Butyl phosphates	2.97E+00	0.00E+00
Cadmium (ionic)	3.91E+02	0.00E+00
Calcium carbonate	7.53E-01	0.00E+00
Calcium (ionic)	1.15E-02	0.00E+00
Calcium nitrate	5.29E-01	0.00E+00
Carbon tetrachloride	2.80E+02	0.00E+00
Chromium IV (ionic)	3.43E+05	0.00E+00
Copper sulfate	1.15E+01	0.00E+00
Copper (ionic)	1.96E+01	0.00E+00
Dibutyl phosphonate	1.51E+00	0.00E+00
Ferric nitrate	6.52E+00	0.00E+00
Ferrocyanide (ionic)	1.30E+00	0.00E+00
Ferrous nitrate	8.51E+00	0.00E+00
Fluoride (ionic)	3.26E+00	0.00E+00
Iron (as ferric ion)	2.28E+01	0.00E+00
Lead (ionic)	4.55E+02	0.00E+00
Magnesium (ionic)	2.80E+00	0.00E+00
Magnesium nitrate	1.03E-01	0.00E+00
Mercury (ionic)	2.28E+03	0.00E+00
Methyl isobutyl ketone	3.91E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00
Nitrate	1.22E-01	0.00E+00
Nitric acid	5.59E+00	0.00E+00
Nitrite	5.76E+00	0.00E+00
Oxalate (ionic)	2.80E+01	0.00E+00
Phosphate (ionic)	2.80E+01	0.00E+00
Potassium (ionic)	3.84E-04	0.00E+00
Potassium borate	2.17E+00	0.00E+00
Silver (ionic)	3.91E+01	0.00E+00
Sodium (ionic)	6.52E-04	0.00E+00
Sodium aluminate	4.55E+00	0.00E+00
Sodium dichromate	3.43E+05	0.00E+00
Sodium oxalate	2.80E+01	0.00E+00
Sodium sulfamate	9.79E-01	0.00E+00
Sulfate (ionic)	2.80E+00	0.00E+00
Sulfuric acid	2.80E+01	0.00E+00
Tributyl phosphate	1.12E+01	0.00E+00
Tributyl phosphonate	1.63E+00	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00
Uranium (ionic)	1.40E+02	0.00E+00
Zinc (ionic)	6.52E-01	0.00E+00

TABLE A.8. Carcinogenic Chemical URFs for Industrial Scenario, Air

<u>Chemical Name</u>	<u>Air Inhal</u>	<u>Air Extern</u>
Aluminum fluoride	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00
Beryllium (ionic)	4.70E-01	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00
Cadmium (ionic)	3.52E-01	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00
Carbon tetrachloride	2.96E-03	0.00E+00
Chromium IV (ionic)	2.29E+00	0.00E+00
Copper sulfate	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00
Nickel (ionic)	4.70E-02	0.00E+00
Nitrate	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00
Sodium dichromate	2.29E+00	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00
Tributyl phosphate	0.00E+00	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00
Trichloroethylene	7.27E-04	0.00E+00
Uranium (ionic)	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00

TABLE A.9. Radionuclide URFs for Industrial Scenario, Air

Radionuclide	Air Inhal	Air Extern
AC225	2.40E-04	1.14E-10
AC227	8.81E-03	1.06E-12
AG110M	6.91E-06	2.61E-08
AM241	3.20E-03	1.58E-10
AM243	3.20E-03	4.28E-10
AU195	8.07E-07	6.22E-10
BA133	3.60E-07	3.44E-09
BE10	2.20E-05	2.17E-12
BE7	2.70E-08	4.55E-10
BI210	8.01E-06	6.35E-12
C14	6.41E-10	4.33E-14
CA45	5.11E-07	1.67E-13
CD109	6.51E-06	5.68E-11
CE144	3.40E-05	1.59E-10
CF250	1.63E-02	8.70E-13
CF252	9.74E-03	9.77E-13
CL36	1.40E-07	4.29E-12
CM243	2.60E-03	1.14E-09
CM244	2.20E-03	9.48E-13
CM245	3.20E-03	7.64E-10
CM246	3.20E-03	8.61E-13
CM248	1.20E-02	6.55E-13
CO57	8.21E-07	1.08E-09
CO58	9.81E-07	9.19E-09
CO60	1.50E-05	2.44E-08
CS134	2.80E-06	1.46E-08
CS137	1.90E-06	4.93E-09
ES254	2.55E-03	8.49E-09
EU152	1.10E-05	1.09E-08
EU154	1.40E-05	1.18E-08
EU155	1.80E-06	4.80E-10
FE55	8.41E-08	0.00E+00
GE68	3.25E-06	8.83E-09
H3	7.81E-09	0.00E+00
I129	1.20E-05	7.25E-11
K40	7.61E-07	1.55E-09
KR85	4.70E-12	2.30E-11
MN54	5.31E-07	7.89E-09
MO93	1.76E-06	4.87E-12
NA22	4.80E-07	2.09E-08
NB93M	1.90E-06	8.55E-13
NB94	2.10E-05	1.49E-08
NB95	5.11E-07	7.22E-09
NI59	7.01E-08	0.00E+00
NI63	1.80E-07	0.00E+00
NP237	2.90E-03	1.99E-10
NP239	1.60E-07	1.48E-09
PA231	3.60E-03	3.33E-10
PA233	8.61E-07	1.81E-09
PB210	4.00E-04	1.13E-11
PB212	5.01E-06	1.25E-09
PM147	3.00E-06	1.34E-13
PO210	2.60E-04	8.02E-14
PU238	3.90E-03	9.41E-13
PU239	3.80E-03	8.18E-13
PU240	3.80E-03	9.16E-13
PU241	2.30E-05	1.40E-14
PU242	3.60E-03	7.73E-13

TABLE A.9. (contd)

<u>Radionuclide</u>	<u>Air Inhal</u>	<u>Air Extern</u>
RA223	3.10E-04	2.64E-09
RA224	1.20E-04	1.55E-08
RA225	1.50E-04	5.39E-11
RA226	3.00E-04	6.07E-11
RA228	3.15E-04	9.23E-09
RE187	3.38E-09	0.00E+00
RN222	7.31E-08	1.71E-08
RU103	8.41E-07	4.06E-09
RU106	4.40E-05	2.03E-09
S35	1.90E-08	4.70E-14
SB122	3.40E-07	4.12E-09
SB124	2.20E-06	1.77E-08
SC46	2.70E-06	1.93E-08
SE75	6.01E-07	3.58E-09
SE79	6.11E-07	5.86E-14
SM147	7.21E-04	0.00E+00
SM151	8.71E-07	6.97E-15
SN113	9.41E-07	2.39E-09
SN123	2.02E-06	7.77E-11
SR85	1.00E-07	4.67E-09
SR90	6.21E-06	1.88E-11
TA182	4.30E-06	1.24E-08
TC99	8.31E-07	3.13E-13
TH227	4.90E-04	9.44E-10
TH228	7.81E-03	1.65E-11
TH229	7.71E-03	7.38E-10
TH230	2.90E-03	3.38E-12
TH231	4.90E-08	1.01E-10
TH232	2.80E-03	1.68E-12
TH234	3.20E-06	6.52E-11
TL204	1.30E-07	1.08E-11
TM170	1.63E-06	4.32E-11
U232	6.01E-03	2.73E-12
U233	2.70E-03	3.15E-12
U234	2.60E-03	1.48E-12
U235	2.50E-03	1.29E-09
U236	2.50E-03	9.65E-13
U238	5.21E-03	6.57E-13
V49	2.14E-08	0.00E+00
Y88	1.74E-06	2.65E-08
Y90	5.51E-07	3.67E-11
ZN65	1.60E-06	5.61E-09
ZR93	6.51E-07	0.00E+00

TABLE A.10. Noncarcinogenic Chemical URFs for Industrial Scenario, Groundwater

<u>Chemical Name</u>	<u>Drink Water</u>	<u>Shwr Dermal</u>	<u>Shwr Ingest</u>	<u>Indr Inhal</u>
Aluminum fluoride	2.39E+00	8.11E-01	4.01E-03	0.00E+00
Aluminum nitrate	8.90E-01	3.02E-01	1.49E-03	0.00E+00
Aluminum (ionic)	2.45E+01	5.99E-04	4.11E-02	0.00E+00
Ammonium carbonate	2.45E-01	8.32E-04	4.11E-04	0.00E+00
Ammonium nitrate	1.09E-01	3.70E-04	1.83E-04	0.00E+00
Beryllium (ionic)	1.96E+00	1.33E+00	3.29E-03	0.00E+00
Butyl phosphates	1.48E-01	1.96E-03	2.49E-04	0.00E+00
Cadmium (ionic)	1.96E+01	1.33E+00	3.29E-02	0.00E+00
Calcium carbonate	3.76E-02	1.28E-04	6.32E-05	0.00E+00
Calcium (ionic)	5.76E-04	6.52E-06	9.67E-07	0.00E+00
Calcium nitrate	2.64E-02	3.00E-04	4.44E-05	0.00E+00
Carbon tetrachloride	1.40E+01	1.05E+00	2.35E-02	1.40E+02
Chromium IV (ionic)	1.96E+00	1.33E+00	3.29E-03	0.00E+00
Copper sulfate	8.15E-01	5.55E-03	1.37E-03	0.00E+00
Copper (ionic)	3.26E+01	2.22E-01	5.48E-02	0.00E+00
Dibutyl phosphonate	7.53E-02	6.19E-04	1.26E-04	0.00E+00
Ferric nitrate	3.26E-01	1.11E-03	5.48E-04	0.00E+00
Ferrocyanide (ionic)	6.52E-02	2.22E-04	1.10E-04	0.00E+00
Ferrous nitrate	4.25E-01	1.45E-02	7.15E-04	0.00E+00
Fluoride (ionic)	1.63E-01	5.55E-04	2.74E-04	0.00E+00
Iron (as ferric ion)	7.53E-03	2.56E-04	1.26E-05	0.00E+00
Lead (ionic)	6.99E+00	4.75E-04	1.17E-02	0.00E+00
Magnesium (ionic)	1.96E-04	1.33E-06	3.29E-07	0.00E+00
Magnesium nitrate	5.15E-03	1.75E-05	8.65E-06	0.00E+00
Mercury (ionic)	3.26E+01	5.55E+00	5.48E-02	0.00E+00
Methyl isobutyl ketone	1.96E-01	2.20E-03	3.29E-04	1.96E+00
Nickel (ionic)	4.89E-01	3.33E-03	8.22E-04	0.00E+00
Nitrate	6.12E-03	2.08E-05	1.03E-05	0.00E+00
Nitric acid	2.80E-01	9.51E-04	4.70E-04	0.00E+00
Nitrite	2.88E-01	9.79E-04	4.84E-04	0.00E+00
Oxalate (ionic)	3.26E-02	1.11E-04	5.48E-05	0.00E+00
Phosphate (ionic)	2.13E-02	9.04E-05	3.57E-05	0.00E+00
Potassium (ionic)	1.92E-05	4.37E-09	3.22E-08	0.00E+00
Potassium borate	1.09E-01	3.70E-04	1.83E-04	0.00E+00
Silver (ionic)	1.96E+00	7.98E-02	3.29E-03	0.00E+00
Sodium (ionic)	3.26E-05	1.11E-07	5.48E-08	0.00E+00
Sodium aluminate	2.28E-01	7.74E-02	3.82E-04	0.00E+00
Sodium dichromate	1.96E+00	1.33E+00	3.29E-03	0.00E+00
Sodium oxalate	1.63E-01	5.55E-04	2.74E-04	0.00E+00
Sodium sulfamate	4.89E-02	1.66E-04	8.22E-05	0.00E+00
Sulfate (ionic)	1.38E-04	4.69E-07	2.32E-07	0.00E+00
Sulfuric acid	1.40E+00	4.75E-03	2.35E-03	0.00E+00
Tributyl phosphate	5.59E-01	5.85E-02	9.39E-04	0.00E+00
Tributyl phosphonate	8.16E-02	4.55E-07	1.37E-04	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	3.26E+00	2.22E-01	5.48E-03	0.00E+00
Zinc (ionic)	3.26E-02	1.33E-04	5.48E-05	0.00E+00

TABLE A.11. Carcinogenic Chemical URFs for Industrial Scenario, Groundwater

<u>Chemical Name</u>	<u>Drink Water</u>	<u>Shwr Dermal</u>	<u>Shwr Ingest</u>	<u>Indr Inhal</u>
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	1.21E-02	8.18E-03	2.04E-05	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	1.77E-02	1.20E-03	2.99E-05	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	3.63E-04	2.72E-05	6.18E-07	1.48E-03
Chromium IV (ionic)	1.14E-01	7.80E-02	1.95E-04	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	1.14E-01	7.80E-02	1.95E-04	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	2.21E-05	2.31E-06	3.75E-08	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	3.08E-05	2.41E-05	5.23E-08	3.63E-04
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.12. Radionuclide URFs for Industrial Scenario, Groundwater

Radionuclide	Drink Water	Shwr Dermal	Shwr Ingest	Indr Inhal
AC225	8.22E-08	2.24E-07	1.40E-10	0.00E+00
AC227	1.75E-06	1.48E-04	2.98E-09	0.00E+00
AG110M	2.35E-08	7.37E-10	3.99E-11	0.00E+00
AM241	1.20E-06	3.90E-05	2.04E-09	0.00E+00
AM243	1.20E-06	3.90E-05	2.04E-09	0.00E+00
AU195	3.28E-09	2.08E-12	5.58E-12	0.00E+00
BA133	6.00E-09	8.01E-11	1.02E-11	0.00E+00
BE10	1.45E-08	1.48E-09	2.46E-11	0.00E+00
BE7	1.49E-10	4.51E-12	2.54E-13	0.00E+00
BI210	7.47E-09	2.66E-10	1.27E-11	0.00E+00
C14	4.50E-09	2.20E-11	7.66E-12	0.00E+00
CA45	4.94E-09	8.21E-11	8.40E-12	0.00E+00
CD109	3.95E-08	2.53E-09	6.72E-11	0.00E+00
CE144	3.10E-08	1.16E-08	5.27E-11	0.00E+00
CF250	6.61E-06	2.32E-05	1.12E-08	0.00E+00
CF252	3.35E-06	1.05E-05	5.69E-09	0.00E+00
CL36	9.01E-09	3.27E-11	1.53E-11	0.00E+00
CM243	9.51E-07	2.64E-05	1.62E-09	0.00E+00
CM244	8.01E-07	2.11E-05	1.36E-09	0.00E+00
CM245	1.20E-06	4.01E-05	2.04E-09	0.00E+00
CM246	1.20E-06	4.01E-05	2.04E-09	0.00E+00
CM248	4.55E-06	1.48E-04	7.74E-09	0.00E+00
CO57	2.90E-09	1.05E-11	4.93E-12	0.00E+00
CO58	7.97E-09	5.77E-11	1.35E-11	0.00E+00
CO60	7.50E-08	3.08E-10	1.28E-10	0.00E+00
CS134	2.05E-07	7.59E-10	3.49E-10	0.00E+00
CS137	1.40E-07	5.27E-10	2.38E-10	0.00E+00
ES254	9.73E-07	3.05E-06	1.65E-09	0.00E+00
EU152	1.05E-08	1.69E-08	1.79E-11	0.00E+00
EU154	1.50E-08	2.21E-08	2.55E-11	0.00E+00
EU155	2.25E-09	3.16E-09	3.83E-12	0.00E+00
FE55	1.35E-09	5.90E-11	2.30E-12	0.00E+00
GE68	4.37E-09	1.00E-11	7.43E-12	0.00E+00
H3	2.70E-10	6.64E-13	4.59E-13	0.00E+00
I129	9.51E-07	2.64E-09	1.62E-09	0.00E+00
K40	5.50E-08	2.11E-10	9.36E-11	0.00E+00
KR85	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN54	5.50E-09	1.01E-10	9.35E-12	0.00E+00
MO93	8.81E-09	1.88E-11	1.50E-11	0.00E+00
NA22	3.40E-08	1.27E-10	5.78E-11	0.00E+00
NB93M	7.51E-10	4.22E-11	1.28E-12	0.00E+00
NB94	1.05E-08	8.86E-10	1.79E-11	0.00E+00
NB95	3.22E-09	9.71E-11	5.48E-12	0.00E+00
NI59	4.55E-10	2.85E-12	7.74E-13	0.00E+00
NI63	1.20E-09	6.96E-12	2.04E-12	0.00E+00
NP237	1.10E-06	4.75E-05	1.87E-09	0.00E+00
NP239	4.06E-09	3.92E-11	6.90E-12	0.00E+00
PA231	4.60E-07	1.16E-04	7.83E-10	0.00E+00
PA233	4.94E-09	0.00E+00	8.40E-12	0.00E+00
PB210	3.30E-06	1.27E-09	5.61E-09	0.00E+00
PB212	1.33E-08	4.05E-12	2.26E-11	0.00E+00
PM147	1.55E-09	1.90E-09	2.64E-12	0.00E+00
PO210	7.49E-07	2.00E-07	1.27E-09	0.00E+00
PU238	1.10E-06	3.37E-05	1.87E-09	0.00E+00
PU239	1.15E-06	3.80E-05	1.96E-09	0.00E+00
PU240	1.15E-06	3.80E-05	1.96E-09	0.00E+00
PU241	1.80E-08	7.28E-07	3.06E-11	0.00E+00
PU242	1.10E-06	3.59E-05	1.87E-09	0.00E+00

TABLE A.12. (contd)

<u>Radionuclide</u>	<u>Drink Water</u>	<u>Shwr Dermal</u>	<u>Shwr Ingest</u>	<u>Indr Inhal</u>
RA223	3.11E-07	1.02E-08	5.28E-10	0.00E+00
RA224	1.73E-07	3.65E-09	2.94E-10	0.00E+00
RA225	2.49E-07	1.13E-08	4.24E-10	0.00E+00
RA226	6.00E-07	5.80E-08	1.02E-09	0.00E+00
RA228	4.47E-06	5.06E-08	7.59E-09	0.00E+00
RE187	2.95E-11	1.58E-13	5.02E-14	0.00E+00
RN222	6.40E-09	0.00E+00	1.09E-11	6.67E-09
RU103	4.51E-09	5.54E-11	7.67E-12	0.00E+00
RU106	4.75E-08	1.16E-09	8.07E-11	0.00E+00
S35	1.10E-09	4.31E-12	1.86E-12	0.00E+00
SB122	8.80E-09	1.39E-11	1.50E-11	0.00E+00
SB124	1.44E-08	7.34E-11	2.45E-11	0.00E+00
SC46	7.97E-09	1.26E-09	1.36E-11	0.00E+00
SE75	2.89E-08	1.16E-10	4.92E-11	0.00E+00
SE79	2.70E-08	1.05E-10	4.59E-11	0.00E+00
SM147	8.01E-08	6.43E-06	1.36E-10	0.00E+00
SM151	5.50E-10	2.53E-09	9.36E-13	0.00E+00
SN113	4.34E-09	7.47E-11	7.38E-12	0.00E+00
SN123	2.60E-08	1.58E-10	4.42E-11	0.00E+00
SR85	3.83E-09	2.52E-11	6.52E-12	0.00E+00
SR90	1.80E-07	4.32E-09	3.06E-10	0.00E+00
TA182	8.48E-09	3.36E-10	1.44E-11	0.00E+00
TC99	6.51E-09	2.64E-11	1.11E-11	0.00E+00
TH227	2.21E-08	5.90E-07	3.76E-11	0.00E+00
TH228	2.75E-07	1.90E-05	4.68E-10	0.00E+00
TH229	4.45E-07	1.79E-04	7.57E-10	0.00E+00
TH230	6.51E-08	2.64E-05	1.11E-10	0.00E+00
TH231	1.44E-09	5.17E-12	2.45E-12	0.00E+00
TH232	6.00E-08	1.48E-04	1.02E-10	0.00E+00
TH234	1.97E-08	4.05E-10	3.35E-11	0.00E+00
TL204	8.50E-09	2.11E-11	1.45E-11	0.00E+00
TM170	1.64E-08	6.84E-10	2.78E-11	0.00E+00
U232	1.85E-07	3.16E-07	3.15E-10	0.00E+00
U233	8.01E-08	6.54E-08	1.36E-10	0.00E+00
U234	8.01E-08	6.43E-08	1.36E-10	0.00E+00
U235	8.01E-08	5.91E-08	1.36E-10	0.00E+00
U236	7.51E-08	6.12E-08	1.28E-10	0.00E+00
U238	1.40E-07	5.80E-08	2.38E-10	0.00E+00
V49	1.90E-10	3.69E-12	3.24E-13	0.00E+00
Y88	1.85E-08	3.15E-07	3.15E-11	0.00E+00
Y90	1.41E-08	4.08E-11	2.39E-11	0.00E+00
ZN65	4.25E-08	1.71E-10	7.22E-11	0.00E+00
ZR93	8.51E-10	7.17E-09	1.45E-12	0.00E+00

TABLE A.13. Noncarcinogenic Chemical URFs for Industrial Scenario, Surface Water

<u>Chemical Name</u>	<u>Drink Water</u>	<u>Shwr Dermal</u>	<u>Shwr Ingest</u>	<u>Indr Inhal</u>
Aluminum fluoride	2.39E+00	8.11E-01	4.01E-03	0.00E+00
Aluminum nitrate	8.90E-01	3.02E-01	1.49E-03	0.00E+00
Aluminum (ionic)	2.45E+01	5.99E-04	4.11E-02	0.00E+00
Ammonium carbonate	2.45E-01	8.32E-04	4.11E-04	0.00E+00
Ammonium nitrate	1.09E-01	3.70E-04	1.83E-04	0.00E+00
Beryllium (ionic)	1.96E+00	1.33E+00	3.29E-03	0.00E+00
Butyl phosphates	1.48E-01	1.96E-03	2.49E-04	0.00E+00
Cadmium (ionic)	1.96E+01	1.33E+00	3.29E-02	0.00E+00
Calcium carbonate	3.76E-02	1.28E-04	6.32E-05	0.00E+00
Calcium (ionic)	5.76E-04	6.52E-06	9.67E-07	0.00E+00
Calcium nitrate	2.64E-02	3.00E-04	4.44E-05	0.00E+00
Carbon tetrachloride	1.40E+01	1.05E+00	2.35E-02	1.40E+02
Chromium IV (ionic)	1.96E+00	1.33E+00	3.29E-03	0.00E+00
Copper sulfate	8.15E-01	5.55E-03	1.37E-03	0.00E+00
Copper (ionic)	3.26E+01	2.22E-01	5.48E-02	0.00E+00
Dibutyl phosphonate	7.53E-02	6.19E-04	1.26E-04	0.00E+00
Ferric nitrate	3.26E-01	1.11E-03	5.48E-04	0.00E+00
Ferrocyanide (ionic)	6.52E-02	2.22E-04	1.10E-04	0.00E+00
Ferrous nitrate	4.25E-01	1.45E-02	7.15E-04	0.00E+00
Fluoride (ionic)	1.63E-01	5.55E-04	2.74E-04	0.00E+00
Iron (as ferric ion)	7.53E-03	2.56E-04	1.26E-05	0.00E+00
Lead (ionic)	6.99E+00	4.75E-04	1.17E-02	0.00E+00
Magnesium (ionic)	1.96E-04	1.33E-06	3.29E-07	0.00E+00
Magnesium nitrate	5.15E-03	1.75E-05	8.65E-06	0.00E+00
Mercury (ionic)	3.26E+01	5.55E+00	5.48E-02	0.00E+00
Methyl isobutyl ketone	1.96E-01	2.20E-03	3.29E-04	1.96E+00
Nickel (ionic)	4.89E-01	3.33E-03	8.22E-04	0.00E+00
Nitrate	6.12E-03	2.08E-05	1.03E-05	0.00E+00
Nitric acid	2.80E-01	9.51E-04	4.70E-04	0.00E+00
Nitrite	2.88E-01	9.79E-04	4.84E-04	0.00E+00
Oxalate (ionic)	3.26E-02	1.11E-04	5.48E-05	0.00E+00
Phosphate (ionic)	2.13E-02	9.04E-05	3.57E-05	0.00E+00
Potassium (ionic)	1.92E-05	4.37E-09	3.22E-08	0.00E+00
Potassium borate	1.09E-01	3.70E-04	1.83E-04	0.00E+00
Silver (ionic)	1.96E+00	7.98E-02	3.29E-03	0.00E+00
Sodium (ionic)	3.26E-05	1.11E-07	5.48E-08	0.00E+00
Sodium aluminate	2.28E-01	7.74E-02	3.82E-04	0.00E+00
Sodium dichromate	1.96E+00	1.33E+00	3.29E-03	0.00E+00
Sodium oxalate	1.63E-01	5.55E-04	2.74E-04	0.00E+00
Sodium sulfamate	4.89E-02	1.66E-04	8.22E-05	0.00E+00
Sulfate (ionic)	1.38E-04	4.69E-07	2.32E-07	0.00E+00
Sulfuric acid	1.40E+00	4.75E-03	2.35E-03	0.00E+00
Tributyl phosphate	5.59E-01	5.85E-02	9.39E-04	0.00E+00
Tributyl phosphonate	8.16E-02	4.55E-07	1.37E-04	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	3.26E+00	2.22E-01	5.48E-03	0.00E+00
Zinc (ionic)	3.26E-02	1.33E-04	5.48E-05	0.00E+00

TABLE A.14. Carcinogenic Chemical URFs for Industrial Scenario, Surface Water

<u>Radionuclide</u>	<u>Drink Water</u>	<u>Shwr Dermal</u>	<u>Shwr Ingest</u>	<u>Indr Inhal</u>
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	1.21E-02	8.18E-03	2.04E-05	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	1.77E-02	1.20E-03	2.99E-05	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	3.63E-04	2.72E-05	6.18E-07	1.48E-03
Chromium IV (ionic)	1.14E-01	7.80E-02	1.95E-04	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	1.14E-01	7.80E-02	1.95E-04	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	2.21E-05	2.31E-06	3.75E-08	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	3.08E-05	2.41E-05	5.23E-08	3.63E-04
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.15. Radionuclide URFs for Industrial Scenario, Surface Water

Radionuclide	Drink Water	Shwr Dermal	Shwr Ingest	Indr Inhal
AC225	8.22E-08	2.24E-07	1.40E-10	0.00E+00
AC227	1.75E-06	1.48E-04	2.98E-09	0.00E+00
AG110M	2.35E-08	7.37E-10	3.99E-11	0.00E+00
AM241	1.20E-06	3.90E-05	2.04E-09	0.00E+00
AM243	1.20E-06	3.90E-05	2.04E-09	0.00E+00
AU195	3.28E-09	2.08E-12	5.58E-12	0.00E+00
BA133	6.00E-09	8.01E-11	1.02E-11	0.00E+00
BE10	1.45E-08	1.48E-09	2.46E-11	0.00E+00
BE7	1.49E-10	4.51E-12	2.54E-13	0.00E+00
BI210	7.47E-09	2.66E-10	1.27E-11	0.00E+00
C14	4.50E-09	2.20E-11	7.66E-12	0.00E+00
CA45	4.94E-09	8.21E-11	8.40E-12	0.00E+00
CD109	3.95E-08	2.53E-09	6.72E-11	0.00E+00
CE144	3.10E-08	1.16E-08	5.27E-11	0.00E+00
CF250	6.61E-06	2.32E-05	1.12E-08	0.00E+00
CF252	3.35E-06	1.05E-05	5.69E-09	0.00E+00
CL36	9.01E-09	3.27E-11	1.53E-11	0.00E+00
CM243	9.51E-07	2.64E-05	1.62E-09	0.00E+00
CM244	8.01E-07	2.11E-05	1.36E-09	0.00E+00
CM245	1.20E-06	4.01E-05	2.04E-09	0.00E+00
CM246	1.20E-06	4.01E-05	2.04E-09	0.00E+00
CM248	4.55E-06	1.48E-04	7.74E-09	0.00E+00
CO57	2.90E-09	1.05E-11	4.93E-12	0.00E+00
CO58	7.97E-09	5.77E-11	1.35E-11	0.00E+00
CO60	7.50E-08	3.08E-10	1.28E-10	0.00E+00
CS134	2.05E-07	7.59E-10	3.49E-10	0.00E+00
CS137	1.40E-07	5.27E-10	2.38E-10	0.00E+00
ES254	9.73E-07	3.05E-06	1.65E-09	0.00E+00
EU152	1.05E-08	1.69E-08	1.79E-11	0.00E+00
EU154	1.50E-08	2.21E-08	2.55E-11	0.00E+00
EU155	2.25E-09	3.16E-09	3.83E-12	0.00E+00
FE55	1.35E-09	5.90E-11	2.30E-12	0.00E+00
GE68	4.37E-09	1.00E-11	7.43E-12	0.00E+00
H3	2.70E-10	6.64E-13	4.59E-13	0.00E+00
I129	9.51E-07	2.64E-09	1.62E-09	0.00E+00
K40	5.50E-08	2.11E-10	9.36E-11	0.00E+00
KR85	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN54	5.50E-09	1.01E-10	9.35E-12	0.00E+00
MO93	8.81E-09	1.88E-11	1.50E-11	0.00E+00
NA22	3.40E-08	1.27E-10	5.78E-11	0.00E+00
NB93M	7.51E-10	4.22E-11	1.28E-12	0.00E+00
NB94	1.05E-08	8.86E-10	1.79E-11	0.00E+00
NB95	3.22E-09	9.71E-11	5.48E-12	0.00E+00
NI59	4.55E-10	2.85E-12	7.74E-13	0.00E+00
NI63	1.20E-09	6.96E-12	2.04E-12	0.00E+00
NP237	1.10E-06	4.75E-05	1.87E-09	0.00E+00
NP239	4.06E-09	3.92E-11	6.90E-12	0.00E+00
PA231	4.60E-07	1.16E-04	7.83E-10	0.00E+00
PA233	4.94E-09	0.00E+00	8.40E-12	0.00E+00
PB210	3.30E-06	1.27E-09	5.61E-09	0.00E+00
PB212	1.33E-08	4.05E-12	2.26E-11	0.00E+00
PM147	1.55E-09	1.90E-09	2.64E-12	0.00E+00
PO210	7.49E-07	2.00E-07	1.27E-09	0.00E+00
PU238	1.10E-06	3.37E-05	1.87E-09	0.00E+00
PU239	1.15E-06	3.80E-05	1.96E-09	0.00E+00
PU240	1.15E-06	3.80E-05	1.96E-09	0.00E+00
PU241	1.80E-08	7.28E-07	3.06E-11	0.00E+00
PU242	1.10E-06	3.59E-05	1.87E-09	0.00E+00

TABLE A.15. (contd)

Radionuclide	Drink Water	Shwr Dermal	Shwr Ingest	Indr Inhal
RA223	3.11E-07	1.02E-08	5.28E-10	0.00E+00
RA224	1.73E-07	3.65E-09	2.94E-10	0.00E+00
RA225	2.49E-07	1.13E-08	4.24E-10	0.00E+00
RA226	6.00E-07	5.80E-08	1.02E-09	0.00E+00
RA228	4.47E-06	5.06E-08	7.59E-09	0.00E+00
RE187	2.95E-11	1.58E-13	5.02E-14	0.00E+00
RN222	6.40E-09	0.00E+00	1.09E-11	6.67E-09
RU103	4.51E-09	5.54E-11	7.67E-12	0.00E+00
RU106	4.75E-08	1.16E-09	8.07E-11	0.00E+00
S35	1.10E-09	4.31E-12	1.86E-12	0.00E+00
SB122	8.80E-09	1.39E-11	1.50E-11	0.00E+00
SB124	1.44E-08	7.34E-11	2.45E-11	0.00E+00
SC46	7.97E-09	1.26E-09	1.36E-11	0.00E+00
SE75	2.89E-08	1.16E-10	4.92E-11	0.00E+00
SE79	2.70E-08	1.05E-10	4.59E-11	0.00E+00
SM147	8.01E-08	6.43E-06	1.36E-10	0.00E+00
SM151	5.50E-10	2.53E-09	9.36E-13	0.00E+00
SN113	4.34E-09	7.47E-11	7.38E-12	0.00E+00
SN123	2.60E-08	1.58E-10	4.42E-11	0.00E+00
SR85	3.83E-09	2.52E-11	6.52E-12	0.00E+00
SR90	1.80E-07	4.32E-09	3.06E-10	0.00E+00
TA182	8.48E-09	3.36E-10	1.44E-11	0.00E+00
TC99	6.51E-09	2.64E-11	1.11E-11	0.00E+00
TH227	2.21E-08	5.90E-07	3.76E-11	0.00E+00
TH228	2.75E-07	1.90E-05	4.68E-10	0.00E+00
TH229	4.45E-07	1.79E-04	7.57E-10	0.00E+00
TH230	6.51E-08	2.64E-05	1.11E-10	0.00E+00
TH231	1.44E-09	5.17E-12	2.45E-12	0.00E+00
TH232	6.00E-08	1.48E-04	1.02E-10	0.00E+00
TH234	1.97E-08	4.05E-10	3.35E-11	0.00E+00
TL204	8.50E-09	2.11E-11	1.45E-11	0.00E+00
TM170	1.64E-08	6.84E-10	2.78E-11	0.00E+00
U232	1.85E-07	3.16E-07	3.15E-10	0.00E+00
U233	8.01E-08	6.54E-08	1.36E-10	0.00E+00
U234	8.01E-08	6.43E-08	1.36E-10	0.00E+00
U235	8.01E-08	5.91E-08	1.36E-10	0.00E+00
U236	7.51E-08	6.12E-08	1.28E-10	0.00E+00
U238	1.40E-07	5.80E-08	2.38E-10	0.00E+00
V49	1.90E-10	3.69E-12	3.24E-13	0.00E+00
Y88	1.85E-08	3.15E-07	3.15E-11	0.00E+00
Y90	1.41E-08	4.08E-11	2.39E-11	0.00E+00
ZN65	4.25E-08	1.71E-10	7.22E-11	0.00E+00
ZR93	8.51E-10	7.17E-09	1.45E-12	0.00E+00

**TABLE A.16. Noncarcinogenic Chemical URFs for Recreational Scenario,
Soil (mass)**

<u>Chemical Name</u>	<u>Soil Ingest</u>	<u>Soil Dermal</u>	<u>Soil Resusp</u>	<u>Soil Extern</u>
Aluminum fluoride	1.70E-05	8.27E-06	7.70E-09	0.00E+00
Aluminum nitrate	6.35E-07	3.08E-07	3.08E-09	0.00E+00
Aluminum (ionic)	1.74E-04	8.47E-07	2.42E-07	0.00E+00
Ammonium carbonate	1.74E-06	8.47E-09	8.47E-09	0.00E+00
Ammonium nitrate	7.76E-07	3.77E-09	3.76E-09	0.00E+00
Beryllium (ionic)	1.40E-05	1.36E-05	0.00E+00	0.00E+00
Butyl phosphates	1.06E-06	5.14E-06	5.13E-09	0.00E+00
Cadmium (ionic)	1.40E-04	1.36E-04	6.78E-07	0.00E+00
Calcium carbonate	2.68E-07	1.30E-09	1.30E-09	0.00E+00
Calcium (ionic)	4.11E-09	6.65E-11	1.99E-11	0.00E+00
Calcium nitrate	1.89E-07	3.05E-09	9.16E-10	0.00E+00
Carbon tetrachloride	1.59E-07	7.72E-07	7.71E-10	0.00E+00
Chromium IV (ionic)	1.40E-05	6.78E-06	5.94E-04	0.00E+00
Copper sulfate	5.82E-06	5.65E-08	1.99E-08	0.00E+00
Copper (ionic)	2.33E-04	2.26E-06	3.39E-08	0.00E+00
Dibutyl phosphonate	5.37E-07	2.61E-06	2.61E-09	0.00E+00
Ferric nitrate	2.33E-06	1.13E-08	1.13E-08	0.00E+00
Ferrocyanide (ionic)	4.65E-07	2.26E-09	2.26E-09	0.00E+00
Ferrous nitrate	3.03E-06	1.47E-07	1.47E-08	0.00E+00
Fluoride (ionic)	1.16E-06	5.65E-09	5.65E-09	0.00E+00
Iron (as ferric ion)	5.37E-08	2.61E-09	3.94E-08	0.00E+00
Lead (ionic)	4.99E-05	1.21E-06	7.88E-07	0.00E+00
Magnesium (ionic)	1.40E-09	1.36E-11	4.84E-09	0.00E+00
Magnesium nitrate	3.67E-08	1.78E-10	1.78E-10	0.00E+00
Mercury (ionic)	2.33E-04	5.65E-05	3.94E-06	0.00E+00
Methyl isobutyl ketone	3.58E-08	1.74E-07	1.74E-10	0.00E+00
Nickel (ionic)	3.49E-06	3.39E-07	0.00E+00	0.00E+00
Nitrate	4.36E-08	2.12E-10	2.12E-10	0.00E+00
Nitric acid	1.99E-06	9.69E-09	9.68E-09	0.00E+00
Nitrite	2.05E-06	9.97E-09	9.96E-09	0.00E+00
Oxalate (ionic)	2.33E-07	1.13E-09	4.84E-08	0.00E+00
Phosphate (ionic)	1.52E-07	9.21E-10	4.84E-08	0.00E+00
Potassium (ionic)	1.37E-10	6.65E-13	6.64E-13	0.00E+00
Potassium borate	7.76E-07	3.77E-09	3.76E-09	0.00E+00
Silver (ionic)	1.40E-05	1.36E-06	6.78E-08	0.00E+00
Sodium (ionic)	2.33E-10	1.13E-12	1.13E-12	0.00E+00
Sodium aluminate	1.62E-06	7.88E-07	7.88E-09	0.00E+00
Sodium dichromate	1.40E-05	6.78E-06	5.94E-04	0.00E+00
Sodium oxalate	1.16E-06	5.65E-09	4.84E-08	0.00E+00
Sodium sulfamate	3.49E-07	1.69E-09	1.69E-09	0.00E+00
Sulfate (ionic)	9.83E-10	4.77E-12	4.84E-09	0.00E+00
Sulfuric acid	9.97E-06	4.84E-08	4.84E-08	0.00E+00
Tributyl phosphate	3.49E-08	1.70E-07	1.70E-10	0.00E+00
Tributyl phosphonate	5.82E-07	2.82E-06	2.82E-09	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	2.33E-05	2.26E-06	2.42E-07	0.00E+00
Zinc (ionic)	2.33E-07	2.26E-09	1.13E-09	0.00E+00

TABLE A.17. Carcinogenic Chemical URFs for Recreational Scenario, Soil (mass)

<u>Chemical Name</u>	<u>Soil Ingest</u>	<u>Soil Dermal</u>	<u>Soil Resusp</u>	<u>Soil Extern</u>
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	1.29E-07	1.25E-07	1.22E-09	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	1.89E-07	1.83E-07	9.15E-10	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	6.21E-12	3.01E-11	1.23E-14	0.00E+00
Chromium IV (ionic)	1.23E-06	5.95E-07	5.95E-09	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	1.22E-10	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	1.23E-06	5.95E-07	5.95E-09	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	2.08E-12	1.00E-11	0.00E+00	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	8.43E-13	4.08E-12	4.82E-15	0.00E+00
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.18. Radionuclide URFs for Recreational Scenario, Soil (mass)

Radionuclide	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
AC225	5.64E-16	3.39E-15	5.97E-16	1.27E-13
AC227	9.14E-12	1.64E-09	1.71E-11	1.46E-10
AG110M	3.90E-15	2.70E-16	4.29E-16	4.69E-11
AM241	5.90E-12	4.23E-10	5.90E-12	7.33E-13
AM243	6.07E-12	4.34E-10	6.05E-12	6.95E-11
AU195	3.99E-16	9.32E-19	3.67E-17	1.25E-12
BA133	1.34E-14	3.93E-16	3.01E-16	5.69E-11
BE10	7.28E-14	1.64E-14	4.15E-14	2.74E-13
BE7	5.31E-18	3.54E-19	3.58E-19	1.61E-13
BI210	1.08E-13	5.87E-14	1.64E-14	1.66E-13
C14	2.26E-14	2.44E-16	1.21E-18	1.07E-14
CA45	5.35E-16	1.96E-17	2.07E-17	1.91E-23
CD109	1.22E-14	1.72E-14	7.51E-16	6.83E-15
CE144	5.84E-15	4.82E-15	2.40E-15	8.02E-13
CF250	1.67E-11	1.29E-10	1.54E-11	2.45E-13
CF252	1.67E-11	1.16E-10	1.82E-11	4.75E-13
CL36	4.54E-14	3.63E-16	2.65E-16	4.48E-13
CM243	4.78E-12	2.93E-10	4.91E-12	2.45E-11
CM244	4.03E-12	2.34E-10	4.15E-12	4.59E-15
CM245	6.05E-12	4.45E-10	6.05E-12	8.12E-12
CM246	6.03E-12	4.44E-10	6.03E-12	4.13E-15
CM248	2.29E-11	1.64E-09	2.27E-11	3.37E-15
CO57	5.20E-16	1.04E-17	5.51E-17	1.03E-12
CO58	3.76E-16	6.01E-18	1.73E-17	4.71E-12
CO60	9.42E-14	2.13E-15	7.06E-15	3.28E-10
CS134	1.02E-13	8.36E-16	5.25E-16	7.90E-11
CS137	5.10E-13	4.23E-15	2.59E-15	2.21E-10
ES254	4.80E-12	3.33E-11	4.70E-12	5.54E-10
EU152	2.71E-14	9.61E-14	1.07E-14	2.83E-10
EU154	2.90E-14	9.42E-14	1.01E-14	2.41E-10
EU155	2.66E-15	8.25E-15	7.99E-16	2.12E-12
FE55	8.83E-16	8.52E-17	2.06E-17	0.00E+00
GE68	8.35E-16	4.22E-18	2.33E-16	2.37E-11
H3	1.12E-17	6.07E-20	1.21E-19	0.00E+00
I129	4.79E-12	2.93E-14	2.27E-14	6.28E-13
K40	2.77E-13	2.34E-15	1.44E-15	8.27E-11
KR85	0.00E+00	0.00E+00	3.92E-21	4.74E-13
MN54	1.14E-15	4.64E-17	4.13E-17	1.83E-11
MO93	4.44E-14	2.09E-16	3.33E-15	3.55E-12
NA22	2.14E-14	1.76E-16	1.13E-16	1.38E-10
NB93M	1.94E-15	2.40E-16	1.84E-15	4.16E-15
NB94	5.29E-14	9.84E-15	3.97E-14	8.27E-10
NB95	7.59E-17	5.05E-18	4.47E-18	1.85E-12
NI59	2.29E-15	3.16E-16	1.32E-16	0.00E+00
NI63	5.44E-15	6.95E-16	3.06E-16	0.00E+00
NP237	5.55E-12	5.27E-10	5.48E-12	8.54E-11
NP239	7.36E-18	1.57E-19	9.40E-20	1.09E-14
PA231	2.33E-12	1.29E-09	6.83E-12	4.17E-12
PA233	1.76E-14	1.03E-19	1.13E-15	4.49E-11
PB210	1.68E-11	3.61E-12	7.89E-13	5.58E-13
PB212	8.53E-18	1.44E-18	5.51E-19	4.92E-14
PM147	9.83E-16	2.65E-15	7.13E-16	1.16E-16
PO210	6.87E-14	4.05E-14	8.93E-15	8.07E-17
PU238	5.54E-12	3.75E-10	7.37E-12	4.29E-15
PU239	5.79E-12	4.22E-10	7.18E-12	2.60E-15
PU240	5.79E-12	4.21E-10	7.17E-12	4.13E-15
PU241	9.09E-14	8.10E-12	4.38E-14	1.33E-15
PU242	5.54E-12	3.98E-10	6.80E-12	3.52E-15

TABLE A.18. (contd)

<u>Radionuclide</u>	<u>Soil Ingest</u>	<u>Soil Dermal</u>	<u>Soil Resusp</u>	<u>Soil Extern</u>
RA223	2.42E-15	1.76E-16	8.79E-16	5.29E-14
RA224	1.94E-13	1.21E-14	4.14E-14	1.48E-10
RA225	8.44E-13	9.94E-13	3.15E-13	3.48E-11
RA226	3.07E-12	6.48E-13	5.68E-13	9.19E-10
RA228	2.24E-11	3.66E-12	8.11E-13	6.33E-10
RE187	1.49E-16	1.76E-18	6.37E-18	0.00E+00
RN222	1.29E-14	1.38E-15	3.26E-16	3.38E-14
RU103	1.19E-16	3.21E-18	8.21E-18	1.19E-12
RU106	1.16E-14	6.25E-16	4.03E-15	4.97E-12
S35	6.38E-17	5.53E-19	4.13E-19	1.29E-16
SB122	1.79E-17	6.25E-20	2.28E-19	7.63E-14
SB124	5.79E-16	6.50E-18	3.30E-17	7.89E-12
SC46	4.45E-16	1.55E-16	5.63E-17	1.17E-11
SE75	2.31E-15	2.04E-17	1.79E-17	1.96E-12
SE79	1.36E-13	1.17E-15	1.15E-15	1.38E-14
SM147	4.03E-13	7.15E-11	1.36E-12	0.00E+00
SM151	2.48E-15	2.51E-14	1.47E-15	5.47E-17
SN113	3.32E-16	1.26E-17	2.69E-17	7.66E-15
SN123	2.23E-15	2.99E-17	6.47E-17	9.43E-14
SR85	1.66E-16	2.40E-18	1.61E-18	1.83E-12
SR90	9.77E-13	4.84E-14	1.26E-14	6.43E-12
TA182	6.49E-16	5.68E-17	1.23E-16	9.51E-12
TC99	3.28E-14	2.93E-16	1.57E-15	9.19E-17
TH227	6.62E-13	4.07E-12	7.75E-13	2.78E-11
TH228	2.26E-12	2.08E-10	1.47E-11	1.51E-09
TH229	2.93E-12	1.99E-09	1.48E-11	1.26E-10
TH230	3.28E-13	2.93E-10	5.48E-12	2.46E-14
TH231	5.14E-16	1.12E-16	5.29E-18	1.80E-14
TH232	4.14E-13	1.64E-09	5.30E-12	3.10E-12
TH234	6.75E-14	3.06E-15	4.05E-15	5.23E-12
TL204	7.75E-15	4.24E-17	4.45E-17	2.41E-14
TM170	1.40E-15	1.29E-16	5.23E-17	6.67E-14
U232	9.64E-13	6.62E-12	1.16E-11	2.10E-11
U233	4.03E-13	7.34E-13	5.10E-12	6.89E-15
U234	4.03E-13	7.15E-13	4.91E-12	4.60E-15
U235	4.13E-13	6.57E-13	4.73E-12	3.71E-11
U236	3.78E-13	6.80E-13	4.72E-12	3.68E-15
U238	7.39E-13	6.46E-13	9.83E-12	8.09E-12
V49	4.17E-17	1.78E-18	1.76E-18	0.00E+00
Y88	1.32E-15	4.95E-14	4.64E-17	2.31E-11
Y90	2.87E-17	1.83E-19	3.70E-19	1.26E-15
ZN65	6.88E-15	1.02E-16	9.71E-17	9.84E-12
ZR93	4.29E-15	7.97E-14	1.24E-15	1.70E-17

**TABLE A.19. Noncarcinogenic Chemical URFs for Recreational Scenario,
Soil (area)**

<u>Chemical Name</u>	<u>Soil Ingest</u>	<u>Soil Dermal</u>	<u>Soil Resusp</u>	<u>Soil Extern</u>
Aluminum fluoride	2.28E-06	1.10E-06	8.31E-10	0.00E+00
Aluminum nitrate	8.48E-08	4.11E-08	3.32E-10	0.00E+00
Aluminum (ionic)	2.33E-05	1.13E-07	2.61E-08	0.00E+00
Ammonium carbonate	2.33E-07	1.13E-09	9.14E-10	0.00E+00
Ammonium nitrate	1.04E-07	5.03E-10	4.06E-10	0.00E+00
Beryllium (ionic)	1.87E-06	1.81E-06	0.00E+00	0.00E+00
Butyl phosphates	1.41E-07	6.86E-07	5.54E-10	0.00E+00
Cadmium (ionic)	1.87E-05	1.81E-05	7.31E-08	0.00E+00
Calcium carbonate	3.59E-08	1.74E-10	1.41E-10	0.00E+00
Calcium (ionic)	5.49E-10	8.88E-12	2.15E-12	0.00E+00
Calcium nitrate	2.52E-08	4.08E-10	9.88E-11	0.00E+00
Carbon tetrachloride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium IV (ionic)	1.87E-06	9.05E-07	6.41E-05	0.00E+00
Copper sulfate	7.77E-07	7.54E-09	2.15E-09	0.00E+00
Copper (ionic)	3.11E-05	3.02E-07	3.66E-09	0.00E+00
Dibutyl phosphonate	7.18E-08	3.48E-07	2.81E-10	0.00E+00
Ferric nitrate	3.11E-07	1.51E-09	1.22E-09	0.00E+00
Ferrocyanide (ionic)	6.22E-08	3.02E-10	2.44E-10	0.00E+00
Ferrous nitrate	4.06E-07	1.97E-08	1.59E-09	0.00E+00
Fluoride (ionic)	1.55E-07	7.54E-10	6.09E-10	0.00E+00
Iron (as ferric ion)	7.18E-09	3.48E-10	4.25E-09	0.00E+00
Lead (ionic)	6.66E-06	1.62E-07	8.50E-08	0.00E+00
Magnesium (ionic)	1.87E-10	1.81E-12	5.22E-10	0.00E+00
Magnesium nitrate	4.91E-09	2.38E-11	1.92E-11	0.00E+00
Mercury (ionic)	3.11E-05	7.54E-06	4.25E-07	0.00E+00
Methyl isobutyl ketone	1.38E-08	6.71E-08	5.42E-11	0.00E+00
Nickel (ionic)	4.66E-07	4.53E-08	0.00E+00	0.00E+00
Nitrate	5.83E-09	2.83E-11	2.28E-11	0.00E+00
Nitric acid	2.67E-07	1.29E-09	1.04E-09	0.00E+00
Nitrite	2.74E-07	1.33E-09	1.08E-09	0.00E+00
Oxalate (ionic)	3.11E-08	1.51E-10	5.22E-09	0.00E+00
Phosphate (ionic)	2.03E-08	1.23E-10	5.22E-09	0.00E+00
Potassium (ionic)	1.83E-11	8.87E-14	7.17E-14	0.00E+00
Potassium borate	1.04E-07	5.03E-10	4.06E-10	0.00E+00
Silver (ionic)	1.87E-06	1.81E-07	7.31E-09	0.00E+00
Sodium (ionic)	3.11E-11	1.51E-13	1.22E-13	0.00E+00
Sodium aluminate	2.17E-07	1.05E-07	8.50E-10	0.00E+00
Sodium dichromate	1.87E-06	9.05E-07	6.41E-05	0.00E+00
Sodium oxalate	1.55E-07	7.54E-10	5.22E-09	0.00E+00
Sodium sulfamate	4.66E-08	2.26E-10	1.83E-10	0.00E+00
Sulfate (ionic)	1.31E-10	6.37E-13	5.22E-10	0.00E+00
Sulfuric acid	1.33E-06	6.47E-09	5.22E-09	0.00E+00
Tributyl phosphate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	3.11E-06	3.02E-07	2.61E-08	0.00E+00
Zinc (ionic)	3.11E-08	3.02E-10	1.22E-10	0.00E+00

TABLE A.20. Carcinogenic Chemical URFs for Recreational Scenario, Soil (area)

Chemical Name	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	1.72E-08	1.67E-08	1.32E-10	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	2.52E-08	2.44E-08	9.87E-11	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium IV (ionic)	1.64E-07	7.95E-08	6.42E-10	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	1.32E-11	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	1.64E-07	7.95E-08	6.42E-10	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.21. Radionuclide URFs for Recreational Scenario, Soil (area)

Radionuclide	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
AC225	2.82E-16	1.69E-09	3.32E-16	6.35E-14
AC227	1.04E-12	1.65E-04	2.01E-12	1.85E-11
AG110M	1.41E-15	9.80E-11	1.73E-16	1.70E-11
AM241	7.94E-13	5.69E-05	8.83E-13	9.87E-14
AM243	8.09E-13	5.78E-05	8.97E-13	9.51E-12
AU195	1.56E-16	3.64E-13	1.60E-17	4.90E-13
BA133	2.38E-15	7.01E-11	5.96E-17	1.01E-11
BE10	9.71E-15	2.19E-09	6.15E-15	3.67E-14
BE7	2.54E-18	1.69E-13	1.91E-19	7.73E-14
BI210	3.70E-17	1.50E-11	8.98E-18	2.31E-16
C14	3.02E-15	3.26E-11	1.79E-19	1.43E-15
CA45	2.15E-16	7.87E-12	9.24E-18	7.66E-24
CD109	3.79E-15	5.36E-09	2.60E-16	2.13E-15
CE144	2.05E-15	1.70E-09	9.40E-16	2.83E-13
CF250	2.84E-12	2.20E-05	2.92E-12	4.19E-14
CF252	5.58E-13	3.88E-06	6.77E-13	1.59E-14
CL36	6.05E-15	4.84E-11	3.93E-17	5.98E-14
CM243	5.12E-13	3.13E-05	5.85E-13	2.62E-12
CM244	3.85E-13	2.24E-05	4.42E-13	4.39E-16
CM245	8.13E-13	5.99E-05	9.02E-13	1.08E-12
CM246	8.05E-13	5.93E-05	8.96E-13	5.52E-16
CM248	3.06E-12	2.19E-04	3.36E-12	4.50E-16
CO57	1.85E-16	3.71E-12	2.18E-17	3.69E-13
CO58	1.75E-16	2.79E-12	8.93E-18	2.19E-12
CO60	2.03E-14	4.59E-10	1.69E-15	7.08E-11
CS134	2.84E-14	2.32E-10	1.62E-16	2.19E-11
CS137	7.63E-14	6.33E-10	4.32E-16	3.32E-11
ES254	1.70E-13	1.27E-06	1.79E-13	7.41E-12
EU152	4.58E-15	1.62E-08	2.00E-15	4.78E-11
EU154	5.42E-15	1.76E-08	2.11E-15	4.51E-11
EU155	5.84E-16	1.81E-09	1.95E-16	4.66E-13
FE55	2.29E-16	2.21E-11	5.94E-18	0.00E+00
GE68	2.93E-16	1.48E-12	9.08E-17	8.32E-12
H3	5.27E-18	2.86E-14	6.35E-20	0.00E+00
I129	6.38E-13	3.91E-09	3.36E-15	8.39E-14
K40	3.70E-14	3.12E-10	2.13E-16	1.10E-11
KR85	0.00E+00	0.00E+00	7.77E-22	8.45E-14
MN54	3.92E-16	1.59E-11	1.58E-17	6.30E-12
MO93	6.07E-15	4.79E-11	6.65E-16	4.74E-13
NA22	5.61E-15	4.60E-11	3.30E-17	3.62E-11
NB93M	3.27E-16	4.06E-11	3.46E-16	7.04E-16
NB94	7.05E-15	1.31E-09	5.89E-15	1.10E-10
NB95	3.72E-17	2.48E-12	2.44E-18	9.06E-13
NI59	3.06E-16	4.22E-11	1.96E-17	0.00E+00
NI63	7.53E-16	9.63E-11	4.71E-17	0.00E+00
NP237	7.42E-13	7.03E-05	8.13E-13	1.68E-11
NP239	3.68E-18	7.83E-14	5.23E-20	5.48E-15
PA231	6.44E-13	2.24E-04	1.65E-12	6.55E-12
PA233	4.43E-17	2.87E-14	3.24E-18	1.13E-13
PB210	2.02E-12	5.55E-07	1.36E-13	6.79E-14
PB212	4.26E-18	7.18E-13	3.07E-19	2.46E-14
PM147	2.57E-16	6.93E-10	2.07E-16	3.03E-17
PO210	2.86E-14	1.68E-08	4.13E-15	3.36E-17
PU238	6.86E-13	4.64E-05	1.01E-12	5.32E-16
PU239	7.73E-13	5.62E-05	1.07E-12	3.48E-16
PU240	7.72E-13	5.62E-05	1.06E-12	5.52E-16
PU241	1.65E-14	1.32E-06	1.37E-14	1.17E-15
PU242	7.39E-13	5.31E-05	1.01E-12	4.71E-16

TABLE A.21. (contd)

<u>Radionuclide</u>	<u>Soil Ingest</u>	<u>Soil Dermal</u>	<u>Soil Resusp</u>	<u>Soil Extern</u>
RA223	1.21E-15	8.78E-11	4.88E-16	2.64E-14
RA224	2.31E-16	1.08E-11	6.08E-17	3.75E-15
RA225	1.27E-15	2.63E-10	3.33E-16	5.45E-15
RA226	1.04E-12	2.61E-07	1.27E-13	1.22E-10
RA228	1.38E-12	9.04E-06	7.49E-13	1.07E-10
RE187	1.98E-17	2.34E-13	9.46E-19	0.00E+00
RN222	3.54E-17	7.40E-12	1.85E-18	4.72E-17
RU103	5.79E-17	1.57E-12	4.46E-18	5.81E-13
RU106	3.83E-15	2.06E-10	1.48E-15	1.64E-12
S35	2.88E-17	2.50E-13	2.08E-19	5.83E-17
SB122	8.96E-18	3.12E-14	1.27E-19	3.82E-14
SB124	2.74E-16	3.08E-12	1.74E-17	3.74E-12
SC46	2.02E-16	7.05E-11	2.85E-17	5.31E-12
SE75	9.88E-16	8.71E-12	8.53E-18	8.40E-13
SE79	1.81E-14	1.56E-10	1.71E-16	1.84E-15
SM147	5.38E-14	9.53E-06	2.02E-13	0.00E+00
SM151	3.44E-16	3.49E-09	2.27E-16	7.61E-18
SN113	1.43E-16	5.43E-12	1.29E-17	3.31E-15
SN123	9.40E-16	1.26E-11	3.04E-17	3.98E-14
SR85	7.78E-17	1.13E-12	8.43E-19	8.61E-13
SR90	1.05E-13	5.20E-09	1.51E-15	7.10E-13
TA182	2.80E-16	2.45E-11	5.91E-17	4.11E-12
TC99	4.37E-15	3.91E-11	2.33E-16	1.23E-17
TH227	2.74E-16	8.19E-09	1.32E-15	3.30E-14
TH228	5.65E-14	5.48E-06	4.31E-13	3.79E-11
TH229	5.12E-13	2.66E-04	2.26E-12	2.59E-11
TH230	4.75E-14	3.91E-05	8.14E-13	4.99E-13
TH231	7.04E-19	1.63E-13	8.36E-21	2.46E-17
TH232	1.86E-12	2.31E-04	1.83E-12	1.47E-10
TH234	1.58E-16	7.19E-12	1.06E-17	1.23E-14
TL204	1.84E-15	1.00E-11	1.17E-17	5.72E-15
TM170	5.92E-16	5.46E-11	2.46E-17	2.82E-14
U232	3.50E-13	2.05E-05	3.12E-12	1.62E-10
U233	5.42E-14	3.32E-07	7.59E-13	2.45E-14
U234	5.38E-14	9.53E-08	7.29E-13	6.14E-16
U235	5.51E-14	1.30E-07	7.01E-13	4.96E-12
U236	5.04E-14	9.06E-08	7.01E-13	4.91E-16
U238	1.07E-13	8.65E-08	1.46E-12	1.71E-12
V49	1.41E-17	6.04E-13	6.63E-19	0.00E+00
Y88	5.76E-16	2.16E-08	2.26E-17	1.01E-11
Y90	1.43E-17	9.16E-14	2.06E-19	6.31E-16
ZN65	2.51E-15	3.71E-11	3.95E-17	3.60E-12
ZR93	7.42E-16	1.06E-08	3.63E-16	3.68E-16

TABLE A.22. Noncarcinogenic Chemical URFs for Recreational Scenario, Air

<u>Chemical Name</u>	<u>Air Inhal</u>	<u>Air Extern</u>
Aluminum fluoride	1.24E-01	0.00E+00
Aluminum nitrate	4.98E-02	0.00E+00
Aluminum (ionic)	3.91E+00	0.00E+00
Ammonium carbonate	1.37E-01	0.00E+00
Ammonium nitrate	6.08E-02	0.00E+00
Beryllium (ionic)	0.00E+00	0.00E+00
Butyl phosphates	8.30E-02	0.00E+00
Cadmium (ionic)	1.10E+01	0.00E+00
Calcium carbonate	2.11E-02	0.00E+00
Calcium (ionic)	3.22E-04	0.00E+00
Calcium nitrate	1.48E-02	0.00E+00
Carbon tetrachloride	7.82E+00	0.00E+00
Chromium IV (ionic)	9.61E+03	0.00E+00
Copper sulfate	3.22E-01	0.00E+00
Copper (ionic)	5.48E-01	0.00E+00
Dibutyl phosphonate	4.21E-02	0.00E+00
Ferric nitrate	1.83E-01	0.00E+00
Ferrocyanide (ionic)	3.65E-02	0.00E+00
Ferrous nitrate	2.38E-01	0.00E+00
Fluoride (ionic)	9.13E-02	0.00E+00
Iron (as ferric ion)	6.37E-01	0.00E+00
Lead (ionic)	1.27E+01	0.00E+00
Magnesium (ionic)	7.82E-02	0.00E+00
Magnesium nitrate	2.88E-03	0.00E+00
Mercury (ionic)	6.37E+01	0.00E+00
Methyl isobutyl ketone	1.10E-01	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00
Nitrate	3.42E-03	0.00E+00
Nitric acid	1.56E-01	0.00E+00
Nitrite	1.61E-01	0.00E+00
Oxalate (ionic)	7.82E-01	0.00E+00
Phosphate (ionic)	7.82E-01	0.00E+00
Potassium (ionic)	1.07E-05	0.00E+00
Potassium borate	6.08E-02	0.00E+00
Silver (ionic)	1.10E+00	0.00E+00
Sodium (ionic)	1.83E-05	0.00E+00
Sodium aluminate	1.27E-01	0.00E+00
Sodium dichromate	9.61E+03	0.00E+00
Sodium oxalate	7.82E-01	0.00E+00
Sodium sulfamate	2.74E-02	0.00E+00
Sulfate (ionic)	7.82E-02	0.00E+00
Sulfuric acid	7.82E-01	0.00E+00
Tributyl phosphate	3.13E-01	0.00E+00
Tributyl phosphonate	4.56E-02	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00
Uranium (ionic)	3.91E+00	0.00E+00
Zinc (ionic)	1.83E-02	0.00E+00

TABLE A.23. Carcinogenic Chemical URFs for Recreational Scenario, Air

Chemical Name	Air Inhal	Air Extern
Aluminum fluoride	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00
Beryllium (ionic)	1.97E-02	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00
Cadmium (ionic)	1.48E-02	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00
Carbon tetrachloride	1.24E-04	0.00E+00
Chromium IV (ionic)	9.62E-02	0.00E+00
Copper sulfate	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00
Nickel (ionic)	1.97E-03	0.00E+00
Nitrate	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00
Sodium dichromate	9.62E-02	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00
Tributyl phosphate	0.00E+00	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00
Trichloroethylene	3.05E-05	0.00E+00
Uranium (ionic)	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00

TABLE A.24. Radionuclide URFs for Recreational Scenario, Air

<u>Radionuclide</u>	<u>Air Inhal</u>	<u>Air Extern</u>
AC225	1.01E-05	2.45E-11
AC227	3.70E-04	2.28E-13
AG110M	2.90E-07	5.62E-09
AM241	1.34E-04	3.41E-11
AM243	1.34E-04	9.22E-11
AU195	3.39E-08	1.34E-10
BA133	1.51E-08	7.41E-10
BE10	9.22E-07	4.69E-13
BE7	1.13E-09	9.81E-11
BI210	3.36E-07	1.37E-12
C14	2.69E-11	9.34E-15
CA45	2.14E-08	3.59E-14
CD109	2.73E-07	1.22E-11
CE144	1.43E-06	3.44E-11
CF250	6.82E-04	1.87E-13
CF252	4.09E-04	2.11E-13
CL36	5.88E-09	9.25E-13
CM243	1.09E-04	2.45E-10
CM244	9.24E-05	2.04E-13
CM245	1.34E-04	1.65E-10
CM246	1.34E-04	1.86E-13
CM248	5.04E-04	1.41E-13
CO57	3.44E-08	2.34E-10
CO58	4.12E-08	1.98E-09
CO60	6.30E-07	5.25E-09
CS134	1.18E-07	3.16E-09
CS137	7.98E-08	1.06E-09
ES254	1.07E-04	1.83E-09
EU152	4.62E-07	2.35E-09
EU154	5.88E-07	2.55E-09
EU155	7.56E-08	1.03E-10
FE55	3.53E-09	0.00E+00
GE68	1.36E-07	1.90E-09
H3	3.28E-10	0.00E+00
I129	5.04E-07	1.56E-11
K40	3.19E-08	3.34E-10
KR85	1.97E-13	4.97E-12
MN54	2.23E-08	1.70E-09
MO93	7.40E-08	1.05E-12
NA22	2.02E-08	4.50E-09
NB93M	7.98E-08	1.84E-13
NB94	8.82E-07	3.22E-09
NB95	2.14E-08	1.56E-09
NI59	2.94E-09	0.00E+00
NI63	7.56E-09	0.00E+00
NP237	1.22E-04	4.28E-11
NP239	6.72E-09	3.19E-10
PA231	1.51E-04	7.19E-11
PA233	3.61E-08	3.91E-10
PB210	1.68E-05	2.44E-12
PB212	2.10E-07	2.69E-10
PM147	1.26E-07	2.88E-14
PO210	1.09E-05	1.73E-14
PU238	1.64E-04	2.03E-13
PU239	1.60E-04	1.76E-13
PU240	1.60E-04	1.97E-13
PU241	9.66E-07	3.02E-15
PU242	1.51E-04	1.67E-13

TABLE A.24. (contd)

<u>Radionuclide</u>	<u>Air Inhal</u>	<u>Air Extern</u>
RA223	1.30E-05	5.69E-10
RA224	5.04E-06	3.34E-09
RA225	6.30E-06	1.16E-11
RA226	1.26E-05	1.31E-11
RA228	1.32E-05	1.99E-09
RE187	1.42E-10	0.00E+00
RN222	3.07E-09	3.69E-09
RU103	3.53E-08	8.75E-10
RU106	1.85E-06	4.37E-10
S35	7.98E-10	1.01E-14
SB122	1.43E-08	8.87E-10
SB124	9.24E-08	3.81E-09
SC46	1.13E-07	4.16E-09
SE75	2.52E-08	7.72E-10
SE79	2.56E-08	1.26E-14
SM147	3.02E-05	0.00E+00
SM151	3.65E-08	1.50E-15
SN113	3.95E-08	5.16E-10
SN123	8.46E-08	1.67E-11
SR85	4.20E-09	1.01E-09
SR90	2.60E-07	4.06E-12
TA182	1.81E-07	2.67E-09
TC99	3.49E-08	6.75E-14
TH227	2.06E-05	2.03E-10
TH228	3.28E-04	3.56E-12
TH229	3.23E-04	1.59E-10
TH230	1.22E-04	7.28E-13
TH231	2.06E-09	2.17E-11
TH232	1.18E-04	3.62E-13
TH234	1.34E-07	1.41E-11
TL204	5.46E-09	2.32E-12
TM170	6.85E-08	9.31E-12
U232	2.52E-04	5.87E-13
U233	1.13E-04	6.78E-13
U234	1.09E-04	3.19E-13
U235	1.05E-04	2.78E-10
U236	1.05E-04	2.08E-13
U238	2.18E-04	1.42E-13
V49	8.98E-10	0.00E+00
Y88	7.32E-08	5.72E-09
Y90	2.31E-08	7.91E-12
ZN65	6.72E-08	1.21E-09
ZR93	2.73E-08	0.00E+00

TABLE A.25. Noncarcinogenic Chemical URFs for Recreational Scenario, Groundwater

<u>Chemical Name</u>	<u>Drink Water</u>	<u>Shwr Dermal</u>	<u>Shwr Ingest</u>	<u>Indr Inhal</u>
Aluminum fluoride	1.34E-01	2.27E-02	1.14E-04	0.00E+00
Aluminum nitrate	4.99E-03	8.48E-04	4.24E-06	0.00E+00
Aluminum (ionic)	1.37E+00	1.68E-05	1.17E-03	0.00E+00
Ammonium carbonate	1.37E-02	2.33E-05	1.17E-05	0.00E+00
Ammonium nitrate	6.10E-03	1.04E-05	5.18E-06	0.00E+00
Beryllium (ionic)	1.10E-01	3.73E-02	9.33E-05	0.00E+00
Butyl phosphates	8.31E-03	5.48E-05	7.07E-06	0.00E+00
Cadmium (ionic)	1.10E+00	3.73E-02	9.33E-04	0.00E+00
Calcium carbonate	2.11E-03	3.59E-06	1.79E-06	0.00E+00
Calcium (ionic)	3.23E-05	1.83E-07	2.74E-08	0.00E+00
Calcium nitrate	1.48E-03	8.40E-06	1.26E-06	0.00E+00
Carbon tetrachloride	7.84E-01	2.93E-02	6.66E-04	3.92E+00
Chromium IV (ionic)	1.10E-01	3.73E-02	9.33E-05	0.00E+00
Copper sulfate	4.57E-02	1.55E-04	3.89E-05	0.00E+00
Copper (ionic)	1.83E+00	6.22E-03	1.55E-03	0.00E+00
Dibutyl phosphonate	4.22E-03	1.74E-05	3.59E-06	0.00E+00
Ferric nitrate	1.83E-02	3.11E-05	1.55E-05	0.00E+00
Ferrocyanide (ionic)	3.66E-03	6.22E-06	3.11E-06	0.00E+00
Ferrous nitrate	2.39E-02	4.05E-04	2.03E-05	0.00E+00
Fluoride (ionic)	9.14E-03	1.55E-05	7.77E-06	0.00E+00
Iron (as ferric ion)	4.22E-04	7.17E-06	3.59E-07	0.00E+00
Lead (ionic)	3.92E-01	1.33E-05	3.33E-04	0.00E+00
Magnesium (ionic)	1.10E-05	3.73E-08	9.33E-09	0.00E+00
Magnesium nitrate	2.89E-04	4.91E-07	2.45E-07	0.00E+00
Mercury (ionic)	1.83E+00	1.55E-01	1.55E-03	0.00E+00
Methyl isobutyl ketone	1.10E-02	6.16E-05	9.33E-06	5.49E-02
Nickel (ionic)	2.74E-02	9.33E-05	2.33E-05	0.00E+00
Nitrate	3.43E-04	5.83E-07	2.91E-07	0.00E+00
Nitric acid	1.57E-02	2.66E-05	1.33E-05	0.00E+00
Nitrite	1.61E-02	2.74E-05	1.37E-05	0.00E+00
Oxalate (ionic)	1.83E-03	3.11E-06	1.55E-06	0.00E+00
Phosphate (ionic)	1.19E-03	2.53E-06	1.01E-06	0.00E+00
Potassium (ionic)	1.08E-06	1.23E-10	9.14E-10	0.00E+00
Potassium borate	6.10E-03	1.04E-05	5.18E-06	0.00E+00
Silver (ionic)	1.10E-01	2.24E-03	9.33E-05	0.00E+00
Sodium (ionic)	1.83E-06	3.11E-09	1.55E-09	0.00E+00
Sodium aluminate	1.28E-02	2.17E-03	1.08E-05	0.00E+00
Sodium dichromate	1.10E-01	3.73E-02	9.33E-05	0.00E+00
Sodium oxalate	9.14E-03	1.55E-05	7.77E-06	0.00E+00
Sodium sulfamate	2.74E-03	4.66E-06	2.33E-06	0.00E+00
Sulfate (ionic)	7.73E-06	1.31E-08	6.57E-09	0.00E+00
Sulfuric acid	7.84E-02	1.33E-04	6.66E-05	0.00E+00
Tributyl phosphate	3.13E-02	1.64E-03	2.66E-05	0.00E+00
Tributyl phosphonate	4.57E-03	1.27E-08	3.89E-06	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	1.83E-01	6.22E-03	1.55E-04	0.00E+00
Zinc (ionic)	1.83E-03	3.73E-06	1.55E-06	0.00E+00

TABLE A.26. Carcinogenic Chemical URFs for Recreational Scenario, Groundwater

<u>Chemical Name</u>	<u>Drink Water</u>	<u>Shwr Dermal</u>	<u>Shwr Ingest</u>	<u>Indr Inhal</u>
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	1.01E-03	3.44E-04	8.59E-07	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	1.48E-03	5.04E-05	1.26E-06	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	3.06E-05	1.14E-06	2.60E-08	6.23E-05
Chromium IV (ionic)	9.64E-03	3.28E-03	8.19E-06	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	9.64E-03	3.28E-03	8.19E-06	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	1.86E-06	9.72E-08	1.58E-09	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	2.59E-06	1.01E-06	2.20E-09	1.53E-05
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.27. Radionuclide URFs for Recreational Scenario, Groundwater

Radionuclide	Drink Water	Shwr Dermal	Shwr Ingest	Indr Inhal
AG110M	1.98E-09	3.10E-11	1.68E-12	0.00E+00
AM241	1.01E-07	1.64E-06	8.58E-11	0.00E+00
AM243	1.01E-07	1.64E-06	8.58E-11	0.00E+00
NP239	3.42E-10	1.65E-12	2.90E-13	0.00E+00
PU239	9.68E-08	1.60E-06	8.23E-11	0.00E+00
AU195	2.76E-10	8.76E-14	2.35E-13	0.00E+00
BA133	5.05E-10	3.37E-12	4.29E-13	0.00E+00
BE7	1.25E-11	1.89E-13	1.07E-14	0.00E+00
BE10	1.22E-09	6.21E-11	1.03E-12	0.00E+00
CA45	4.16E-10	3.45E-12	3.53E-13	0.00E+00
C14	3.79E-10	9.27E-13	3.22E-13	0.00E+00
CD109	3.32E-09	1.06E-10	2.82E-12	0.00E+00
CE144	2.61E-09	4.87E-10	2.22E-12	0.00E+00
CF252	2.82E-07	4.43E-07	2.39E-10	0.00E+00
CM248	3.83E-07	6.21E-06	3.26E-10	0.00E+00
CM243	7.99E-08	1.11E-06	6.80E-11	0.00E+00
CM244	6.73E-08	8.87E-07	5.72E-11	0.00E+00
PU240	9.68E-08	1.60E-06	8.23E-11	0.00E+00
CM245	1.01E-07	1.69E-06	8.58E-11	0.00E+00
PU241	1.51E-09	3.06E-08	1.29E-12	0.00E+00
CL36	7.57E-10	1.37E-12	6.44E-13	0.00E+00
CO57	2.44E-10	4.43E-13	2.07E-13	0.00E+00
CO58	6.70E-10	2.43E-12	5.70E-13	0.00E+00
CO60	6.31E-09	1.29E-11	5.36E-12	0.00E+00
CS134	1.72E-08	3.19E-11	1.47E-11	0.00E+00
CS137	1.18E-08	2.22E-11	1.00E-11	0.00E+00
ES254	8.18E-08	1.28E-07	6.95E-11	0.00E+00
CF250	5.56E-07	9.76E-07	4.72E-10	0.00E+00
CM246	1.01E-07	1.69E-06	8.58E-11	0.00E+00
EU152	8.84E-10	7.10E-10	7.51E-13	0.00E+00
EU154	1.26E-09	9.31E-10	1.07E-12	0.00E+00
EU155	1.89E-10	1.33E-10	1.61E-13	0.00E+00
FE55	1.14E-10	2.48E-12	9.65E-14	0.00E+00
GE68	3.67E-10	4.21E-13	3.12E-13	0.00E+00
H3	2.27E-11	2.79E-14	1.93E-14	0.00E+00
I129	8.00E-08	1.11E-10	6.80E-11	0.00E+00
K40	4.63E-09	8.87E-12	3.93E-12	0.00E+00
KR85	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN54	4.62E-10	4.25E-12	3.93E-13	0.00E+00
NA22	2.86E-09	5.32E-12	2.43E-12	0.00E+00
MO93	7.41E-10	7.89E-13	6.30E-13	0.00E+00
NB93M	6.31E-11	1.77E-12	5.37E-14	0.00E+00
ZR93	7.15E-11	3.02E-10	6.08E-14	0.00E+00
NB94	8.84E-10	3.73E-11	7.51E-13	0.00E+00
NB95	2.71E-10	4.08E-12	2.30E-13	0.00E+00
NI59	3.83E-11	1.20E-13	3.26E-14	0.00E+00
NI63	1.01E-10	2.93E-13	8.58E-14	0.00E+00
NP237	9.26E-08	2.00E-06	7.87E-11	0.00E+00
PA233	4.15E-10	0.00E+00	3.53E-13	0.00E+00
U233	6.73E-09	2.75E-09	5.72E-12	0.00E+00
TH229	3.75E-08	7.54E-06	3.18E-11	0.00E+00
RA225	2.10E-08	4.77E-10	1.78E-11	0.00E+00
AC225	6.91E-09	9.42E-09	5.87E-12	0.00E+00
U235	6.73E-09	2.48E-09	5.72E-12	0.00E+00
TH231	1.21E-10	2.17E-13	1.03E-13	0.00E+00
PA231	3.87E-08	4.88E-06	3.29E-11	0.00E+00
AC227	1.47E-07	6.21E-06	1.25E-10	0.00E+00
TH227	1.86E-09	2.48E-08	1.58E-12	0.00E+00
RA223	2.61E-08	4.30E-10	2.22E-11	0.00E+00

TABLE A.27. (contd)

Radionuclide	Drink Water	Shwr Dermal	Shwr Ingest	Indr Inhal
PM147	1.30E-10	7.98E-11	1.11E-13	0.00E+00
ZN65	3.57E-09	7.17E-12	3.04E-12	0.00E+00
PU238	9.26E-08	1.42E-06	7.87E-11	0.00E+00
PU242	9.26E-08	1.51E-06	7.87E-11	0.00E+00
U238	1.18E-08	2.44E-09	1.00E-11	0.00E+00
TH234	1.66E-09	1.70E-11	1.41E-12	0.00E+00
U234	6.73E-09	2.71E-09	5.72E-12	0.00E+00
TH230	5.47E-09	1.11E-06	4.65E-12	0.00E+00
RA226	5.05E-08	2.44E-09	4.29E-11	0.00E+00
RN222	5.38E-10	0.00E+00	4.57E-13	2.81E-10
PB210	2.78E-07	5.32E-11	2.36E-10	0.00E+00
BI210	6.28E-10	1.12E-11	5.34E-13	0.00E+00
PO210	6.30E-08	8.41E-09	5.35E-11	0.00E+00
RE187	2.48E-12	6.65E-15	2.11E-15	0.00E+00
RU103	3.80E-10	2.33E-12	3.23E-13	0.00E+00
RU106	3.99E-09	4.87E-11	3.39E-12	0.00E+00
S35	9.22E-11	1.81E-13	7.84E-14	0.00E+00
SB122	7.40E-10	5.85E-13	6.29E-13	0.00E+00
SB124	1.21E-09	3.09E-12	1.03E-12	0.00E+00
SC46	6.71E-10	5.30E-11	5.70E-13	0.00E+00
SE75	2.43E-09	4.86E-12	2.07E-12	0.00E+00
SE79	2.27E-09	4.43E-12	1.93E-12	0.00E+00
SM147	6.73E-09	2.71E-07	5.72E-12	0.00E+00
SM151	4.63E-11	1.06E-10	3.93E-14	0.00E+00
SN113	3.65E-10	3.14E-12	3.10E-13	0.00E+00
SN123	2.19E-09	6.63E-12	1.86E-12	0.00E+00
SR85	3.22E-10	1.06E-12	2.74E-13	0.00E+00
SR90	1.51E-08	1.82E-10	1.29E-11	0.00E+00
Y90	1.18E-09	1.72E-12	1.01E-12	0.00E+00
TA182	7.13E-10	1.41E-11	6.06E-13	0.00E+00
TC99	5.47E-10	1.11E-12	4.65E-13	0.00E+00
U232	1.56E-08	1.33E-08	1.32E-11	0.00E+00
TH232	5.05E-09	6.21E-06	4.29E-12	0.00E+00
RA228	3.76E-07	2.13E-09	3.19E-10	0.00E+00
TH228	2.31E-08	7.98E-07	1.97E-11	0.00E+00
RA224	1.45E-08	1.53E-10	1.24E-11	0.00E+00
PB212	1.12E-09	1.70E-13	9.49E-13	0.00E+00
TL204	7.15E-10	8.87E-13	6.08E-13	0.00E+00
TM170	1.38E-09	2.87E-11	1.17E-12	0.00E+00
V49	1.60E-11	1.55E-13	1.36E-14	0.00E+00
Y88	1.56E-09	1.33E-08	1.32E-12	0.00E+00
U236	6.31E-09	2.57E-09	5.37E-12	0.00E+00

TABLE A.28. Noncarcinogenic Chemical URFs for Recreational Scenario, Surface Water

<u>Chemical Name</u>	<u>Drink Water</u>	<u>Fish Ingest</u>	<u>Swim Ingest</u>	<u>Swim Dermal</u>	<u>Shor Dermal</u>	<u>Shor Ingest</u>	<u>Swim Extern</u>	<u>Boat Extern</u>	<u>Shor Extern</u>
Aluminum fluoride	1.34E-01	0.00E+00	1.74E-02	3.48E-01	5.23E-02	1.08E-01	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	4.99E-02	0.00E+00	6.48E-03	1.30E-01	1.95E-02	4.02E-02	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	1.37E+00	9.64E+00	1.78E-01	2.57E-04	5.36E-03	1.10E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	1.37E-02	0.00E+00	1.78E-03	3.57E-04	5.36E-05	1.10E-02	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	6.10E-03	0.00E+00	7.92E-04	1.58E-04	2.38E-05	4.91E-03	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	1.10E-01	1.47E+00	1.43E-02	5.70E-01	8.58E-02	8.84E-02	0.00E+00	0.00E+00	0.00E+00
Butyl phosphates	8.31E-03	3.82E-02	1.08E-03	8.38E-04	3.25E-02	6.70E-03	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	1.10E+00	1.54E+02	1.43E-01	5.70E-01	8.58E-01	8.84E-01	0.00E+00	0.00E+00	0.00E+00
Calcium carbonate	2.11E-03	0.00E+00	2.74E-04	5.48E-05	8.25E-06	1.70E-03	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	3.23E-05	0.00E+00	4.19E-06	2.80E-06	4.20E-07	2.60E-05	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	1.48E-03	0.00E+00	1.93E-04	1.28E-04	1.93E-05	1.19E-03	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	7.84E-01	8.27E+01	1.02E-01	4.48E-01	1.23E-04	2.54E-05	0.00E+00	0.00E+00	0.00E+00
Chromium IV (ionic)	1.10E-01	1.54E+01	1.43E-02	5.70E-01	4.29E-02	8.84E-02	0.00E+00	0.00E+00	0.00E+00
Copper sulfate	4.57E-02	0.00E+00	5.94E-03	2.38E-03	3.57E-04	3.68E-02	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	1.83E+00	6.43E+01	2.38E-01	9.51E-02	1.43E-02	1.47E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	4.22E-03	2.17E-02	5.49E-04	2.65E-04	1.65E-02	3.40E-03	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	1.83E-02	0.00E+00	2.38E-03	4.75E-04	7.15E-05	1.47E-02	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	3.66E-03	0.00E+00	4.75E-04	9.51E-05	1.43E-05	2.95E-03	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	2.39E-02	0.00E+00	3.10E-03	6.20E-03	9.32E-04	1.92E-02	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	9.14E-03	6.43E-02	1.19E-03	2.38E-04	3.57E-05	7.36E-03	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	4.22E-04	5.93E-01	5.49E-05	1.10E-04	1.65E-05	3.40E-04	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	3.92E-01	2.76E+01	5.09E-02	2.04E-04	7.66E-03	3.16E-01	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	1.10E-05	3.86E-04	1.43E-06	5.70E-07	8.58E-08	8.84E-06	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	2.89E-04	0.00E+00	3.75E-05	7.51E-06	1.13E-06	2.33E-04	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	1.83E+00	1.29E+03	2.38E-01	2.38E+00	3.57E-01	1.47E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	1.10E-02	5.71E-03	1.43E-03	9.41E-04	1.11E-05	2.29E-06	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	2.74E-02	1.93E+00	3.57E-03	1.43E-03	2.14E-03	2.21E-02	0.00E+00	0.00E+00	0.00E+00
Nitrate	3.43E-04	3.62E+01	4.46E-05	8.91E-06	1.34E-06	2.76E-04	0.00E+00	0.00E+00	0.00E+00
Nitric acid	1.57E-02	1.65E+03	2.04E-03	4.07E-04	6.13E-05	1.26E-02	0.00E+00	0.00E+00	0.00E+00
Nitrite	1.61E-02	0.00E+00	2.10E-03	4.19E-04	6.31E-05	1.30E-02	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	1.83E-03	0.00E+00	2.38E-04	4.75E-05	7.15E-06	1.47E-03	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	1.19E-03	5.87E+01	1.55E-04	3.87E-05	5.83E-06	9.61E-04	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	1.08E-06	7.56E-04	1.40E-07	1.87E-09	4.20E-09	8.66E-07	0.00E+00	0.00E+00	0.00E+00
Potassium borate	6.10E-03	9.43E-04	7.92E-04	1.58E-04	2.38E-05	4.91E-03	0.00E+00	0.00E+00	0.00E+00

TABLE A.28. (contd)

<u>Chemical Name</u>	<u>Drink Water</u>	<u>Fish Ingest</u>	<u>Swim Ingest</u>	<u>Swim Dermal</u>	<u>Shor Dermal</u>	<u>Shor Ingest</u>	<u>Swim Extern</u>	<u>Boat Extern</u>	<u>Shor Extern</u>
Silver (ionic)	1.10E-01	1.77E-01	1.43E-02	3.42E-02	8.58E-03	8.84E-02	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	1.83E-06	1.29E-04	2.38E-07	4.75E-08	7.15E-09	1.47E-06	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	1.28E-02	8.97E-02	1.66E-03	3.32E-02	4.99E-03	1.03E-02	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	1.10E-01	1.54E+01	1.43E-02	5.70E-01	4.29E-02	8.84E-02	0.00E+00	0.00E+00	0.00E+00
Sodium oxalate	9.14E-03	0.00E+00	1.19E-03	2.38E-04	3.57E-05	7.37E-03	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	2.74E-03	0.00E+00	3.57E-04	7.13E-05	1.07E-05	2.21E-03	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	7.73E-06	4.07E-03	1.00E-06	2.01E-07	3.02E-08	6.22E-06	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	7.84E-02	0.00E+00	1.02E-02	2.04E-03	3.06E-04	6.31E-02	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	3.13E-02	1.50E+01	4.07E-03	2.51E-02	6.52E-06	1.34E-06	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphonate	4.57E-03	1.58E+00	5.94E-04	1.95E-07	1.79E-02	3.68E-03	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	1.83E-01	6.43E+00	2.38E-02	9.51E-02	1.43E-02	1.47E-01	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	1.83E-03	3.21E+00	2.38E-04	5.70E-05	1.43E-05	1.47E-03	0.00E+00	0.00E+00	0.00E+00

TABLE A.29. Carcinogenic Chemical URFs for Recreational Scenario, Surface Water

Chemical Name	Drink Water	Fish Ingest	Swim Ingest	Swim Dermal	Shor Dermal	Shor Ingest	Swim Extern	Boat Extern	Shor Extern
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	1.01E-03	1.35E-02	1.31E-04	5.26E-03	7.90E-04	8.14E-04	0.00E+00	0.00E+00	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	1.48E-03	2.08E-01	1.93E-04	7.70E-04	1.16E-03	1.19E-03	0.00E+00	0.00E+00	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	3.06E-05	3.22E-03	3.97E-06	1.75E-05	4.81E-09	9.92E-10	0.00E+00	0.00E+00	0.00E+00
Chromium IV (ionic)	9.64E-03	1.35E+00	1.25E-03	5.01E-02	3.77E-03	7.76E-03	0.00E+00	0.00E+00	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	9.64E-03	1.35E+00	1.25E-03	5.01E-02	3.77E-03	7.76E-03	0.00E+00	0.00E+00	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.29. (contd)

<u>Chemical Name</u>	<u>Drink Water</u>	<u>Fish Ingest</u>	<u>Swim Ingest</u>	<u>Swim Dermal</u>	<u>Shor Dermal</u>	<u>Shor Ingest</u>	<u>Swim Extern</u>	<u>Boat Extern</u>	<u>Shor Extern</u>
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	1.86E-06	8.86E-04	2.41E-07	1.49E-06	3.86E-10	7.96E-11	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	2.59E-06	2.00E-05	3.36E-07	1.55E-05	3.83E-10	7.90E-11	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.30. Radionuclide URFs for Recreational Scenario, Surface Water

Radionuclide	Drink Water	Fish Ingest	Swim Ingest	Swim Dermal	Shor Dermal	Shor Ingest	Swim Extern	Boat Extern	Shor Extern
AC225	6.91E-09	9.81E-08	9.30E-10	1.80E-10	5.68E-12	7.14E-12	6.07E-12	3.04E-12	1.31E-10
AC227	1.47E-07	2.59E-06	1.91E-08	3.83E-09	1.10E-06	5.30E-08	5.77E-14	2.88E-14	7.76E-08
AG110M	1.98E-09	3.20E-09	2.57E-10	5.13E-11	4.52E-13	4.93E-11	1.33E-09	6.65E-10	4.83E-08
AM241	1.01E-07	1.78E-05	1.31E-08	2.63E-09	3.59E-07	3.78E-08	8.48E-12	4.24E-12	3.82E-10
AM243	1.01E-07	1.78E-05	1.31E-08	2.63E-09	3.63E-07	3.84E-08	2.39E-11	1.20E-11	3.79E-08
AU195	2.76E-10	6.42E-09	3.59E-11	4.31E-12	1.56E-15	5.05E-12	3.29E-11	1.65E-11	1.29E-09
BA133	5.05E-10	7.10E-08	6.56E-11	1.31E-11	4.78E-13	1.23E-10	1.77E-10	8.83E-11	4.25E-08
BE10	1.22E-09	1.71E-09	1.58E-10	3.16E-11	1.37E-11	4.61E-10	9.77E-14	4.88E-14	1.41E-10
BE7	1.25E-11	1.78E-11	1.64E-12	3.26E-13	5.92E-16	6.72E-14	2.32E-11	1.16E-11	1.66E-10
BI210	6.28E-10	7.10E-09	8.75E-11	1.63E-11	2.46E-12	3.19E-11	2.86E-13	1.43E-13	4.79E-13
C14	3.79E-10	1.23E-06	4.92E-11	9.85E-12	2.05E-13	1.43E-10	1.98E-15	9.90E-16	5.51E-12
CA45	4.16E-10	1.17E-08	5.42E-11	1.08E-11	3.28E-14	6.78E-12	7.60E-15	3.80E-15	1.97E-20
CD109	3.32E-09	4.68E-07	4.32E-10	8.64E-11	2.88E-11	1.54E-10	3.06E-12	1.53E-12	7.04E-12
CE144	2.61E-09	9.17E-07	3.39E-10	6.77E-11	8.07E-12	7.40E-11	8.14E-12	4.07E-12	8.26E-10
CF250	5.56E-07	9.77E-06	7.22E-08	1.44E-08	1.49E-07	1.45E-07	4.78E-14	2.39E-14	1.74E-10
CF252	2.82E-07	4.95E-06	3.66E-08	7.32E-09	2.44E-08	2.66E-08	5.32E-14	2.66E-14	6.15E-11
CL36	7.57E-10	2.66E-08	9.85E-11	1.97E-11	3.04E-13	2.87E-10	1.96E-13	9.82E-14	2.31E-10
CM243	7.99E-08	1.41E-05	1.04E-08	2.08E-09	2.06E-07	2.54E-08	5.87E-11	2.93E-11	1.06E-08
CM244	6.73E-08	1.18E-05	8.75E-09	1.75E-09	1.49E-07	1.94E-08	5.19E-14	2.59E-14	1.80E-12
CM245	1.01E-07	1.78E-05	1.31E-08	2.63E-09	3.75E-07	3.85E-08	4.00E-11	2.00E-11	4.18E-09
CM246	1.01E-07	1.78E-05	1.31E-08	2.63E-09	3.72E-07	3.82E-08	4.71E-14	2.36E-14	2.13E-12
CM248	3.83E-07	6.73E-05	4.98E-08	9.96E-09	1.37E-06	1.45E-07	3.59E-14	1.80E-14	1.74E-12
C057	2.44E-10	5.66E-08	3.17E-11	2.53E-12	1.74E-14	6.58E-12	5.66E-11	2.83E-11	1.07E-09
C058	6.70E-10	1.56E-07	8.75E-11	1.74E-11	1.01E-14	4.76E-12	4.65E-10	2.32E-10	4.86E-09
C060	6.31E-09	1.46E-06	8.20E-10	6.56E-11	3.13E-12	1.05E-09	1.23E-09	6.17E-10	2.97E-07
CS134	1.72E-08	2.43E-05	2.24E-09	4.48E-10	1.39E-12	1.29E-09	7.43E-10	3.71E-10	8.09E-08
CS137	1.18E-08	1.66E-05	1.53E-09	3.06E-10	4.15E-12	3.78E-09	2.34E-10	1.17E-10	1.34E-07
ES254	8.18E-08	5.76E-07	1.06E-08	2.13E-09	1.02E-08	1.02E-08	4.31E-10	2.15E-10	2.15E-08
EU152	8.84E-10	1.55E-08	1.15E-10	2.30E-11	1.10E-10	2.34E-10	5.53E-10	2.76E-10	1.99E-07
EU154	1.26E-09	2.22E-08	1.64E-10	3.28E-11	1.21E-10	2.81E-10	6.00E-10	3.00E-10	1.90E-07
EU155	1.89E-10	3.33E-09	2.46E-11	4.92E-12	1.23E-11	3.00E-11	2.54E-11	1.27E-11	1.95E-09
FE55	1.14E-10	1.60E-07	1.48E-11	2.95E-12	1.40E-13	1.09E-11	0.00E+00	0.00E+00	0.00E+00
GE68	3.67E-10	8.54E-07	4.78E-11	9.55E-12	7.07E-15	1.06E-11	4.51E-10	2.26E-10	2.44E-08
H3	2.27E-11	1.60E-11	2.95E-12	5.91E-13	4.36E-17	6.08E-14	0.00E+00	0.00E+00	0.00E+00
I129	8.00E-08	2.81E-05	1.04E-08	2.08E-09	2.45E-11	3.03E-08	4.04E-12	2.02E-12	3.24E-10
K40	4.63E-09	3.25E-06	6.02E-10	1.20E-10	1.96E-12	1.75E-09	7.83E-11	3.92E-11	4.26E-08
KR85	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-12	5.75E-13	3.54E-10
MN54	4.62E-10	1.30E-07	6.02E-11	1.20E-11	7.76E-14	1.45E-11	4.00E-10	2.00E-10	1.89E-08
MO93	7.41E-10	5.21E-09	9.63E-11	1.93E-11	2.86E-13	2.87E-10	2.67E-13	1.34E-13	1.83E-09
NA22	2.86E-09	2.01E-07	3.72E-10	7.44E-11	2.89E-13	2.66E-10	1.06E-09	5.31E-10	1.40E-07
NB93M	6.31E-11	8.88E-09	8.21E-12	1.64E-12	2.74E-13	1.67E-11	7.19E-14	3.59E-14	2.93E-12
NB94	8.84E-10	1.24E-07	1.15E-10	2.30E-11	8.24E-12	3.35E-10	7.53E-10	3.76E-10	4.26E-07
NB95	2.71E-10	3.85E-08	3.56E-11	7.04E-12	8.46E-15	9.61E-13	3.66E-10	1.83E-10	1.90E-09
NI59	3.83E-11	2.69E-09	4.98E-12	9.96E-14	2.65E-13	1.45E-11	0.00E+00	0.00E+00	0.00E+00

TABLE A.30. (contd)

Radionuclide	Drink Water	Fish Ingest	Swim Ingest	Swim Dermal	Shor Dermal	Shor Ingest	Swim Extern	Boat Extern	Shor Extern
NI63	1.01E-10	7.10E-09	1.31E-11	2.63E-13	6.14E-13	3.63E-11	0.00E+00	0.00E+00	0.00E+00
NP237	9.26E-08	1.63E-05	1.20E-08	2.41E-09	4.41E-07	3.52E-08	1.04E-11	5.22E-12	6.69E-08
NP239	3.42E-10	6.95E-08	5.14E-11	8.88E-12	2.62E-16	9.32E-14	7.70E-11	3.85E-11	1.13E-11
PA231	3.87E-08	2.99E-07	5.03E-09	1.01E-09	1.36E-06	2.83E-08	1.71E-11	8.55E-12	2.19E-08
PA233	4.15E-10	3.25E-09	5.47E-11	1.08E-11	8.25E-16	1.14E-12	9.26E-11	4.63E-11	2.36E-10
PB210	2.78E-07	1.95E-05	3.61E-08	2.89E-11	3.80E-09	1.03E-07	6.78E-13	3.39E-13	3.00E-10
PB212	1.12E-09	1.72E-07	3.17E-10	1.16E-13	2.40E-15	1.08E-13	6.51E-11	3.26E-11	5.06E-11
PM147	1.30E-10	2.29E-09	1.70E-11	3.39E-12	4.36E-12	1.22E-11	6.34E-15	3.17E-15	1.17E-13
PO210	6.30E-08	2.22E-05	8.21E-09	1.64E-09	6.77E-11	8.69E-10	4.07E-15	2.03E-15	8.32E-14
PU238	9.26E-08	1.63E-05	1.20E-08	2.41E-09	2.96E-07	3.31E-08	5.12E-14	2.56E-14	2.08E-12
PU239	9.68E-08	1.70E-05	1.26E-08	2.52E-09	3.53E-07	3.67E-08	4.34E-14	2.17E-14	1.34E-12
PU240	9.68E-08	1.70E-05	1.26E-08	2.52E-09	3.53E-07	3.67E-08	5.02E-14	2.51E-14	2.13E-12
PU241	1.51E-09	2.66E-07	1.97E-10	3.94E-11	8.27E-09	7.73E-10	7.33E-16	3.66E-16	4.15E-12
PU242	9.26E-08	1.63E-05	1.20E-08	2.41E-09	3.34E-07	3.51E-08	4.21E-14	2.10E-14	1.82E-12
RA223	2.61E-08	1.33E-06	3.50E-09	6.79E-10	2.95E-13	3.06E-11	1.35E-10	6.75E-11	5.45E-11
RA224	1.45E-08	7.87E-07	2.08E-09	3.78E-10	5.58E-14	6.73E-12	7.87E-10	3.93E-10	4.20E-10
RA225	2.10E-08	1.06E-06	2.79E-09	5.45E-10	8.83E-12	4.23E-11	2.93E-12	1.47E-12	1.94E-10
RA226	5.05E-08	2.49E-06	6.56E-09	1.31E-09	1.47E-09	4.48E-08	3.14E-12	1.57E-12	4.72E-07
RA228	3.76E-07	1.85E-05	4.88E-08	9.77E-09	7.41E-08	7.24E-08	4.68E-10	2.34E-10	5.12E-07
RE187	2.48E-12	2.09E-10	3.23E-13	6.45E-14	1.47E-15	9.40E-13	0.00E+00	0.00E+00	0.00E+00
RN222	5.38E-10	0.00E+00	7.66E-11	1.40E-11	1.78E-12	4.84E-11	8.61E-10	4.31E-10	2.36E-13
RU103	3.80E-10	2.69E-08	4.98E-11	9.87E-12	5.38E-15	1.50E-12	2.07E-10	1.03E-10	1.23E-09
RU106	3.99E-09	2.81E-07	5.20E-10	1.04E-10	1.05E-12	1.47E-10	9.50E-11	4.75E-11	5.12E-09
S35	9.22E-11	4.88E-08	1.20E-11	2.40E-12	9.26E-16	8.08E-13	2.14E-15	1.07E-15	1.33E-13
SB122	7.40E-10	1.18E-07	1.09E-10	1.92E-11	1.05E-16	2.27E-13	2.09E-10	1.05E-10	7.86E-11
SB124	1.21E-09	1.72E-07	1.59E-10	3.15E-11	1.09E-14	7.33E-12	8.95E-10	4.48E-10	8.13E-09
SC46	6.71E-10	4.73E-08	8.75E-11	1.74E-11	2.60E-13	5.63E-12	9.77E-10	4.88E-10	1.20E-08
SE75	2.43E-09	2.92E-07	3.17E-10	6.33E-11	3.41E-14	2.92E-11	1.83E-10	9.17E-11	2.02E-09
SE79	2.27E-09	2.71E-07	2.95E-10	5.90E-11	9.81E-13	8.60E-10	2.68E-15	1.34E-15	7.11E-12
SM147	6.73E-09	1.18E-07	8.75E-10	1.75E-10	5.98E-08	2.55E-09	0.00E+00	0.00E+00	0.00E+00
SM151	4.63E-11	8.14E-10	6.02E-12	1.20E-12	2.22E-11	1.66E-11	3.83E-16	1.92E-16	2.98E-14
SN113	3.65E-10	7.72E-07	4.76E-11	9.49E-12	2.11E-14	4.20E-12	1.23E-10	6.16E-11	7.89E-12
SN123	2.19E-09	4.62E-06	2.85E-10	5.68E-11	5.00E-14	2.82E-11	3.87E-12	1.93E-12	9.71E-11
SR85	3.22E-10	1.14E-08	4.21E-11	8.38E-12	4.02E-15	2.10E-12	2.37E-10	1.19E-10	1.89E-09
SR90	1.51E-08	5.33E-07	1.97E-09	3.94E-10	3.41E-11	5.25E-09	4.41E-13	2.20E-13	2.98E-09
TA182	7.13E-10	1.51E-05	9.30E-11	1.85E-11	9.51E-14	8.21E-12	6.27E-10	3.14E-10	9.80E-09
TC99	5.47E-10	5.77E-09	7.11E-11	1.42E-11	2.45E-13	2.07E-10	1.42E-14	7.09E-15	4.74E-14
TH227	1.86E-09	1.33E-07	2.46E-10	4.83E-11	2.80E-11	5.38E-11	4.85E-11	2.42E-11	1.52E-10
TH228	2.31E-08	1.63E-06	3.01E-09	6.01E-10	3.24E-08	2.89E-09	8.92E-13	4.46E-13	1.60E-07
TH229	3.75E-08	2.63E-06	4.87E-09	9.74E-10	1.67E-06	2.50E-08	3.87E-11	1.93E-11	1.03E-07
TH230	5.47E-09	3.85E-07	7.11E-10	1.42E-10	2.45E-07	2.19E-09	1.78E-13	8.89E-14	1.54E-09
TH231	1.21E-10	1.18E-08	2.19E-11	3.16E-12	1.20E-13	2.03E-14	5.32E-12	2.66E-12	5.26E-14
TH232	5.05E-09	3.55E-07	6.56E-10	1.31E-10	1.44E-06	8.48E-08	8.95E-14	4.48E-14	5.19E-07
TH234	1.66E-09	1.18E-07	2.19E-10	4.31E-11	2.44E-14	4.05E-12	3.73E-12	1.87E-12	2.55E-11

TABLE A.30. (contd)

<u>Radionuclide</u>	<u>Drink Water</u>	<u>Fish Ingest</u>	<u>Swim Ingest</u>	<u>Swim Dermal</u>	<u>Shor Dermal</u>	<u>Shor Ingest</u>	<u>Swim Extern</u>	<u>Boat Extern</u>	<u>Shor Extern</u>
TL204	7.15E-10	5.03E-08	9.30E-11	1.86E-11	6.68E-14	9.22E-11	5.53E-13	2.76E-13	2.34E-11
TM170	1.38E-09	2.43E-08	1.79E-10	3.58E-11	2.17E-13	1.78E-11	2.25E-12	1.13E-12	6.88E-11
U232	1.56E-08	5.47E-07	2.02E-09	4.05E-10	1.38E-07	1.76E-08	1.45E-13	7.27E-14	6.72E-07
U233	6.73E-09	2.37E-07	8.75E-10	1.75E-10	1.79E-09	2.57E-09	1.64E-13	8.21E-14	7.62E-11
U234	6.73E-09	2.37E-07	8.75E-10	1.75E-10	5.98E-10	2.55E-09	7.90E-14	3.95E-14	2.37E-12
U235	6.73E-09	2.37E-07	8.75E-10	1.75E-10	7.51E-10	2.62E-09	1.02E-10	5.09E-11	1.91E-08
U236	6.31E-09	2.22E-07	8.20E-10	1.64E-10	5.69E-10	2.39E-09	5.22E-14	2.61E-14	1.89E-12
U238	1.18E-08	4.14E-07	1.53E-09	3.06E-10	5.43E-10	5.10E-09	3.59E-14	1.80E-14	6.84E-09
V49	1.60E-11	1.13E-10	2.08E-12	4.16E-13	2.98E-15	5.28E-13	0.00E+00	0.00E+00	0.00E+00
Y88	1.56E-09	2.75E-08	2.03E-10	4.05E-11	8.29E-11	1.67E-11	1.34E-09	6.71E-10	2.38E-08
Y90	1.18E-09	2.37E-08	1.75E-10	3.08E-11	3.07E-16	3.63E-13	1.64E-12	8.19E-13	1.30E-12
ZN65	3.57E-09	6.29E-06	4.65E-10	5.57E-11	1.70E-13	8.71E-11	2.84E-10	1.42E-10	1.01E-08
ZR93	7.15E-11	1.01E-08	9.30E-12	1.86E-12	6.68E-11	3.43E-11	0.00E+00	0.00E+00	1.26E-12

**TABLE A.31. Noncarcinogenic Chemical URFs for Residential Scenario,
Soil (mass)**

<u>Chemical Name</u>	<u>Soil Ingest</u>	<u>Soil Dermal</u>	<u>Soil Resusp</u>	<u>Soil Extern</u>
Aluminum fluoride	8.89E-04	2.13E-04	3.25E-07	0.00E+00
Aluminum nitrate	3.31E-04	7.92E-05	1.30E-06	0.00E+00
Aluminum (ionic)	9.11E-03	2.18E-05	1.02E-06	0.00E+00
Ammonium carbonate	9.11E-05	2.18E-07	3.57E-07	0.00E+00
Ammonium nitrate	4.05E-05	9.68E-08	1.59E-07	0.00E+00
Beryllium (ionic)	7.29E-04	3.49E-04	0.00E+00	0.00E+00
Butyl phosphates	5.52E-05	1.32E-04	2.17E-07	0.00E+00
Cadmium (ionic)	7.29E-03	3.49E-03	2.86E-05	0.00E+00
Calcium carbonate	1.40E-05	3.35E-08	5.50E-08	0.00E+00
Calcium (ionic)	2.14E-07	1.71E-09	8.41E-10	0.00E+00
Calcium nitrate	9.85E-06	7.85E-08	3.86E-08	0.00E+00
Carbon tetrachloride	8.29E-06	1.98E-05	3.25E-08	0.00E+00
Chromium IV (ionic)	7.29E-04	1.74E-04	2.51E-02	0.00E+00
Copper sulfate	3.04E-04	1.45E-06	8.41E-07	0.00E+00
Copper (ionic)	1.21E-02	5.81E-05	1.43E-06	0.00E+00
Dibutyl phosphonate	2.80E-05	6.70E-05	1.10E-07	0.00E+00
Ferric nitrate	1.21E-04	2.90E-07	4.76E-07	0.00E+00
Ferrocyanide (ionic)	2.43E-05	5.81E-08	9.53E-08	0.00E+00
Ferrous nitrate	1.58E-04	3.79E-06	6.21E-07	0.00E+00
Fluoride (ionic)	6.07E-05	1.45E-07	2.38E-07	0.00E+00
Iron (as ferric ion)	2.80E-06	6.70E-08	1.66E-06	0.00E+00
Lead (ionic)	2.60E-03	3.11E-05	3.32E-05	0.00E+00
Magnesium (ionic)	7.29E-08	3.49E-10	2.04E-07	0.00E+00
Magnesium nitrate	1.92E-06	4.59E-09	7.52E-09	0.00E+00
Mercury (ionic)	1.21E-02	1.45E-03	1.66E-04	0.00E+00
Methyl isobutyl ketone	1.87E-06	4.47E-06	7.34E-09	0.00E+00
Nickel (ionic)	1.82E-04	8.71E-06	0.00E+00	0.00E+00
Nitrate	2.28E-06	5.45E-09	8.93E-09	0.00E+00
Nitric acid	1.04E-04	2.49E-07	4.08E-07	0.00E+00
Nitrite	1.07E-04	2.56E-07	4.20E-07	0.00E+00
Oxalate (ionic)	1.21E-05	2.90E-08	2.04E-06	0.00E+00
Phosphate (ionic)	7.92E-06	2.37E-08	2.04E-06	0.00E+00
Potassium (ionic)	7.14E-09	1.71E-11	2.80E-11	0.00E+00
Potassium borate	4.05E-05	9.68E-08	1.59E-07	0.00E+00
Silver (ionic)	7.29E-04	3.49E-05	2.86E-06	0.00E+00
Sodium (ionic)	1.21E-08	2.90E-11	4.76E-11	0.00E+00
Sodium aluminate	8.47E-05	2.03E-05	3.32E-07	0.00E+00
Sodium dichromate	7.29E-04	1.74E-04	2.51E-02	0.00E+00
Sodium oxalate	6.07E-05	1.45E-07	2.04E-06	0.00E+00
Sodium sulfamate	1.82E-05	4.36E-08	7.14E-08	0.00E+00
Sulfate (ionic)	5.13E-08	1.23E-10	2.04E-07	0.00E+00
Sulfuric acid	5.20E-04	1.24E-06	2.04E-06	0.00E+00
Tributyl phosphate	1.82E-06	4.36E-06	7.15E-09	0.00E+00
Tributyl phosphonate	3.04E-05	7.26E-05	1.19E-07	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	1.21E-03	5.81E-05	1.02E-05	0.00E+00
Zinc (ionic)	1.21E-05	5.81E-08	4.76E-08	0.00E+00

TABLE A.32. Carcinogenic Chemical URFs for Residential Scenario, Soil (mass)

Chemical Name	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	6.71E-06	3.21E-06	5.14E-08	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	9.83E-06	4.70E-06	3.86E-08	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	3.23E-10	7.73E-10	5.17E-13	0.00E+00
Chromium IV (ionic)	6.40E-05	1.53E-05	2.51E-07	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	5.14E-09	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	6.40E-05	1.53E-05	2.51E-07	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	1.08E-10	2.58E-10	0.00E+00	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	4.39E-11	1.05E-10	2.03E-13	0.00E+00
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.33. Radionuclide URFs for Residential Scenario, Soil (mass)

Radionuclide	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
AC225	2.94E-14	8.73E-14	3.46E-14	1.99E-11
AC227	4.77E-10	4.22E-08	9.90E-10	2.28E-08
AG110M	2.03E-13	6.94E-15	2.49E-14	7.34E-09
AM241	3.08E-10	1.09E-08	3.42E-10	1.15E-10
AM243	3.17E-10	1.11E-08	3.51E-10	1.09E-08
AU195	2.08E-14	2.40E-17	2.13E-15	1.96E-10
BA133	6.97E-13	1.01E-14	1.74E-14	8.90E-09
BE10	3.80E-12	4.22E-13	2.41E-12	4.30E-11
BE7	2.77E-16	9.09E-18	2.08E-17	2.52E-11
BI210	5.63E-12	1.51E-12	9.50E-13	2.60E-11
C14	1.18E-12	6.29E-15	7.00E-17	1.67E-12
CA45	2.79E-14	5.04E-16	1.20E-15	2.99E-21
CD109	6.35E-13	4.42E-13	4.35E-14	1.07E-12
CE144	3.05E-13	1.24E-13	1.39E-13	1.26E-10
CF250	8.70E-10	3.32E-09	8.92E-10	3.84E-11
CF252	8.71E-10	2.98E-09	1.06E-09	7.43E-11
CL36	2.37E-12	9.34E-15	1.53E-14	7.01E-11
CM243	2.50E-10	7.53E-09	2.85E-10	3.83E-09
CM244	2.10E-10	6.02E-09	2.41E-10	7.18E-13
CM245	3.16E-10	1.15E-08	3.51E-10	1.27E-09
CM246	3.15E-10	1.14E-08	3.50E-10	6.46E-13
CM248	1.20E-09	4.22E-08	1.32E-09	5.28E-13
CO57	2.71E-14	2.68E-16	3.19E-15	1.62E-10
CO58	1.96E-14	1.54E-16	1.00E-15	7.38E-10
CO60	4.91E-12	5.48E-14	4.10E-13	5.14E-08
CS134	5.35E-12	2.15E-14	3.04E-14	1.24E-08
CS137	2.66E-11	1.09E-13	1.50E-13	3.46E-08
ES254	2.50E-10	8.56E-10	2.73E-10	8.67E-08
EU152	1.42E-12	2.47E-12	6.18E-13	4.42E-08
EU154	1.51E-12	2.42E-12	5.88E-13	3.77E-08
EU155	1.39E-13	2.12E-13	4.63E-14	3.32E-10
FE55	4.61E-14	2.19E-15	1.19E-15	0.00E+00
GE68	4.36E-14	1.09E-16	1.35E-14	3.71E-09
H3	5.83E-16	1.56E-18	7.02E-18	0.00E+00
I129	2.50E-10	7.53E-13	1.32E-12	9.83E-11
K40	1.45E-11	6.03E-14	8.33E-14	1.30E-08
KR85	0.00E+00	0.00E+00	2.28E-19	7.42E-11
MN54	5.96E-14	1.19E-15	2.39E-15	2.87E-09
MO93	2.32E-12	5.39E-15	1.93E-13	5.56E-10
NA22	1.12E-12	4.52E-15	6.58E-15	2.16E-08
NB93M	1.01E-13	6.18E-15	1.07E-13	6.51E-13
NB94	2.76E-12	2.53E-13	2.30E-12	1.29E-07
NB95	3.96E-15	1.30E-16	2.59E-16	2.89E-10
NI59	1.20E-13	8.13E-15	7.67E-15	0.00E+00
NI63	2.84E-13	1.79E-14	1.77E-14	0.00E+00
NP237	2.90E-10	1.36E-08	3.18E-10	1.34E-08
NP239	3.84E-16	4.03E-18	5.45E-18	1.71E-12
PA231	1.22E-10	3.32E-08	3.96E-10	6.52E-10
PA233	9.17E-13	2.66E-18	6.58E-14	7.02E-09
PB210	8.77E-10	9.30E-11	4.58E-11	8.74E-11
PB212	4.45E-16	3.69E-17	3.20E-17	7.69E-12
PM147	5.13E-14	6.82E-14	4.14E-14	1.81E-14
PO210	3.58E-12	1.04E-12	5.18E-13	1.26E-14
PU238	2.89E-10	9.64E-09	4.27E-10	6.71E-13
PU239	3.02E-10	1.08E-08	4.16E-10	4.08E-13
PU240	3.02E-10	1.08E-08	4.16E-10	6.47E-13
PU241	4.75E-12	2.08E-10	2.54E-12	2.08E-13
PU242	2.89E-10	1.02E-08	3.95E-10	5.52E-13

TABLE A.33. (contd)

Radionuclide	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
RA223	1.26E-13	4.52E-15	5.10E-14	8.28E-12
RA224	1.01E-11	3.12E-13	2.40E-12	2.32E-08
RA225	4.40E-11	2.56E-11	1.83E-11	5.44E-09
RA226	1.60E-10	1.67E-11	3.29E-11	1.44E-07
RA228	1.17E-09	9.40E-11	4.70E-11	9.91E-08
RE187	7.75E-15	4.52E-17	3.70E-16	0.00E+00
RN222	6.72E-13	3.54E-14	1.89E-14	5.30E-12
RU103	6.19E-15	8.26E-17	4.76E-16	1.86E-10
RU106	6.05E-13	1.61E-14	2.34E-13	7.79E-10
S35	3.33E-15	1.42E-17	2.40E-17	2.02E-14
SB122	9.35E-16	1.61E-18	1.32E-17	1.19E-11
SB124	3.02E-14	1.67E-16	1.91E-15	1.24E-09
SC46	2.32E-14	3.99E-15	3.26E-15	1.83E-09
SE75	1.21E-13	5.24E-16	1.04E-15	3.07E-10
SE79	7.09E-12	3.01E-14	6.69E-14	2.16E-12
SM147	2.10E-11	1.84E-09	7.89E-11	0.00E+00
SM151	1.29E-13	6.46E-13	8.51E-14	8.57E-15
SN113	1.73E-14	3.24E-16	1.56E-15	1.20E-12
SN123	1.16E-13	7.68E-16	3.75E-15	1.48E-11
SR85	8.64E-15	6.17E-17	9.35E-17	2.86E-10
SR90	5.10E-11	1.25E-12	7.31E-13	1.01E-09
TA182	3.38E-14	1.46E-15	7.14E-15	1.49E-09
TC99	1.71E-12	7.53E-15	9.10E-14	1.44E-14
TH227	3.46E-11	1.05E-10	4.49E-11	4.35E-09
TH228	1.18E-10	5.35E-09	8.53E-10	2.37E-07
TH229	1.53E-10	5.12E-08	8.57E-10	1.97E-08
TH230	1.71E-11	7.53E-09	3.18E-10	3.86E-12
TH231	2.68E-14	2.89E-15	3.07E-16	2.81E-12
TH232	2.16E-11	4.22E-08	3.07E-10	4.86E-10
TH234	3.52E-12	7.87E-14	2.35E-13	8.19E-10
TL204	4.05E-13	1.09E-15	2.58E-15	3.78E-12
TM170	7.33E-14	3.33E-15	3.04E-15	1.04E-11
U232	5.03E-11	1.70E-10	6.70E-10	3.28E-09
U233	2.10E-11	1.89E-11	2.96E-10	1.08E-12
U234	2.10E-11	1.84E-11	2.85E-10	7.20E-13
U235	2.15E-11	1.69E-11	2.74E-10	5.81E-09
U236	1.97E-11	1.75E-11	2.74E-10	5.76E-13
U238	3.86E-11	1.66E-11	5.70E-10	1.27E-09
V49	2.18E-15	4.58E-17	1.02E-16	0.00E+00
Y88	6.88E-14	1.27E-12	2.69E-15	3.62E-09
Y90	1.50E-15	4.71E-18	2.14E-17	1.97E-13
ZN65	3.59E-13	2.61E-15	5.63E-15	1.54E-09
ZR93	2.24E-13	2.05E-12	7.17E-14	2.66E-15

TABLE A.34. Noncarcinogenic Chemical URFs for Residential Scenario, Soil (area)

<u>Chemical Name</u>	<u>Leafy Veg</u>	<u>Other Veg</u>	<u>Soil Ingest</u>	<u>Soil Dermal</u>	<u>Soil Resusp</u>	<u>Soil Extern</u>
Aluminum fluoride	0.00E+00	0.00E+00	1.18E-04	2.83E-05	4.33E-08	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	4.42E-05	1.06E-05	1.73E-07	0.00E+00
Aluminum (ionic)	1.66E-05	8.72E-06	1.21E-03	2.90E-06	1.36E-07	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	1.21E-05	2.90E-08	4.76E-08	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	5.40E-06	1.29E-08	2.12E-08	0.00E+00
Beryllium (ionic)	3.47E-06	1.82E-06	9.71E-05	4.65E-05	0.00E+00	0.00E+00
Butyl phosphates	5.21E-04	2.73E-04	7.36E-06	1.76E-05	2.88E-08	0.00E+00
Cadmium (ionic)	2.77E-03	1.45E-03	9.71E-04	4.65E-04	3.81E-06	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	1.87E-06	4.47E-09	7.32E-09	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	2.86E-08	2.28E-10	1.12E-10	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	1.31E-06	1.05E-08	5.15E-09	0.00E+00
Carbon tetrachloride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium IV (ionic)	8.34E-06	4.38E-06	9.71E-05	2.32E-05	3.34E-03	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	4.05E-05	1.94E-07	1.12E-07	0.00E+00
Copper (ionic)	7.69E-03	4.04E-03	1.62E-03	7.74E-06	1.90E-07	0.00E+00
Dibutyl phosphonate	2.46E-04	1.29E-04	3.74E-06	8.94E-06	1.46E-08	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	1.62E-05	3.87E-08	6.35E-08	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	3.24E-06	7.74E-09	1.27E-08	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	2.11E-05	5.05E-07	8.28E-08	0.00E+00
Fluoride (ionic)	1.23E-05	6.46E-06	8.09E-06	1.94E-08	3.17E-08	0.00E+00
Iron (as ferric ion)	7.10E-09	3.73E-09	3.74E-07	8.94E-09	2.21E-07	0.00E+00
Lead (ionic)	2.11E-05	1.11E-05	3.47E-04	4.15E-06	4.43E-06	0.00E+00
Magnesium (ionic)	1.02E-07	5.35E-08	9.71E-09	4.65E-11	2.72E-08	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	2.56E-07	6.11E-10	1.00E-09	0.00E+00
Mercury (ionic)	6.15E-03	3.23E-03	1.62E-03	1.94E-04	2.21E-05	0.00E+00
Methyl isobutyl ketone	2.10E-04	1.10E-04	7.20E-07	1.72E-06	2.82E-09	0.00E+00
Nickel (ionic)	2.77E-05	1.45E-05	2.43E-05	1.16E-06	0.00E+00	0.00E+00
Nitrate	1.73E-04	9.08E-05	3.04E-07	7.26E-10	1.19E-09	0.00E+00
Nitric acid	7.91E-03	4.15E-03	1.39E-05	3.32E-08	5.44E-08	0.00E+00
Nitrite	0.00E+00	0.00E+00	1.43E-05	3.42E-08	5.60E-08	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	1.62E-06	3.87E-09	2.72E-07	0.00E+00
Phosphate (ionic)	7.02E-05	3.69E-05	1.06E-06	3.16E-09	2.72E-07	0.00E+00
Potassium (ionic)	9.99E-09	5.24E-09	9.52E-10	2.28E-12	3.73E-12	0.00E+00
Potassium borate	4.92E-05	2.58E-05	5.40E-06	1.29E-08	2.12E-08	0.00E+00
Silver (ionic)	2.40E-06	1.26E-06	9.71E-05	4.65E-06	3.81E-07	0.00E+00
Sodium (ionic)	1.70E-09	8.91E-10	1.62E-09	3.87E-12	6.35E-12	0.00E+00
Sodium aluminate	1.55E-07	8.11E-08	1.13E-05	2.70E-06	4.43E-08	0.00E+00
Sodium dichromate	8.34E-06	4.38E-06	9.71E-05	2.32E-05	3.34E-03	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	8.09E-06	1.94E-08	2.72E-07	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	2.43E-06	5.81E-09	9.52E-09	0.00E+00
Sulfate (ionic)	1.95E-07	1.02E-07	6.84E-09	1.64E-11	2.72E-08	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	6.94E-05	1.66E-07	2.72E-07	0.00E+00
Tributyl phosphate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	4.31E-05	2.26E-05	1.62E-04	7.74E-06	1.36E-06	0.00E+00
Zinc (ionic)	1.82E-05	9.56E-06	1.62E-06	7.74E-09	6.35E-09	0.00E+00

TABLE A.35. Carcinogenic Chemical URFs for Residential Scenario, Soil (area)

Chemical Name	Leafy Veg	Other Veg	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	3.20E-08	1.68E-08	8.95E-07	4.28E-07	6.85E-09	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	3.74E-06	1.96E-06	1.31E-06	6.27E-07	5.14E-09	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium IV (ionic)	7.33E-07	3.85E-07	8.53E-06	2.04E-06	3.35E-08	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.85E-10	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	7.33E-07	3.85E-07	8.53E-06	2.04E-06	3.35E-08	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.36. Radionuclide URFs for Residential Scenario, Soil (area)

Radionuclide	Leafy Veg	Other Veg	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
AC225	1.44E-12	1.36E-14	1.47E-14	4.36E-14	1.73E-14	9.93E-12
AC227	1.66E-12	8.68E-13	5.45E-11	4.25E-09	1.05E-10	2.90E-09
AG110M	3.97E-15	1.78E-15	7.38E-14	2.52E-15	9.03E-15	2.66E-09
AM241	6.89E-13	3.62E-13	4.14E-11	1.46E-09	4.60E-11	1.54E-11
AM243	7.58E-13	3.98E-13	4.22E-11	1.49E-09	4.67E-11	1.49E-09
AU195	2.69E-14	1.13E-14	8.14E-15	9.36E-18	8.32E-16	7.67E-11
BA133	7.63E-14	3.96E-14	1.24E-13	1.80E-15	3.10E-15	1.58E-09
BE10	3.07E-14	1.61E-14	5.07E-13	5.62E-14	3.21E-13	5.73E-12
BE7	8.06E-18	1.99E-18	1.32E-16	4.35E-18	9.93E-18	1.21E-11
BI210	5.29E-16	1.80E-16	1.93E-15	3.86E-16	4.68E-16	3.61E-14
C14	0.00E+00	0.00E+00	1.58E-13	8.39E-16	9.34E-18	2.23E-13
CA45	1.62E-13	6.65E-14	1.12E-14	2.02E-16	4.81E-16	1.20E-21
CD109	1.23E-12	5.93E-13	1.98E-13	1.38E-13	1.36E-14	3.34E-13
CE144	1.78E-14	8.10E-15	1.07E-13	4.36E-14	4.90E-14	4.42E-11
CF250	6.06E-11	3.16E-11	1.48E-10	5.66E-10	1.52E-10	6.55E-12
CF252	1.21E-11	6.08E-12	2.91E-11	9.97E-11	3.53E-11	2.49E-12
CL36	8.92E-10	4.68E-10	3.16E-13	1.25E-15	2.05E-15	9.35E-12
CM243	2.61E-13	1.36E-13	2.67E-11	8.05E-10	3.05E-11	4.10E-10
CM244	1.97E-13	1.03E-13	2.01E-11	5.76E-10	2.30E-11	6.87E-14
CM245	4.12E-13	2.16E-13	4.24E-11	1.54E-09	4.70E-11	1.69E-10
CM246	4.07E-13	2.14E-13	4.20E-11	1.52E-09	4.67E-11	8.62E-14
CM248	1.55E-12	8.11E-13	1.60E-10	5.62E-09	1.75E-10	7.04E-14
CO57	1.60E-14	7.24E-15	9.66E-15	9.54E-17	1.14E-15	5.77E-11
CO58	1.49E-14	4.43E-15	9.12E-15	7.18E-17	4.65E-16	3.43E-10
CO60	1.75E-12	8.98E-13	1.06E-12	1.18E-14	8.82E-14	1.11E-08
CS134	3.02E-12	1.51E-12	1.48E-12	5.97E-15	8.43E-15	3.43E-09
CS137	7.96E-12	4.16E-12	3.98E-12	1.63E-14	2.25E-14	5.18E-09
ES254	3.64E-12	1.80E-12	8.89E-12	3.27E-11	9.33E-12	1.16E-09
EU152	3.91E-14	2.04E-14	2.39E-13	4.18E-13	1.04E-13	7.48E-09
EU154	4.64E-14	2.41E-14	2.83E-13	4.53E-13	1.10E-13	7.04E-09
EU155	5.03E-15	2.58E-15	3.05E-14	4.66E-14	1.02E-14	7.29E-11
FE55	4.95E-16	2.49E-16	1.19E-14	5.68E-16	3.10E-16	0.00E+00
GE68	2.53E-13	1.16E-13	1.53E-14	3.80E-17	4.73E-15	1.30E-09
H3	0.00E+00	0.00E+00	2.75E-16	7.35E-19	3.31E-18	0.00E+00
I129	6.72E-11	3.53E-11	3.33E-11	1.00E-13	1.75E-13	1.31E-11
K40	4.30E-11	2.26E-11	1.93E-12	8.04E-15	1.11E-14	1.73E-09
KR85	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.05E-20	1.32E-11
MN54	1.27E-13	5.88E-14	2.05E-14	4.09E-16	8.22E-16	9.84E-10
MO93	7.48E-13	3.93E-13	3.17E-13	1.23E-15	3.46E-14	7.41E-11
NA22	6.69E-13	3.37E-13	2.93E-13	1.18E-15	1.72E-15	5.65E-09
NB93M	3.49E-15	1.82E-15	1.71E-14	1.04E-15	1.80E-14	1.10E-13
NB94	7.43E-14	3.90E-14	3.68E-13	3.37E-14	3.07E-13	1.73E-08
NB95	3.89E-16	6.51E-17	1.94E-15	6.37E-17	1.27E-16	1.42E-10
NI59	3.86E-14	2.03E-14	1.60E-14	1.08E-15	1.02E-15	0.00E+00
NI63	9.54E-14	5.00E-14	3.93E-14	2.48E-15	2.45E-15	0.00E+00
NP237	1.46E-11	7.68E-12	3.87E-11	1.81E-09	4.24E-11	2.63E-09
NP239	4.18E-17	8.77E-25	1.92E-16	2.01E-18	2.72E-18	8.57E-13
PA231	6.93E-13	3.64E-13	3.36E-11	5.77E-09	8.60E-11	1.02E-09
PA233	2.30E-17	2.79E-18	2.31E-15	7.38E-19	1.69E-16	1.77E-11
PB210	1.79E-11	9.36E-12	1.06E-10	1.43E-11	7.07E-12	1.06E-11
PB212	1.30E-18	0.00E+00	2.22E-16	1.85E-17	1.60E-17	3.85E-12
PM147	2.22E-15	1.12E-15	1.34E-14	1.78E-14	1.08E-14	4.73E-15
PO210	5.53E-13	2.17E-13	1.49E-12	4.33E-13	2.15E-13	5.26E-15
PU238	2.90E-13	1.52E-13	3.58E-11	1.19E-09	5.29E-11	8.31E-14
PU239	3.25E-13	1.71E-13	4.03E-11	1.45E-09	5.55E-11	5.44E-14
PU240	3.25E-13	1.71E-13	4.03E-11	1.44E-09	5.55E-11	8.63E-14
PU241	1.06E-14	5.56E-15	8.63E-13	3.41E-11	7.16E-13	1.83E-13
PU242	3.11E-13	1.63E-13	3.86E-11	1.37E-09	5.26E-11	7.36E-14

TABLE A.36. (contd)

Radionuclide	Leafy Veg	Other Veg	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
RA223	7.44E-15	1.15E-16	6.30E-14	2.26E-15	2.54E-14	4.13E-12
RA224	1.10E-15	9.81E-21	1.21E-14	2.78E-16	3.17E-15	5.86E-13
RA225	1.30E-13	4.53E-15	6.63E-14	6.76E-15	1.74E-14	8.52E-13
RA226	8.15E-12	4.28E-12	5.40E-11	6.70E-12	6.59E-12	1.91E-08
RA228	9.10E-12	4.69E-12	7.20E-11	2.32E-10	3.90E-11	1.68E-08
RE187	1.46E-14	7.67E-15	1.03E-15	6.03E-18	4.93E-17	0.00E+00
RN222	2.39E-16	1.25E-16	1.85E-15	1.90E-16	9.63E-17	7.39E-15
RU103	2.43E-15	4.59E-16	3.02E-15	4.03E-17	2.32E-16	9.08E-11
RU106	1.66E-13	7.80E-14	2.00E-13	5.30E-15	7.71E-14	2.57E-10
S35	9.25E-14	3.07E-14	1.50E-15	6.42E-18	1.08E-17	9.12E-15
SB122	6.53E-18	1.17E-24	4.67E-16	8.03E-19	6.62E-18	5.97E-12
SB124	3.26E-16	8.78E-17	1.43E-14	7.91E-17	9.04E-16	5.85E-10
SC46	4.33E-16	1.41E-16	1.06E-14	1.81E-15	1.48E-15	8.30E-10
SE75	5.31E-14	1.99E-14	5.16E-14	2.24E-16	4.44E-16	1.31E-10
SE79	9.54E-13	5.01E-13	9.46E-13	4.02E-15	8.91E-15	2.88E-13
SM147	4.53E-13	2.38E-13	2.81E-12	2.45E-10	1.05E-11	0.00E+00
SM151	2.90E-15	1.52E-15	1.79E-14	8.96E-14	1.18E-14	1.19E-15
SN113	1.85E-15	6.83E-16	7.47E-15	1.40E-16	6.73E-16	5.17E-13
SN123	1.21E-14	4.66E-15	4.91E-14	3.24E-16	1.58E-15	6.22E-12
SR85	1.34E-13	3.79E-14	4.06E-15	2.90E-17	4.39E-17	1.35E-10
SR90	1.67E-10	8.75E-11	5.49E-12	1.34E-13	7.87E-14	1.11E-10
TA182	1.50E-15	5.56E-16	1.46E-14	6.30E-16	3.08E-15	6.42E-10
TC99	1.01E-11	5.31E-12	2.28E-13	1.00E-15	1.21E-14	1.92E-15
TH227	9.07E-16	5.55E-17	1.43E-14	2.10E-13	6.86E-14	5.16E-12
TH228	1.51E-13	7.49E-14	2.95E-12	1.41E-10	2.25E-11	5.93E-09
TH229	3.03E-10	1.59E-10	2.67E-11	6.83E-09	1.18E-10	4.05E-09
TH230	3.93E-14	2.07E-14	2.48E-12	1.00E-09	4.24E-11	7.79E-11
TH231	5.01E-20	2.64E-22	3.67E-17	4.19E-18	4.36E-19	3.85E-15
TH232	1.16E-11	6.07E-12	9.73E-11	5.95E-09	9.53E-11	2.30E-08
TH234	3.91E-17	3.90E-18	8.27E-15	1.85E-16	5.53E-16	1.92E-12
TL204	1.59E-15	8.09E-16	9.59E-14	2.58E-16	6.11E-16	8.95E-13
TM170	1.32E-14	5.09E-15	3.09E-14	1.40E-15	1.28E-15	4.41E-12
U232	4.09E-12	2.15E-12	1.83E-11	5.27E-10	1.63E-10	2.53E-08
U233	1.86E-12	9.77E-13	2.83E-12	8.54E-12	3.95E-11	3.83E-12
U234	1.59E-12	8.32E-13	2.81E-12	2.45E-12	3.80E-11	9.59E-14
U235	1.59E-12	8.32E-13	2.88E-12	3.35E-12	3.65E-11	7.75E-10
U236	1.49E-12	7.80E-13	2.63E-12	2.33E-12	3.65E-11	7.68E-14
U238	2.78E-12	1.46E-12	5.56E-12	2.22E-12	7.60E-11	2.67E-10
V49	1.59E-16	7.39E-17	7.37E-16	1.55E-17	3.45E-17	0.00E+00
Y88	7.42E-15	2.68E-15	3.01E-14	5.57E-13	1.18E-15	1.58E-09
Y90	1.12E-16	2.01E-23	7.48E-16	2.36E-18	1.07E-17	9.86E-14
ZN65	3.21E-12	1.43E-12	1.31E-13	9.54E-16	2.06E-15	5.63E-10
ZR93	2.36E-15	1.24E-15	3.87E-14	2.74E-13	1.89E-14	5.75E-14

TABLE A.37. Noncarcinogenic Chemical URFs for Residential Scenario, Air

Chemical Name	Leafy Veg	Other Veg	Air Inhal	Air Extern
Aluminum fluoride	3.44E+01	1.81E+00	6.49E+00	0.00E+00
Aluminum nitrate	1.28E+01	6.74E-01	2.60E+01	0.00E+00
Aluminum (ionic)	3.53E+02	1.85E+01	2.04E+01	0.00E+00
Ammonium carbonate	3.53E+00	1.85E-01	7.14E+00	0.00E+00
Ammonium nitrate	1.57E+00	8.24E-02	3.17E+00	0.00E+00
Beryllium (ionic)	2.82E+01	1.48E+00	0.00E+00	0.00E+00
Butyl phosphates	2.14E+00	1.12E-01	4.33E+00	0.00E+00
Cadmium (ionic)	2.82E+02	1.48E+01	5.71E+02	0.00E+00
Calcium carbonate	5.43E-01	2.85E-02	1.10E+00	0.00E+00
Calcium (ionic)	8.31E-03	4.36E-04	1.68E-02	0.00E+00
Calcium nitrate	3.82E-01	2.00E-02	7.72E-01	0.00E+00
Carbon tetrachloride	2.61E-01	1.37E-02	4.08E+02	0.00E+00
Chromium IV (ionic)	2.82E+01	1.48E+00	5.01E+05	0.00E+00
Copper sulfate	1.18E+01	6.18E-01	1.68E+01	0.00E+00
Copper (ionic)	4.71E+02	2.47E+01	2.86E+01	0.00E+00
Dibutyl phosphonate	1.09E+00	5.70E-02	2.20E+00	0.00E+00
Ferric nitrate	4.71E+00	2.47E-01	9.52E+00	0.00E+00
Ferrocyanide (ionic)	9.41E-01	4.94E-02	1.90E+00	0.00E+00
Ferrous nitrate	6.14E+00	3.22E-01	1.24E+01	0.00E+00
Fluoride (ionic)	2.35E+00	1.24E-01	4.76E+00	0.00E+00
Iron (as ferric ion)	1.09E-01	5.70E-03	3.32E+01	0.00E+00
Lead (ionic)	1.01E+02	5.29E+00	6.64E+02	0.00E+00
Magnesium (ionic)	2.82E-03	1.48E-04	4.08E+00	0.00E+00
Magnesium nitrate	7.43E-02	3.90E-03	1.50E-01	0.00E+00
Mercury (ionic)	4.71E+02	2.47E+01	3.32E+03	0.00E+00
Methyl isobutyl ketone	3.86E-02	2.03E-03	5.71E+00	0.00E+00
Nickel (ionic)	7.06E+00	3.71E-01	0.00E+00	0.00E+00
Nitrate	8.83E-02	4.63E-03	1.79E-01	0.00E+00
Nitric acid	4.03E+00	2.12E-01	8.16E+00	0.00E+00
Nitrite	4.15E+00	2.18E-01	8.40E+00	0.00E+00
Oxalate (ionic)	4.71E-01	2.47E-02	4.08E+01	0.00E+00
Phosphate (ionic)	3.07E-01	1.61E-02	4.08E+01	0.00E+00
Potassium (ionic)	2.77E-04	1.45E-05	5.60E-04	0.00E+00
Potassium borate	1.57E+00	8.24E-02	3.17E+00	0.00E+00
Silver (ionic)	2.82E+01	1.48E+00	5.71E+01	0.00E+00
Sodium (ionic)	4.71E-04	2.47E-05	9.52E-04	0.00E+00
Sodium aluminate	3.28E+00	1.72E-01	6.64E+00	0.00E+00
Sodium dichromate	2.82E+01	1.48E+00	5.01E+05	0.00E+00
Sodium oxalate	2.35E+00	1.24E-01	4.08E+01	0.00E+00
Sodium sulfamate	7.06E-01	3.71E-02	1.43E+00	0.00E+00
Sulfate (ionic)	1.99E-03	1.04E-04	4.08E+00	0.00E+00
Sulfuric acid	2.02E+01	1.06E+00	4.08E+01	0.00E+00
Tributyl phosphate	1.51E-01	7.91E-03	1.63E+01	0.00E+00
Tributyl phosphonate	1.97E+00	1.03E-01	2.38E+00	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	4.71E+01	2.47E+00	2.04E+02	0.00E+00
Zinc (ionic)	4.71E-01	2.47E-02	9.52E-01	0.00E+00

TABLE A.38. Carcinogenic Chemical URFs for Residential Scenario, Air

Chemical Name	Leafy Veg	Other Veg	Air Inhal	Air Extern
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	2.60E-01	1.37E-02	1.03E+00	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	3.81E-01	2.00E-02	7.72E-01	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	1.02E-05	5.34E-07	6.49E-03	0.00E+00
Chromium IV (ionic)	2.48E+00	1.30E-01	4.96E+00	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	1.03E-01	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	2.48E+00	1.30E-01	4.96E+00	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	8.93E-06	4.69E-07	0.00E+00	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	1.37E-06	7.18E-08	1.59E-03	0.00E+00
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.39. Radionuclide URFs for Residential Scenario, Air

Radionuclide	Leafy Veg	Other Veg	Air Inhal	Air Extern
AC225	7.03E-07	6.63E-10	5.26E-04	1.28E-09
AC227	4.14E-05	2.16E-06	1.93E-02	1.19E-11
AG110M	4.83E-07	2.16E-08	1.51E-05	2.94E-07
AM241	2.60E-05	1.36E-06	7.01E-03	1.78E-09
AM243	5.09E-05	2.67E-06	7.01E-03	4.81E-09
AU195	6.63E-08	2.80E-09	1.77E-06	7.00E-09
BA133	1.30E-07	6.73E-09	7.89E-07	3.86E-08
BE10	3.13E-07	1.64E-08	4.81E-05	2.45E-11
BE7	2.58E-09	6.37E-11	5.92E-08	5.12E-09
BI210	1.48E-05	5.81E-07	1.75E-05	7.14E-11
C14	4.44E-07	2.33E-07	1.40E-09	4.88E-13
CA45	9.91E-08	4.07E-09	1.12E-06	1.88E-12
CD109	8.32E-07	4.00E-08	1.42E-05	6.39E-10
CE144	6.42E-07	2.92E-08	7.45E-05	1.79E-09
CF250	1.43E-04	7.43E-06	3.56E-02	9.78E-12
CF252	1.70E-04	8.78E-06	2.13E-02	1.10E-11
CL36	1.95E-07	1.02E-08	3.07E-07	4.83E-11
CM243	7.15E-05	3.75E-06	5.70E-03	1.28E-08
CM244	4.22E-05	2.21E-06	4.82E-03	1.07E-11
CM245	5.24E-05	2.75E-06	7.01E-03	8.59E-09
CM246	2.60E-05	1.36E-06	7.01E-03	9.69E-12
CM248	9.86E-05	5.17E-06	2.63E-02	7.37E-12
CO57	5.99E-08	2.71E-09	1.80E-06	1.22E-08
CO58	1.45E-07	4.32E-09	2.15E-06	1.03E-07
CO60	1.61E-06	8.30E-08	3.29E-05	2.74E-07
CS134	4.36E-06	2.17E-07	6.14E-06	1.65E-07
CS137	3.03E-06	1.58E-07	4.16E-06	5.54E-08
ES254	1.89E-04	9.70E-06	5.59E-03	9.56E-08
EU152	2.27E-07	1.18E-08	2.41E-05	1.23E-07
EU154	3.24E-07	1.68E-08	3.07E-05	1.33E-07
EU155	4.84E-08	2.48E-09	3.95E-06	5.40E-09
FE55	2.89E-08	1.45E-09	1.84E-07	0.00E+00
GE68	9.05E-08	4.13E-09	7.12E-06	9.93E-08
H3	5.32E-09	2.77E-09	1.71E-08	0.00E+00
I129	2.06E-05	1.08E-06	2.63E-05	8.15E-10
K40	1.19E-06	6.25E-08	1.67E-06	1.74E-08
KR85	0.00E+00	0.00E+00	1.03E-11	2.59E-10
MN54	1.14E-07	5.28E-09	1.16E-06	8.87E-08
MO93	2.07E-07	1.09E-08	3.86E-06	5.48E-11
NA22	7.26E-07	3.66E-08	1.05E-06	2.35E-07
NB93M	1.62E-08	8.44E-10	4.16E-06	9.62E-12
NB94	2.27E-07	1.19E-08	4.60E-05	1.68E-07
NB95	5.02E-08	8.42E-10	1.12E-06	8.12E-08
NI59	9.86E-09	5.17E-10	1.53E-07	0.00E+00
NI63	2.60E-08	1.36E-09	3.95E-07	0.00E+00
NP237	3.91E-05	2.05E-06	6.36E-03	2.23E-09
NP239	8.60E-09	1.81E-17	3.51E-07	1.66E-08
PA231	5.14E-05	2.70E-06	7.89E-03	3.75E-09
PA233	1.52E-05	7.97E-07	1.89E-06	2.04E-08
PB210	8.64E-05	4.51E-06	8.77E-04	1.27E-10
PB212	8.88E-10	0.00E+00	1.10E-05	1.40E-08
PM147	3.31E-08	1.67E-09	6.58E-06	1.50E-12
PO210	1.48E-05	5.81E-07	5.70E-04	9.02E-13
PU238	2.55E-05	1.34E-06	8.55E-03	1.06E-11
PU239	2.49E-05	1.31E-06	8.33E-03	9.20E-12
PU240	2.49E-05	1.31E-06	8.33E-03	1.03E-11
PU241	2.64E-05	1.38E-06	5.04E-05	1.57E-13
PU242	2.38E-05	1.25E-06	7.89E-03	8.69E-12

TABLE A.39. (contd)

Radionuclide	Leafy Veg	Other Veg	Air Inhal	Air Extern
RA223	2.90E-06	4.48E-09	6.80E-04	2.97E-08
RA224	6.29E-07	5.61E-13	2.63E-04	1.74E-07
RA225	3.45E-06	1.20E-08	3.29E-04	6.07E-10
RA226	9.94E-05	5.22E-06	6.58E-04	6.83E-10
RA228	1.03E-04	5.30E-06	6.90E-04	1.04E-07
RE187	6.39E-10	3.35E-11	7.39E-09	0.00E+00
RN222	8.64E-05	4.51E-06	1.60E-07	1.92E-07
RU103	7.26E-08	1.37E-09	1.84E-06	4.57E-08
RU106	9.93E-07	4.67E-08	9.64E-05	2.28E-08
S35	2.06E-08	6.84E-10	4.16E-08	5.28E-13
SB122	2.21E-08	3.96E-16	7.45E-07	4.63E-08
SB124	2.56E-07	6.88E-09	4.82E-06	1.99E-07
SC46	1.49E-07	4.85E-09	5.92E-06	2.17E-07
SE75	5.65E-07	2.12E-08	1.32E-06	4.03E-08
SE79	5.84E-07	3.07E-08	1.34E-06	6.59E-13
SM147	1.73E-06	9.10E-08	1.58E-03	0.00E+00
SM151	1.19E-08	6.24E-10	1.91E-06	7.84E-14
SN113	8.44E-08	3.12E-09	2.06E-06	2.69E-08
SN123	5.11E-07	1.96E-08	4.42E-06	8.74E-10
SR85	6.88E-08	1.94E-09	2.19E-07	5.25E-08
SR90	3.95E-06	2.07E-07	1.36E-05	2.12E-10
TA182	1.65E-07	6.10E-09	9.43E-06	1.39E-07
TC99	1.41E-07	7.39E-09	1.82E-06	3.52E-12
TH227	3.31E-06	2.03E-08	1.07E-03	1.06E-08
TH228	6.76E-06	3.35E-07	1.71E-02	1.86E-10
TH229	1.34E-05	7.05E-07	1.69E-02	8.30E-09
TH230	1.01E-04	5.29E-06	6.36E-03	3.80E-11
TH231	5.14E-05	2.70E-06	1.07E-07	1.13E-09
TH232	1.04E-04	5.47E-06	6.14E-03	1.89E-11
TH234	2.00E-06	9.36E-08	7.01E-06	7.34E-10
TL204	1.82E-07	9.30E-09	2.85E-07	1.21E-10
TM170	3.22E-07	1.24E-08	3.57E-06	4.86E-10
U232	1.08E-05	5.65E-07	1.32E-02	3.07E-11
U233	1.52E-05	7.96E-07	5.92E-03	3.54E-11
U234	1.73E-06	9.10E-08	5.70E-03	1.66E-11
U235	5.31E-05	2.79E-06	5.48E-03	1.45E-08
U236	1.62E-06	8.53E-08	5.48E-03	1.09E-11
U238	1.06E-04	5.56E-06	1.14E-02	7.39E-12
V49	3.96E-09	1.84E-10	4.69E-08	0.00E+00
Y88	3.57E-07	1.29E-08	3.82E-06	2.98E-07
Y90	3.53E-08	6.34E-16	1.21E-06	4.13E-10
ZN65	8.73E-07	3.89E-08	3.51E-06	6.31E-08
ZR93	3.46E-08	1.82E-09	1.42E-06	0.00E+00

TABLE A.40. Noncarcinogenic Chemical URFs for Residential Scenario, Groundwater

Chemical Name	Drink Water	Shwr Dermal	Shwr Ingest	Leafy Veg	Other Veg	Indr Inhal
Aluminum fluoride	6.97E+00	1.18E+00	3.55E-02	2.23E+00	1.17E-01	0.00E+00
Aluminum nitrate	2.60E+00	4.42E-01	1.32E-02	8.30E-01	4.36E-02	0.00E+00
Aluminum (ionic)	7.14E+01	8.74E-04	3.64E-01	2.28E+01	1.20E+00	0.00E+00
Ammonium carbonate	7.14E-01	1.21E-03	3.64E-03	2.28E-01	1.20E-02	0.00E+00
Ammonium nitrate	3.17E-01	5.40E-04	1.62E-03	1.01E-01	5.32E-03	0.00E+00
Beryllium (ionic)	5.71E+00	1.94E+00	2.91E-02	1.83E+00	9.65E-02	0.00E+00
Butyl phosphates	4.33E-01	2.86E-03	2.21E-03	3.47E-01	1.17E-01	0.00E+00
Cadmium (ionic)	5.71E+01	1.94E+00	2.91E-01	1.94E+01	1.54E+00	0.00E+00
Calcium carbonate	1.10E-01	1.87E-04	5.60E-04	3.51E-02	1.84E-03	0.00E+00
Calcium (ionic)	1.68E-03	9.52E-06	8.57E-06	5.37E-04	2.82E-05	0.00E+00
Calcium nitrate	7.72E-02	4.38E-04	3.94E-04	2.47E-02	1.29E-03	0.00E+00
Carbon tetrachloride	4.08E+01	1.53E+00	2.08E-01	1.32E+01	7.45E-01	1.53E+02
Chromium IV (ionic)	5.71E+00	1.94E+00	2.91E-02	1.83E+00	9.76E-02	0.00E+00
Copper sulfate	2.38E+00	8.09E-03	1.21E-02	7.60E-01	3.99E-02	0.00E+00
Copper (ionic)	9.52E+01	3.24E-01	4.86E-01	3.35E+01	3.21E+00	0.00E+00
Dibutyl phosphonate	2.20E-01	9.04E-04	1.12E-03	1.69E-01	5.53E-02	0.00E+00
Ferric nitrate	9.52E-01	1.62E-03	4.86E-03	3.04E-01	1.60E-02	0.00E+00
Ferrocyanide (ionic)	1.90E-01	3.24E-04	9.71E-04	6.08E-02	3.19E-03	0.00E+00
Ferrous nitrate	1.24E+00	2.11E-02	6.33E-03	3.97E-01	2.08E-02	0.00E+00
Fluoride (ionic)	4.76E-01	8.10E-04	2.43E-03	1.57E-01	1.06E-02	0.00E+00
Iron (as ferric ion)	2.20E-02	3.74E-04	1.12E-04	7.02E-03	3.70E-04	0.00E+00
Lead (ionic)	2.04E+01	6.94E-04	1.04E-01	6.53E+00	3.47E-01	0.00E+00
Magnesium (ionic)	5.71E-04	1.94E-06	2.91E-06	2.23E-04	3.10E-05	0.00E+00
Magnesium nitrate	1.50E-02	2.56E-05	7.67E-05	4.80E-03	2.52E-04	0.00E+00
Mercury (ionic)	9.52E+01	8.10E+00	4.86E-01	3.29E+01	2.89E+00	0.00E+00
Methyl isobutyl ketone	5.71E-01	3.21E-03	2.91E-03	2.94E-01	6.81E-02	2.14E+00
Nickel (ionic)	1.43E+00	4.86E-03	7.29E-03	4.67E-01	2.98E-02	0.00E+00
Nitrate	1.79E-02	3.04E-05	9.11E-05	7.49E-02	3.66E-02	0.00E+00
Nitric acid	8.16E-01	1.39E-03	4.16E-03	3.42E+00	1.67E+00	0.00E+00
Nitrite	8.40E-01	1.43E-03	4.29E-03	2.68E-01	1.41E-02	0.00E+00
Oxalate (ionic)	9.52E-02	1.62E-04	4.86E-04	3.04E-02	1.60E-03	0.00E+00
Phosphate (ionic)	6.21E-02	1.32E-04	3.17E-04	4.79E-02	1.58E-02	0.00E+00
Potassium (ionic)	5.60E-05	6.38E-09	2.86E-07	2.19E-05	3.04E-06	0.00E+00
Potassium borate	3.17E-01	5.40E-04	1.62E-03	1.21E-01	1.57E-02	0.00E+00
Silver (ionic)	5.71E+00	1.17E-01	2.91E-02	1.83E+00	9.63E-02	0.00E+00
Sodium (ionic)	9.52E-05	1.62E-07	4.86E-07	3.11E-05	1.95E-06	0.00E+00
Sodium aluminate	6.64E-01	1.13E-01	3.39E-03	2.12E-01	1.12E-02	0.00E+00
Sodium dichromate	5.71E+00	1.94E+00	2.91E-02	1.83E+00	9.76E-02	0.00E+00
Sodium oxalate	4.76E-01	8.10E-04	2.43E-03	1.52E-01	7.98E-03	0.00E+00
Sodium sulfamate	1.43E-01	2.43E-04	7.29E-04	4.56E-02	2.40E-03	0.00E+00
Sulfate (ionic)	4.02E-04	6.84E-07	2.05E-06	2.07E-04	4.77E-05	0.00E+00
Sulfuric acid	4.08E+00	6.94E-03	2.08E-02	1.30E+00	6.84E-02	0.00E+00
Tributyl phosphate	1.63E+00	8.55E-02	8.33E-03	5.24E-01	2.87E-02	0.00E+00
Tributyl phosphonate	2.38E-01	6.64E-07	1.21E-03	8.33E-02	7.80E-03	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	9.52E+00	3.24E-01	4.86E-02	3.06E+00	1.69E-01	0.00E+00
Zinc (ionic)	9.52E-02	1.94E-04	4.86E-04	3.77E-02	5.42E-03	0.00E+00

TABLE A.41. Carcinogenic Chemical URFs for Residential Scenario, Groundwater

Chemical Name	Drink Water	Shwr Dermal	Shwr Ingest	Leafy Veg	Other Veg	Indr Inhal
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	5.27E-02	1.79E-02	2.69E-04	1.68E-02	8.89E-04	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	7.71E-02	2.62E-03	3.93E-04	2.61E-02	2.08E-03	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	1.59E-03	5.95E-05	8.12E-06	5.13E-04	2.91E-05	2.43E-03
Chromium IV (ionic)	5.03E-01	1.71E-01	2.56E-03	1.60E-01	8.57E-03	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	5.03E-01	1.71E-01	2.56E-03	1.60E-01	8.57E-03	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	9.67E-05	5.06E-06	4.93E-07	3.10E-05	1.70E-06	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	1.35E-04	5.27E-05	6.87E-07	4.38E-05	2.68E-06	5.97E-04
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.42. Radionuclide URFs for Residential Scenario, Groundwater

Radionuclide	Drink Water	Shwr Dermal	Shwr Ingest	Leafy Veg	Other Veg	Indr Inhal
AC225	3.60E-07	4.91E-07	1.84E-09	4.73E-08	5.98E-11	0.00E+00
AC227	7.67E-06	3.23E-04	3.91E-08	2.68E-06	1.40E-07	0.00E+00
AG110M	1.03E-07	1.61E-09	5.25E-10	3.12E-08	1.40E-09	0.00E+00
AM241	5.26E-06	8.55E-05	2.68E-08	1.68E-06	8.83E-08	0.00E+00
AM243	5.26E-06	8.55E-05	2.68E-08	3.29E-06	1.73E-07	0.00E+00
AU195	1.44E-08	4.57E-12	7.33E-11	4.30E-09	1.87E-10	0.00E+00
BA133	2.63E-08	1.76E-10	1.34E-10	8.40E-09	4.51E-10	0.00E+00
BE10	6.33E-08	3.23E-09	3.23E-10	2.02E-08	1.07E-09	0.00E+00
BE7	6.53E-10	9.87E-12	3.33E-12	1.67E-10	4.12E-12	0.00E+00
BI210	3.27E-08	5.82E-10	1.67E-10	9.59E-07	3.75E-08	0.00E+00
C14	1.97E-08	4.83E-11	1.01E-10	3.32E-08	1.74E-08	0.00E+00
CA45	2.17E-08	1.80E-10	1.10E-10	6.49E-09	3.00E-10	0.00E+00
CD109	1.73E-07	5.54E-09	8.83E-10	5.43E-08	2.86E-09	0.00E+00
CE144	1.36E-07	2.54E-08	6.92E-10	4.15E-08	1.89E-09	0.00E+00
CF250	2.89E-05	5.08E-05	1.48E-07	9.24E-06	4.93E-07	0.00E+00
CF252	1.47E-05	2.31E-05	7.48E-08	1.10E-05	5.70E-07	0.00E+00
CL36	3.95E-08	7.16E-11	2.01E-10	3.69E-07	1.88E-07	0.00E+00
CM243	4.16E-06	5.78E-05	2.12E-08	4.62E-06	2.42E-07	0.00E+00
CM244	3.51E-06	4.62E-05	1.79E-08	2.73E-06	1.43E-07	0.00E+00
CM245	5.26E-06	8.78E-05	2.68E-08	3.38E-06	1.78E-07	0.00E+00
CM246	5.26E-06	8.78E-05	2.68E-08	1.68E-06	8.83E-08	0.00E+00
CM248	1.99E-05	3.23E-04	1.02E-07	6.37E-06	3.35E-07	0.00E+00
CO57	1.27E-08	2.31E-11	6.48E-11	3.88E-09	1.79E-10	0.00E+00
CO58	3.49E-08	1.26E-10	1.78E-10	9.40E-09	2.83E-10	0.00E+00
CO60	3.29E-07	6.74E-10	1.68E-09	1.05E-07	5.73E-09	0.00E+00
CS134	8.98E-07	1.66E-09	4.58E-09	2.83E-07	1.47E-08	0.00E+00
CS137	6.14E-07	1.16E-09	3.13E-09	1.99E-07	1.19E-08	0.00E+00
ES254	4.26E-06	6.69E-06	2.17E-08	1.22E-05	6.28E-07	0.00E+00
EU152	4.60E-08	3.70E-08	2.35E-10	1.47E-08	7.72E-10	0.00E+00
EU154	6.58E-08	4.85E-08	3.35E-10	2.09E-08	1.09E-09	0.00E+00
EU155	9.86E-09	6.93E-09	5.03E-11	3.13E-09	1.62E-10	0.00E+00
FE55	5.92E-09	1.29E-10	3.02E-11	1.87E-09	9.41E-11	0.00E+00
GE68	1.91E-08	2.19E-11	9.76E-11	5.97E-09	3.24E-10	0.00E+00
H3	1.18E-09	1.46E-12	6.04E-12	4.26E-11	2.22E-11	0.00E+00
I129	4.16E-06	5.78E-09	2.12E-08	1.36E-06	8.39E-08	0.00E+00
K40	2.41E-07	4.62E-10	1.23E-09	9.42E-08	1.31E-08	0.00E+00
KR85	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN54	2.41E-08	2.22E-10	1.23E-10	7.45E-09	3.69E-10	0.00E+00
MO93	3.86E-08	4.11E-11	1.97E-10	1.37E-08	8.59E-10	0.00E+00
NA22	1.49E-07	2.77E-10	7.60E-10	4.72E-08	2.51E-09	0.00E+00
NB93M	3.29E-09	9.24E-11	1.68E-11	1.05E-09	5.53E-11	0.00E+00
NB94	4.60E-08	1.94E-09	2.35E-10	1.47E-08	7.87E-10	0.00E+00
NB95	1.41E-08	2.13E-10	7.20E-11	3.25E-09	5.45E-11	0.00E+00
NI59	1.99E-09	6.24E-12	1.02E-11	6.52E-10	4.15E-11	0.00E+00
NI63	5.26E-09	1.52E-11	2.68E-11	1.72E-09	1.08E-10	0.00E+00
NP237	4.82E-06	1.04E-04	2.46E-08	2.53E-06	1.36E-07	0.00E+00
NP239	1.78E-08	8.58E-11	9.07E-11	5.56E-10	1.17E-18	0.00E+00
PA231	2.02E-06	2.54E-04	1.03E-08	3.32E-06	1.74E-07	0.00E+00
PA233	2.16E-08	0.00E+00	1.10E-10	9.84E-07	5.15E-08	0.00E+00
PB210	1.45E-05	2.77E-09	7.38E-08	5.59E-06	2.95E-07	0.00E+00
PB212	5.81E-08	8.87E-12	2.97E-10	5.74E-11	0.00E+00	0.00E+00
PM147	6.79E-09	4.16E-09	3.46E-11	2.14E-09	1.08E-10	0.00E+00
PO210	3.28E-06	4.38E-07	1.67E-08	9.57E-07	3.77E-08	0.00E+00
PU238	4.82E-06	7.39E-05	2.46E-08	1.65E-06	8.66E-08	0.00E+00
PU239	5.04E-06	8.32E-05	2.57E-08	1.61E-06	8.46E-08	0.00E+00
PU240	5.04E-06	8.32E-05	2.57E-08	1.61E-06	8.46E-08	0.00E+00
PU241	7.89E-08	1.59E-06	4.02E-10	1.70E-06	8.95E-08	0.00E+00
PU242	4.82E-06	7.85E-05	2.46E-08	1.54E-06	8.09E-08	0.00E+00

TABLE A.42. (contd)

Radionuclide	Drink Water	Shwr Dermal	Shwr Ingest	Leafy Veg	Other Veg	Indr Inhal
RA223	1.36E-06	2.24E-08	6.94E-09	1.87E-07	2.89E-10	0.00E+00
RA224	7.58E-07	7.99E-09	3.86E-09	4.07E-08	3.62E-14	0.00E+00
RA225	1.09E-06	2.48E-08	5.57E-09	2.23E-07	7.80E-10	0.00E+00
RA226	2.63E-06	1.27E-07	1.34E-08	6.43E-06	3.39E-07	0.00E+00
RA228	1.96E-05	1.11E-07	9.98E-08	6.65E-06	3.44E-07	0.00E+00
RE187	1.29E-10	3.47E-13	6.59E-13	4.71E-11	5.23E-12	0.00E+00
RN222	2.80E-08	0.00E+00	1.43E-10	5.58E-06	2.92E-07	1.10E-08
RU103	1.98E-08	1.21E-10	1.01E-10	4.70E-09	8.90E-11	0.00E+00
RU106	2.08E-07	2.54E-09	1.06E-09	6.43E-08	3.06E-09	0.00E+00
S35	4.80E-09	9.43E-12	2.45E-11	1.40E-09	6.52E-11	0.00E+00
SB122	3.86E-08	3.05E-11	1.97E-10	1.43E-09	2.56E-17	0.00E+00
SB124	6.32E-08	1.61E-10	3.22E-10	1.65E-08	4.45E-10	0.00E+00
SC46	3.49E-08	2.76E-09	1.78E-10	9.64E-09	3.13E-10	0.00E+00
SE75	1.27E-07	2.53E-10	6.47E-10	3.65E-08	1.38E-09	0.00E+00
SE79	1.18E-07	2.31E-10	6.03E-10	3.81E-08	2.18E-09	0.00E+00
SM147	3.51E-07	1.41E-05	1.79E-09	1.12E-07	5.97E-09	0.00E+00
SM151	2.41E-09	5.54E-09	1.23E-11	7.71E-10	4.10E-11	0.00E+00
SN113	1.90E-08	1.64E-10	9.70E-11	5.45E-09	2.02E-10	0.00E+00
SN123	1.14E-07	3.46E-10	5.81E-10	3.30E-08	1.27E-09	0.00E+00
SR85	1.68E-08	5.51E-11	8.56E-11	4.55E-09	1.55E-10	0.00E+00
SR90	7.89E-07	9.47E-09	4.02E-09	3.23E-07	4.86E-08	0.00E+00
TA182	3.72E-08	7.37E-10	1.89E-10	1.07E-08	3.95E-10	0.00E+00
TC99	2.85E-08	5.78E-11	1.45E-10	1.31E-08	2.60E-09	0.00E+00
TH227	9.68E-08	1.29E-06	4.94E-10	2.14E-07	1.31E-09	0.00E+00
TH228	1.21E-06	4.16E-05	6.15E-09	4.37E-07	2.17E-08	0.00E+00
TH229	1.95E-06	3.93E-04	9.95E-09	9.89E-07	1.09E-07	0.00E+00
TH230	2.85E-07	5.78E-05	1.45E-09	6.52E-06	3.42E-07	0.00E+00
TH231	6.32E-09	1.13E-11	3.22E-11	3.32E-06	1.74E-07	0.00E+00
TH232	2.63E-07	3.23E-04	1.34E-09	6.74E-06	3.56E-07	0.00E+00
TH234	8.64E-08	8.88E-10	4.41E-10	1.29E-07	6.05E-09	0.00E+00
TL204	3.73E-08	4.62E-11	1.90E-10	1.18E-08	6.01E-10	0.00E+00
TM170	7.17E-08	1.50E-09	3.66E-10	2.08E-08	8.02E-10	0.00E+00
U232	8.11E-07	6.93E-07	4.14E-09	6.98E-07	3.74E-08	0.00E+00
U233	3.51E-07	1.43E-07	1.79E-09	9.81E-07	5.18E-08	0.00E+00
U234	3.51E-07	1.41E-07	1.79E-09	1.13E-07	6.21E-09	0.00E+00
U235	3.51E-07	1.29E-07	1.79E-09	3.43E-06	1.81E-07	0.00E+00
U236	3.29E-07	1.34E-07	1.68E-09	1.06E-07	5.82E-09	0.00E+00
U238	6.14E-07	1.27E-07	3.13E-09	6.84E-06	3.60E-07	0.00E+00
V49	8.34E-10	8.08E-12	4.25E-12	2.56E-10	1.19E-11	0.00E+00
Y88	8.11E-08	6.91E-07	4.14E-10	2.31E-08	8.34E-10	0.00E+00
Y90	6.17E-08	8.94E-11	3.15E-10	2.28E-09	4.10E-17	0.00E+00
ZN65	1.86E-07	3.74E-10	9.49E-10	5.80E-08	3.23E-09	0.00E+00
ZR93	3.73E-09	1.57E-08	1.90E-11	2.24E-09	1.18E-10	0.00E+00

**TABLE A.43a. Noncarcinogenic Chemical URFs for Residential Scenario,
Surface Water**

Chemical Name	Drink Water	Shwr Dermal	Shwr Ingest	Leafy Veg	Other Veg	Fish Ingest	Swim Ingest
Aluminum fluoride	6.97E+00	1.18E+00	3.55E-02	2.23E+00	1.17E-01	0.00E+00	1.74E-02
Aluminum nitrate	2.60E+00	4.42E-01	1.32E-02	8.30E-01	4.36E-02	0.00E+00	6.48E-03
Aluminum (ionic)	7.14E+01	8.74E-04	3.64E-01	2.28E+01	1.20E+00	9.64E+00	1.78E-01
Ammonium carbonate	7.14E-01	1.21E-03	3.64E-03	2.28E-01	1.20E-02	0.00E+00	1.78E-03
Ammonium nitrate	3.17E-01	5.40E-04	1.62E-03	1.01E-01	5.32E-03	0.00E+00	7.92E-04
Beryllium (ionic)	5.71E+00	1.94E+00	2.91E-02	1.83E+00	9.65E-02	1.47E+00	1.43E-02
Butyl phosphates	4.33E-01	2.86E-03	2.21E-03	3.47E-01	1.17E-01	3.82E-02	1.08E-03
Cadmium (ionic)	5.71E+01	1.94E+00	2.91E-01	1.94E+01	1.54E+00	1.54E+02	1.43E-01
Calcium carbonate	1.10E-01	1.87E-04	5.60E-04	3.51E-02	1.84E-03	0.00E+00	2.74E-04
Calcium (ionic)	1.68E-03	9.52E-06	8.57E-06	5.37E-04	2.82E-05	0.00E+00	4.19E-06
Calcium nitrate	7.72E-02	4.38E-04	3.94E-04	2.47E-02	1.29E-03	0.00E+00	1.93E-04
Carbon tetrachloride	4.08E+01	1.53E+00	2.08E-01	1.32E+01	7.45E-01	8.27E+01	1.02E-01
Chromium IV (ionic)	5.71E+00	1.94E+00	2.91E-02	1.83E+00	9.76E-02	1.54E+01	1.43E-02
Copper sulfate	2.38E+00	8.09E-03	1.21E-02	7.60E-01	3.99E-02	0.00E+00	5.94E-03
Copper (ionic)	9.52E+01	3.24E-01	4.86E-01	3.35E+01	3.21E+00	6.43E+01	2.38E-01
Dibutyl phosphonate	2.20E-01	9.04E-04	1.12E-03	1.69E-01	5.53E-02	2.17E-02	5.49E-04
Ferric nitrate	9.52E-01	1.62E-03	4.86E-03	3.04E-01	1.60E-02	0.00E+00	2.38E-03
Ferrocyanide (ionic)	1.90E-01	3.24E-04	9.71E-04	6.08E-02	3.19E-03	0.00E+00	4.75E-04
Ferrous nitrate	1.24E+00	2.11E-02	6.33E-03	3.97E-01	2.08E-02	0.00E+00	3.10E-03
Fluoride (ionic)	4.76E-01	8.10E-04	2.43E-03	1.57E-01	1.06E-02	6.43E-02	1.19E-03
Iron (as ferric ion)	2.20E-02	3.74E-04	1.12E-04	7.02E-03	3.70E-04	5.93E-01	5.49E-05
Lead (ionic)	2.04E+01	6.94E-04	1.04E-01	6.53E+00	3.47E-01	2.76E+01	5.09E-02
Magnesium (ionic)	5.71E-04	1.94E-06	2.91E-06	2.23E-04	3.10E-05	3.86E-04	1.43E-06
Magnesium nitrate	1.50E-02	2.56E-05	7.67E-05	4.80E-03	2.52E-04	0.00E+00	3.75E-05
Mercury (ionic)	9.52E+01	8.10E+00	4.86E-01	3.29E+01	2.89E+00	1.29E+03	2.38E-01
Methyl isobutyl ketone	5.71E-01	3.21E-03	2.91E-03	2.94E-01	6.81E-02	5.71E-03	1.43E-03
Nickel (ionic)	1.43E+00	4.86E-03	7.29E-03	4.67E-01	2.98E-02	1.93E+00	3.57E-03
Nitrate	1.79E-02	3.04E-05	9.11E-05	7.49E-02	3.66E-02	3.62E+01	4.46E-05
Nitric acid	8.16E-01	1.39E-03	4.16E-03	3.42E+00	1.67E+00	1.65E+03	2.04E-03
Nitrite	8.40E-01	1.43E-03	4.29E-03	2.68E-01	1.41E-02	0.00E+00	2.10E-03
Oxalate (ionic)	9.52E-02	1.62E-04	4.86E-04	3.04E-02	1.60E-03	0.00E+00	2.38E-04
Phosphate (ionic)	6.21E-02	1.32E-04	3.17E-04	4.79E-02	1.58E-02	5.87E+01	1.55E-04
Potassium (ionic)	5.60E-05	6.38E-09	2.86E-07	2.19E-05	3.04E-06	7.56E-04	1.40E-07
Potassium borate	3.17E-01	5.40E-04	1.62E-03	1.21E-01	1.57E-02	9.43E-04	7.92E-04
Silver (ionic)	5.71E+00	1.17E-01	2.91E-02	1.83E+00	9.63E-02	1.77E-01	1.43E-02
Sodium (ionic)	9.52E-05	1.62E-07	4.86E-07	3.11E-05	1.95E-06	1.29E-04	2.38E-07
Sodium aluminate	6.64E-01	1.13E-01	3.39E-03	2.12E-01	1.12E-02	8.97E-02	1.66E-03
Sodium dichromate	5.71E+00	1.94E+00	2.91E-02	1.83E+00	9.76E-02	1.54E+01	1.43E-02
Sodium oxalate	4.76E-01	8.10E-04	2.43E-03	1.52E-01	7.98E-03	0.00E+00	1.19E-03
Sodium sulfamate	1.43E-01	2.43E-04	7.29E-04	4.56E-02	2.40E-03	0.00E+00	3.57E-04
Sulfate (ionic)	4.02E-04	6.84E-07	2.05E-06	2.07E-04	4.77E-05	4.07E-03	1.00E-06
Sulfuric acid	4.08E+00	6.94E-03	2.08E-02	1.30E+00	6.84E-02	0.00E+00	1.02E-02
Tributyl phosphate	1.63E+00	8.55E-02	8.33E-03	5.24E-01	2.87E-02	1.50E+01	4.07E-03
Tributyl phosphonate	2.38E-01	6.64E-07	1.21E-03	8.33E-02	7.80E-03	1.58E+00	5.94E-04
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	9.52E+00	3.24E-01	4.86E-02	3.06E+00	1.69E-01	6.43E+00	2.38E-02
Zinc (ionic)	9.52E-02	1.94E-04	4.86E-04	3.77E-02	5.42E-03	3.21E+00	2.38E-04

TABLE A.43b. Noncarcinogenic Chemical URFs for Residential Scenario, Surface Water

Chemical Name	Swim Dermal	Shor Dermal	Shor Ingest	Indr Inhal	Swim Extern	Boat Extern	Shor Extern
Aluminum fluoride	3.48E-01	5.24E-02	1.08E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	1.30E-01	1.95E-02	4.02E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	2.57E-04	5.37E-03	1.10E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	3.57E-04	5.37E-05	1.10E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	1.58E-04	2.39E-05	4.91E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	5.70E-01	8.59E-02	8.84E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Butyl phosphates	8.38E-04	3.26E-02	6.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	5.70E-01	8.59E-01	8.84E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium carbonate	5.48E-05	8.26E-06	1.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	2.80E-06	4.21E-07	2.60E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	1.28E-04	1.94E-05	1.19E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	4.48E-01	1.24E-04	2.54E-05	1.53E+02	0.00E+00	0.00E+00	0.00E+00
Chromium IV (ionic)	5.70E-01	4.30E-02	8.84E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper sulfate	2.38E-03	3.58E-04	3.68E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	9.51E-02	1.43E-02	1.47E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	2.65E-04	1.65E-02	3.40E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	4.75E-04	7.16E-05	1.47E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	9.51E-05	1.43E-05	2.95E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	6.20E-03	9.34E-04	1.92E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	2.38E-04	3.58E-05	7.36E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	1.10E-04	1.65E-05	3.40E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	2.04E-04	7.67E-03	3.16E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	5.70E-07	8.59E-08	8.84E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	7.51E-06	1.13E-06	2.33E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	2.38E+00	3.58E-01	1.47E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	9.41E-04	1.12E-05	2.29E-06	2.14E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	1.43E-03	2.15E-03	2.21E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrate	8.91E-06	1.34E-06	2.76E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	4.07E-04	6.14E-05	1.26E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	4.19E-04	6.32E-05	1.30E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	4.75E-05	7.16E-06	1.47E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	3.87E-05	5.84E-06	9.61E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	1.87E-09	4.21E-09	8.66E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	1.58E-04	2.39E-05	4.91E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	3.42E-02	8.59E-03	8.84E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	4.75E-08	7.16E-09	1.47E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	3.32E-02	5.00E-03	1.03E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	5.70E-01	4.30E-02	8.84E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium oxalate	2.38E-04	3.58E-05	7.37E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	7.13E-05	1.07E-05	2.21E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	2.01E-07	3.03E-08	6.22E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	2.04E-03	3.07E-04	6.31E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	2.51E-02	6.53E-06	1.34E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphonate	1.95E-07	1.79E-02	3.68E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	9.51E-02	1.43E-02	1.47E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	5.70E-05	1.43E-05	1.47E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.44a. Carcinogenic Chemical URFs for Residential Scenario, Surface Water

Chemical Name	Drink Water	Shwr Dermal	Shwr Ingest	Leafy Veg	Other Veg	Fish Ingest	Swim Ingest
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	5.27E-02	1.79E-02	2.69E-04	1.68E-02	8.89E-04	1.35E-02	1.31E-04
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	7.71E-02	2.62E-03	3.93E-04	2.61E-02	2.08E-03	2.08E-01	1.93E-04
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	1.59E-03	5.95E-05	8.12E-06	5.13E-04	2.91E-05	3.22E-03	3.97E-06
Chromium IV (ionic)	5.03E-01	1.71E-01	2.56E-03	1.60E-01	8.57E-03	1.35E+00	1.25E-03
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	5.03E-01	1.71E-01	2.56E-03	1.60E-01	8.57E-03	1.35E+00	1.25E-03
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	9.67E-05	5.06E-06	4.93E-07	3.10E-05	1.70E-06	8.86E-04	2.41E-07
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	1.35E-04	5.27E-05	6.87E-07	4.38E-05	2.68E-06	2.00E-05	3.36E-07
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.44b. Carcinogenic Chemical URFs for Residential Scenario, Surface Water

Chemical Name	Swim Dermal	Shor Dermal	Shor Ingest	Indr Inhal	Swim Extern	Boat Extern	Shor Extern
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	5.26E-03	7.92E-04	8.14E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	7.70E-04	1.16E-03	1.19E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	1.75E-05	4.82E-09	9.92E-10	2.43E-03	0.00E+00	0.00E+00	0.00E+00
Chromium IV (ionic)	5.01E-02	3.78E-03	7.76E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	5.01E-02	3.78E-03	7.76E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	1.49E-06	3.87E-10	7.96E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	1.55E-05	3.84E-10	7.90E-11	5.97E-04	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.45a. Radionuclide URFs for Residential Scenario, Surface Water

Radionuclide	Drink Water	Shwr Dermal	Shwr Ingest	Leafy Veg	Other Veg	Fish Ingest	Swim Ingest
AG110M	1.03E-07	1.61E-09	5.25E-10	3.12E-08	1.40E-09	3.20E-09	2.57E-10
AM241	5.26E-06	8.55E-05	2.68E-08	1.68E-06	8.83E-08	1.78E-05	1.31E-08
AM243	5.26E-06	8.55E-05	2.68E-08	3.29E-06	1.73E-07	1.78E-05	1.31E-08
NP239	1.78E-08	8.58E-11	9.07E-11	5.56E-10	1.17E-18	6.95E-08	5.14E-11
PU239	5.04E-06	8.32E-05	2.57E-08	1.61E-06	8.46E-08	1.70E-05	1.26E-08
AU195	1.44E-08	4.57E-12	7.33E-11	4.30E-09	1.87E-10	6.42E-09	3.59E-11
BA133	2.63E-08	1.76E-10	1.34E-10	8.40E-09	4.51E-10	7.10E-08	6.56E-11
BE7	6.53E-10	9.87E-12	3.33E-12	1.67E-10	4.12E-12	1.78E-11	1.64E-12
BE10	6.33E-08	3.23E-09	3.23E-10	2.02E-08	1.07E-09	1.71E-09	1.58E-10
CA45	2.17E-08	1.80E-10	1.10E-10	6.49E-09	3.00E-10	1.17E-08	5.42E-11
C14	1.97E-08	4.83E-11	1.01E-10	3.32E-08	1.74E-08	1.23E-06	4.92E-11
CD109	1.73E-07	5.54E-09	8.83E-10	5.43E-08	2.86E-09	4.68E-07	4.32E-10
CE144	1.36E-07	2.54E-08	6.92E-10	4.15E-08	1.89E-09	9.17E-07	3.39E-10
CF252	1.47E-05	2.31E-05	7.48E-08	1.10E-05	5.70E-07	4.95E-06	3.66E-08
CM248	1.99E-05	3.23E-04	1.02E-07	6.37E-06	3.35E-07	6.73E-05	4.98E-08
CM243	4.16E-06	5.78E-05	2.12E-08	4.62E-06	2.42E-07	1.41E-05	1.04E-08
CM244	3.51E-06	4.62E-05	1.79E-08	2.73E-06	1.43E-07	1.18E-05	8.75E-09
PU240	5.04E-06	8.32E-05	2.57E-08	1.61E-06	8.46E-08	1.70E-05	1.26E-08
CM245	5.26E-06	8.78E-05	2.68E-08	3.38E-06	1.78E-07	1.78E-05	1.31E-08
PU241	7.89E-08	1.59E-06	4.02E-10	1.70E-06	8.95E-08	2.66E-07	1.97E-10
CL36	3.95E-08	7.16E-11	2.01E-10	3.69E-07	1.88E-07	2.66E-08	9.85E-11
CO57	1.27E-08	2.31E-11	6.48E-11	3.88E-09	1.79E-10	5.66E-08	3.17E-11
CO58	3.49E-08	1.26E-10	1.78E-10	9.40E-09	2.83E-10	1.56E-07	8.75E-11
CO60	3.29E-07	6.74E-10	1.68E-09	1.05E-07	5.73E-09	1.46E-06	8.20E-10
CS134	8.98E-07	1.66E-09	4.58E-09	2.83E-07	1.47E-08	2.43E-05	2.24E-09
CS137	6.14E-07	1.16E-09	3.13E-09	1.99E-07	1.19E-08	1.66E-05	1.53E-09
ES254	4.26E-06	6.69E-06	2.17E-08	1.22E-05	6.28E-07	5.76E-07	1.06E-08
CF250	2.89E-05	5.08E-05	1.48E-07	9.24E-06	4.93E-07	9.77E-06	7.22E-08
CM246	5.26E-06	8.78E-05	2.68E-08	1.68E-06	8.83E-08	1.78E-05	1.31E-08
EU152	4.60E-08	3.70E-08	2.35E-10	1.47E-08	7.72E-10	1.55E-08	1.15E-10
EU154	6.58E-08	4.85E-08	3.35E-10	2.09E-08	1.09E-09	2.22E-08	1.64E-10
EU155	9.86E-09	6.93E-09	5.03E-11	3.13E-09	1.62E-10	3.33E-09	2.46E-11
FE55	5.92E-09	1.29E-10	3.02E-11	1.87E-09	9.41E-11	1.60E-07	1.48E-11
GE68	1.91E-08	2.19E-11	9.76E-11	5.97E-09	3.24E-10	8.54E-07	4.78E-11
H3	1.18E-09	1.46E-12	6.04E-12	4.26E-11	2.22E-11	1.60E-11	2.95E-12
I129	4.16E-06	5.78E-09	2.12E-08	1.36E-06	8.39E-08	2.81E-05	1.04E-08
K40	2.41E-07	4.62E-10	1.23E-09	9.42E-08	1.31E-08	3.25E-06	6.02E-10
KR85	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN54	2.41E-08	2.22E-10	1.23E-10	7.45E-09	3.69E-10	1.30E-07	6.02E-11
NA22	1.49E-07	2.77E-10	7.60E-10	4.72E-08	2.51E-09	2.01E-07	3.72E-10
MO93	3.86E-08	4.11E-11	1.97E-10	1.37E-08	8.59E-10	5.21E-09	9.63E-11
NB93M	3.29E-09	9.24E-11	1.68E-11	1.05E-09	5.53E-11	8.88E-09	8.21E-12
ZR93	3.73E-09	1.57E-08	1.90E-11	2.24E-09	1.18E-10	1.01E-08	9.30E-12
NB94	4.60E-08	1.94E-09	2.35E-10	1.47E-08	7.87E-10	1.24E-07	1.15E-10
NB95	1.41E-08	2.13E-10	7.20E-11	3.25E-09	5.45E-11	3.85E-08	3.56E-11
NI59	1.99E-09	6.24E-12	1.02E-11	6.52E-10	4.15E-11	2.69E-09	4.98E-12
NI63	5.26E-09	1.52E-11	2.68E-11	1.72E-09	1.08E-10	7.10E-09	1.31E-11
NP237	4.82E-06	1.04E-04	2.46E-08	2.53E-06	1.36E-07	1.63E-05	1.20E-08
PA233	2.16E-08	0.00E+00	1.10E-10	9.84E-07	5.15E-08	3.25E-09	5.47E-11
U233	3.51E-07	1.43E-07	1.79E-09	9.81E-07	5.18E-08	2.37E-07	8.75E-10
TH229	1.95E-06	3.93E-04	9.95E-09	9.89E-07	1.09E-07	2.63E-06	4.87E-09
RA225	1.09E-06	2.48E-08	5.57E-09	2.23E-07	7.80E-10	1.06E-06	2.79E-09
AC225	3.60E-07	4.91E-07	1.84E-09	4.73E-08	5.98E-11	9.81E-08	9.30E-10
U235	3.51E-07	1.29E-07	1.79E-09	3.43E-06	1.81E-07	2.37E-07	8.75E-10
TH231	6.32E-09	1.13E-11	3.22E-11	3.32E-06	1.74E-07	1.18E-08	2.19E-11
PA231	2.02E-06	2.54E-04	1.03E-08	3.32E-06	1.74E-07	2.99E-07	5.03E-09
AC227	7.67E-06	3.23E-04	3.91E-08	2.68E-06	1.40E-07	2.59E-06	1.91E-08
TH227	9.68E-08	1.29E-06	4.94E-10	2.14E-07	1.31E-09	1.33E-07	2.46E-10
RA223	1.36E-06	2.24E-08	6.94E-09	1.87E-07	2.89E-10	1.33E-06	3.50E-09

TABLE A.45a. (contd)

Radionuclide	Drink Water	Shwr Dermal	Shwr Ingest	Leafy Veg	Other Veg	Fish Ingest	Swim Ingest
PM147	6.79E-09	4.16E-09	3.46E-11	2.14E-09	1.08E-10	2.29E-09	1.70E-11
ZN65	1.86E-07	3.74E-10	9.49E-10	5.80E-08	3.23E-09	6.29E-06	4.65E-10
PU238	4.82E-06	7.39E-05	2.46E-08	1.65E-06	8.66E-08	1.63E-05	1.20E-08
PU242	4.82E-06	7.85E-05	2.46E-08	1.54E-06	8.09E-08	1.63E-05	1.20E-08
U238	6.14E-07	1.27E-07	3.13E-09	6.84E-06	3.60E-07	4.14E-07	1.53E-09
TH234	8.64E-08	8.88E-10	4.41E-10	1.29E-07	6.05E-09	1.18E-07	2.19E-10
U234	3.51E-07	1.41E-07	1.79E-09	1.13E-07	6.21E-09	2.37E-07	8.75E-10
TH230	2.85E-07	5.78E-05	1.45E-09	6.52E-06	3.42E-07	3.85E-07	7.11E-10
RA226	2.63E-06	1.27E-07	1.34E-08	6.43E-06	3.39E-07	2.49E-06	6.56E-09
RN222	2.80E-08	0.00E+00	1.43E-10	5.58E-06	2.92E-07	0.00E+00	7.66E-11
PB210	1.45E-05	2.77E-09	7.38E-08	5.59E-06	2.95E-07	1.95E-05	3.61E-08
BI210	3.27E-08	5.82E-10	1.67E-10	9.59E-07	3.75E-08	7.10E-09	8.75E-11
PO210	3.28E-06	4.38E-07	1.67E-08	9.57E-07	3.77E-08	2.22E-05	8.21E-09
RE187	1.29E-10	3.47E-13	6.59E-13	4.71E-11	5.23E-12	2.09E-10	3.23E-13
RU103	1.98E-08	1.21E-10	1.01E-10	4.70E-09	8.90E-11	2.69E-08	4.98E-11
RU106	2.08E-07	2.54E-09	1.06E-09	6.43E-08	3.06E-09	2.81E-07	5.20E-10
S35	4.80E-09	9.43E-12	2.45E-11	1.40E-09	6.52E-11	4.88E-08	1.20E-11
SB122	3.86E-08	3.05E-11	1.97E-10	1.43E-09	2.56E-17	1.18E-07	1.09E-10
SB124	6.32E-08	1.61E-10	3.22E-10	1.65E-08	4.45E-10	1.72E-07	1.59E-10
SC46	3.49E-08	2.76E-09	1.78E-10	9.64E-09	3.13E-10	4.73E-08	8.75E-11
SE75	1.27E-07	2.53E-10	6.47E-10	3.65E-08	1.38E-09	2.92E-07	3.17E-10
SE79	1.18E-07	2.31E-10	6.03E-10	3.81E-08	2.18E-09	2.71E-07	2.95E-10
SM147	3.51E-07	1.41E-05	1.79E-09	1.12E-07	5.97E-09	1.18E-07	8.75E-10
SM151	2.41E-09	5.54E-09	1.23E-11	7.71E-10	4.10E-11	8.14E-10	6.02E-12
SN113	1.90E-08	1.64E-10	9.70E-11	5.45E-09	2.02E-10	7.72E-07	4.76E-11
SN123	1.14E-07	3.46E-10	5.81E-10	3.30E-08	1.27E-09	4.62E-06	2.85E-10
SR85	1.68E-08	5.51E-11	8.56E-11	4.55E-09	1.55E-10	1.14E-08	4.21E-11
SR90	7.89E-07	9.47E-09	4.02E-09	3.23E-07	4.86E-08	5.33E-07	1.97E-09
Y90	6.17E-08	8.94E-11	3.15E-10	2.28E-09	4.10E-17	2.37E-08	1.75E-10
TA182	3.72E-08	7.37E-10	1.89E-10	1.07E-08	3.95E-10	1.51E-05	9.30E-11
TC99	2.85E-08	5.78E-11	1.45E-10	1.31E-08	2.60E-09	5.77E-09	7.11E-11
U232	8.11E-07	6.93E-07	4.14E-09	6.98E-07	3.74E-08	5.47E-07	2.02E-09
TH232	2.63E-07	3.23E-04	1.34E-09	6.74E-06	3.56E-07	3.55E-07	6.56E-10
RA228	1.96E-05	1.11E-07	9.98E-08	6.65E-06	3.44E-07	1.85E-05	4.88E-08
TH228	1.21E-06	4.16E-05	6.15E-09	4.37E-07	2.17E-08	1.63E-06	3.01E-09
RA224	7.58E-07	7.99E-09	3.86E-09	4.07E-08	3.62E-14	7.87E-07	2.08E-09
PB212	5.81E-08	8.87E-12	2.97E-10	5.74E-11	0.00E+00	1.72E-07	3.17E-10
TL204	3.73E-08	4.62E-11	1.90E-10	1.18E-08	6.01E-10	5.03E-08	9.30E-11
TM170	7.17E-08	1.50E-09	3.66E-10	2.08E-08	8.02E-10	2.43E-08	1.79E-10
V49	8.34E-10	8.08E-12	4.25E-12	2.56E-10	1.19E-11	1.13E-10	2.08E-12
Y88	8.11E-08	6.91E-07	4.14E-10	2.31E-08	8.34E-10	2.75E-08	2.03E-10
U236	3.29E-07	1.34E-07	1.68E-09	1.06E-07	5.82E-09	2.22E-07	8.20E-10

TABLE A.45b. Radionuclide URFs for Residential Scenario, Surface Water

Radionuclide	Swim Dermal	Shor Dermal	Shor Ingest	Indr Inhal	Swim Extern	Boat Extern	Shor Extern
AG110M	5.13E-11	4.56E-13	4.93E-11	0.00E+00	1.33E-09	6.65E-10	4.83E-08
AM241	2.63E-09	3.62E-07	3.78E-08	0.00E+00	8.48E-12	4.24E-12	3.82E-10
AM243	2.63E-09	3.66E-07	3.84E-08	0.00E+00	2.39E-11	1.20E-11	3.79E-08
NP239	8.88E-12	2.64E-16	9.32E-14	0.00E+00	7.70E-11	3.85E-11	1.13E-11
PU239	2.52E-09	3.56E-07	3.67E-08	0.00E+00	4.34E-14	2.17E-14	1.34E-12
AU195	4.31E-12	1.57E-15	5.05E-12	0.00E+00	3.29E-11	1.65E-11	1.29E-09
BA133	1.31E-11	4.81E-13	1.23E-10	0.00E+00	1.77E-10	8.83E-11	4.25E-08
BE7	3.26E-13	5.97E-16	6.72E-14	0.00E+00	2.32E-11	1.16E-11	1.66E-10
BE10	3.16E-11	1.38E-11	4.61E-10	0.00E+00	9.77E-14	4.88E-14	1.41E-10
CA45	1.08E-11	3.31E-14	6.78E-12	0.00E+00	7.60E-15	3.80E-15	1.97E-20
C14	9.85E-12	2.06E-13	1.43E-10	0.00E+00	1.98E-15	9.90E-16	5.51E-12
CD109	8.64E-11	2.90E-11	1.54E-10	0.00E+00	3.06E-12	1.53E-12	7.04E-12
CE144	6.77E-11	8.13E-12	7.40E-11	0.00E+00	8.14E-12	4.07E-12	8.26E-10
CF252	7.32E-09	2.46E-08	2.66E-08	0.00E+00	5.32E-14	2.66E-14	6.15E-11
CM248	9.96E-09	1.38E-06	1.45E-07	0.00E+00	3.59E-14	1.80E-14	1.74E-12
CM243	2.08E-09	2.07E-07	2.54E-08	0.00E+00	5.87E-11	2.93E-11	1.06E-08
CM244	1.75E-09	1.51E-07	1.94E-08	0.00E+00	5.19E-14	2.59E-14	1.80E-12
PU240	2.52E-09	3.56E-07	3.67E-08	0.00E+00	5.02E-14	2.51E-14	2.13E-12
CM245	2.63E-09	3.78E-07	3.85E-08	0.00E+00	4.00E-11	2.00E-11	4.18E-09
PU241	3.94E-11	8.34E-09	7.73E-10	0.00E+00	7.33E-16	3.66E-16	4.15E-12
CL36	1.97E-11	3.07E-13	2.87E-10	0.00E+00	1.96E-13	9.82E-14	2.31E-10
CO57	2.53E-12	1.76E-14	6.58E-12	0.00E+00	5.66E-11	2.83E-11	1.07E-09
CO58	1.74E-11	1.01E-14	4.76E-12	0.00E+00	4.65E-10	2.32E-10	4.86E-09
CO60	6.56E-11	3.16E-12	1.05E-09	0.00E+00	1.23E-09	6.17E-10	2.97E-07
CS134	4.48E-10	1.40E-12	1.29E-09	0.00E+00	7.43E-10	3.71E-10	8.09E-08
CS137	3.06E-10	4.18E-12	3.78E-09	0.00E+00	2.34E-10	1.17E-10	1.34E-07
ES254	2.13E-09	1.03E-08	1.02E-08	0.00E+00	4.31E-10	2.15E-10	2.15E-08
CF250	1.44E-08	1.50E-07	1.45E-07	0.00E+00	4.78E-14	2.39E-14	1.74E-10
CM246	2.63E-09	3.75E-07	3.82E-08	0.00E+00	4.71E-14	2.36E-14	2.13E-12
EU152	2.30E-11	1.11E-10	2.34E-10	0.00E+00	5.53E-10	2.76E-10	1.99E-07
EU154	3.28E-11	1.22E-10	2.81E-10	0.00E+00	6.00E-10	3.00E-10	1.90E-07
EU155	4.92E-12	1.24E-11	3.00E-11	0.00E+00	2.54E-11	1.27E-11	1.95E-09
FE55	2.95E-12	1.41E-13	1.09E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GE68	9.55E-12	7.12E-15	1.06E-11	0.00E+00	4.51E-10	2.26E-10	2.44E-08
H3	5.91E-13	4.40E-17	6.08E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I129	2.08E-09	2.47E-11	3.03E-08	0.00E+00	4.04E-12	2.02E-12	3.24E-10
K40	1.20E-10	1.98E-12	1.75E-09	0.00E+00	7.83E-11	3.92E-11	4.26E-08
KR85	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-12	5.75E-13	3.54E-10
MN54	1.20E-11	7.82E-14	1.45E-11	0.00E+00	4.00E-10	2.00E-10	1.89E-08
NA22	7.44E-11	2.91E-13	2.66E-10	0.00E+00	1.06E-09	5.31E-10	1.40E-07
MO93	1.93E-11	2.88E-13	2.87E-10	0.00E+00	2.67E-13	1.34E-13	1.83E-09
NB93M	1.64E-12	2.77E-13	1.67E-11	0.00E+00	7.19E-14	3.59E-14	2.93E-12
ZR93	1.86E-12	6.74E-11	3.43E-11	0.00E+00	0.00E+00	0.00E+00	1.26E-12
NB94	2.30E-11	8.30E-12	3.35E-10	0.00E+00	7.53E-10	3.76E-10	4.26E-07
NB95	7.04E-12	8.52E-15	9.61E-13	0.00E+00	3.66E-10	1.83E-10	1.90E-09
NI59	9.96E-14	2.67E-13	1.45E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI63	2.63E-13	6.19E-13	3.63E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NP237	2.41E-09	4.45E-07	3.52E-08	0.00E+00	1.04E-11	5.22E-12	6.69E-08
PA233	1.08E-11	8.32E-16	1.14E-12	0.00E+00	9.26E-11	4.63E-11	2.36E-10
U233	1.75E-10	1.81E-09	2.57E-09	0.00E+00	1.64E-13	8.21E-14	7.62E-11
TH229	9.74E-10	1.68E-06	2.50E-08	0.00E+00	3.87E-11	1.93E-11	1.03E-07
RA225	5.45E-10	8.90E-12	4.23E-11	0.00E+00	2.93E-12	1.47E-12	1.94E-10
AC225	1.80E-10	5.73E-12	7.14E-12	0.00E+00	6.07E-12	3.04E-12	1.31E-10
U235	1.75E-10	7.57E-10	2.62E-09	0.00E+00	1.02E-10	5.09E-11	1.91E-08
TH231	3.16E-12	1.21E-13	2.03E-14	0.00E+00	5.32E-12	2.66E-12	5.26E-14
PA231	1.01E-09	1.37E-06	2.83E-08	0.00E+00	1.71E-11	8.55E-12	2.19E-08
AC227	3.83E-09	1.11E-06	5.30E-08	0.00E+00	5.77E-14	2.88E-14	7.76E-08
TH227	4.83E-11	2.82E-11	5.38E-11	0.00E+00	4.85E-11	2.42E-11	1.52E-10
RA223	6.79E-10	2.97E-13	3.06E-11	0.00E+00	1.35E-10	6.75E-11	5.45E-11

TABLE A.45b. (contd)

Radionuclide	Swim Dermal	Shor Dermal	Shor Ingest	Indr Inhal	Swim Extern	Boat Extern	Shor Extern
PM147	3.39E-12	4.40E-12	1.22E-11	0.00E+00	6.34E-15	3.17E-15	1.17E-13
ZN65	5.57E-11	1.72E-13	8.71E-11	0.00E+00	2.84E-10	1.42E-10	1.01E-08
PU238	2.41E-09	2.98E-07	3.31E-08	0.00E+00	5.12E-14	2.56E-14	2.08E-12
PU242	2.41E-09	3.36E-07	3.51E-08	0.00E+00	4.21E-14	2.10E-14	1.82E-12
U238	3.06E-10	5.48E-10	5.10E-09	0.00E+00	3.59E-14	1.80E-14	6.84E-09
TH234	4.31E-11	2.46E-14	4.05E-12	0.00E+00	3.73E-12	1.87E-12	2.55E-11
U234	1.75E-10	6.03E-10	2.55E-09	0.00E+00	7.90E-14	3.95E-14	2.37E-12
TH230	1.42E-10	2.47E-07	2.19E-09	0.00E+00	1.78E-13	8.89E-14	1.54E-09
RA226	1.31E-09	1.49E-09	4.48E-08	0.00E+00	3.14E-12	1.57E-12	4.72E-07
RN222	1.40E-11	1.79E-12	4.84E-11	1.10E-08	8.61E-10	4.31E-10	2.36E-13
PB210	2.89E-11	3.83E-09	1.03E-07	0.00E+00	6.78E-13	3.39E-13	3.00E-10
BI210	1.63E-11	2.48E-12	3.19E-11	0.00E+00	2.86E-13	1.43E-13	4.79E-13
PO210	1.64E-09	6.83E-11	8.69E-10	0.00E+00	4.07E-15	2.03E-15	8.32E-14
RE187	6.45E-14	1.48E-15	9.40E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RU103	9.87E-12	5.42E-15	1.50E-12	0.00E+00	2.07E-10	1.03E-10	1.23E-09
RU106	1.04E-10	1.05E-12	1.47E-10	0.00E+00	9.50E-11	4.75E-11	5.12E-09
S35	2.40E-12	9.33E-16	8.08E-13	0.00E+00	2.14E-15	1.07E-15	1.33E-13
SB122	1.92E-11	1.05E-16	2.27E-13	0.00E+00	2.09E-10	1.05E-10	7.86E-11
SB124	3.15E-11	1.10E-14	7.33E-12	0.00E+00	8.95E-10	4.48E-10	8.13E-09
SC46	1.74E-11	2.62E-13	5.63E-12	0.00E+00	9.77E-10	4.88E-10	1.20E-08
SE75	6.33E-11	3.44E-14	2.92E-11	0.00E+00	1.83E-10	9.17E-11	2.02E-09
SE79	5.90E-11	9.89E-13	8.60E-10	0.00E+00	2.68E-15	1.34E-15	7.11E-12
SM147	1.75E-10	6.03E-08	2.55E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SM151	1.20E-12	2.24E-11	1.66E-11	0.00E+00	3.83E-16	1.92E-16	2.98E-14
SN113	9.49E-12	2.13E-14	4.20E-12	0.00E+00	1.23E-10	6.16E-11	7.89E-12
SN123	5.68E-11	5.04E-14	2.82E-11	0.00E+00	3.87E-12	1.93E-12	9.71E-11
SR85	8.38E-12	4.05E-15	2.10E-12	0.00E+00	2.37E-10	1.19E-10	1.89E-09
SR90	3.94E-10	3.44E-11	5.25E-09	0.00E+00	4.41E-13	2.20E-13	2.98E-09
Y90	3.08E-11	3.09E-16	3.63E-13	0.00E+00	1.64E-12	8.19E-13	1.30E-12
TA182	1.85E-11	9.58E-14	8.21E-12	0.00E+00	6.27E-10	3.14E-10	9.80E-09
TC99	1.42E-11	2.47E-13	2.07E-10	0.00E+00	1.42E-14	7.09E-15	4.74E-14
U232	4.05E-10	1.40E-07	1.76E-08	0.00E+00	1.45E-13	7.27E-14	6.72E-07
TH232	1.31E-10	1.46E-06	8.48E-08	0.00E+00	8.95E-14	4.48E-14	5.19E-07
RA228	9.77E-09	7.47E-08	7.24E-08	0.00E+00	4.68E-10	2.34E-10	5.12E-07
TH228	6.01E-10	3.26E-08	2.89E-09	0.00E+00	8.92E-13	4.46E-13	1.60E-07
RA224	3.78E-10	5.62E-14	6.73E-12	0.00E+00	7.87E-10	3.93E-10	4.20E-10
PB212	1.16E-13	2.42E-15	1.08E-13	0.00E+00	6.51E-11	3.26E-11	5.06E-11
TL204	1.86E-11	6.73E-14	9.22E-11	0.00E+00	5.53E-13	2.76E-13	2.34E-11
TM170	3.58E-11	2.18E-13	1.78E-11	0.00E+00	2.25E-12	1.13E-12	6.88E-11
V49	4.16E-13	3.01E-15	5.28E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y88	4.05E-11	8.36E-11	1.67E-11	0.00E+00	1.34E-09	6.71E-10	2.38E-08
U236	1.64E-10	5.74E-10	2.39E-09	0.00E+00	5.22E-14	2.61E-14	1.89E-12

TABLE A.46. Noncarcinogenic Chemical URFs for Agricultural Scenario, Soil (mass)

<u>Chemical Name</u>	<u>Soil Ingest</u>	<u>Soil Dermal</u>	<u>Soil Resusp</u>	<u>Soil Extern</u>
Aluminum fluoride	8.89E-04	2.13E-04	3.25E-07	0.00E+00
Aluminum nitrate	3.31E-04	7.92E-05	1.30E-06	0.00E+00
Aluminum (ionic)	9.11E-03	2.18E-05	1.02E-06	0.00E+00
Ammonium carbonate	9.11E-05	2.18E-07	3.57E-07	0.00E+00
Ammonium nitrate	4.05E-05	9.68E-08	1.59E-07	0.00E+00
Beryllium (ionic)	7.29E-04	3.49E-04	0.00E+00	0.00E+00
Butyl phosphates	5.52E-05	1.32E-04	2.17E-07	0.00E+00
Cadmium (ionic)	7.29E-03	3.49E-03	2.86E-05	0.00E+00
Calcium carbonate	1.40E-05	3.35E-08	5.50E-08	0.00E+00
Calcium (ionic)	2.14E-07	1.71E-09	8.41E-10	0.00E+00
Calcium nitrate	9.85E-06	7.85E-08	3.86E-08	0.00E+00
Carbon tetrachloride	8.29E-06	1.98E-05	3.25E-08	0.00E+00
Chromium IV (ionic)	7.29E-04	1.74E-04	2.51E-02	0.00E+00
Copper sulfate	3.04E-04	1.45E-06	8.41E-07	0.00E+00
Copper (ionic)	1.21E-02	5.81E-05	1.43E-06	0.00E+00
Dibutyl phosphonate	2.80E-05	6.70E-05	1.10E-07	0.00E+00
Ferric nitrate	1.21E-04	2.90E-07	4.76E-07	0.00E+00
Ferrocyanide (ionic)	2.43E-05	5.81E-08	9.53E-08	0.00E+00
Ferrous nitrate	1.58E-04	3.79E-06	6.21E-07	0.00E+00
Fluoride (ionic)	6.07E-05	1.45E-07	2.38E-07	0.00E+00
Iron (as ferric ion)	2.80E-06	6.70E-08	1.66E-06	0.00E+00
Lead (ionic)	2.60E-03	3.11E-05	3.32E-05	0.00E+00
Magnesium (ionic)	7.29E-08	3.49E-10	2.04E-07	0.00E+00
Magnesium nitrate	1.92E-06	4.59E-09	7.52E-09	0.00E+00
Mercury (ionic)	1.21E-02	1.45E-03	1.66E-04	0.00E+00
Methyl isobutyl ketone	1.87E-06	4.47E-06	7.34E-09	0.00E+00
Nickel (ionic)	1.82E-04	8.71E-06	0.00E+00	0.00E+00
Nitrate	2.28E-06	5.45E-09	8.93E-09	0.00E+00
Nitric acid	1.04E-04	2.49E-07	4.08E-07	0.00E+00
Nitrite	1.07E-04	2.56E-07	4.20E-07	0.00E+00
Oxalate (ionic)	1.21E-05	2.90E-08	2.04E-06	0.00E+00
Phosphate (ionic)	7.92E-06	2.37E-08	2.04E-06	0.00E+00
Potassium (ionic)	7.14E-09	1.71E-11	2.80E-11	0.00E+00
Potassium borate	4.05E-05	9.68E-08	1.59E-07	0.00E+00
Silver (ionic)	7.29E-04	3.49E-05	2.86E-06	0.00E+00
Sodium (ionic)	1.21E-08	2.90E-11	4.76E-11	0.00E+00
Sodium aluminate	8.47E-05	2.03E-05	3.32E-07	0.00E+00
Sodium dichromate	7.29E-04	1.74E-04	2.51E-02	0.00E+00
Sodium oxalate	6.07E-05	1.45E-07	2.04E-06	0.00E+00
Sodium sulfamate	1.82E-05	4.36E-08	7.14E-08	0.00E+00
Sulfate (ionic)	5.13E-08	1.23E-10	2.04E-07	0.00E+00
Sulfuric acid	5.20E-04	1.24E-06	2.04E-06	0.00E+00
Tributyl phosphate	1.82E-06	4.36E-06	7.15E-09	0.00E+00
Tributyl phosphonate	3.04E-05	7.26E-05	1.19E-07	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	1.21E-03	5.81E-05	1.02E-05	0.00E+00
Zinc (ionic)	1.21E-05	5.81E-08	4.76E-08	0.00E+00

TABLE A.47. Carcinogenic Chemical URFs for Agricultural Scenario, Soil (mass)

Chemical Name	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	6.71E-06	3.21E-06	5.14E-08	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	9.83E-06	4.70E-06	3.86E-08	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	3.23E-10	7.73E-10	5.17E-13	0.00E+00
Chromium IV (ionic)	6.40E-05	1.53E-05	2.51E-07	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	5.14E-09	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	6.40E-05	1.53E-05	2.51E-07	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	1.08E-10	2.58E-10	0.00E+00	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	4.39E-11	1.05E-10	2.03E-13	0.00E+00
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.48. Radionuclide URFs for Agricultural Scenario, Soil (mass)

Radionuclide	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
AC225	2.94E-14	8.73E-14	3.46E-14	1.99E-11
AC227	4.77E-10	4.22E-08	9.90E-10	2.28E-08
AG110M	2.03E-13	6.94E-15	2.49E-14	7.34E-09
AM241	3.08E-10	1.09E-08	3.42E-10	1.15E-10
AM243	3.17E-10	1.11E-08	3.51E-10	1.09E-08
AU195	2.08E-14	2.40E-17	2.13E-15	1.96E-10
BA133	6.97E-13	1.01E-14	1.74E-14	8.90E-09
BE10	3.80E-12	4.22E-13	2.41E-12	4.30E-11
BE7	2.77E-16	9.09E-18	2.08E-17	2.52E-11
BI210	5.63E-12	1.51E-12	9.50E-13	2.60E-11
C14	1.18E-12	6.29E-15	7.00E-17	1.67E-12
CA45	2.79E-14	5.04E-16	1.20E-15	2.99E-21
CD109	6.35E-13	4.42E-13	4.35E-14	1.07E-12
CE144	3.05E-13	1.24E-13	1.39E-13	1.26E-10
CF250	8.70E-10	3.32E-09	8.92E-10	3.84E-11
CF252	8.71E-10	2.98E-09	1.06E-09	7.43E-11
CL36	2.37E-12	9.34E-15	1.53E-14	7.01E-11
CM243	2.50E-10	7.53E-09	2.85E-10	3.83E-09
CM244	2.10E-10	6.02E-09	2.41E-10	7.18E-13
CM245	3.16E-10	1.15E-08	3.51E-10	1.27E-09
CM246	3.15E-10	1.14E-08	3.50E-10	6.46E-13
CM248	1.20E-09	4.22E-08	1.32E-09	5.28E-13
CO57	2.71E-14	2.68E-16	3.19E-15	1.62E-10
CO58	1.96E-14	1.54E-16	1.00E-15	7.38E-10
CO60	4.91E-12	5.48E-14	4.10E-13	5.14E-08
CS134	5.35E-12	2.15E-14	3.04E-14	1.24E-08
CS137	2.66E-11	1.09E-13	1.50E-13	3.46E-08
ES254	2.50E-10	8.56E-10	2.73E-10	8.67E-08
EU152	1.42E-12	2.47E-12	6.18E-13	4.42E-08
EU154	1.51E-12	2.42E-12	5.88E-13	3.77E-08
EU155	1.39E-13	2.12E-13	4.63E-14	3.32E-10
FE55	4.61E-14	2.19E-15	1.19E-15	0.00E+00
GE68	4.36E-14	1.09E-16	1.35E-14	3.71E-09
H3	5.83E-16	1.56E-18	7.02E-18	0.00E+00
II29	2.50E-10	7.53E-13	1.32E-12	9.83E-11
K40	1.45E-11	6.03E-14	8.33E-14	1.30E-08
KR85	0.00E+00	0.00E+00	2.28E-19	7.42E-11
MN54	5.96E-14	1.19E-15	2.39E-15	2.87E-09
MO93	2.32E-12	5.39E-15	1.93E-13	5.56E-10
NA22	1.12E-12	4.52E-15	6.58E-15	2.16E-08
NB93M	1.01E-13	6.18E-15	1.07E-13	6.51E-13
NB94	2.76E-12	2.53E-13	2.30E-12	1.29E-07
NB95	3.96E-15	1.30E-16	2.59E-16	2.89E-10
NI59	1.20E-13	8.13E-15	7.67E-15	0.00E+00
NI63	2.84E-13	1.79E-14	1.77E-14	0.00E+00
NP237	2.90E-10	1.36E-08	3.18E-10	1.34E-08
NP239	3.84E-16	4.03E-18	5.45E-18	1.71E-12
PA231	1.22E-10	3.32E-08	3.96E-10	6.52E-10
PA233	9.17E-13	2.66E-18	6.58E-14	7.02E-09
PB210	8.77E-10	9.30E-11	4.58E-11	8.74E-11
PB212	4.45E-16	3.69E-17	3.20E-17	7.69E-12
PM147	5.13E-14	6.82E-14	4.14E-14	1.81E-14
PO210	3.58E-12	1.04E-12	5.18E-13	1.26E-14
PU238	2.89E-10	9.64E-09	4.27E-10	6.71E-13
PU239	3.02E-10	1.08E-08	4.16E-10	4.08E-13
PU240	3.02E-10	1.08E-08	4.16E-10	6.47E-13
PU241	4.75E-12	2.08E-10	2.54E-12	2.08E-13
PU242	2.89E-10	1.02E-08	3.95E-10	5.52E-13

TABLE A.48. (contd)

Radionuclide	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
RA223	1.26E-13	4.52E-15	5.10E-14	8.28E-12
RA224	1.01E-11	3.12E-13	2.40E-12	2.32E-08
RA225	4.40E-11	2.56E-11	1.83E-11	5.44E-09
RA226	1.60E-10	1.67E-11	3.29E-11	1.44E-07
RA228	1.17E-09	9.40E-11	4.70E-11	9.91E-08
RE187	7.75E-15	4.52E-17	3.70E-16	0.00E+00
RN222	6.72E-13	3.54E-14	1.89E-14	5.30E-12
RU103	6.19E-15	8.26E-17	4.76E-16	1.86E-10
RU106	6.05E-13	1.61E-14	2.34E-13	7.79E-10
S35	3.33E-15	1.42E-17	2.40E-17	2.02E-14
SB122	9.35E-16	1.61E-18	1.32E-17	1.19E-11
SB124	3.02E-14	1.67E-16	1.91E-15	1.24E-09
SC46	2.32E-14	3.99E-15	3.26E-15	1.83E-09
SE75	1.21E-13	5.24E-16	1.04E-15	3.07E-10
SE79	7.09E-12	3.01E-14	6.69E-14	2.16E-12
SM147	2.10E-11	1.84E-09	7.89E-11	0.00E+00
SM151	1.29E-13	6.46E-13	8.51E-14	8.57E-15
SN113	1.73E-14	3.24E-16	1.56E-15	1.20E-12
SN123	1.16E-13	7.68E-16	3.75E-15	1.48E-11
SR85	8.64E-15	6.17E-17	9.35E-17	2.86E-10
SR90	5.10E-11	1.25E-12	7.31E-13	1.01E-09
TA182	3.38E-14	1.46E-15	7.14E-15	1.49E-09
TC99	1.71E-12	7.53E-15	9.10E-14	1.44E-14
TH227	3.46E-11	1.05E-10	4.49E-11	4.35E-09
TH228	1.18E-10	5.35E-09	8.53E-10	2.37E-07
TH229	1.53E-10	5.12E-08	8.57E-10	1.97E-08
TH230	1.71E-11	7.53E-09	3.18E-10	3.86E-12
TH231	2.68E-14	2.89E-15	3.07E-16	2.81E-12
TH232	2.16E-11	4.22E-08	3.07E-10	4.86E-10
TH234	3.52E-12	7.87E-14	2.35E-13	8.19E-10
TL204	4.05E-13	1.09E-15	2.58E-15	3.78E-12
TM170	7.33E-14	3.33E-15	3.04E-15	1.04E-11
U232	5.03E-11	1.70E-10	6.70E-10	3.28E-09
U233	2.10E-11	1.89E-11	2.96E-10	1.08E-12
U234	2.10E-11	1.84E-11	2.85E-10	7.20E-13
U235	2.15E-11	1.69E-11	2.74E-10	5.81E-09
U236	1.97E-11	1.75E-11	2.74E-10	5.76E-13
U238	3.86E-11	1.66E-11	5.70E-10	1.27E-09
V49	2.18E-15	4.58E-17	1.02E-16	0.00E+00
Y88	6.88E-14	1.27E-12	2.69E-15	3.62E-09
Y90	1.50E-15	4.71E-18	2.14E-17	1.97E-13
ZN65	3.59E-13	2.61E-15	5.63E-15	1.54E-09
ZR93	2.24E-13	2.05E-12	7.17E-14	2.66E-15

TABLE A.49. Noncarcinogenic Chemical URFs for Agricultural Scenario, Soil (area)

Chemical Name	Leafy Veg	Other Veg	Meat Ingest	Milk Ingest	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-04	2.83E-05	4.33E-08	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.42E-05	1.06E-05	1.73E-07	0.00E+00
Aluminum (ionic)	1.66E-05	8.72E-06	1.59E-06	1.71E-06	1.21E-03	2.90E-06	1.36E-07	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.21E-05	2.90E-08	4.76E-08	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.40E-06	1.29E-08	2.12E-08	0.00E+00
Beryllium (ionic)	3.47E-06	1.82E-06	1.77E-07	1.43E-09	9.71E-05	4.65E-05	0.00E+00	0.00E+00
Butyl phosphates	5.21E-04	2.73E-04	4.79E-08	4.90E-08	7.36E-06	1.76E-05	2.88E-08	0.00E+00
Cadmium (ionic)	2.77E-03	1.45E-03	9.70E-05	5.71E-04	9.71E-04	4.65E-04	3.81E-06	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.87E-06	4.47E-09	7.32E-09	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.86E-08	2.28E-10	1.12E-10	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.31E-06	1.05E-08	5.15E-09	0.00E+00
Carbon tetrachloride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium IV (ionic)	8.34E-06	4.38E-06	2.92E-06	2.58E-06	9.71E-05	2.32E-05	3.34E-03	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.05E-05	1.94E-07	1.12E-07	0.00E+00
Copper (ionic)	7.69E-03	4.04E-03	4.90E-03	2.38E-03	1.62E-03	7.74E-06	1.90E-07	0.00E+00
Dibutyl phosphonate	2.46E-04	1.29E-04	2.57E-08	2.63E-08	3.74E-06	8.94E-06	1.46E-08	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.62E-05	3.87E-08	6.35E-08	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.24E-06	7.74E-09	1.27E-08	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.11E-05	5.05E-07	8.28E-08	0.00E+00
Fluoride (ionic)	1.23E-05	6.46E-06	1.57E-05	1.78E-05	8.09E-06	1.94E-08	3.17E-08	0.00E+00
Iron (as ferric ion)	7.10E-09	3.73E-09	9.04E-09	3.66E-10	3.74E-07	8.94E-09	2.21E-07	0.00E+00
Lead (ionic)	2.11E-05	1.11E-05	4.03E-07	1.09E-06	3.47E-04	4.15E-06	4.43E-06	0.00E+00
Magnesium (ionic)	1.02E-07	5.35E-08	3.25E-08	8.40E-08	9.71E-09	4.65E-11	2.72E-08	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.56E-07	6.11E-10	1.00E-09	0.00E+00
Mercury (ionic)	6.15E-03	3.23E-03	9.80E-02	5.71E-04	1.62E-03	1.94E-04	2.21E-05	0.00E+00
Methyl isobutyl ketone	2.10E-04	1.10E-04	1.76E-09	1.80E-09	7.20E-07	1.72E-06	2.82E-09	0.00E+00
Nickel (ionic)	2.77E-05	1.45E-05	1.06E-05	5.71E-06	2.43E-05	1.16E-06	0.00E+00	0.00E+00
Nitrate	1.73E-04	9.08E-05	8.27E-04	8.92E-04	3.04E-07	7.26E-10	1.19E-09	0.00E+00
Nitric acid	7.91E-03	4.15E-03	3.78E-02	4.08E-02	1.39E-05	3.32E-08	5.44E-08	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-05	3.42E-08	5.60E-08	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.62E-06	3.87E-09	2.72E-07	0.00E+00
Phosphate (ionic)	7.02E-05	3.69E-05	2.46E-04	2.17E-04	1.06E-06	3.16E-09	2.72E-07	0.00E+00
Potassium (ionic)	9.99E-09	5.24E-09	1.27E-08	1.44E-08	9.52E-10	2.28E-12	3.73E-12	0.00E+00
Potassium borate	4.92E-05	2.58E-05	2.51E-06	2.74E-05	5.40E-06	1.29E-08	2.12E-08	0.00E+00
Silver (ionic)	2.40E-06	1.26E-06	4.59E-07	9.90E-06	9.71E-05	4.65E-06	3.81E-07	0.00E+00
Sodium (ionic)	1.70E-09	8.91E-10	5.95E-09	1.23E-08	1.62E-09	3.87E-12	6.35E-12	0.00E+00
Sodium aluminate	1.55E-07	8.11E-08	1.48E-08	1.59E-08	1.13E-05	2.70E-06	4.43E-08	0.00E+00
Sodium dichromate	8.34E-06	4.38E-06	2.92E-06	2.58E-06	9.71E-05	2.32E-05	3.34E-03	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.09E-06	1.94E-08	2.72E-07	0.00E+00

TABLE A.49. (contd)

<u>Chemical Name</u>	<u>Leafy Veg</u>	<u>Other Veg</u>	<u>Meat Ingest</u>	<u>Milk Ingest</u>	<u>Soil Ingest</u>	<u>Soil Dermal</u>	<u>Soil Resusp</u>	<u>Soil Extern</u>
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.43E-06	5.81E-09	9.52E-09	0.00E+00
Sulfate (ionic)	1.95E-07	1.02E-07	1.24E-06	6.03E-07	6.84E-09	1.64E-11	2.72E-08	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.94E-05	1.66E-07	2.72E-07	0.00E+00
Tributyl phosphate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	4.31E-05	2.26E-05	5.49E-07	5.33E-06	1.62E-04	7.74E-06	1.36E-06	0.00E+00
Zinc (ionic)	1.82E-05	9.56E-06	1.16E-04	3.76E-05	1.62E-06	7.74E-09	6.35E-09	0.00E+00

TABLE A.50. Carcinogenic Chemical URFs for Agricultural Scenario, Soil (area)

Chemical Name	Leafy Veg	Other Veg	Meat Ingest	Milk Ingest	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	3.20E-08	1.68E-08	1.63E-09	1.32E-11	8.95E-07	4.28E-07	6.85E-09	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	3.74E-06	1.96E-06	1.31E-07	7.71E-07	1.31E-06	6.27E-07	5.14E-09	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium IV (ionic)	7.33E-07	3.85E-07	2.57E-07	2.27E-07	8.53E-06	2.04E-06	3.35E-08	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.85E-10	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	7.33E-07	3.85E-07	2.57E-07	2.27E-07	8.53E-06	2.04E-06	3.35E-08	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.50. (contd)

<u>Chemical Name</u>	<u>Leafy Veg</u>	<u>Other Veg</u>	<u>Meat Ingest</u>	<u>Milk Ingest</u>	<u>Soil Ingest</u>	<u>Soil Dermal</u>	<u>Soil Resusp</u>	<u>Soil Extern</u>
Tributyl phosphate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.51. Radionuclide URFs for Agricultural Scenario, Soil (area)

Radionuclide	Leafy Veg	Other Veg	Meat Ingest	Milk Ingest	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
AC225	1.44E-12	1.36E-14	6.62E-17	2.05E-16	1.47E-14	4.36E-14	1.73E-14	9.93E-12
AC227	1.66E-12	8.68E-13	1.70E-14	9.56E-14	5.45E-11	4.25E-09	1.05E-10	2.90E-09
AG110M	3.97E-15	1.78E-15	7.23E-16	1.63E-14	7.38E-14	2.52E-15	9.03E-15	2.66E-09
AM241	6.89E-13	3.62E-13	1.54E-16	5.69E-17	4.14E-11	1.46E-09	4.60E-11	1.54E-11
AM243	7.58E-13	3.98E-13	9.01E-16	7.28E-15	4.22E-11	1.49E-09	4.67E-11	1.49E-09
AU195	2.69E-14	1.13E-14	1.28E-14	3.03E-17	8.14E-15	9.36E-18	8.32E-16	7.67E-11
BA133	7.63E-14	3.96E-14	7.27E-16	5.50E-15	1.24E-13	1.80E-15	3.10E-15	1.58E-09
BE10	3.07E-14	1.61E-14	1.96E-15	5.69E-18	5.07E-13	5.62E-14	3.21E-13	5.73E-12
BE7	8.06E-18	1.99E-18	4.07E-19	1.46E-21	1.32E-16	4.35E-18	9.93E-18	1.21E-11
BI210	5.29E-16	1.80E-16	8.17E-18	3.83E-17	1.93E-15	3.86E-16	4.68E-16	3.61E-14
C14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.58E-13	8.39E-16	9.34E-18	2.23E-13
CA45	1.62E-13	6.65E-14	6.70E-15	3.31E-13	1.12E-14	2.02E-16	4.81E-16	1.20E-21
CD109	1.23E-12	5.93E-13	4.20E-14	2.53E-13	1.98E-13	1.38E-13	1.36E-14	3.34E-13
CE144	1.78E-14	8.10E-15	8.13E-16	7.29E-17	1.07E-13	4.36E-14	4.90E-14	4.42E-11
CF250	6.06E-11	3.16E-11	1.93E-11	9.37E-15	1.48E-10	5.66E-10	1.52E-10	6.55E-12
CF252	1.21E-11	6.08E-12	3.80E-12	1.86E-15	2.91E-11	9.97E-11	3.53E-11	2.49E-12
CL36	8.92E-10	4.68E-10	4.55E-09	2.76E-09	3.16E-13	1.25E-15	2.05E-15	9.35E-12
CM243	2.61E-13	1.36E-13	5.80E-17	1.07E-15	2.67E-11	8.05E-10	3.05E-11	4.10E-10
CM244	1.97E-13	1.03E-13	4.37E-17	8.10E-16	2.01E-11	5.76E-10	2.30E-11	6.87E-14
CM245	4.12E-13	2.16E-13	9.15E-17	1.68E-15	4.24E-11	1.54E-09	4.70E-11	1.69E-10
CM246	4.07E-13	2.14E-13	9.08E-17	1.68E-15	4.20E-11	1.52E-09	4.67E-11	8.62E-14
CM248	1.55E-12	8.11E-13	3.45E-16	6.37E-15	1.60E-10	5.62E-09	1.75E-10	7.04E-14
CO57	1.60E-14	7.24E-15	1.95E-14	6.56E-15	9.66E-15	9.54E-17	1.14E-15	5.77E-11
CO58	1.49E-14	4.43E-15	1.59E-14	6.03E-15	9.12E-15	7.18E-17	4.65E-16	3.43E-10
CO60	1.75E-12	8.98E-13	2.21E-12	7.20E-13	1.06E-12	1.18E-14	8.82E-14	1.11E-08
CS134	3.02E-12	1.51E-12	3.79E-12	4.36E-12	1.48E-12	5.97E-15	8.43E-15	3.43E-09
CS137	7.96E-12	4.16E-12	1.01E-11	1.15E-11	3.98E-12	1.63E-14	2.25E-14	5.18E-09
ES254	3.64E-12	1.80E-12	7.41E-13	1.75E-15	8.89E-12	3.27E-11	9.33E-12	1.16E-09
EU152	3.91E-14	2.04E-14	1.24E-14	1.61E-16	2.39E-13	4.18E-13	1.04E-13	7.48E-09
EU154	4.64E-14	2.41E-14	1.47E-14	1.91E-16	2.83E-13	4.53E-13	1.10E-13	7.04E-09
EU155	5.03E-15	2.58E-15	1.59E-15	2.07E-17	3.05E-14	4.66E-14	1.02E-14	7.29E-11
FE55	4.95E-16	2.49E-16	6.23E-16	2.55E-17	1.19E-14	5.68E-16	3.10E-16	0.00E+00
GE68	2.53E-13	1.16E-13	3.09E-10	2.60E-14	1.53E-14	3.80E-17	4.73E-15	1.30E-09
H3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.75E-16	7.35E-19	3.31E-18	0.00E+00
I129	6.72E-11	3.53E-11	3.00E-11	1.39E-10	3.33E-11	1.00E-13	1.75E-13	1.31E-11
K40	4.30E-11	2.26E-11	5.48E-11	6.20E-11	1.93E-12	8.04E-15	1.11E-14	1.73E-09
KR85	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.05E-20	1.32E-11
MN54	1.27E-13	5.88E-14	3.12E-15	9.15E-15	2.05E-14	4.09E-16	8.22E-16	9.84E-10
MO93	7.48E-13	3.93E-13	3.12E-13	2.38E-13	3.17E-13	1.23E-15	3.46E-14	7.41E-11
NA22	6.69E-13	3.37E-13	2.32E-12	4.83E-12	2.93E-13	1.18E-15	1.72E-15	5.65E-09

TABLE A.51. (contd)

Radionuclide	Leafy Veg	Other Veg	Meat Ingest	Milk Ingest	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
NB93M	3.49E-15	1.82E-15	5.55E-14	1.44E-14	1.71E-14	1.04E-15	1.80E-14	1.10E-13
NB94	7.43E-14	3.90E-14	1.18E-12	3.06E-13	3.68E-13	3.37E-14	3.07E-13	1.73E-08
NB95	3.89E-16	6.51E-17	4.35E-15	1.54E-15	1.94E-15	6.37E-17	1.27E-16	1.42E-10
NI59	3.86E-14	2.03E-14	1.48E-14	7.97E-15	1.60E-14	1.08E-15	1.02E-15	0.00E+00
NI63	9.54E-14	5.00E-14	3.65E-14	1.97E-14	3.93E-14	2.48E-15	2.45E-15	0.00E+00
NP237	1.46E-11	7.68E-12	5.13E-14	1.51E-14	3.87E-11	1.81E-09	4.24E-11	2.63E-09
NP239	4.18E-17	8.77E-25	2.70E-21	2.87E-18	1.92E-16	2.01E-18	2.72E-18	8.57E-13
PA231	6.93E-13	3.64E-13	5.65E-15	3.14E-14	3.36E-11	5.77E-09	8.60E-11	1.02E-09
PA233	2.30E-17	2.79E-18	1.09E-20	3.86E-20	2.31E-15	7.38E-19	1.69E-16	1.77E-11
PB210	1.79E-11	9.36E-12	3.42E-13	1.06E-12	1.06E-10	1.43E-11	7.07E-12	1.06E-11
PB212	1.30E-18	0.00E+00	1.46E-32	2.93E-21	2.22E-16	1.85E-17	1.60E-17	3.85E-12
PM147	2.22E-15	1.12E-15	6.99E-16	9.15E-18	1.34E-14	1.78E-14	1.08E-14	4.73E-15
PO210	5.53E-13	2.17E-13	9.67E-15	3.95E-14	1.49E-12	4.33E-13	2.15E-13	5.26E-15
PU238	2.90E-13	1.52E-13	9.72E-18	1.07E-17	3.58E-11	1.19E-09	5.29E-11	8.31E-14
PU239	3.25E-13	1.71E-13	1.04E-17	6.71E-18	4.03E-11	1.45E-09	5.55E-11	5.44E-14
PU240	3.25E-13	1.71E-13	1.04E-17	6.71E-18	4.03E-11	1.44E-09	5.55E-11	8.63E-14
PU241	1.06E-14	5.56E-15	1.71E-18	6.64E-19	8.63E-13	3.41E-11	7.16E-13	1.83E-13
PU242	3.11E-13	1.63E-13	9.92E-18	6.42E-18	3.86E-11	1.37E-09	5.26E-11	7.36E-14
RA223	7.44E-15	1.15E-16	3.97E-17	6.11E-16	6.30E-14	2.26E-15	2.54E-14	4.13E-12
RA224	1.10E-15	9.81E-21	5.81E-19	6.99E-17	1.21E-14	2.78E-16	3.17E-15	5.86E-13
RA225	1.30E-13	4.53E-15	6.27E-17	6.86E-16	6.63E-14	6.76E-15	1.74E-14	8.52E-13
RA226	8.15E-12	4.28E-12	1.47E-13	5.74E-13	5.40E-11	6.70E-12	6.59E-12	1.91E-08
RA228	9.10E-12	4.69E-12	1.44E-13	8.41E-13	7.20E-11	2.32E-10	3.90E-11	1.68E-08
RE187	1.46E-14	7.67E-15	7.45E-15	4.52E-15	1.03E-15	6.03E-18	4.93E-17	0.00E+00
RN222	2.39E-16	1.25E-16	4.56E-18	1.42E-17	1.85E-15	1.90E-16	9.63E-17	7.39E-15
RU103	2.43E-15	4.59E-16	2.25E-16	2.90E-19	3.02E-15	4.03E-17	2.32E-16	9.08E-11
RU106	1.66E-13	7.80E-14	2.04E-14	2.04E-17	2.00E-13	5.30E-15	7.71E-14	2.57E-10
S35	9.25E-14	3.07E-14	5.11E-13	2.82E-13	1.50E-15	6.42E-18	1.08E-17	9.12E-15
SB122	6.53E-18	1.17E-24	4.10E-21	8.05E-20	4.67E-16	8.03E-19	6.62E-18	5.97E-12
SB124	3.26E-16	8.78E-17	1.69E-17	6.57E-18	1.43E-14	7.91E-17	9.04E-16	5.85E-10
SC46	4.33E-16	1.41E-16	3.56E-16	4.39E-19	1.06E-14	1.81E-15	1.48E-15	8.30E-10
SE75	5.31E-14	1.99E-14	4.57E-14	4.33E-14	5.16E-14	2.24E-16	4.44E-16	1.31E-10
SE79	9.54E-13	5.01E-13	9.12E-13	7.87E-13	9.46E-13	4.02E-15	8.91E-15	2.88E-13
SM147	4.53E-13	2.38E-13	1.44E-13	4.67E-15	2.81E-12	2.45E-10	1.05E-11	0.00E+00
SM151	2.90E-15	1.52E-15	9.24E-16	1.20E-17	1.79E-14	8.96E-14	1.18E-14	1.19E-15
SN113	1.85E-15	6.83E-16	8.44E-15	3.76E-16	7.47E-15	1.40E-16	6.73E-16	5.17E-13
SN123	1.21E-14	4.66E-15	5.62E-14	2.48E-15	4.91E-14	3.24E-16	1.58E-15	6.22E-12
SR85	1.34E-13	3.79E-14	2.12E-15	4.07E-14	4.06E-15	2.90E-17	4.39E-17	1.35E-10
SR90	1.67E-10	8.75E-11	3.20E-12	5.17E-11	5.49E-12	1.34E-13	7.87E-14	1.11E-10
TA182	1.50E-15	5.56E-16	5.16E-17	9.18E-19	1.46E-14	6.30E-16	3.08E-15	6.42E-10
TC99	1.01E-11	5.31E-12	5.48E-12	2.09E-11	2.28E-13	1.00E-15	1.21E-14	1.92E-15

TABLE A.51. (contd)

Radionuclide	Leafy Veg	Other Veg	Meat Ingest	Milk Ingest	Soil Ingest	Soil Dermal	Soil Resusp	Soil Extern
TH227	9.07E-16	5.55E-17	7.15E-18	7.53E-17	1.43E-14	2.10E-13	6.86E-14	5.16E-12
TH228	1.51E-13	7.49E-14	2.28E-15	1.24E-14	2.95E-12	1.41E-10	2.25E-11	5.93E-09
TH229	3.03E-10	1.59E-10	6.55E-14	1.49E-13	2.67E-11	6.83E-09	1.18E-10	4.05E-09
TH230	3.93E-14	2.07E-14	5.12E-16	2.05E-15	2.48E-12	1.00E-09	4.24E-11	7.79E-11
TH231	5.01E-20	2.64E-22	4.16E-24	3.70E-23	3.67E-17	4.19E-18	4.36E-19	3.85E-15
TH232	1.16E-11	6.07E-12	1.84E-13	1.07E-12	9.73E-11	5.95E-09	9.53E-11	2.30E-08
TH234	3.91E-17	3.90E-18	9.77E-21	4.65E-20	8.27E-15	1.85E-16	5.53E-16	1.92E-12
TL204	1.59E-15	8.09E-16	4.01E-15	6.54E-16	9.59E-14	2.58E-16	6.11E-16	8.95E-13
TM170	1.32E-14	5.09E-15	3.37E-15	1.35E-17	3.09E-14	1.40E-15	1.28E-15	4.41E-12
U232	4.09E-12	2.15E-12	5.43E-14	4.77E-13	1.83E-11	5.27E-10	1.63E-10	2.53E-08
U233	1.86E-12	9.77E-13	2.03E-14	1.96E-13	2.83E-12	8.54E-12	3.95E-11	3.83E-12
U234	1.59E-12	8.32E-13	2.02E-14	1.96E-13	2.81E-12	2.45E-12	3.80E-11	9.59E-14
U235	1.59E-12	8.32E-13	2.02E-14	1.96E-13	2.88E-12	3.35E-12	3.65E-11	7.75E-10
U236	1.49E-12	7.80E-13	1.89E-14	1.84E-13	2.63E-12	2.33E-12	3.65E-11	7.68E-14
U238	2.78E-12	1.46E-12	3.54E-14	3.43E-13	5.56E-12	2.22E-12	7.60E-11	2.67E-10
V49	1.59E-16	7.39E-17	2.24E-17	3.26E-17	7.37E-16	1.55E-17	3.45E-17	0.00E+00
Y88	7.42E-15	2.68E-15	1.26E-16	3.02E-17	3.01E-14	5.57E-13	1.18E-15	1.58E-09
Y90	1.12E-16	2.01E-23	2.11E-20	2.76E-19	7.48E-16	2.36E-18	1.07E-17	9.86E-14
ZN65	3.21E-12	1.43E-12	1.95E-11	6.59E-12	1.31E-13	9.54E-16	2.06E-15	5.63E-10
ZR93	2.36E-15	1.24E-15	2.82E-14	7.24E-15	3.87E-14	2.74E-13	1.89E-14	5.75E-14

TABLE A.52. Noncarcinogenic Chemical URFs for Agricultural Scenario, Air

Chemical Name	Leafy Veg	Other Veg	Meat Ingest	Milk Ingest	Air Inhal	Air Extern
Aluminum fluoride	3.44E+01	1.81E+00	0.00E+00	0.00E+00	6.49E+00	0.00E+00
Aluminum nitrate	1.28E+01	6.74E-01	0.00E+00	0.00E+00	2.60E+01	0.00E+00
Aluminum (ionic)	3.53E+02	1.85E+01	7.86E+00	.8.48E+01	2.04E+01	0.00E+00
Ammonium carbonate	3.53E+00	1.85E-01	0.00E+00	0.00E+00	7.14E+00	0.00E+00
Ammonium nitrate	1.57E+00	8.24E-02	0.00E+00	0.00E+00	3.17E+00	0.00E+00
Beryllium (ionic)	2.82E+01	1.48E+00	3.35E-01	2.71E-02	0.00E+00	0.00E+00
Butyl phosphates	2.14E+00	1.12E-01	4.59E-05	4.70E-04	4.33E+00	0.00E+00
Cadmium (ionic)	2.82E+02	1.48E+01	2.31E+00	1.36E+02	5.71E+02	0.00E+00
Calcium carbonate	5.43E-01	2.85E-02	0.00E+00	0.00E+00	1.10E+00	0.00E+00
Calcium (ionic)	8.31E-03	4.36E-04	0.00E+00	0.00E+00	1.68E-02	0.00E+00
Calcium nitrate	3.82E-01	2.00E-02	0.00E+00	0.00E+00	7.72E-01	0.00E+00
Carbon tetrachloride	2.61E-01	1.37E-02	4.24E-05	4.34E-04	4.08E+02	0.00E+00
Chromium IV (ionic)	2.82E+01	1.48E+00	2.31E+00	2.04E+01	5.01E+05	0.00E+00
Copper sulfate	1.18E+01	6.18E-01	0.00E+00	0.00E+00	1.68E+01	0.00E+00
Copper (ionic)	4.71E+02	2.47E+01	6.99E+01	3.39E+02	2.86E+01	0.00E+00
Dibutyl phosphonate	1.09E+00	5.70E-02	2.64E-05	2.70E-04	2.20E+00	0.00E+00
Ferric nitrate	4.71E+00	2.47E-01	0.00E+00	0.00E+00	9.52E+00	0.00E+00
Ferrocyanide (ionic)	9.41E-01	4.94E-02	0.00E+00	0.00E+00	1.90E+00	0.00E+00
Ferrous nitrate	6.14E+00	3.22E-01	0.00E+00	0.00E+00	1.24E+01	0.00E+00
Fluoride (ionic)	2.35E+00	1.24E-01	6.99E-01	7.92E+00	4.76E+00	0.00E+00
Iron (as ferric ion)	1.09E-01	5.70E-03	3.22E-02	1.30E-02	3.32E+01	0.00E+00
Lead (ionic)	1.01E+02	5.29E+00	4.49E-01	1.21E+01	6.64E+02	0.00E+00
Magnesium (ionic)	2.82E-03	1.48E-04	2.10E-04	5.43E-03	4.08E+00	0.00E+00
Magnesium nitrate	7.43E-02	3.90E-03	0.00E+00	0.00E+00	1.50E-01	0.00E+00
Mercury (ionic)	4.71E+02	2.47E+01	1.75E+03	1.02E+02	3.32E+03	0.00E+00
Methyl isobutyl ketone	3.86E-02	2.03E-03	7.56E-08	7.73E-07	5.71E+00	0.00E+00
Nickel (ionic)	7.06E+00	3.71E-01	6.29E-01	3.39E+00	0.00E+00	0.00E+00
Nitrate	8.83E-02	4.63E-03	9.83E-02	1.06E+00	1.79E-01	0.00E+00
Nitric acid	4.03E+00	2.12E-01	4.49E+00	4.85E+01	8.16E+00	0.00E+00
Nitrite	4.15E+00	2.18E-01	0.00E+00	0.00E+00	8.40E+00	0.00E+00
Oxalate (ionic)	4.71E-01	2.47E-02	0.00E+00	0.00E+00	4.08E+01	0.00E+00
Phosphate (ionic)	3.07E-01	1.61E-02	2.51E-01	2.21E+00	4.08E+01	0.00E+00
Potassium (ionic)	2.77E-04	1.45E-05	8.22E-05	9.31E-04	5.60E-04	0.00E+00
Potassium borate	1.57E+00	8.24E-02	1.86E-02	2.04E+00	3.17E+00	0.00E+00
Silver (ionic)	2.82E+01	1.48E+00	1.26E+00	2.71E+02	5.71E+01	0.00E+00
Sodium (ionic)	4.71E-04	2.47E-05	3.84E-04	7.92E-03	9.52E-04	0.00E+00
Sodium aluminate	3.28E+00	1.72E-01	7.31E-02	7.89E-01	6.64E+00	0.00E+00
Sodium dichromate	2.82E+01	1.48E+00	2.31E+00	2.04E+01	5.01E+05	0.00E+00
Sodium oxalate	2.35E+00	1.24E-01	0.00E+00	0.00E+00	4.08E+01	0.00E+00
Sodium sulfamate	7.06E-01	3.71E-02	0.00E+00	0.00E+00	1.43E+00	0.00E+00
Sulfate (ionic)	1.99E-03	1.04E-04	2.95E-03	1.43E-02	4.08E+00	0.00E+00
Sulfuric acid	2.02E+01	1.06E+00	0.00E+00	0.00E+00	4.08E+01	0.00E+00
Tributyl phosphate	1.51E-01	7.91E-03	5.49E-04	5.62E-03	1.63E+01	0.00E+00
Tributyl phosphonate	1.97E+00	1.03E-01	5.00E-03	5.12E-02	2.38E+00	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	4.71E+01	2.47E+00	1.40E-01	1.36E+01	2.04E+02	0.00E+00
Zinc (ionic)	4.71E-01	2.47E-02	6.99E-01	2.26E+00	9.52E-01	0.00E+00

TABLE A.53. Carcinogenic Chemical URFs for Agricultural Scenario, Air

<u>Chemical Name</u>	<u>Leafy Veg</u>	<u>Other Veg</u>	<u>Meat Ingest</u>	<u>Milk Ingest</u>	<u>Air Inhal</u>	<u>Air Extern</u>
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	2.60E-01	1.37E-02	3.09E-03	2.50E-04	1.03E+00	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	3.81E-01	2.00E-02	3.11E-03	1.83E-01	7.72E-01	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	1.02E-05	5.34E-07	1.65E-09	1.69E-08	6.49E-03	0.00E+00
Chromium IV (ionic)	2.48E+00	1.30E-01	2.02E-01	1.79E+00	4.96E+00	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-01	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	2.48E+00	1.30E-01	2.02E-01	1.79E+00	4.96E+00	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	8.93E-06	4.69E-07	3.26E-08	3.33E-07	0.00E+00	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	1.37E-06	7.18E-08	1.23E-10	1.25E-09	1.59E-03	0.00E+00
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.54. Radionuclide URFs for Agricultural Scenario, Air

Radionuclide	Leafy Veg	Other Veg	Meat Ingest	Milk Ingest	Air Inhal	Air Extern
AC225	7.03E-07	6.63E-10	8.98E-12	2.79E-10	5.26E-04	1.28E-09
AC227	4.14E-05	2.16E-06	2.84E-08	1.20E-06	1.93E-02	1.19E-11
AG110M	4.83E-07	2.16E-08	2.08E-08	4.69E-06	1.51E-05	2.94E-07
AM241	2.60E-05	1.36E-06	1.35E-09	4.99E-09	7.01E-03	1.78E-09
AM243	5.09E-05	2.67E-06	1.59E-09	1.17E-08	7.01E-03	4.81E-09
AU195	6.63E-08	2.80E-09	7.51E-09	1.78E-10	1.77E-06	7.00E-09
BA133	1.30E-07	6.73E-09	2.88E-10	2.18E-08	7.89E-07	3.86E-08
BE10	3.13E-07	1.64E-08	4.65E-09	1.35E-10	4.81E-05	2.45E-11
BE7	2.58E-09	6.37E-11	3.22E-11	1.16E-12	5.92E-08	5.12E-09
BI210	1.48E-05	5.81E-07	6.19E-08	2.54E-06	1.75E-05	7.14E-11
C14	4.44E-07	2.33E-07	1.11E-06	1.29E-06	1.40E-09	4.88E-13
CA45	9.91E-08	4.07E-09	9.76E-10	4.83E-07	1.12E-06	1.88E-12
CD109	8.32E-07	4.00E-08	6.67E-09	4.02E-07	1.42E-05	6.39E-10
CE144	6.42E-07	2.92E-08	6.93E-09	6.22E-09	7.45E-05	1.79E-09
CF250	1.43E-04	7.43E-06	1.06E-05	5.14E-08	3.56E-02	9.78E-12
CF252	1.70E-04	8.78E-06	5.27E-06	9.73E-07	2.13E-02	1.10E-11
CL36	1.95E-07	1.02E-08	2.32E-07	1.40E-06	3.07E-07	4.83E-11
CM243	7.15E-05	3.75E-06	2.66E-09	2.09E-07	5.70E-03	1.28E-08
CM244	4.22E-05	2.21E-06	1.08E-09	1.67E-07	4.82E-03	1.07E-11
CM245	5.24E-05	2.75E-06	2.70E-09	2.55E-07	7.01E-03	8.59E-09
CM246	2.60E-05	1.36E-06	1.35E-09	2.50E-07	7.01E-03	9.69E-12
CM248	9.86E-05	5.17E-06	5.12E-09	9.47E-07	2.63E-02	7.37E-12
CO57	5.99E-08	2.71E-09	1.72E-08	5.80E-08	1.80E-06	1.22E-08
CO58	1.45E-07	4.32E-09	3.80E-08	1.44E-07	2.15E-06	1.03E-07
CO60	1.61E-06	8.30E-08	4.77E-07	1.55E-06	3.29E-05	2.74E-07
CS134	4.36E-06	2.17E-07	1.28E-06	1.47E-05	6.14E-06	1.65E-07
CS137	3.03E-06	1.58E-07	8.99E-07	1.02E-05	4.16E-06	5.54E-08
ES254	1.89E-04	9.70E-06	1.06E-05	3.50E-07	5.59E-03	9.56E-08
EU152	2.27E-07	1.18E-08	1.68E-08	2.18E-09	2.41E-05	1.23E-07
EU154	3.24E-07	1.68E-08	2.40E-08	3.11E-09	3.07E-05	1.33E-07
EU155	4.84E-08	2.48E-09	3.58E-09	4.66E-10	3.95E-06	5.40E-09
FE55	2.89E-08	1.45E-09	8.50E-09	3.47E-09	1.84E-07	0.00E+00
GE68	9.05E-08	4.13E-09	2.61E-05	2.19E-08	7.12E-06	9.93E-08
H3	5.32E-09	2.77E-09	2.27E-09	9.93E-09	1.71E-08	0.00E+00
I129	2.06E-05	1.08E-06	2.14E-06	9.89E-05	2.63E-05	8.15E-10
K40	1.19E-06	6.25E-08	3.54E-07	4.01E-06	1.67E-06	1.74E-08
KR85	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-11	2.59E-10
MN54	1.14E-07	5.28E-09	6.60E-10	1.94E-08	1.16E-06	8.87E-08
MO93	2.07E-07	1.09E-08	7.72E-08	2.93E-07	3.86E-06	5.48E-11
NA22	7.26E-07	3.66E-08	5.88E-07	1.22E-05	1.05E-06	2.35E-07
NB93M	1.62E-08	8.44E-10	6.01E-08	1.56E-07	4.16E-06	9.62E-12
NB94	2.27E-07	1.19E-08	8.44E-07	2.19E-06	4.60E-05	1.68E-07
NB95	5.02E-08	8.42E-10	1.43E-07	5.06E-07	1.12E-06	8.12E-08
NI59	9.86E-09	5.17E-10	8.78E-10	4.74E-09	1.53E-07	0.00E+00
NI63	2.60E-08	1.36E-09	2.31E-09	1.25E-08	3.95E-07	0.00E+00
NP237	3.91E-05	2.05E-06	3.84E-08	1.33E-06	6.36E-03	2.23E-09
NP239	8.60E-09	1.81E-17	1.59E-13	1.69E-09	3.51E-07	1.66E-08
PA231	5.14E-05	2.70E-06	3.00E-08	1.23E-06	7.89E-03	3.75E-09
PA233	1.52E-05	7.97E-07	1.89E-08	1.27E-06	1.89E-06	2.04E-08
PB210	8.64E-05	4.51E-06	3.86E-07	1.12E-05	8.77E-04	1.27E-10
PB212	8.88E-10	0.00E+00	2.85E-24	5.73E-12	1.10E-05	1.40E-08
PM147	3.31E-08	1.67E-09	2.44E-09	3.19E-10	6.58E-06	1.50E-12
PO210	1.48E-05	5.81E-07	6.19E-08	2.53E-06	5.70E-04	9.02E-13
PU238	2.55E-05	1.34E-06	5.32E-09	5.01E-07	8.55E-03	1.06E-11
PU239	2.49E-05	1.31E-06	1.85E-10	1.20E-09	8.33E-03	9.20E-12
PU240	2.49E-05	1.31E-06	1.85E-10	1.20E-09	8.33E-03	1.03E-11
PU241	2.64E-05	1.38E-06	1.35E-09	5.01E-09	5.04E-05	1.57E-13
PU242	2.38E-05	1.25E-06	1.77E-10	1.14E-09	7.89E-03	8.69E-12

TABLE A.54. (contd)

Radionuclide	Leafy Veg	Other Veg	Meat Ingest	Milk Ingest	Air Inhal	Air Extern
RA223	2.90E-06	4.48E-09	4.26E-09	6.57E-07	6.80E-04	2.97E-08
RA224	6.29E-07	5.61E-13	9.52E-11	1.13E-07	2.63E-04	1.74E-07
RA225	3.45E-06	1.20E-08	5.06E-09	6.22E-07	3.29E-04	6.07E-10
RA226	9.94E-05	5.22E-06	4.35E-07	1.40E-05	6.58E-04	6.83E-10
RA228	1.03E-04	5.30E-06	3.60E-07	2.11E-05	6.90E-04	1.04E-07
RE187	6.39E-10	3.35E-11	7.59E-11	4.60E-10	7.39E-09	0.00E+00
RN222	8.64E-05	4.51E-06	3.86E-07	1.12E-05	1.60E-07	1.92E-07
RU103	7.26E-08	1.37E-09	1.70E-09	2.19E-11	1.84E-06	4.57E-08
RU106	9.93E-07	4.67E-08	2.88E-08	2.88E-10	9.64E-05	2.28E-08
S35	2.06E-08	6.84E-10	2.76E-08	1.52E-07	4.16E-08	5.28E-13
SB122	2.21E-08	3.96E-16	3.96E-12	7.79E-10	7.45E-07	4.63E-08
SB124	2.56E-07	6.88E-09	3.26E-09	1.27E-08	4.82E-06	1.99E-07
SC46	1.49E-07	4.85E-09	2.98E-08	3.67E-10	5.92E-06	2.17E-07
SE75	5.65E-07	2.12E-08	1.17E-07	1.11E-06	1.32E-06	4.03E-08
SE79	5.84E-07	3.07E-08	1.30E-07	1.12E-06	1.34E-06	6.59E-13
SM147	1.73E-06	9.10E-08	1.29E-07	4.16E-08	1.58E-03	0.00E+00
SM151	1.19E-08	6.24E-10	8.84E-10	1.14E-10	1.91E-06	7.84E-14
SN113	8.44E-08	3.12E-09	9.27E-08	4.13E-08	2.06E-06	2.69E-08
SN123	5.11E-07	1.96E-08	5.67E-07	2.50E-07	4.42E-06	8.74E-10
SR85	6.88E-08	1.94E-09	2.67E-10	5.12E-08	2.19E-07	5.25E-08
SR90	3.95E-06	2.07E-07	1.77E-08	2.81E-06	1.36E-05	2.12E-10
TA182	1.65E-07	6.10E-09	1.36E-09	2.42E-10	9.43E-06	1.39E-07
TC99	1.41E-07	7.39E-09	1.78E-08	6.76E-07	1.82E-06	3.52E-12
TH227	3.31E-06	2.03E-08	6.87E-09	7.23E-07	1.07E-03	1.06E-08
TH228	6.76E-06	3.35E-07	4.63E-09	2.54E-07	1.71E-02	1.86E-10
TH229	1.34E-05	7.05E-07	1.38E-08	7.73E-07	1.69E-02	8.30E-09
TH230	1.01E-04	5.29E-06	4.35E-07	1.40E-05	6.36E-03	3.80E-11
TH231	5.14E-05	2.70E-06	3.00E-08	1.23E-06	1.07E-07	1.13E-09
TH232	1.04E-04	5.47E-06	3.62E-07	2.11E-05	6.14E-03	1.89E-11
TH234	2.00E-06	9.36E-08	5.16E-09	5.00E-07	7.01E-06	7.34E-10
TL204	1.82E-07	9.30E-09	1.08E-07	1.76E-07	2.85E-07	1.21E-10
TM170	3.22E-07	1.24E-08	1.96E-08	7.86E-10	3.57E-06	4.86E-10
U232	1.08E-05	5.65E-07	1.66E-08	1.41E-06	1.32E-02	3.07E-11
U233	1.52E-05	7.96E-07	1.89E-08	1.27E-06	5.92E-03	3.54E-11
U234	1.73E-06	9.10E-08	5.15E-09	5.00E-07	5.70E-03	1.66E-11
U235	5.31E-05	2.79E-06	3.51E-08	1.73E-06	5.48E-03	1.45E-08
U236	1.62E-06	8.53E-08	4.83E-09	4.68E-07	5.48E-03	1.09E-11
U238	1.06E-04	5.56E-06	4.49E-07	1.54E-05	1.14E-02	7.39E-12
V49	3.96E-09	1.84E-10	1.32E-10	1.92E-09	4.69E-08	0.00E+00
Y88	3.57E-07	1.29E-08	1.46E-09	3.50E-09	3.82E-06	2.98E-07
Y90	3.53E-08	6.34E-16	1.90E-12	2.49E-10	1.21E-06	4.13E-10
ZN65	8.73E-07	3.89E-08	1.25E-06	4.23E-06	3.51E-06	6.31E-08
ZR93	3.46E-08	1.82E-09	6.17E-08	1.56E-07	1.42E-06	0.00E+00

TABLE A.55. Noncarcinogenic Chemical URFs for Agricultural Scenario, Groundwater

Chemical Name	Drink Water	Shwr Dermal	Shwr Ingest	Leafy Veg	Other Veg	Meat Ingest	Milk Ingest	Indr Inhal
Aluminum fluoride	6.97E+00	1.18E+00	3.55E-02	2.23E+00	1.17E-01	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	2.60E+00	4.42E-01	1.32E-02	8.30E-01	4.36E-02	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	7.14E+01	8.74E-04	3.64E-01	2.28E+01	1.20E+00	7.09E-01	5.80E+00	0.00E+00
Ammonium carbonate	7.14E-01	1.21E-03	3.64E-03	2.28E-01	1.20E-02	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	3.17E-01	5.40E-04	1.62E-03	1.01E-01	5.32E-03	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	5.71E+00	1.94E+00	2.91E-02	1.83E+00	9.65E-02	3.03E-02	1.86E-03	0.00E+00
Butyl phosphates	4.33E-01	2.86E-03	2.21E-03	3.47E-01	1.17E-01	1.37E-05	4.19E-05	0.00E+00
Cadmium (ionic)	5.71E+01	1.94E+00	2.91E-01	1.94E+01	1.54E+00	2.27E-01	9.40E+00	0.00E+00
Calcium carbonate	1.10E-01	1.87E-04	5.60E-04	3.51E-02	1.84E-03	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	1.68E-03	9.52E-06	8.57E-06	5.37E-04	2.82E-05	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	7.72E-02	4.38E-04	3.94E-04	2.47E-02	1.29E-03	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	4.08E+01	1.53E+00	2.08E-01	1.32E+01	7.45E-01	3.03E-03	2.30E-02	1.53E+02
Chromium IV (ionic)	5.71E+00	1.94E+00	2.91E-02	1.83E+00	9.76E-02	2.08E-01	1.39E+00	0.00E+00
Copper sulfate	2.38E+00	8.09E-03	1.21E-02	7.60E-01	3.99E-02	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	9.52E+01	3.24E-01	4.86E-01	3.35E+01	3.21E+00	7.28E+00	2.37E+01	0.00E+00
Dibutyl phosphonate	2.20E-01	9.04E-04	1.12E-03	1.69E-01	5.53E-02	7.52E-06	2.37E-05	0.00E+00
Ferric nitrate	9.52E-01	1.62E-03	4.86E-03	3.04E-01	1.60E-02	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	1.90E-01	3.24E-04	9.71E-04	6.08E-02	3.19E-03	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	1.24E+00	2.11E-02	6.33E-03	3.97E-01	2.08E-02	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	4.76E-01	8.10E-04	2.43E-03	1.57E-01	1.06E-02	6.61E-02	5.45E-01	0.00E+00
Iron (as ferric ion)	2.20E-02	3.74E-04	1.12E-04	7.02E-03	3.70E-04	2.91E-03	8.93E-04	0.00E+00
Lead (ionic)	2.04E+01	6.94E-04	1.04E-01	6.53E+00	3.47E-01	4.06E-02	8.29E-01	0.00E+00
Magnesium (ionic)	5.71E-04	1.94E-06	2.91E-06	2.23E-04	3.10E-05	2.54E-05	3.88E-04	0.00E+00
Magnesium nitrate	1.50E-02	2.56E-05	7.67E-05	4.80E-03	2.52E-04	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	9.52E+01	8.10E+00	4.86E-01	3.29E+01	2.89E+00	1.77E+02	7.08E+00	0.00E+00
Methyl isobutyl ketone	5.71E-01	3.21E-03	2.91E-03	2.94E-01	6.81E-02	9.92E-07	4.38E-06	2.14E+00
Nickel (ionic)	1.43E+00	4.86E-03	7.29E-03	4.67E-01	2.98E-02	5.88E-02	2.33E-01	0.00E+00
Nitrate	1.79E-02	3.04E-05	9.11E-05	7.49E-02	3.66E-02	1.74E-01	2.51E-01	0.00E+00
Nitric acid	8.16E-01	1.39E-03	4.16E-03	3.42E+00	1.67E+00	7.96E+00	1.15E+01	0.00E+00
Nitrite	8.40E-01	1.43E-03	4.29E-03	2.68E-01	1.41E-02	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	9.52E-02	1.62E-04	4.86E-04	3.04E-02	1.60E-03	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	6.21E-02	1.32E-04	3.17E-04	4.79E-02	1.58E-02	7.18E-02	1.95E-01	0.00E+00
Potassium (ionic)	5.60E-05	6.38E-09	2.86E-07	2.19E-05	3.04E-06	9.96E-06	6.66E-05	0.00E+00
Potassium borate	3.17E-01	5.40E-04	1.62E-03	1.21E-01	1.57E-02	2.18E-03	1.45E-01	0.00E+00
Silver (ionic)	5.71E+00	1.17E-01	2.91E-02	1.83E+00	9.63E-02	1.13E-01	1.86E+01	0.00E+00
Sodium (ionic)	9.52E-05	1.62E-07	4.86E-07	3.11E-05	1.95E-06	3.58E-05	5.44E-04	0.00E+00
Sodium aluminate	6.64E-01	1.13E-01	3.39E-03	2.12E-01	1.12E-02	6.60E-03	5.40E-02	0.00E+00
Sodium dichromate	5.71E+00	1.94E+00	2.91E-02	1.83E+00	9.76E-02	2.08E-01	1.39E+00	0.00E+00
Sodium oxalate	4.76E-01	8.10E-04	2.43E-03	1.52E-01	7.98E-03	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	1.43E-01	2.43E-04	7.29E-04	4.56E-02	2.40E-03	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	4.02E-04	6.84E-07	2.05E-06	2.07E-04	4.77E-05	5.15E-04	1.10E-03	0.00E+00

TABLE A.55. (contd)

<u>Chemical Name</u>	<u>Drink Water</u>	<u>Shwr Dermal</u>	<u>Shwr Ingest</u>	<u>Leafy Veg</u>	<u>Other Veg</u>	<u>Meat Ingest</u>	<u>Milk Ingest</u>	<u>Inhr Inhal</u>
Sulfuric acid	4.08E+00	6.94E-03	2.08E-02	1.30E+00	6.84E-02	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	1.63E+00	8.55E-02	8.33E-03	5.24E-01	2.87E-02	2.67E-03	2.06E-02	0.00E+00
Tributyl phosphonate	2.38E-01	6.64E-07	1.21E-03	8.33E-02	7.80E-03	3.09E-04	2.13E-03	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	9.52E+00	3.24E-01	4.86E-02	3.06E+00	1.69E-01	1.27E-02	9.29E-01	0.00E+00
Zinc (ionic)	9.52E-02	1.94E-04	4.86E-04	3.77E-02	5.42E-03	8.62E-02	1.62E-01	0.00E+00

TABLE A.56. Carcinogenic Chemical URFs for Agricultural Scenario, Groundwater

Chemical Name	Drink Water	Shwr Dermal	Shwr Ingest	Leafy Veg	Other Veg	Meat Ingest	Milk Ingest	Indr Inhal
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	5.27E-02	1.79E-02	2.69E-04	1.68E-02	8.89E-04	2.79E-04	1.71E-05	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	7.71E-02	2.62E-03	3.93E-04	2.61E-02	2.08E-03	3.07E-04	1.27E-02	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	1.59E-03	5.95E-05	8.12E-06	5.13E-04	2.91E-05	1.18E-07	8.98E-07	2.43E-03
Chromium IV (ionic)	5.03E-01	1.71E-01	2.56E-03	1.60E-01	8.57E-03	1.84E-02	1.22E-01	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	5.03E-01	1.71E-01	2.56E-03	1.60E-01	8.57E-03	1.84E-02	1.22E-01	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.56. (contd)

<u>Chemical Name</u>	<u>Drink Water</u>	<u>Shwr Dermal</u>	<u>Shwr Ingest</u>	<u>Leafy Veg</u>	<u>Other Veg</u>	<u>Meat Ingest</u>	<u>Milk Ingest</u>	<u>Indr Inhal</u>
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	9.67E-05	5.06E-06	4.93E-07	3.10E-05	1.70E-06	1.58E-07	1.22E-06	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	1.35E-04	5.27E-05	6.87E-07	4.38E-05	2.68E-06	5.61E-09	4.20E-08	5.97E-04
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.57. Radionuclide URFs for Agricultural Scenario, Groundwater

Radionuclide	Drink Water	Shwr Dermal	Shwr Ingest	Leafy Veg	Other Veg	Meat Ingest	Milk Ingest	Indr Inhal
AC225	3.60E-07	4.91E-07	1.84E-09	4.73E-08	5.98E-11	1.09E-12	2.02E-11	0.00E+00
AC227	7.67E-06	3.23E-04	3.91E-08	2.68E-06	1.40E-07	2.86E-09	8.48E-08	0.00E+00
AG110M	1.03E-07	1.61E-09	5.25E-10	3.12E-08	1.40E-09	1.89E-09	3.21E-07	0.00E+00
AM241	5.26E-06	8.55E-05	2.68E-08	1.68E-06	8.83E-08	1.22E-10	3.42E-10	0.00E+00
AM243	5.26E-06	8.55E-05	2.68E-08	3.29E-06	1.73E-07	1.50E-10	8.90E-10	0.00E+00
AU195	1.44E-08	4.57E-12	7.33E-11	4.30E-09	1.87E-10	6.89E-10	1.22E-11	0.00E+00
BA133	2.63E-08	1.76E-10	1.34E-10	8.40E-09	4.51E-10	2.61E-11	1.49E-09	0.00E+00
BE10	6.33E-08	3.23E-09	3.23E-10	2.02E-08	1.07E-09	4.19E-10	9.26E-12	0.00E+00
BE7	6.53E-10	9.87E-12	3.33E-12	1.67E-10	4.12E-12	3.03E-12	7.98E-14	0.00E+00
BI210	3.27E-08	5.82E-10	1.67E-10	9.59E-07	3.75E-08	5.67E-09	1.74E-07	0.00E+00
C14	1.97E-08	4.83E-11	1.01E-10	3.32E-08	1.74E-08	2.18E-08	2.75E-08	0.00E+00
CA45	2.17E-08	1.80E-10	1.10E-10	6.49E-09	3.00E-10	9.12E-11	3.32E-08	0.00E+00
CD109	1.73E-07	5.54E-09	8.83E-10	5.43E-08	2.86E-09	6.14E-10	2.76E-08	0.00E+00
CE144	1.36E-07	2.54E-08	6.92E-10	4.15E-08	1.89E-09	6.30E-10	4.26E-10	0.00E+00
CF250	2.89E-05	5.08E-05	1.48E-07	9.24E-06	4.93E-07	9.58E-07	3.52E-09	0.00E+00
CF252	1.47E-05	2.31E-05	7.48E-08	1.10E-05	5.70E-07	4.77E-07	6.66E-08	0.00E+00
CL36	3.95E-08	7.16E-11	2.01E-10	3.69E-07	1.88E-07	9.30E-07	6.48E-07	0.00E+00
CM243	4.16E-06	5.78E-05	2.12E-08	4.62E-06	2.42E-07	2.46E-10	1.44E-08	0.00E+00
CM244	3.51E-06	4.62E-05	1.79E-08	2.73E-06	1.43E-07	9.77E-11	1.15E-08	0.00E+00
CM245	5.26E-06	8.78E-05	2.68E-08	3.38E-06	1.78E-07	2.44E-10	1.74E-08	0.00E+00
CM246	5.26E-06	8.78E-05	2.68E-08	1.68E-06	8.83E-08	1.22E-10	1.71E-08	0.00E+00
CM248	1.99E-05	3.23E-04	1.02E-07	6.37E-06	3.35E-07	4.62E-10	6.48E-08	0.00E+00
CO57	1.27E-08	2.31E-11	6.48E-11	3.88E-09	1.79E-10	1.57E-09	3.98E-09	0.00E+00
CO58	3.49E-08	1.26E-10	1.78E-10	9.40E-09	2.83E-10	3.54E-09	9.89E-09	0.00E+00
CO60	3.29E-07	6.74E-10	1.68E-09	1.05E-07	5.73E-09	4.35E-08	1.06E-07	0.00E+00
CS134	8.98E-07	1.66E-09	4.58E-09	2.83E-07	1.47E-08	1.17E-07	1.01E-06	0.00E+00
CS137	6.14E-07	1.16E-09	3.13E-09	1.99E-07	1.19E-08	8.31E-08	6.99E-07	0.00E+00
ES254	4.26E-06	6.69E-06	2.17E-08	1.22E-05	6.28E-07	9.59E-07	2.39E-08	0.00E+00
EU152	4.60E-08	3.70E-08	2.35E-10	1.47E-08	7.72E-10	1.52E-09	1.49E-10	0.00E+00
EU154	6.58E-08	4.85E-08	3.35E-10	2.09E-08	1.09E-09	2.17E-09	2.13E-10	0.00E+00
EU155	9.86E-09	6.93E-09	5.03E-11	3.13E-09	1.62E-10	3.23E-10	3.19E-11	0.00E+00
FE55	5.92E-09	1.29E-10	3.02E-11	1.87E-09	9.41E-11	7.68E-10	2.38E-10	0.00E+00
GE68	1.91E-08	2.19E-11	9.76E-11	5.97E-09	3.24E-10	2.45E-06	1.51E-09	0.00E+00
H3	1.18E-09	1.46E-12	6.04E-12	4.26E-11	2.22E-11	3.99E-11	1.76E-10	0.00E+00
I129	4.16E-06	5.78E-09	2.12E-08	1.36E-06	8.39E-08	1.99E-07	6.79E-06	0.00E+00
K40	2.41E-07	4.62E-10	1.23E-09	9.42E-08	1.31E-08	4.29E-08	2.87E-07	0.00E+00
KR85	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN54	2.41E-08	2.22E-10	1.23E-10	7.45E-09	3.69E-10	6.07E-11	1.33E-09	0.00E+00
MO93	3.86E-08	4.11E-11	1.97E-10	1.37E-08	8.59E-10	7.03E-09	2.01E-08	0.00E+00
NA22	1.49E-07	2.77E-10	7.60E-10	4.72E-08	2.51E-09	5.36E-08	8.39E-07	0.00E+00
NB93M	3.29E-09	9.24E-11	1.68E-11	1.05E-09	5.53E-11	5.43E-09	1.07E-08	0.00E+00
NB94	4.60E-08	1.94E-09	2.35E-10	1.47E-08	7.87E-10	7.64E-08	1.50E-07	0.00E+00
NB95	1.41E-08	2.13E-10	7.20E-11	3.25E-09	5.45E-11	1.37E-08	3.51E-08	0.00E+00

TABLE A.57. (contd)

Radionuclide	Drink Water	Shwr Dermal	Shwr Ingest	Leafy Veg	Other Veg	Meat Ingest	Milk Ingest	Indr Inhal
NI59	1.99E-09	6.24E-12	1.02E-11	6.52E-10	4.15E-11	8.21E-11	3.26E-10	0.00E+00
NI63	5.26E-09	1.52E-11	2.68E-11	1.72E-09	1.08E-10	2.16E-10	8.58E-10	0.00E+00
NP237	4.82E-06	1.04E-04	2.46E-08	2.53E-06	1.36E-07	3.67E-09	9.27E-08	0.00E+00
NP239	1.78E-08	8.58E-11	9.07E-11	5.56E-10	1.17E-18	3.20E-14	1.44E-10	0.00E+00
PA231	2.02E-06	2.54E-04	1.03E-08	3.32E-06	1.74E-07	2.99E-09	8.64E-08	0.00E+00
PA233	2.16E-08	0.00E+00	1.10E-10	9.84E-07	5.15E-08	1.90E-09	8.87E-08	0.00E+00
PB210	1.45E-05	2.77E-09	7.38E-08	5.59E-06	2.95E-07	3.50E-08	7.65E-07	0.00E+00
PB212	5.81E-08	8.87E-12	2.97E-10	5.74E-11	0.00E+00	2.02E-24	9.17E-13	0.00E+00
PM147	6.79E-09	4.16E-09	3.46E-11	2.14E-09	1.08E-10	2.20E-10	2.18E-11	0.00E+00
PO210	3.28E-06	4.38E-07	1.67E-08	9.57E-07	3.77E-08	5.67E-09	1.74E-07	0.00E+00
PU238	4.82E-06	7.39E-05	2.46E-08	1.65E-06	8.66E-08	4.80E-10	3.43E-08	0.00E+00
PU239	5.04E-06	8.32E-05	2.57E-08	1.61E-06	8.46E-08	1.67E-11	8.19E-11	0.00E+00
PU240	5.04E-06	8.32E-05	2.57E-08	1.61E-06	8.46E-08	1.67E-11	8.19E-11	0.00E+00
PU241	7.89E-08	1.59E-06	4.02E-10	1.70E-06	8.95E-08	1.22E-10	3.43E-10	0.00E+00
PU242	4.82E-06	7.85E-05	2.46E-08	1.54E-06	8.09E-08	1.60E-11	7.83E-11	0.00E+00
RA223	1.36E-06	2.24E-08	6.94E-09	1.87E-07	2.89E-10	4.70E-10	4.69E-08	0.00E+00
RA224	7.58E-07	7.99E-09	3.86E-09	4.07E-08	3.62E-14	1.66E-11	9.02E-09	0.00E+00
RA225	1.09E-06	2.48E-08	5.57E-09	2.23E-07	7.80E-10	5.33E-10	4.39E-08	0.00E+00
RA226	2.63E-06	1.27E-07	1.34E-08	6.43E-06	3.39E-07	3.94E-08	9.57E-07	0.00E+00
RA228	1.96E-05	1.11E-07	9.98E-08	6.65E-06	3.44E-07	3.29E-08	1.44E-06	0.00E+00
RE187	1.29E-10	3.47E-13	6.59E-13	4.71E-11	5.23E-12	8.33E-12	3.24E-11	0.00E+00
RN222	2.80E-08	0.00E+00	1.43E-10	5.58E-06	2.92E-07	3.50E-08	7.65E-07	1.10E-08
RU103	1.98E-08	1.21E-10	1.01E-10	4.70E-09	8.90E-11	1.63E-10	1.51E-12	0.00E+00
RU106	2.08E-07	2.54E-09	1.06E-09	6.43E-08	3.06E-09	2.62E-09	1.97E-11	0.00E+00
S35	4.80E-09	9.43E-12	2.45E-11	1.40E-09	6.52E-11	2.75E-09	1.06E-08	0.00E+00
SB122	3.86E-08	3.05E-11	1.97E-10	1.43E-09	2.56E-17	7.40E-13	6.45E-11	0.00E+00
SB124	6.32E-08	1.61E-10	3.22E-10	1.65E-08	4.45E-10	3.06E-10	8.75E-10	0.00E+00
SC46	3.49E-08	2.76E-09	1.78E-10	9.64E-09	3.13E-10	2.76E-09	2.53E-11	0.00E+00
SE75	1.27E-07	2.53E-10	6.47E-10	3.65E-08	1.38E-09	1.08E-08	7.59E-08	0.00E+00
SE79	1.18E-07	2.31E-10	6.03E-10	3.81E-08	2.18E-09	1.19E-08	7.70E-08	0.00E+00
SM147	3.51E-07	1.41E-05	1.79E-09	1.12E-07	5.97E-09	1.16E-08	2.85E-09	0.00E+00
SM151	2.41E-09	5.54E-09	1.23E-11	7.71E-10	4.10E-11	7.99E-11	7.83E-12	0.00E+00
SN113	1.90E-08	1.64E-10	9.70E-11	5.45E-09	2.02E-10	8.53E-09	2.84E-09	0.00E+00
SN123	1.14E-07	3.46E-10	5.81E-10	3.30E-08	1.27E-09	5.20E-08	1.71E-08	0.00E+00
SR85	1.68E-08	5.51E-11	8.56E-11	4.55E-09	1.55E-10	2.58E-11	3.54E-09	0.00E+00
SR90	7.89E-07	9.47E-09	4.02E-09	3.23E-07	4.86E-08	2.27E-09	2.03E-07	0.00E+00
TA182	3.72E-08	7.37E-10	1.89E-10	1.07E-08	3.95E-10	1.25E-10	1.66E-11	0.00E+00
TC99	2.85E-08	5.78E-11	1.45E-10	1.31E-08	2.60E-09	2.70E-09	5.05E-08	0.00E+00
TH227	9.68E-08	1.29E-06	4.94E-10	2.14E-07	1.31E-09	7.58E-10	5.16E-08	0.00E+00
TH228	1.21E-06	4.16E-05	6.15E-09	4.37E-07	2.17E-08	7.66E-10	2.01E-08	0.00E+00
TH229	1.95E-06	3.93E-04	9.95E-09	9.89E-07	1.09E-07	1.45E-09	5.46E-08	0.00E+00
TH230	2.85E-07	5.78E-05	1.45E-09	6.52E-06	3.42E-07	3.94E-08	9.58E-07	0.00E+00
TH231	6.32E-09	1.13E-11	3.22E-11	3.32E-06	1.74E-07	2.99E-09	8.64E-08	0.00E+00

TABLE A.57. (contd)

Radionuclide	Drink Water	Shwr Dermal	Shwr Ingest	Leafy Veg	Other Veg	Meat Ingest	Milk Ingest	Indr Inhal
TH232	2.63E-07	3.23E-04	1.34E-09	6.74E-06	3.56E-07	3.31E-08	1.45E-06	0.00E+00
TH234	8.64E-08	8.88E-10	4.41E-10	1.29E-07	6.05E-09	4.66E-10	3.42E-08	0.00E+00
TL204	3.73E-08	4.62E-11	1.90E-10	1.18E-08	6.01E-10	9.72E-09	1.20E-08	0.00E+00
TM170	7.17E-08	1.50E-09	3.66E-10	2.08E-08	8.02E-10	1.80E-09	5.40E-11	0.00E+00
U232	8.11E-07	6.93E-07	4.14E-09	6.98E-07	3.74E-08	1.86E-09	9.93E-08	0.00E+00
U233	3.51E-07	1.43E-07	1.79E-09	9.81E-07	5.18E-08	1.91E-09	8.88E-08	0.00E+00
U234	3.51E-07	1.41E-07	1.79E-09	1.13E-07	6.21E-09	4.68E-10	3.42E-08	0.00E+00
U235	3.51E-07	1.29E-07	1.79E-09	3.43E-06	1.81E-07	3.46E-09	1.21E-07	0.00E+00
U236	3.29E-07	1.34E-07	1.68E-09	1.06E-07	5.82E-09	4.39E-10	3.21E-08	0.00E+00
U238	6.14E-07	1.27E-07	3.13E-09	6.84E-06	3.60E-07	4.07E-08	1.05E-06	0.00E+00
V49	8.34E-10	8.08E-12	4.25E-12	2.56E-10	1.19E-11	1.20E-11	1.31E-10	0.00E+00
Y88	8.11E-08	6.91E-07	4.14E-10	2.31E-08	8.34E-10	1.35E-10	2.41E-10	0.00E+00
Y90	6.17E-08	8.94E-11	3.15E-10	2.28E-09	4.10E-17	3.55E-13	2.06E-11	0.00E+00
ZN65	1.86E-07	3.74E-10	9.49E-10	5.80E-08	3.23E-09	1.19E-07	2.92E-07	0.00E+00
ZR93	3.73E-09	1.57E-08	1.90E-11	2.24E-09	1.18E-10	5.57E-09	1.07E-08	0.00E+00

TABLE A.58a. Noncarcinogenic Chemical URFs for Agricultural Scenario, Surface Water

Chemical Name	Drink Water	Shwr Dermal	Shwr Ingest	Leafy Veg	Other Veg	Meat Ing.	Milk Ing.	Fish Ingest
Aluminum fluoride	6.97E+00	1.18E+00	3.55E-02	2.23E+00	1.17E-01	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	2.60E+00	4.42E-01	1.32E-02	8.30E-01	4.36E-02	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	7.14E+01	8.74E-04	3.64E-01	2.28E+01	1.20E+00	7.09E-01	5.80E+00	9.64E+00
Ammonium carbonate	7.14E-01	1.21E-03	3.64E-03	2.28E-01	1.20E-02	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	3.17E-01	5.40E-04	1.62E-03	1.01E-01	5.32E-03	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	5.71E+00	1.94E+00	2.91E-02	1.83E+00	9.65E-02	3.03E-02	1.86E-03	1.47E+00
Butyl phosphates	4.33E-01	2.86E-03	2.21E-03	3.47E-01	1.17E-01	1.37E-05	4.19E-05	3.82E-02
Cadmium (ionic)	5.71E+01	1.94E+00	2.91E-01	1.94E+01	1.54E+00	2.27E-01	9.40E+00	1.54E+02
Calcium carbonate	1.10E-01	1.87E-04	5.60E-04	3.51E-02	1.84E-03	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	1.68E-03	9.52E-06	8.57E-06	5.37E-04	2.82E-05	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	7.72E-02	4.38E-04	3.94E-04	2.47E-02	1.29E-03	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	4.08E+01	1.53E+00	2.08E-01	1.32E+01	7.45E-01	3.03E-03	2.30E-02	8.27E+01
Chromium IV (ionic)	5.71E+00	1.94E+00	2.91E-02	1.83E+00	9.76E-02	2.08E-01	1.39E+00	1.54E+01
Copper sulfate	2.38E+00	8.09E-03	1.21E-02	7.60E-01	3.99E-02	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	9.52E+01	3.24E-01	4.86E-01	3.35E+01	3.21E+00	7.28E+00	2.37E+01	6.43E+01
Dibutyl phosphonate	2.20E-01	9.04E-04	1.12E-03	1.69E-01	5.53E-02	7.52E-06	2.37E-05	2.17E-02
Ferric nitrate	9.52E-01	1.62E-03	4.86E-03	3.04E-01	1.60E-02	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	1.90E-01	3.24E-04	9.71E-04	6.08E-02	3.19E-03	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	1.24E+00	2.11E-02	6.33E-03	3.97E-01	2.08E-02	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	4.76E-01	8.10E-04	2.43E-03	1.57E-01	1.06E-02	6.61E-02	5.45E-01	6.43E-02
Iron (as ferric ion)	2.20E-02	3.74E-04	1.12E-04	7.02E-03	3.70E-04	2.91E-03	8.93E-04	5.93E-01
Lead (ionic)	2.04E+01	6.94E-04	1.04E-01	6.53E+00	3.47E-01	4.06E-02	8.29E-01	2.76E+01
Magnesium (ionic)	5.71E-04	1.94E-06	2.91E-06	2.23E-04	3.10E-05	2.54E-05	3.88E-04	3.86E-04
Magnesium nitrate	1.50E-02	2.56E-05	7.67E-05	4.80E-03	2.52E-04	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	9.52E+01	8.10E+00	4.86E-01	3.29E+01	2.89E+00	1.77E+02	7.08E+00	1.29E+03
Methyl isobutyl ketone	5.71E-01	3.21E-03	2.91E-03	2.94E-01	6.81E-02	9.92E-07	4.38E-06	5.71E-03
Nickel (ionic)	1.43E+00	4.86E-03	7.29E-03	4.67E-01	2.98E-02	5.88E-02	2.33E-01	1.93E+00
Nitrate	1.79E-02	3.04E-05	9.11E-05	7.49E-02	3.66E-02	1.74E-01	2.51E-01	3.62E+01
Nitric acid	8.16E-01	1.39E-03	4.16E-03	3.42E+00	1.67E+00	7.96E+00	1.15E+01	1.65E+03
Nitrite	8.40E-01	1.43E-03	4.29E-03	2.68E-01	1.41E-02	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	9.52E-02	1.62E-04	4.86E-04	3.04E-02	1.60E-03	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	6.21E-02	1.32E-04	3.17E-04	4.79E-02	1.58E-02	7.18E-02	1.95E-01	5.87E+01
Potassium (ionic)	5.60E-05	6.38E-09	2.86E-07	2.19E-05	3.04E-06	9.96E-06	6.66E-05	7.56E-04
Potassium borate	3.17E-01	5.40E-04	1.62E-03	1.21E-01	1.57E-02	2.18E-03	1.45E-01	9.43E-04

TABLE A.58a. (contd)

Chemical Name	Drink Water	Shwr Dermal	Shwr Ingest	Leafy Veg	Other Veg	Meat Ing.	Milk Ing.	Fish Ingest
Silver (ionic)	5.71E+00	1.17E-01	2.91E-02	1.83E+00	9.63E-02	1.13E-01	1.86E+01	1.77E-01
Sodium (ionic)	9.52E-05	1.62E-07	4.86E-07	3.11E-05	1.95E-06	3.58E-05	5.44E-04	1.29E-04
Sodium aluminate	6.64E-01	1.13E-01	3.39E-03	2.12E-01	1.12E-02	6.60E-03	5.40E-02	8.97E-02
Sodium dichromate	5.71E+00	1.94E+00	2.91E-02	1.83E+00	9.76E-02	2.08E-01	1.39E+00	1.54E+01
Sodium oxalate	4.76E-01	8.10E-04	2.43E-03	1.52E-01	7.98E-03	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	1.43E-01	2.43E-04	7.29E-04	4.56E-02	2.40E-03	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	4.02E-04	6.84E-07	2.05E-06	2.07E-04	4.77E-05	5.15E-04	1.10E-03	4.07E-03
Sulfuric acid	4.08E+00	6.94E-03	2.08E-02	1.30E+00	6.84E-02	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	1.63E+00	8.55E-02	8.33E-03	5.24E-01	2.87E-02	2.67E-03	2.06E-02	1.50E+01
Tributyl phosphonate	2.38E-01	6.64E-07	1.21E-03	8.33E-02	7.80E-03	3.09E-04	2.13E-03	1.58E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	9.52E+00	3.24E-01	4.86E-02	3.06E+00	1.69E-01	1.27E-02	9.29E-01	6.43E+00
Zinc (ionic)	9.52E-02	1.94E-04	4.86E-04	3.77E-02	5.42E-03	8.62E-02	1.62E-01	3.21E+00

TABLE A.58b. Noncarcinogenic Chemical URFs for Agricultural Scenario, Surface Water

Chemical Name	Swim Ingest	Swim Dermal	Shor Dermal	Shor Ingest	Indr Inhal	Swim Extern	Boat Extern	Shor Extern
Aluminum fluoride	1.74E-02	3.48E-01	5.24E-02	1.08E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	6.48E-03	1.30E-01	1.95E-02	4.02E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	1.78E-01	2.57E-04	5.37E-03	1.10E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	1.78E-03	3.57E-04	5.37E-05	1.10E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	7.92E-04	1.58E-04	2.39E-05	4.91E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	1.43E-02	5.70E-01	8.59E-02	8.84E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Butyl phosphates	1.08E-03	8.38E-04	3.26E-02	6.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	1.43E-01	5.70E-01	8.59E-01	8.84E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium carbonate	2.74E-04	5.48E-05	8.26E-06	1.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	4.19E-06	2.80E-06	4.21E-07	2.60E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	1.93E-04	1.28E-04	1.94E-05	1.19E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	1.02E-01	4.48E-01	1.24E-04	2.54E-05	1.53E+02	0.00E+00	0.00E+00	0.00E+00
Chromium IV (ionic)	1.43E-02	5.70E-01	4.30E-02	8.84E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper sulfate	5.94E-03	2.38E-03	3.58E-04	3.68E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	2.38E-01	9.51E-02	1.43E-02	1.47E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	5.49E-04	2.65E-04	1.65E-02	3.40E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	2.38E-03	4.75E-04	7.16E-05	1.47E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	4.75E-04	9.51E-05	1.43E-05	2.95E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	3.10E-03	6.20E-03	9.34E-04	1.92E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	1.19E-03	2.38E-04	3.58E-05	7.36E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	5.49E-05	1.10E-04	1.65E-05	3.40E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	5.09E-02	2.04E-04	7.67E-03	3.16E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	1.43E-06	5.70E-07	8.59E-08	8.84E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	3.75E-05	7.51E-06	1.13E-06	2.33E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	2.38E-01	2.38E+00	3.58E-01	1.47E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	1.43E-03	9.41E-04	1.12E-05	2.29E-06	2.14E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	3.57E-03	1.43E-03	2.15E-03	2.21E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrate	4.46E-05	8.91E-06	1.34E-06	2.76E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	2.04E-03	4.07E-04	6.14E-05	1.26E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	2.10E-03	4.19E-04	6.32E-05	1.30E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	2.38E-04	4.75E-05	7.16E-06	1.47E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	1.55E-04	3.87E-05	5.84E-06	9.61E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	1.40E-07	1.87E-09	4.21E-09	8.66E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	7.92E-04	1.58E-04	2.39E-05	4.91E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	1.43E-02	3.42E-02	8.59E-03	8.84E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.58b. (contd)

Chemical Name	Swim Ingest	Swim Dermal	Shor Dermal	Shor Ingest	Indr Inhal	Swim Extern	Boat Extern	Shor Extern
Sodium (ionic)	2.38E-07	4.75E-08	7.16E-09	1.47E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	1.66E-03	3.32E-02	5.00E-03	1.03E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	1.43E-02	5.70E-01	4.30E-02	8.84E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium oxalate	1.19E-03	2.38E-04	3.58E-05	7.37E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	3.57E-04	7.13E-05	1.07E-05	2.21E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	1.00E-06	2.01E-07	3.03E-08	6.22E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	1.02E-02	2.04E-03	3.07E-04	6.31E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	4.07E-03	2.51E-02	6.53E-06	1.34E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphonate	5.94E-04	1.95E-07	1.79E-02	3.68E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	2.38E-02	9.51E-02	1.43E-02	1.47E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	2.38E-04	5.70E-05	1.43E-05	1.47E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.59a. Carcinogenic Chemical URFs for Agricultural Scenario, Surface Water

Chemical Name	Drink Water	Shwr Dermal	Shwr Ingest	Leafy Veg	Other Veg	Meat Ingest	Milk Ingest	Fish Ingest
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	5.27E-02	1.79E-02	2.69E-04	1.68E-02	8.89E-04	2.79E-04	1.71E-05	1.35E-02
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	7.71E-02	2.62E-03	3.93E-04	2.61E-02	2.08E-03	3.07E-04	1.27E-02	2.08E-01
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	1.59E-03	5.95E-05	8.12E-06	5.13E-04	2.91E-05	1.18E-07	8.98E-07	3.22E-03
Chromium IV (ionic)	5.03E-01	1.71E-01	2.56E-03	1.60E-01	8.57E-03	1.84E-02	1.22E-01	1.35E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.59a. (contd)

<u>Chemical Name</u>	<u>Drink Water</u>	<u>Shwr Dermal</u>	<u>Shwr Ingest</u>	<u>Leafy Veg</u>	<u>Other Veg</u>	<u>Meat Ingest</u>	<u>Milk Ingest</u>	<u>Fish Ingest</u>
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	5.03E-01	1.71E-01	2.56E-03	1.60E-01	8.57E-03	1.84E-02	1.22E-01	1.35E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	9.67E-05	5.06E-06	4.93E-07	3.10E-05	1.70E-06	1.58E-07	1.22E-06	8.86E-04
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	1.35E-04	5.27E-05	6.87E-07	4.38E-05	2.68E-06	5.61E-09	4.20E-08	2.00E-05
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.59b. Carcinogenic Chemical URFs for Agricultural Scenario, Surface Water

Chemical Name	Swim Ingest	Swim Dermal	Shor Dermal	Shor Ingest	Indr Inhal	Swim Extern	Boat Extern	Shor Extern
Aluminum fluoride	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium (ionic)	1.31E-04	5.26E-03	7.92E-04	8.14E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Butyl phosphates	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium (ionic)	1.93E-04	7.70E-04	1.16E-03	1.19E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium carbonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	3.97E-06	1.75E-05	4.82E-09	9.92E-10	2.43E-03	0.00E+00	0.00E+00	0.00E+00
Chromium IV (ionic)	1.25E-03	5.01E-02	3.78E-03	7.76E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper sulfate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibutyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferric nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrocyanide (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ferrous nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron (as ferric ion)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl isobutyl ketone	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrite	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Oxalate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium borate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.59b. (contd)

Chemical Name	Swim Ingest	Swim Dermal	Shor Dermal	Shor Ingest	Indr Inhal	Swim Extern	Boat Extern	Shor Extern
Silver (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium aluminate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium dichromate	1.25E-03	5.01E-02	3.78E-03	7.76E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium oxalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium sulfamate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfate (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sulfuric acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphate	2.41E-07	1.49E-06	3.87E-10	7.96E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tributyl phosphonate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	3.36E-07	1.55E-05	3.84E-10	7.90E-11	5.97E-04	0.00E+00	0.00E+00	0.00E+00
Uranium (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc (ionic)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.60a. Radionuclide URFs for Agricultural Scenario, Surface Water

Radionuclide	Drink Water	Shwr Dermal	Shwr Ingest	Leafy Veg	Other Veg	Meat Ingest	Milk Ingest	Fish Ingest
AC225	3.60E-07	4.91E-07	1.84E-09	4.73E-08	5.98E-11	1.09E-12	2.02E-11	9.81E-08
AC227	7.67E-06	3.23E-04	3.91E-08	2.68E-06	1.40E-07	2.86E-09	8.48E-08	2.59E-06
AG110M	1.03E-07	1.61E-09	5.25E-10	3.12E-08	1.40E-09	1.89E-09	3.21E-07	3.20E-09
AM241	5.26E-06	8.55E-05	2.68E-08	1.68E-06	8.83E-08	1.22E-10	3.42E-10	1.78E-05
AM243	5.26E-06	8.55E-05	2.68E-08	3.29E-06	1.73E-07	1.50E-10	8.90E-10	1.78E-05
AU195	1.44E-08	4.57E-12	7.33E-11	4.30E-09	1.87E-10	6.89E-10	1.22E-11	6.42E-09
BA133	2.63E-08	1.76E-10	1.34E-10	8.40E-09	4.51E-10	2.61E-11	1.49E-09	7.10E-08
BE10	6.33E-08	3.23E-09	3.23E-10	2.02E-08	1.07E-09	4.19E-10	9.26E-12	1.71E-09
BE7	6.53E-10	9.87E-12	3.33E-12	1.67E-10	4.12E-12	3.03E-12	7.98E-14	1.78E-11
BI210	3.27E-08	5.82E-10	1.67E-10	9.59E-07	3.75E-08	5.67E-09	1.74E-07	7.10E-09
C14	1.97E-08	4.83E-11	1.01E-10	3.32E-08	1.74E-08	2.18E-08	2.75E-08	1.23E-06
CA45	2.17E-08	1.80E-10	1.10E-10	6.49E-09	3.00E-10	9.12E-11	3.32E-08	1.17E-08
CD109	1.73E-07	5.54E-09	8.83E-10	5.43E-08	2.86E-09	6.14E-10	2.76E-08	4.68E-07
CE144	1.36E-07	2.54E-08	6.92E-10	4.15E-08	1.89E-09	6.30E-10	4.26E-10	9.17E-07
CF250	2.89E-05	5.08E-05	1.48E-07	9.24E-06	4.93E-07	9.58E-07	3.52E-09	9.77E-06
CF252	1.47E-05	2.31E-05	7.48E-08	1.10E-05	5.70E-07	4.77E-07	6.66E-08	4.95E-06
CL36	3.95E-08	7.16E-11	2.01E-10	3.69E-07	1.88E-07	9.30E-07	6.48E-07	2.66E-08
CM243	4.16E-06	5.78E-05	2.12E-08	4.62E-06	2.42E-07	2.46E-10	1.44E-08	1.41E-05
CM244	3.51E-06	4.62E-05	1.79E-08	2.73E-06	1.43E-07	9.77E-11	1.15E-08	1.18E-05
CM245	5.26E-06	8.78E-05	2.68E-08	3.38E-06	1.78E-07	2.44E-10	1.74E-08	1.78E-05
CM246	5.26E-06	8.78E-05	2.68E-08	1.68E-06	8.83E-08	1.22E-10	1.71E-08	1.78E-05
CM248	1.99E-05	3.23E-04	1.02E-07	6.37E-06	3.35E-07	4.62E-10	6.48E-08	6.73E-05
CO57	1.27E-08	2.31E-11	6.48E-11	3.88E-09	1.79E-10	1.57E-09	3.98E-09	5.66E-08
CO58	3.49E-08	1.26E-10	1.78E-10	9.40E-09	2.83E-10	3.54E-09	9.89E-09	1.56E-07
CO60	3.29E-07	6.74E-10	1.68E-09	1.05E-07	5.73E-09	4.35E-08	1.06E-07	1.46E-06
CS134	8.98E-07	1.66E-09	4.58E-09	2.83E-07	1.47E-08	1.17E-07	1.01E-06	2.43E-05
CS137	6.14E-07	1.16E-09	3.13E-09	1.99E-07	1.19E-08	8.31E-08	6.99E-07	1.66E-05
ES254	4.26E-06	6.69E-06	2.17E-08	1.22E-05	6.28E-07	9.59E-07	2.39E-08	5.76E-07
EU152	4.60E-08	3.70E-08	2.35E-10	1.47E-08	7.72E-10	1.52E-09	1.49E-10	1.55E-08
EU154	6.58E-08	4.85E-08	3.35E-10	2.09E-08	1.09E-09	2.17E-09	2.13E-10	2.22E-08
EU155	9.86E-09	6.93E-09	5.03E-11	3.13E-09	1.62E-10	3.23E-10	3.19E-11	3.33E-09
FE55	5.92E-09	1.29E-10	3.02E-11	1.87E-09	9.41E-11	7.68E-10	2.38E-10	1.60E-07
GE68	1.91E-08	2.19E-11	9.76E-11	5.97E-09	3.24E-10	2.45E-06	1.51E-09	8.54E-07
H3	1.18E-09	1.46E-12	6.04E-12	4.26E-11	2.22E-11	3.99E-11	1.76E-10	1.60E-11
I129	4.16E-06	5.78E-09	2.12E-08	1.36E-06	8.39E-08	1.99E-07	6.79E-06	2.81E-05
K40	2.41E-07	4.62E-10	1.23E-09	9.42E-08	1.31E-08	4.29E-08	2.87E-07	3.25E-06
KR85	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN54	2.41E-08	2.22E-10	1.23E-10	7.45E-09	3.69E-10	6.07E-11	1.33E-09	1.30E-07
MO93	3.86E-08	4.11E-11	1.97E-10	1.37E-08	8.59E-10	7.03E-09	2.01E-08	5.21E-09
NA22	1.49E-07	2.77E-10	7.60E-10	4.72E-08	2.51E-09	5.36E-08	8.39E-07	2.01E-07
NB93M	3.29E-09	9.24E-11	1.68E-11	1.05E-09	5.53E-11	5.43E-09	1.07E-08	8.88E-09
NB94	4.60E-08	1.94E-09	2.35E-10	1.47E-08	7.87E-10	7.64E-08	1.50E-07	1.24E-07
NB95	1.41E-08	2.13E-10	7.20E-11	3.25E-09	5.45E-11	1.37E-08	3.51E-08	3.85E-08
NI59	1.99E-09	6.24E-12	1.02E-11	6.52E-10	4.15E-11	8.21E-11	3.26E-10	2.69E-09

TABLE A.60a. (contd)

Radionuclide	Drink Water	Shwr Dermal	Shwr Ingest	Leafy Veg	Other Veg	Meat Ingest	Milk Ingest	Fish Ingest
NI63	5.26E-09	1.52E-11	2.68E-11	1.72E-09	1.08E-10	2.16E-10	8.58E-10	7.10E-09
NP237	4.82E-06	1.04E-04	2.46E-08	2.53E-06	1.36E-07	3.67E-09	9.27E-08	1.63E-05
NP239	1.78E-08	8.58E-11	9.07E-11	5.56E-10	1.17E-18	3.20E-14	1.44E-10	6.95E-08
PA231	2.02E-06	2.54E-04	1.03E-08	3.32E-06	1.74E-07	2.99E-09	8.64E-08	2.99E-07
PA233	2.16E-08	0.00E+00	1.10E-10	9.84E-07	5.15E-08	1.90E-09	8.87E-08	3.25E-09
PB210	1.45E-05	2.77E-09	7.38E-08	5.59E-06	2.95E-07	3.50E-08	7.65E-07	1.95E-05
PB212	5.81E-08	8.87E-12	2.97E-10	5.74E-11	0.00E+00	2.02E-24	9.17E-13	1.72E-07
PM147	6.79E-09	4.16E-09	3.46E-11	2.14E-09	1.08E-10	2.20E-10	2.18E-11	2.29E-09
PO210	3.28E-06	4.38E-07	1.67E-08	9.57E-07	3.77E-08	5.67E-09	1.74E-07	2.22E-05
PU238	4.82E-06	7.39E-05	2.46E-08	1.65E-06	8.66E-08	4.80E-10	3.43E-08	1.63E-05
PU239	5.04E-06	8.32E-05	2.57E-08	1.61E-06	8.46E-08	1.67E-11	8.19E-11	1.70E-05
PU240	5.04E-06	8.32E-05	2.57E-08	1.61E-06	8.46E-08	1.67E-11	8.19E-11	1.70E-05
PU241	7.89E-08	1.59E-06	4.02E-10	1.70E-06	8.95E-08	1.22E-10	3.43E-10	2.66E-07
PU242	4.82E-06	7.85E-05	2.46E-08	1.54E-06	8.09E-08	1.60E-11	7.83E-11	1.63E-05
RA223	1.36E-06	2.24E-08	6.94E-09	1.87E-07	2.89E-10	4.70E-10	4.69E-08	1.33E-06
RA224	7.58E-07	7.99E-09	3.86E-09	4.07E-08	3.62E-14	1.66E-11	9.02E-09	7.87E-07
RA225	1.09E-06	2.48E-08	5.57E-09	2.23E-07	7.80E-10	5.33E-10	4.39E-08	1.06E-06
RA226	2.63E-06	1.27E-07	1.34E-08	6.43E-06	3.39E-07	3.94E-08	9.57E-07	2.49E-06
RA228	1.96E-05	1.11E-07	9.98E-08	6.65E-06	3.44E-07	3.29E-08	1.44E-06	1.85E-05
RE187	1.29E-10	3.47E-13	6.59E-13	4.71E-11	5.23E-12	8.33E-12	3.24E-11	2.09E-10
RN222	2.80E-08	0.00E+00	1.43E-10	5.58E-06	2.92E-07	3.50E-08	7.65E-07	0.00E+00
RU103	1.98E-08	1.21E-10	1.01E-10	4.70E-09	8.90E-11	1.63E-10	1.51E-12	2.69E-08
RU106	2.08E-07	2.54E-09	1.06E-09	6.43E-08	3.06E-09	2.62E-09	1.97E-11	2.81E-07
S35	4.80E-09	9.43E-12	2.45E-11	1.40E-09	6.52E-11	2.75E-09	1.06E-08	4.88E-08
SB122	3.86E-08	3.05E-11	1.97E-10	1.43E-09	2.56E-17	7.40E-13	6.45E-11	1.18E-07
SB124	6.32E-08	1.61E-10	3.22E-10	1.65E-08	4.45E-10	3.06E-10	8.75E-10	1.72E-07
SC46	3.49E-08	2.76E-09	1.78E-10	9.64E-09	3.13E-10	2.76E-09	2.53E-11	4.73E-08
SE75	1.27E-07	2.53E-10	6.47E-10	3.65E-08	1.38E-09	1.08E-08	7.59E-08	2.92E-07
SE79	1.18E-07	2.31E-10	6.03E-10	3.81E-08	2.18E-09	1.19E-08	7.70E-08	2.71E-07
SM147	3.51E-07	1.41E-05	1.79E-09	1.12E-07	5.97E-09	1.16E-08	2.85E-09	1.18E-07
SM151	2.41E-09	5.54E-09	1.23E-11	7.71E-10	4.10E-11	7.99E-11	7.83E-12	8.14E-10
SN113	1.90E-08	1.64E-10	9.70E-11	5.45E-09	2.02E-10	8.53E-09	2.84E-09	7.72E-07
SN123	1.14E-07	3.46E-10	5.81E-10	3.30E-08	1.27E-09	5.20E-08	1.71E-08	4.62E-06
SR85	1.68E-08	5.51E-11	8.56E-11	4.55E-09	1.55E-10	2.58E-11	3.54E-09	1.14E-08
SR90	7.89E-07	9.47E-09	4.02E-09	3.23E-07	4.86E-08	2.27E-09	2.03E-07	5.33E-07
TA182	3.72E-08	7.37E-10	1.89E-10	1.07E-08	3.95E-10	1.25E-10	1.66E-11	1.51E-05
TC99	2.85E-08	5.78E-11	1.45E-10	1.31E-08	2.60E-09	2.70E-09	5.05E-08	5.77E-09
TH227	9.68E-08	1.29E-06	4.94E-10	2.14E-07	1.31E-09	7.58E-10	5.16E-08	1.33E-07
TH228	1.21E-06	4.16E-05	6.15E-09	4.37E-07	2.17E-08	7.66E-10	2.01E-08	1.63E-06
TH229	1.95E-06	3.93E-04	9.95E-09	9.89E-07	1.09E-07	1.45E-09	5.46E-08	2.63E-06
TH230	2.85E-07	5.78E-05	1.45E-09	6.52E-06	3.42E-07	3.94E-08	9.58E-07	3.85E-07
TH231	6.32E-09	1.13E-11	3.22E-11	3.32E-06	1.74E-07	2.99E-09	8.64E-08	1.18E-08
TH232	2.63E-07	3.23E-04	1.34E-09	6.74E-06	3.56E-07	3.31E-08	1.45E-06	3.55E-07
TH234	8.64E-08	8.88E-10	4.41E-10	1.29E-07	6.05E-09	4.66E-10	3.42E-08	1.18E-07

TABLE A.60a. (contd)

<u>Radionuclide</u>	<u>Drink Water</u>	<u>Shwr Dermal</u>	<u>Shwr Ingest</u>	<u>Leafy Veg</u>	<u>Other Veg</u>	<u>Meat Ingest</u>	<u>Milk Ingest</u>	<u>Fish Ingest</u>
TL204	3.73E-08	4.62E-11	1.90E-10	1.18E-08	6.01E-10	9.72E-09	1.20E-08	5.03E-08
TM170	7.17E-08	1.50E-09	3.66E-10	2.08E-08	8.02E-10	1.80E-09	5.40E-11	2.43E-08
U232	8.11E-07	6.93E-07	4.14E-09	6.98E-07	3.74E-08	1.86E-09	9.93E-08	5.47E-07
U233	3.51E-07	1.43E-07	1.79E-09	9.81E-07	5.18E-08	1.91E-09	8.88E-08	2.37E-07
U234	3.51E-07	1.41E-07	1.79E-09	1.13E-07	6.21E-09	4.68E-10	3.42E-08	2.37E-07
U235	3.51E-07	1.29E-07	1.79E-09	3.43E-06	1.81E-07	3.46E-09	1.21E-07	2.37E-07
U236	3.29E-07	1.34E-07	1.68E-09	1.06E-07	5.82E-09	4.39E-10	3.21E-08	2.22E-07
U238	6.14E-07	1.27E-07	3.13E-09	6.84E-06	3.60E-07	4.07E-08	1.05E-06	4.14E-07
V49	8.34E-10	8.08E-12	4.25E-12	2.56E-10	1.19E-11	1.20E-11	1.31E-10	1.13E-10
Y88	8.11E-08	6.91E-07	4.14E-10	2.31E-08	8.34E-10	1.35E-10	2.41E-10	2.75E-08
Y90	6.17E-08	8.94E-11	3.15E-10	2.28E-09	4.10E-17	3.55E-13	2.06E-11	2.37E-08
ZN65	1.86E-07	3.74E-10	9.49E-10	5.80E-08	3.23E-09	1.19E-07	2.92E-07	6.29E-06
ZR93	3.73E-09	1.57E-08	1.90E-11	2.24E-09	1.18E-10	5.57E-09	1.07E-08	1.01E-08

TABLE A.60b. Radionuclide URFs for Agricultural Scenario, Surface Water

Radionuclide	Swim Ingest	Swim Dermal	Shor Dermal	Shor Ingest	Indr Inhal	Swim Extern	Boat Extern	Shor Extern
AC225	9.30E-10	1.80E-10	5.73E-12	7.14E-12	0.00E+00	6.07E-12	3.04E-12	1.31E-10
AC227	1.91E-08	3.83E-09	1.11E-06	5.30E-08	0.00E+00	5.77E-14	2.88E-14	7.76E-08
AG110M	2.57E-10	5.13E-11	4.56E-13	4.93E-11	0.00E+00	1.33E-09	6.65E-10	4.83E-08
AM241	1.31E-08	2.63E-09	3.62E-07	3.78E-08	0.00E+00	8.48E-12	4.24E-12	3.82E-10
AM243	1.31E-08	2.63E-09	3.66E-07	3.84E-08	0.00E+00	2.39E-11	1.20E-11	3.79E-08
AU195	3.59E-11	4.31E-12	1.57E-15	5.05E-12	0.00E+00	3.29E-11	1.65E-11	1.29E-09
BA133	6.56E-11	1.31E-11	4.81E-13	1.23E-10	0.00E+00	1.77E-10	8.83E-11	4.25E-08
BE10	1.58E-10	3.16E-11	1.38E-11	4.61E-10	0.00E+00	9.77E-14	4.88E-14	1.41E-10
BE7	1.64E-12	3.26E-13	5.97E-16	6.72E-14	0.00E+00	2.32E-11	1.16E-11	1.66E-10
BI210	8.75E-11	1.63E-11	2.48E-12	3.19E-11	0.00E+00	2.86E-13	1.43E-13	4.79E-13
C14	4.92E-11	9.85E-12	2.06E-13	1.43E-10	0.00E+00	1.98E-15	9.90E-16	5.51E-12
CA45	5.42E-11	1.08E-11	3.31E-14	6.78E-12	0.00E+00	7.60E-15	3.80E-15	1.97E-20
CD109	4.32E-10	8.64E-11	2.90E-11	1.54E-10	0.00E+00	3.06E-12	1.53E-12	7.04E-12
CE144	3.39E-10	6.77E-11	8.13E-12	7.40E-11	0.00E+00	8.14E-12	4.07E-12	8.26E-10
CF250	7.22E-08	1.44E-08	1.50E-07	1.45E-07	0.00E+00	4.78E-14	2.39E-14	1.74E-10
CF252	3.66E-08	7.32E-09	2.46E-08	2.66E-08	0.00E+00	5.32E-14	2.66E-14	6.15E-11
CL36	9.85E-11	1.97E-11	3.07E-13	2.87E-10	0.00E+00	1.96E-13	9.82E-14	2.31E-10
CM243	1.04E-08	2.08E-09	2.07E-07	2.54E-08	0.00E+00	5.87E-11	2.93E-11	1.06E-08
CM244	8.75E-09	1.75E-09	1.51E-07	1.94E-08	0.00E+00	5.19E-14	2.59E-14	1.80E-12
CM245	1.31E-08	2.63E-09	3.78E-07	3.85E-08	0.00E+00	4.00E-11	2.00E-11	4.18E-09
CM246	1.31E-08	2.63E-09	3.75E-07	3.82E-08	0.00E+00	4.71E-14	2.36E-14	2.13E-12
CM248	4.98E-08	9.96E-09	1.38E-06	1.45E-07	0.00E+00	3.59E-14	1.80E-14	1.74E-12
CO57	3.17E-11	2.53E-12	1.76E-14	6.58E-12	0.00E+00	5.66E-11	2.83E-11	1.07E-09
CO58	8.75E-11	1.74E-11	1.01E-14	4.76E-12	0.00E+00	4.65E-10	2.32E-10	4.86E-09
CO60	8.20E-10	6.56E-11	3.16E-12	1.05E-09	0.00E+00	1.23E-09	6.17E-10	2.97E-07
CS134	2.24E-09	4.48E-10	1.40E-12	1.29E-09	0.00E+00	7.43E-10	3.71E-10	8.09E-08
CS137	1.53E-09	3.06E-10	4.18E-12	3.78E-09	0.00E+00	2.34E-10	1.17E-10	1.34E-07
ES254	1.06E-08	2.13E-09	1.03E-08	1.02E-08	0.00E+00	4.31E-10	2.15E-10	2.15E-08
EU152	1.15E-10	2.30E-11	1.11E-10	2.34E-10	0.00E+00	5.53E-10	2.76E-10	1.99E-07
EU154	1.64E-10	3.28E-11	1.22E-10	2.81E-10	0.00E+00	6.00E-10	3.00E-10	1.90E-07
EU155	2.46E-11	4.92E-12	1.24E-11	3.00E-11	0.00E+00	2.54E-11	1.27E-11	1.95E-09
FE55	1.48E-11	2.95E-12	1.41E-13	1.09E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GE68	4.78E-11	9.55E-12	7.12E-15	1.06E-11	0.00E+00	4.51E-10	2.26E-10	2.44E-08
H3	2.95E-12	5.91E-13	4.40E-17	6.08E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I129	1.04E-08	2.08E-09	2.47E-11	3.03E-08	0.00E+00	4.04E-12	2.02E-12	3.24E-10
K40	6.02E-10	1.20E-10	1.98E-12	1.75E-09	0.00E+00	7.83E-11	3.92E-11	4.26E-08
KR85	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-12	5.75E-13	3.54E-10
MN54	6.02E-11	1.20E-11	7.82E-14	1.45E-11	0.00E+00	4.00E-10	2.00E-10	1.89E-08
MO93	9.63E-11	1.93E-11	2.88E-13	2.87E-10	0.00E+00	2.67E-13	1.34E-13	1.83E-09
NA22	3.72E-10	7.44E-11	2.91E-13	2.66E-10	0.00E+00	1.06E-09	5.31E-10	1.40E-07
NB93M	8.21E-12	1.64E-12	2.77E-13	1.67E-11	0.00E+00	7.19E-14	3.59E-14	2.93E-12
NB94	1.15E-10	2.30E-11	8.30E-12	3.35E-10	0.00E+00	7.53E-10	3.76E-10	4.26E-07
NB95	3.56E-11	7.04E-12	8.52E-15	9.61E-13	0.00E+00	3.66E-10	1.83E-10	1.90E-09
NI59	4.98E-12	9.96E-14	2.67E-13	1.45E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE A.60b. (contd)

Radionuclide	Swim Ingest	Swim Dermal	Shor Dermal	Shor Ingest	Indr Inhal	Swim Extern	Boat Extern	Shor Extern
NI63	1.31E-11	2.63E-13	6.19E-13	3.63E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NP237	1.20E-08	2.41E-09	4.45E-07	3.52E-08	0.00E+00	1.04E-11	5.22E-12	6.69E-08
NP239	5.14E-11	8.88E-12	2.64E-16	9.32E-14	0.00E+00	7.70E-11	3.85E-11	1.13E-11
PA231	5.03E-09	1.01E-09	1.37E-06	2.83E-08	0.00E+00	1.71E-11	8.55E-12	2.19E-08
PA233	5.47E-11	1.08E-11	8.32E-16	1.14E-12	0.00E+00	9.26E-11	4.63E-11	2.36E-10
PB210	3.61E-08	2.89E-11	3.83E-09	1.03E-07	0.00E+00	6.78E-13	3.39E-13	3.00E-10
PB212	3.17E-10	1.16E-13	2.42E-15	1.08E-13	0.00E+00	6.51E-11	3.26E-11	5.06E-11
PM147	1.70E-11	3.39E-12	4.40E-12	1.22E-11	0.00E+00	6.34E-15	3.17E-15	1.17E-13
PO210	8.21E-09	1.64E-09	6.83E-11	8.69E-10	0.00E+00	4.07E-15	2.03E-15	8.32E-14
PU238	1.20E-08	2.41E-09	2.98E-07	3.31E-08	0.00E+00	5.12E-14	2.56E-14	2.08E-12
PU239	1.26E-08	2.52E-09	3.56E-07	3.67E-08	0.00E+00	4.34E-14	2.17E-14	1.34E-12
PU240	1.26E-08	2.52E-09	3.56E-07	3.67E-08	0.00E+00	5.02E-14	2.51E-14	2.13E-12
PU241	1.97E-10	3.94E-11	8.34E-09	7.73E-10	0.00E+00	7.33E-16	3.66E-16	4.15E-12
PU242	1.20E-08	2.41E-09	3.36E-07	3.51E-08	0.00E+00	4.21E-14	2.10E-14	1.82E-12
RA223	3.50E-09	6.79E-10	2.97E-13	3.06E-11	0.00E+00	1.35E-10	6.75E-11	5.45E-11
RA224	2.08E-09	3.78E-10	5.62E-14	6.73E-12	0.00E+00	7.87E-10	3.93E-10	4.20E-10
RA225	2.79E-09	5.45E-10	8.90E-12	4.23E-11	0.00E+00	2.93E-12	1.47E-12	1.94E-10
RA226	6.56E-09	1.31E-09	1.49E-09	4.48E-08	0.00E+00	3.14E-12	1.57E-12	4.72E-07
RA228	4.88E-08	9.77E-09	7.47E-08	7.24E-08	0.00E+00	4.68E-10	2.34E-10	5.12E-07
RE187	3.23E-13	6.45E-14	1.48E-15	9.40E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RN222	7.66E-11	1.40E-11	1.79E-12	4.84E-11	1.10E-08	8.61E-10	4.31E-10	2.36E-13
RU103	4.98E-11	9.87E-12	5.42E-15	1.50E-12	0.00E+00	2.07E-10	1.03E-10	1.23E-09
RU106	5.20E-10	1.04E-10	1.05E-12	1.47E-10	0.00E+00	9.50E-11	4.75E-11	5.12E-09
S35	1.20E-11	2.40E-12	9.33E-16	8.08E-13	0.00E+00	2.14E-15	1.07E-15	1.33E-13
SB122	1.09E-10	1.92E-11	1.05E-16	2.27E-13	0.00E+00	2.09E-10	1.05E-10	7.86E-11
SB124	1.59E-10	3.15E-11	1.10E-14	7.33E-12	0.00E+00	8.95E-10	4.48E-10	8.13E-09
SC46	8.75E-11	1.74E-11	2.62E-13	5.63E-12	0.00E+00	9.77E-10	4.88E-10	1.20E-08
SE75	3.17E-10	6.33E-11	3.44E-14	2.92E-11	0.00E+00	1.83E-10	9.17E-11	2.02E-09
SE79	2.95E-10	5.90E-11	9.89E-13	8.60E-10	0.00E+00	2.68E-15	1.34E-15	7.11E-12
SM147	8.75E-10	1.75E-10	6.03E-08	2.55E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SM151	6.02E-12	1.20E-12	2.24E-11	1.66E-11	0.00E+00	3.83E-16	1.92E-16	2.98E-14
SN113	4.76E-11	9.49E-12	2.13E-14	4.20E-12	0.00E+00	1.23E-10	6.16E-11	7.89E-12
SN123	2.85E-10	5.68E-11	5.04E-14	2.82E-11	0.00E+00	3.87E-12	1.93E-12	9.71E-11
SR85	4.21E-11	8.38E-12	4.05E-15	2.10E-12	0.00E+00	2.37E-10	1.19E-10	1.89E-09
SR90	1.97E-09	3.94E-10	3.44E-11	5.25E-09	0.00E+00	4.41E-13	2.20E-13	2.98E-09
TA182	9.30E-11	1.85E-11	9.58E-14	8.21E-12	0.00E+00	6.27E-10	3.14E-10	9.80E-09
TC99	7.11E-11	1.42E-11	2.47E-13	2.07E-10	0.00E+00	1.42E-14	7.09E-15	4.74E-14
TH227	2.46E-10	4.83E-11	2.82E-11	5.38E-11	0.00E+00	4.85E-11	2.42E-11	1.52E-10
TH228	3.01E-09	6.01E-10	3.26E-08	2.89E-09	0.00E+00	8.92E-13	4.46E-13	1.60E-07
TH229	4.87E-09	9.74E-10	1.68E-06	2.50E-08	0.00E+00	3.87E-11	1.93E-11	1.03E-07
TH230	7.11E-10	1.42E-10	2.47E-07	2.19E-09	0.00E+00	1.78E-13	8.89E-14	1.54E-09
TH231	2.19E-11	3.16E-12	1.21E-13	2.03E-14	0.00E+00	5.32E-12	2.66E-12	5.26E-14
TH232	6.56E-10	1.31E-10	1.46E-06	8.48E-08	0.00E+00	8.95E-14	4.48E-14	5.19E-07
TH234	2.19E-10	4.31E-11	2.46E-14	4.05E-12	0.00E+00	3.73E-12	1.87E-12	2.55E-11

TABLE A.60b. (contd)

Radionuclide	Swim Ingest	Swim Dermal	Shor Dermal	Shor Ingest	Indr Inhal	Swim Extern	Boat Extern	Shor Extern
TL204	9.30E-11	1.86E-11	6.73E-14	9.22E-11	0.00E+00	5.53E-13	2.76E-13	2.34E-11
TM170	1.79E-10	3.58E-11	2.18E-13	1.78E-11	0.00E+00	2.25E-12	1.13E-12	6.88E-11
U232	2.02E-09	4.05E-10	1.40E-07	1.76E-08	0.00E+00	1.45E-13	7.27E-14	6.72E-07
U233	8.75E-10	1.75E-10	1.81E-09	2.57E-09	0.00E+00	1.64E-13	8.21E-14	7.62E-11
U234	8.75E-10	1.75E-10	6.03E-10	2.55E-09	0.00E+00	7.90E-14	3.95E-14	2.37E-12
U235	8.75E-10	1.75E-10	7.57E-10	2.62E-09	0.00E+00	1.02E-10	5.09E-11	1.91E-08
U236	8.20E-10	1.64E-10	5.74E-10	2.39E-09	0.00E+00	5.22E-14	2.61E-14	1.89E-12
U238	1.53E-09	3.06E-10	5.48E-10	5.10E-09	0.00E+00	3.59E-14	1.80E-14	6.84E-09
V49	2.08E-12	4.16E-13	3.01E-15	5.28E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y88	2.03E-10	4.05E-11	8.36E-11	1.67E-11	0.00E+00	1.34E-09	6.71E-10	2.38E-08
Y90	1.75E-10	3.08E-11	3.09E-16	3.63E-13	0.00E+00	1.64E-12	8.19E-13	1.30E-12
ZN65	4.65E-10	5.57E-11	1.72E-13	8.71E-11	0.00E+00	2.84E-10	1.42E-10	1.01E-08
ZR93	9.30E-12	1.86E-12	6.74E-11	3.43E-11	0.00E+00	0.00E+00	0.00E+00	1.26E-12

APPENDIX B

POLLUTANT-SPECIFIC PARAMETERS

APPENDIX B

POLLUTANT-SPECIFIC PARAMETERS

This appendix presents the pollutant-specific parameters used in the development of the unit risk factors. The parameter values are presented in tables for chemicals and radionuclides. References are given for all values based on the reference index system developed for the MEPAS chemical database. The reference citations are given at the end of this appendix, keyed to the MEPAS reference numbers given in the tables.

The chemical toxicity parameters are given in Table B.1, with parameters described as follows.

- Oral Slope Factor: slope factor for estimation of cancer incidence for ingestion and dermal exposure pathways (risk per mg/kg/d)
- Inhalation Slope Factor: slope factor for estimation of cancer incidence for inhalation exposure pathways (risk per mg/kg/d)
- Oral Reference Dose: reference dose for calculation of hazard indices for ingestion and dermal exposure pathways (mg/kg/d)
- Inhalation Reference Dose: reference dose for calculation of hazard indices for inhalation exposure pathways (mg/kg/d).

The radionuclide slope factors are given in Table B.2, with parameters described as follows.

- Oral Slope Factor: slope factor for estimation of cancer incidence for ingestion of radionuclides (risk/pCi ingested)
- Inhalation Slope Factor: slope factor for estimation of cancer incidence for inhalation of radionuclides (risk/pCi inhaled)
- External Slope Factor: slope factor for estimation of cancer incidence for exposure to external radiation normalized to activity in an infinite slab of uniformly contaminated soil (risk/yr per pCi/g)

The food chain transfer factors for chemicals are given in Table B.3 and for radionuclides in Table B.4. The parameters in these tables are described as follows.

- Plant Concentration Ratio: ratio of pollutant concentration in plants relative to the concentration in soil (for chemicals, mg/kg wet-weight plant per mg/kg dry soil, and for radionuclides pCi/kg wet-weight plant per pCi/kg dry soil)
- Meat Transfer Factor: factor to estimate meat concentration from constant intake of a pollutant in animal feed or water (for chemicals, mg/kg wet-weight meat per mg/d intake, and for radionuclides, pCi/kg wet-weight meat per pCi/d intake)
- Milk Transfer Factor: factor to estimate milk concentration from constant intake of a pollutant in animal feed or water (for chemicals, mg/L milk per mg/d intake, and for radionuclides, pCi/L milk per pCi/d intake)
- Fish Bioaccumulation Factor: ratio of pollutant concentration in edible parts of fish relative to the concentration in surface water (for chemicals, mg/kg wet-weight fish per mg/L water, and for radionuclides, pCi/kg wet-weight fish per pCi/L water).

TABLE B.1. Chemical Toxicity Parameters

Chemical Name	CAS No.	Oral		Inhalation		Oral		Inhalation	
		Slope Factor	Ref No.	Slope Factor	Ref No.	Reference Dose	Ref No.	Reference Dose	Ref No.
		kg/d/mg		kg/d/mg		mg/kg/d		mg/kg/d	
Aluminum fluoride	7784181	0.00e+00	1	0.00e+00	1	4.10e-03	442	4.40e-02	443
Aluminum nitrate	13473900	0.00e+00	1	0.00e+00	1	1.10e-02	338	1.10e-02	427
Aluminum (ionic)	7429905	0.00e+00	1	0.00e+00	1	4.00e-04	400	1.40e-02	342
Ammonium carbonate	506876	0.00e+00	1	0.00e+00	1	4.00e-02	444	4.00e-02	334
Ammonium nitrate	6484522	0.00e+00	1	0.00e+00	1	9.00e-02	445	9.00e-02	334
Beryllium (ionic)	7440417	4.30e+00	404	8.40e+00	404	5.00e-03	404	0.00e+00	1
Butyl phosphates	12788931	0.00e+00	1	0.00e+00	1	6.60e-02	438	6.60e-02	334
Cadmium (ionic)	7440439	6.30e+00	338	6.30e+00	404	5.00e-04	404	5.00e-04	334
Calcium (ionic)	7440702	0.00e+00	1	0.00e+00	1	1.70e+01	429	1.70e+01	334
Calcium nitrate	10124375	0.00e+00	1	0.00e+00	1	3.70e-01	430	3.70e-01	334
Carbon tetrachloride	56235	1.30e-01	404	5.30e-02	404	7.00e-04	404	7.00e-04	334
Copper sulfate	7758987	0.00e+00	1	0.00e+00	1	1.20e-02	431	1.70e-02	432
Copper (ionic)	7440508	0.00e+00	1	0.00e+00	1	3.00e-04	404	1.00e-02	276
Dibutyl phosphonate	1809194	0.00e+00	1	0.00e+00	1	1.30e-01	451	1.30e-01	334
Ferric nitrate	10421484	0.00e+00	1	0.00e+00	1	3.00e-02	338	3.00e-02	434
Ferrocyanide (ionic)	13943583	0.00e+00	1	0.00e+00	1	1.50e-01	435	1.50e-01	334
Ferrous nitrate	13520688	0.00e+00	1	0.00e+00	1	2.30e-02	338	2.30e-02	437
Fluoride (ionic)	7782414	0.00e+00	1	0.00e+00	1	6.00e-02	404	6.00e-02	334
Iron (as ferric ion)	15438310	0.00e+00	1	0.00e+00	1	1.30e+00	386	8.60e-03	289
Lead (ionic)	7439921	0.00e+00	1	0.00e+00	1	1.40e-03	321	4.30e-04	291
Magnesium nitrate	10377603	0.00e+00	1	0.00e+00	1	1.90e+00	449	1.90e+00	334
Mercury (ionic)	7439976	0.00e+00	1	0.00e+00	1	3.00e-04	314	8.60e-05	314
Methyl isobutyl ketone	108101	0.00e+00	1	0.00e+00	1	5.00e-02	400	5.00e-02	334
Nickel (ionic)	7440020	0.00e+00	1	8.40e-01	404	2.00e-02	404	0.00e+00	1
Nitrate	14797558	0.00e+00	1	0.00e+00	1	1.60e+00	404	1.60e+00	334
Nitrite	NITRITE	0.00e+00	1	0.00e+00	1	3.40e-02	338	3.40e-02	339
Oxalate (ionic)	144627	0.00e+00	1	0.00e+00	1	3.00e-01	446	7.00e-03	448
Phosphate (ionic)	7601549	0.00e+00	1	0.00e+00	1	4.60e-01	340	7.00e-03	340
Potassium borate	7632044	0.00e+00	1	0.00e+00	1	9.00e-02	420	9.00e-02	334
Silver (ionic)	7440224	0.00e+00	1	0.00e+00	1	5.00e-03	404	5.00e-03	334
Sodium (ionic)	7647145	0.00e+00	1	0.00e+00	1	3.00e+02	377	3.00e+02	334
Sodium aluminate	1302427	0.00e+00	1	0.00e+00	1	4.30e-02	338	4.30e-02	440
Sodium dichromate	10588019	4.10e+01	338	4.10e+01	404	5.00e-03	404	5.70e-07	400
Sodium oxalate	62760	0.00e+00	1	0.00e+00	1	6.00e-02	447	7.00e-03	446
Sodium sulfamate	5329146	0.00e+00	1	0.00e+00	1	2.00e-01	420	2.00e-01	334
Sulfate (ionic)	12808798	0.00e+00	1	0.00e+00	1	7.10e+01	379	7.00e-02	339
Sulfuric acid	7664939	0.00e+00	1	0.00e+00	1	7.00e-03	338	7.00e-03	339
Tributyl phosphate	126738	7.90e-03	404	0.00e+00	1	1.75e-02	338	1.75e-02	339
Tributyl phosphonate	78466	0.00e+00	1	0.00e+00	1	1.20e-01	453	1.20e-01	334
Trichloroethylene	79016	1.10e-02	404	1.30e-02	404	0.00e+00	1	0.00e+00	1
Uranium (ionic)	7440611	0.00e+00	1	0.00e+00	1	1.40e-03	338	1.40e-03	339
Zinc (ionic)	7646857	0.00e+00	1	0.00e+00	1	3.00e-01	404	3.00e-01	334

TABLE B.2. Radionuclide Slope Factors and Dermal Dose Factors

Radio-nuclide	Oral Slope Factor risk/pCi	Ref. No.	Inhalation Slope Factor risk/pCi	Ref. No.	External Slope Factor risk/yr per pCi/g	Ref. No.	Dermal Dose Factor rem/pCi	Ref. No.
AC225	1.70E-11	393	2.40E-09	393	6.30E-07	393	2.20E-05	398
AC227	3.50E-10	393	8.80E-08	393	8.50E-07	393	1.40E-02	398
AG110M	4.70E-12	419	6.90E-11	419	9.30E-06	419	7.00E-08	425
AM241	2.40E-10	393	3.20E-08	393	4.90E-09	393	3.70E-03	398
AM243	2.40E-10	393	3.20E-08	393	2.50E-07	393	3.70E-03	398
AU195	8.49E-13	500	8.12E-12	500	3.68E-07	500	3.30E-10	425
BA133	1.20E-12	419	3.60E-12	419	8.40E-07	419	7.60E-09	425
BE10	2.89E-12	500	2.19E-10	500	1.79E-09	500	1.40E-07	398
BE7	3.00E-14	393	2.70E-13	393	1.50E-07	393	4.30E-10	425
BI210	1.60E-02	419	8.00E-11	419	0.00E+00	NDF	2.70E-08	425
CL36	1.80E-12	393	1.40E-12	393	2.92E-09	500	3.10E-09	398
C14	9.00E-13	393	6.40E-15	393	6.98E-11	500	2.09E-09	398
CA45	9.90E-13	419	5.10E-12	419	5.80E-18	419	7.80E-09	425
CD109	7.90E-12	419	6.50E-11	419	7.30E-10	419	2.40E-07	425
CE144	6.20E-12	393	3.40E-10	393	1.40E-07	393	1.10E-06	398
CF250	7.32E-10	500	1.04E-07	500	2.56E-09	500	2.20E-03	425
CF252	3.97E-10	500	9.05E-08	500	2.36E-09	500	1.00E-03	425
CM243	1.90E-10	393	2.60E-08	393	1.60E-07	393	2.50E-03	398
CM244	1.60E-10	393	2.20E-08	393	3.00E-11	393	2.00E-03	398
CM245	2.40E-10	393	3.20E-08	393	5.30E-08	393	3.80E-03	398
CM246	2.40E-10	419	3.20E-08	419	2.70E-11	419	3.80E-03	425
CM248	9.10E-10	419	1.20E-07	419	2.20E-11	419	1.40E-02	425
CO57	5.80E-13	393	8.20E-12	393	1.90E-07	393	2.50E-09	398
CO58	1.60E-12	419	9.80E-12	419	3.30E-06	419	5.50E-09	398
CO60	1.50E-11	393	1.50E-10	393	8.60E-06	393	7.30E-08	398
CS134	4.10E-11	393	2.80E-11	393	5.20E-06	393	7.20E-08	398
CS137	2.80E-11	393	1.90E-11	393	2.00E-06	393	5.00E-08	398
ES254	1.22E-10	500	1.62E-08	500	4.34E-08	500	2.90E-04	425
EU152	2.10E-12	393	1.10E-10	393	3.60E-06	393	1.60E-06	398
EU154	3.00E-12	393	1.40E-10	393	4.10E-06	393	2.10E-06	398
EU155	4.50E-13	393	1.80E-11	393	5.90E-08	393	3.00E-07	398
FE55	2.70E-13	419	8.40E-13	419	8.05E-10	500	5.60E-09	425
GE68	6.70E-13	500	3.19E-11	500	4.27E-09	500	9.50E-10	425
H3	5.40E-14	393	7.80E-14	393	0.00E+00	NDF	0.00E+00	NDF
I129	1.90E-10	393	1.20E-10	393	4.10E-09	393	2.50E-07	398
K40	1.10E-11	393	7.60E-12	393	5.40E-07	393	2.00E-08	398
KR85	0.00E+00	NDF	4.70E-17	393	7.00E-09	393	0.00E+00	NDF
MN54	1.10E-12	393	5.30E-12	393	2.90E-06	393	9.60E-09	398
MO93	5.41E-13	500	1.75E-11	500	2.16E-08	500	1.78E-09	425
NA22	6.80E-12	393	4.80E-12	393	7.20E-06	393	1.20E-08	398
NB93M	1.50E-13	393	1.90E-11	393	5.30E-11	393	4.00E-09	398
NB94	2.10E-12	419	2.10E-10	419	8.40E-08	398	5.40E-06	419
NB95	6.50E-13	393	5.10E-12	393	2.60E-06	393	9.30E-09	398
NI59	9.10E-14	393	7.00E-13	393	0.00E+00	NDF	2.70E-09	398
NI63	2.40E-13	393	1.80E-12	393	0.00E+00	NDF	6.60E-09	398
NP237	2.20E-10	393	2.90E-08	393	4.30E-07	393	4.50E-03	398
NP239	9.40E-13	419	1.60E-12	419	2.30E-07	419	4.30E-09	425
PA231	9.20E-11	393	3.60E-08	393	2.60E-08	393	1.10E-02	398
PA233	1.00E-12	393	8.60E-12	393	4.20E-07	393	0.00E+00	NDF
PB210	6.60E-10	393	4.00E-09	393	1.60E-10	393	3.00E-05	398
PB212	5.80E-12	393	5.00E-11	393	5.50E-06	393	2.10E-07	398
PM147	3.10E-13	419	3.00E-11	419	6.00E-12	419	1.80E-07	425
PO210	1.50E-10	393	2.60E-09	393	2.90E-11	393	1.90E-05	398
PO210	1.50E-10	393	2.60E-09	393	2.90E-11	393	1.90E-05	398
PU238	2.20E-10	393	3.90E-08	393	2.80E-11	393	3.20E-03	398
PU239	2.30E-10	393	3.80E-08	393	1.70E-11	393	3.60E-03	398

TABLE B.2. (contd)

Radio-nuclide	Oral Slope Factor risk/pCi	Ref. No.	Inhalation Slope Factor risk/pCi	Ref. No.	External Slope Factor risk/yr per pCi/g	Ref. No.	Dermal Dose Factor rem/pCi	Ref. No.
PU240	2.30E-10	393	3.80E-08	393	2.70E-11	393	3.60E-03	398
PU241	3.60E-12	393	2.30E-10	393	8.38E-12	500	6.90E-05	398
PU242	2.20E-10	419	3.60E-08	419	2.30E-11	419	3.40E-03	398
RA223	6.40E-11	393	3.10E-09	393	2.30E-07	393	1.00E-06	398
RA224	3.80E-11	419	1.20E-09	419	2.30E-08	419	3.80E-07	398
RA225	5.10E-11	393	1.50E-09	393	1.90E-09	393	1.10E-06	398
RA226	1.20E-10	393	3.00E-09	393	6.00E-06	393	5.50E-06	398
RA228	6.32E-10	500	2.66E-09	500	2.46E-15	500	4.80E-06	398
RE187	9.92E-15	500	3.63E-14	500	0.00E+00	NDF	1.50E-11	425
RN222	1.40E-12	419	7.30E-13	419	1.20E-09	419	0.00E+00	NDF
RU103	9.10E-13	393	8.40E-12	393	1.50E-06	393	5.30E-09	398
RU106	9.50E-12	393	4.40E-10	393	6.70E-07	393	0.00E+00	NDF
S35	2.20E-13	393	1.90E-13	393	7.30E-11	500	4.10E-10	398
SB122	2.00E-12	419	3.40E-12	419	1.40E-06	419	1.50E-09	398
SB124	2.90E-12	419	2.20E-11	419	6.50E-06	419	7.00E-09	398
SC46	1.60E-12	419	2.70E-11	419	6.90E-06	419	1.20E-07	425
SE75	5.80E-12	419	6.00E-12	419	8.10E-07	419	1.10E-08	398
SE79	0.00E+00	NDF	0.00E+00	NDF	1.00E-08	398	0.00E+00	NDF
SM147	1.60E-11	419	7.20E-09	419	0.00E+00	NDF	6.10E-04	398
SM151	1.10E-13	393	8.70E-12	393	4.00E-13	393	2.40E-07	398
SN113	8.70E-13	419	9.40E-12	419	3.30E-09	419	7.10E-09	425
SN123	7.44E-12	500	2.11E-11	500	2.41E-08	500	1.50E-08	425
SR85	7.70E-13	419	1.00E-12	419	1.40E-06	419	2.40E-09	398
SR90	3.60E-11	393	6.20E-11	393	2.18E-08	500	4.10E-07	398
TA182	1.70E-12	419	4.30E-11	419	4.10E-06	419	3.20E-08	425
TC99	1.30E-12	393	8.30E-12	393	6.00E-13	393	2.50E-09	398
TH227	4.50E-12	393	4.90E-09	393	1.60E-07	393	5.70E-05	398
TH228	5.50E-11	393	7.80E-08	393	5.56E-06	393	1.80E-03	398
TH229	8.90E-11	393	7.70E-08	393	6.80E-07	393	1.70E-02	398
TH230	1.30E-11	393	2.90E-08	393	2.50E-03	398	5.40E-11	393
TH231	4.00E-13	419	4.90E-13	419	2.30E-09	419	6.80E-10	398
TH232	1.20E-11	393	2.80E-08	393	1.40E-02	398	2.60E-11	393
TH234	4.00E-12	393	3.20E-11	393	5.10E-08	393	3.90E-08	398
TL204	1.70E-12	419	1.30E-12	419	8.70E-10	419	2.00E-09	425
TM170	4.75E-12	500	1.64E-11	500	2.31E-08	500	6.50E-08	425
U232	3.70E-11	419	6.00E-08	419	4.60E-11	419	3.00E-05	398
U233	1.60E-11	393	2.70E-08	393	4.20E-11	393	6.20E-06	398
U234	1.60E-11	393	2.60E-08	393	3.00E-11	393	6.10E-06	398
U235	1.60E-11	393	2.50E-08	393	2.40E-07	393	5.60E-06	398
U238	2.80E-11	393	5.20E-08	393	3.60E-08	393	5.50E-06	398
V49	5.37E-14	500	2.17E-13	500	2.81E-10	500	3.50E-10	425
Y88	3.71E-12	500	1.74E-11	500	1.07E-05	500	3.00E-05	425
Y90	3.20E-12	393	5.50E-12	393	2.31E-08	500	4.40E-09	398
ZN65	8.50E-12	393	1.60E-11	393	2.00E-06	393	2.70E-08	398
ZR93	1.70E-13	393	6.50E-12	393	0.00E+00	NV	6.80E-07	398

TABLE B.3. Food Chain Transfer Factors for Chemicals

Chemical Name	CAS No.	Plant CR	Ref	Meat TF	Ref	Milk TF	Ref	Fish BCF	Ref
Aluminum fluoride	7784181	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV
Aluminum nitrate	13473900	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV
Aluminum (ionic)	7429905	1.80e-04	152	1.50e-03	152	5.00e-04	152	1.00e+01	152
Ammonium carbonate	506876	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV
Ammonium nitrate	6484522	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV
Beryllium (ionic)	7440417	4.70e-04	95	8.00e-04	95	2.00e-06	95	1.90e+01	245
Butyl phosphates	12788931	7.13e+00	501	4.27e-08	502	1.35e-08	503	1.62e+00	504
Cadmium (ionic)	7440439	3.75e-02	402	5.50e-04	402	1.00e-03	402	2.00e+02	402
Calcium carbonate	471341	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV
Calcium (ionic)	7440702	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV
Calcium nitrate	10124375	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV
Carbon tetrachloride	56235	3.81e+00	501	1.26e-07	502	3.99e-08	503	1.50e+02	246
Chromium IV (ionic)	7440473	1.13e-03	402	5.50e-03	402	1.50e-03	402	2.00e+02	402
Copper sulfate	7758987	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV
Copper (ionic)	7440508	6.25e-02	402	1.00e-02	402	1.50e-03	402	5.00e+01	402
Dibutyl phosphonate	1809194	8.66e-01	501	1.64e-06	502	5.18e-07	503	7.33e+00	504
Ferric nitrate	10421484	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV
Ferrocyanide (ionic)	13943583	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV
Ferrous nitrate	13520688	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV
Fluoride (ionic)	7782414	2.00e-02	95	2.00e-02	95	7.00e-03	95	1.00e+01	95
Iron (as ferric ion)	15438310	2.50e-04	402	2.00e-02	402	2.50e-04	402	2.00e+03	402
Lead (ionic)	7439921	8.00e-04	402	3.00e-04	402	2.50e-04	402	1.00e+02	402
Magnesium (ionic)	7786303	1.38e-01	402	5.00e-03	402	4.00e-03	402	5.00e+01	402
Magnesium nitrate	10377603	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV
Mercury (ionic)	7439976	5.00e-02	402	2.50e-01	402	4.50e-04	402	1.00e+03	402
Methyl isobutyl ketone	108101	6.60e+00	501	4.87e-08	502	1.54e-08	503	1.83e+00	504
Nickel (ionic)	7440020	1.50e-02	402	6.00e-03	402	1.00e-03	402	1.00e+02	402
Nitrate	14797558	7.50e+00	402	7.50e-02	402	2.50e-02	402	1.50e+05	402
Nitric acid	7697372	7.50e+00	402	7.50e-02	402	2.50e-02	402	1.50e+05	402
Nitrite	NITRITE	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV
Oxalate (ionic)	144627	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV
Phosphate (ionic)	7601549	8.75e-01	402	5.50e-02	402	1.50e-02	402	7.00e+04	402
Potassium (ionic)	7447407	1.38e-01	402	2.00e-02	402	7.00e-03	402	1.00e+03	402
Potassium borate	7632044	1.20e-01	152	8.00e-04	152	2.70e-03	152	2.20e-01	152
Silver (ionic)	7440224	3.25e-04	402	3.00e-03	402	2.00e-02	402	2.30e+00	402
Sodium (ionic)	7647145	1.38e-02	402	5.50e-02	402	3.50e-02	402	1.00e+02	402
Sodium aluminate	1302427	1.80e-04	152	1.50e-03	152	5.00e-04	152	1.00e+01	152
Sodium dichromate	10588019	1.13e-03	402	5.50e-03	402	1.50e-03	402	2.00e+02	402
Sodium oxalate	62760	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV
Sodium sulfamate	5329146	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV
Sulfate (ionic)	12808798	3.75e-01	402	1.00e-01	402	1.50e-02	402	7.50e+02	402
Sulfuric acid	7664939	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV
Tributyl phosphate	126738	3.43e+00	501	1.51e-07	502	4.79e-08	503	5.13e+00	504
Tributyl phosphonate	78466	7.03e+00	501	4.37e-08	502	1.38e-08	503	1.66e+00	504
Trichloroethylene	79016	8.47e+00	501	3.16e-08	502	1.00e-08	503	1.10e+01	161
Uranium (ionic)	7440611	3.50e-03	402	2.00e-04	402	6.00e-04	402	5.00e+01	402
Zinc (ionic)	7646857	1.48e-01	402	1.00e-01	402	1.00e-02	402	2.50e+03	402

TABLE B.4. Food Chain Transfer Factors for Radionuclides

Radio-nuclide	Plant CR	Ref	Meat TF	Ref	Milk TF	Ref	Fish BCF	Ref
AC225	6.76e-01	402	2.51e-06	402	7.94e-07	402	1.95e+01	402
AC227	8.75e-05	402	2.50e-05	402	2.00e-05	402	2.50e+01	402
AG110M	3.25e-04	402	3.00e-03	402	2.00e-02	402	2.30e+00	402
AM241	1.03e-04	402	3.50e-06	402	4.00e-07	402	2.50e+02	402
AM243	1.03e-04	402	3.50e-06	402	4.00e-07	402	2.50e+02	402
AU195	2.00e-02	402	8.00e-03	402	5.50e-06	402	3.30e+01	402
BA133	3.75e-03	402	1.50e-04	402	3.50e-04	402	2.00e+02	402
BE10	3.75e-04	402	1.00e-03	402	9.00e-07	402	2.00e+00	402
BE7	3.75e-04	402	1.00e-03	402	9.00e-07	402	2.00e+00	402
BI210	8.00e-04	402	4.00e-04	402	5.00e-04	402	1.50e+01	402
CL36	1.75e+01	402	8.00e-02	402	1.50e-02	402	5.00e+01	402
C14	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	4.60e+03	95
CA45	8.75e-02	402	7.00e-04	402	1.00e-02	402	4.00e+01	402
CD109	3.75e-02	402	5.50e-04	402	1.00e-03	402	2.00e+02	402
CE144	1.00e-03	402	7.50e-04	402	2.00e-05	402	5.00e+02	402
CF250	2.50e-03	402	5.00e-03	402	7.50e-07	402	2.50e+01	402
CF252	2.50e-03	402	5.00e-03	402	7.50e-07	402	2.50e+01	402
CM243	6.00e-05	402	3.50e-06	402	2.00e-05	402	2.50e+02	402
CM244	6.00e-05	402	3.50e-06	402	2.00e-05	402	2.50e+02	402
CM245	6.00e-05	402	3.50e-06	402	2.00e-05	402	2.50e+02	402
CM246	6.00e-05	402	3.50e-06	402	2.00e-05	402	2.50e+02	402
CM248	6.00e-05	402	3.50e-06	402	2.00e-05	402	2.50e+02	402
CO57	1.00e-02	402	2.00e-02	402	2.00e-03	402	3.30e+02	402
CO58	1.00e-02	402	2.00e-02	402	2.00e-03	402	3.30e+02	402
CO60	1.00e-02	402	2.00e-02	402	2.00e-03	402	3.30e+02	402
CS134	1.23e-02	402	2.00e-02	402	7.00e-03	402	2.00e+03	402
CS137	1.23e-02	402	2.00e-02	402	7.00e-03	402	2.00e+03	402
ES254	2.50e-03	402	2.00e-04	402	5.00e-06	402	1.00e+01	402
EU152	1.00e-03	402	5.00e-03	402	2.00e-05	402	2.50e+01	402
EU154	1.00e-03	402	5.00e-03	402	2.00e-05	402	2.50e+01	402
EU155	1.00e-03	402	5.00e-03	402	2.00e-05	402	2.50e+01	402
FE55	2.50e-04	402	2.00e-02	402	2.50e-04	402	2.00e+03	402
GE68	1.00e-01	152	2.00e+01	152	5.00e-04	152	3.30e+03	152
H3	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	1.00e+00	95
I129	1.25e-02	402	7.00e-03	402	1.00e-02	402	5.00e+02	402
K40	1.38e-01	402	2.00e-02	402	7.00e-03	402	1.00e+03	402
KR85	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV	0.00e+00	NV
MN54	3.75e-02	402	4.00e-04	402	3.50e-04	402	4.00e+02	402
MO93	1.50e-02	402	6.00e-03	402	1.50e-03	402	1.00e+01	402
NA22	1.38e-02	402	5.50e-02	402	3.50e-02	402	1.00e+02	402
NB93M	1.25e-03	402	2.50e-01	402	2.00e-02	402	2.00e+02	402
NB94	1.25e-03	402	2.50e-01	402	2.00e-02	402	2.00e+02	402
NB95	1.25e-03	402	2.50e-01	402	2.00e-02	402	2.00e+02	402
NI59	1.50e-02	402	6.00e-03	402	1.00e-03	402	1.00e+02	402
NI63	1.50e-02	402	6.00e-03	402	1.00e-03	402	1.00e+02	402
NP237	2.35e-03	402	5.50e-05	402	5.00e-06	402	2.50e+02	402
NP239	2.35e-03	402	2.00e-04	402	6.00e-04	402	2.50e+02	402
PA231	6.25e-05	402	1.00e-05	402	5.00e-06	402	1.10e+01	402
PA233	6.25e-05	402	1.00e-05	402	5.00e-06	402	1.10e+01	402
PB210	8.00e-04	402	3.00e-04	402	2.50e-04	402	1.00e+02	402
PB212	8.00e-04	402	3.00e-04	402	2.50e-04	402	1.00e+02	402
PM147	1.00e-03	402	5.00e-03	402	2.00e-05	402	2.50e+01	402
PO210	2.25e-03	402	3.00e-04	402	3.50e-04	402	5.00e+02	402
PU238	5.00e-05	402	5.00e-07	402	1.00e-07	402	2.50e+02	402
PU239	5.00e-05	402	5.00e-07	402	1.00e-07	402	2.50e+02	402
PU240	5.00e-05	402	5.00e-07	402	1.00e-07	402	2.50e+02	402
PU241	5.00e-05	402	5.00e-07	402	1.00e-07	402	2.50e+02	402

TABLE B.4. (contd)

<u>Radio-nuclide</u>	<u>Plant CR</u>	<u>Ref</u>	<u>Meat TF</u>	<u>Ref</u>	<u>Milk TF</u>	<u>Ref</u>	<u>Fish BCF</u>	<u>Ref</u>
PU242	5.00E-05	402	5.00E-07	402	1.00E-07	402	2.50E+02	402
RA223	8.00E-04	402	2.50E-04	402	4.50E-04	402	7.00E+01	402
RA224	8.00E-04	402	2.50E-04	402	4.50E-04	402	7.00E+01	402
RA225	8.00E-04	402	2.50E-04	402	4.50E-04	402	7.00E+01	402
RA226	8.00E-04	402	2.50E-04	402	4.50E-04	402	7.00E+01	402
RA228	8.00E-04	402	2.50E-04	402	4.50E-04	402	7.00E+01	402
RE187	8.75E-02	402	8.00E-03	402	1.50E-03	402	1.20E+02	402
RN222	0.00E+00	NV	0.00E+00	NV	0.00E+00	NV	0.00E+00	NV
RU103	5.00E-03	402	2.00E-03	402	6.00E-07	402	1.00E+02	402
RU106	5.00E-03	402	2.00E-03	402	6.00E-07	402	1.00E+02	402
S35	3.75E-01	402	1.00E-01	402	1.50E-02	402	7.50E+02	402
SB122	1.40E-04	402	1.00E-03	402	1.00E-04	402	2.00E+02	402
SB124	1.40E-04	402	1.00E-03	402	1.00E-04	402	2.00E+02	402
SC46	2.50E-04	402	1.50E-02	402	5.00E-06	402	1.00E+02	402
SE75	6.25E-03	402	1.50E-02	402	4.00E-03	402	1.70E+02	402
SE79	6.25E-03	402	1.50E-02	402	4.00E-03	402	1.70E+02	402
SM147	1.00E-03	402	5.00E-03	402	5.00E-05	402	2.50E+01	402
SM151	1.00E-03	402	5.00E-03	402	2.00E-05	402	2.50E+01	402
SN113	1.50E-03	402	8.00E-02	402	1.00E-03	402	3.00E+03	402
SN123	1.50E-03	402	8.00E-02	402	1.00E-03	402	3.00E+03	402
SR85	2.03E-01	402	3.00E-04	402	1.50E-03	402	5.00E+01	402
SR90	2.03E-01	402	3.00E-04	402	1.50E-03	402	5.00E+01	402
TA182	6.25E-04	402	6.00E-04	402	3.00E-06	402	3.00E+04	402
TC99	2.75E-01	402	8.50E-03	402	1.00E-02	402	1.50E+01	402
TH227	3.00E-05	402	6.00E-06	402	5.00E-06	402	1.00E+02	402
TH228	3.00E-05	402	6.00E-06	402	5.00E-06	402	1.00E+02	402
TH229	3.00E-05	402	6.00E-06	402	5.00E-06	402	1.00E+02	402
TH230	3.00E-05	402	6.00E-06	402	5.00E-06	402	1.00E+02	402
TH231	3.00E-05	402	6.00E-06	402	5.00E-06	402	1.00E+02	402
TH232	3.00E-05	402	6.00E-06	402	5.00E-06	402	1.00E+02	402
TH234	3.00E-05	402	6.00E-06	402	5.00E-06	402	1.00E+02	402
TL204	1.00E-04	402	4.00E-02	402	2.00E-03	402	1.00E+02	423
TM170	2.60E-03	152	4.40E-03	152	5.00E-06	152	2.50E+01	152
U232	3.50E-03	402	2.00E-04	402	6.00E-04	402	5.00E+01	402
U233	3.50E-03	402	2.00E-04	402	6.00E-04	402	5.00E+01	402
U234	3.50E-03	402	2.00E-04	402	6.00E-04	402	5.00E+01	402
U235	3.50E-03	402	2.00E-04	402	6.00E-04	402	5.00E+01	402
U236	3.50E-03	402	2.00E-04	402	6.00E-04	402	5.00E+01	402
U238	3.50E-03	402	2.00E-04	402	6.00E-04	402	5.00E+01	402
V49	1.30E-03	402	2.30E-03	402	1.00E-03	402	1.00E+01	402
Y88	1.50E-03	402	3.00E-04	402	2.00E-05	402	2.50E+01	402
Y90	1.50E-03	402	3.00E-04	402	2.00E-05	402	2.50E+01	402
ZN65	1.48E-01	402	1.00E-01	402	1.00E-02	402	2.50E+03	402
ZR93	1.25E-04	402	5.50E-03	402	3.00E-05	402	2.00E+02	402

B.1 REFERENCES CITED IN POLLUTANT PARAMETER TABLES

This section contains footnotes and reference citations for parameter values given in this Appendix.

NDF - No dose factors are defined for this radionuclide and exposure route.

NV - No parameter value is defined

1 No value defined in the chemical database

- 95 Napier, B. A., R. L. Roswell, W. E. Kennedy II, and D. L. Streng. 1980. *Assessment of Effectiveness of Geologic Isolation Systems: ARRRG and FOOD: Computer Programs for Calculating Radiation Dose to Man from Radionuclides in the Environment*. PNL-3180. Pacific Northwest Laboratory, Richland, Washington.
- 152 Streng, D. L., R. A. Peloquin, and G. Whelan. 1986. *LADTAP II - Technical Reference and User Guide*. NUREG/CR-4013, U.S. Nuclear Regulatory Commission, Washington, D.C.
- 161 Veith, G. D., K. J. Macek, R. Petrocelli, and J. Carroll. 1980. "An Evaluation of Using Partition Coefficients and Water Solubility to Estimate Bioconcentration Factors of Organic Chemicals in Fish: J. Fish. Res. Board. Can. (Prepublication Copy).
- 238 Travis, C. C., and A. D. Arms. 1988. "Bioconcentration of Organics in Beef, Milk, and Vegetation." *Environ. Sci. Technol.* 22(3):271-274.
- 245 U.S. Environmental Protection Agency (EPA). 1980e. *Ambient Water Quality Criteria for Beryllium*. EPA-440/5-80-024, Office of Water Regulations and Standards, Criteria and Standards Division, Washington, D.C.
- 246 U.S. Environmental Protection Agency (EPA). 1980f. *Ambient Water Quality Criteria for Carbon Tetrachloride*. EPA-440/5-80-026, Office of Water Regulations and Standards, Criteria and Standards Division, Washington, D.C.
- 276 U.S. Environmental Protection Agency (EPA). 1984n. *Health Effects Assessment for Copper*. EPA/540/1-86-025, Environmental Criteria and Assessment Office, Cincinnati, Ohio.
- 289 U.S. Environmental Protection Agency (EPA). 1984aa. *Health Effects Assessment for Iron and Compounds*. EPA/540/1-86-054, Environmental Criteria and Assessment Office, Cincinnati, Ohio.

- 291 U.S. Environmental Protection Agency (EPA). 1984ac. *Health Effects Assessment for Manganese and Compounds*. EPA/540/1-86-057, Environmental Criteria and Assessment Office, Cincinnati, Ohio.
- 314 U.S. Environmental Protection Agency (EPA). 1992. *Health Effects Assessment Summary Tables*. NTIG/PB92+921199. D Swer, Washington, D.C.
- 321 U.S. Environmental Protection Agency (EPA). 1986b. *Verified Reference Doses (RfDs) of the USEPA*. ECAO-CIN-475. Office of Health and Environmental Assessment, Washington, D.C.
- 334 Toxicity value set equal to value for ingestion
- 338 Toxicity value set equal to value for inhalation
- 339 Inhalation toxicity value is based on the American Council of Gov. Industr. Hygienists (ACGIH) value for TLV. The reference dose is:
 $RfD = TLV (mg/m^3) \times 0.007$.
- 340 The ingestion toxicity values are based on the rat oral LD50 value from RTECS (NIOSH. 1987 and later versions, Registry of Toxic Effects of Chemical Substances).
- 342 The TLV used to estimate the inhalation reference value is based on the value reported for soluble salts of aluminum.
- 377 The average intake of sodium is 1600 to 9600 mg/day. Reference dose (RfD) is set to twice the higher value: $RfD = 9600 \text{ mg/day} \times 2 / 70 \text{ kg} = 300 \text{ mg/kg/d}$.
- 379 The ingestion reference dose for sulfate ion is based on the secondary drinking water standard: $RfD = 250 \text{ mg/L} \times 2 \text{ L/d} / 70 \text{ kg} = 7.14 \text{ mg/kg/d}$.
- 386 The ingestion RfD is based on the recommended daily allowance of 18 mg for iron, increased by a factor of 5. $RfD = 18 \text{ mg/d} / 70 \text{ kg} \times 5 = 1.3 \text{ mg/kg/d}$.
- 393 Calculated by the EPA Office of Radiation Programs (ORP). EPA classifies all radionuclides as Group A carcinogens. For guidance, refer to the User's Guide for radionuclides.
- 398 Dermal absorption calculated using the Code for Internal Dosimetry (CINDY). Streng, Kennedy, Sula, Johnson. 1992. Code for Internal Dosimetry. PNL-7493 Pt 1, Rev 1. PNL, Richland, Washington
- 400 U.S. Environmental Protection Agency (EPA). 1991, 1992, 1993. *Health Effects Assessment Summary Tables*. EPA 540-R-93-058.

- 402 Kennedy, W. E., and D. L. Streng. 1992. *Residual Radioactive Contamination From Decommissioning: Technical Basis for Translating Contamination Levels to Annual Total Effective Dose Equivalent*. NUREG/CR-5512 (PNL-7994) Vol. 1, U.S. Nuclear Regulatory Commission, Washington, DC.
- 404 IRIS (EPA Integrated Risk Information System).
- 419 U.S. EPA Health Effects Assessment Summary Tables, Office of Solid Waste and Emergency Response. EPA 540-R-93-058. Annual Updates.
- 420 IRIS Online Monthly Updates (EPA Integrated Risk Information System)
- 423 Set to value for mercury from Kennedy and Streng (1992), reference 402.
- 425 Calculated using Code for Internal Dosimetry (CINDY) with modified data libraries. Streng, Kennedy, Sula, Johnson. 1992. Code for Internal Dosimetry. PNL-7493 Pt 1, Rev 1. PNL, Richland, Washington.
- 427 Based on TLV-TWA for Aluminum of 2 mg/m³, ACGIH, 1986.
- 429 Based on recommended daily allowance (RDA) for calcium of 1200 mg/d (10-18 yrs). Oral RfD = 1200 mg/d x 1/70 kg = 17 mg/kg/d.
- 430 Based on rat oral LD50 for calcium of 9285 mg/kg. RfD = 9285 x 4E-5 = 0.37 mg/kg/d.
- 431 Based on rat oral LD50 for copper sulfate of 300 mg/kg. RfD = 300 x 4E-5 = 0.012 mg/kg/d.
- 432 Based on ACGIH TLV-TWA of 1 mg/m³ for copper. RfD inhalation = 1 mg/m³ Cu x 159.6/63.55 = 2.51 mg/m³ CuSO₄ x 0.007 = 0.018 mg/kg/d.
- 434 Based on ACGIH TLV-TWA of 1 mg/m³ for iron. RfD inhalation = 1 x 241.88/55.85 = 4.33 mg/m³ Fe(NO₃)₂ x 0.007 = 0.03 mg/kg/d.
- 435 Based on Registry of Toxic Effects of Chemical Substances (RTECS) rat oral LD50 of 6400 mg/kg for potassium ferrocyanide. RfD ingestion = 6400 x 211.97/368.37 = 3683 mg/kg x 4E-5 = 0.15 mg/kg/d.
- 437 Based on ACGIH TLV-TWA of 1 mg/m³ for iron. RfD inhalation = 1 x 180/55.85 = 3.22 mg/m³ Fe(NO₃)₂ x 0.007 = 0.023 mg/kg/d.
- 438 Based on RTECS mouse oral LD50 of 1640 mg/kg for butyl phosphate. RfD ingestion = 1640 x 4E-5 = 0.066 mg/kg/d.
- 440 Based on ACGIH TLV-TWA of 2 mg/m³ for aluminum. RfD inhalation = 2 mg/m³ Al x 81.97/26.98 x 0.007 = 0.043 mg/kg/d.

- 442 Based on RTECS mouse oral LD50 of 103 mg/kg for aluminum fluoride. RfD ingestion = $103 \times 4\text{E-}5 = 0.0041 \text{ mg/kg/d}$.
- 443 Based on ACGIH TLV-TWA of 2 mg/m³ for aluminum soluble salts. $2 \times 83.98/27 = 6.22 \text{ mg/m}^3 \text{ AlF}_3$. RfD inhalation = $6.22 \times 0.007 = 0.044$.
- 444 Based on mouse intravenous LD50 of 96 mg/kg. RfD = $96 \text{ mg/kg} \times 4\text{E-}5 \times 10 \text{ oral/intravenous} = 0.04 \text{ mg/kg/d}$.
- 445 Based on rat oral LD50 of 2217 mg/kg. RfD ingestion = $2217 \times 4\text{E-}5 = 0.09 \text{ mg/kg/d}$.
- 446 Based on ACGIH TLV-TWA of 1 mg/m³ for oxalic acid. RfD inhalation = $1 \text{ mg/m}^3 \times 0.007 = 0.007 \text{ mg/kg/d}$.
- 447 Based on mouse intravenous LD50 of 155 mg/kg. RfD = $155 \times 4\text{E-}5 \times 10 \text{ oral/intravenous} = 0.06 \text{ mg/kg/d}$.
- 448 Based on RTECS oral LD50 of 7500 mg/kg for oxalic acid. RfD ingestion = $7500 \times 4\text{E-}3 = 0.3 \text{ mg/kg/d}$.
- 449 Based on nitrate RfD of 1.6 mg/kg/d. $\text{MW } 2\text{NO}_3 = 2 \times 62 = 124$.
RfD $\text{Mg}(\text{NO}_3)_2 = 148/124 \times 1.6 = 1.9 \text{ mg/kg/d}$.
- 451 Based on rat oral LD50 of 3200 mg/kg for dibutyl phosphonate. RfD = $3200 \times 4\text{E-}5 = 0.13 \text{ mg/kg/d}$.
- 453 Based on rat oral LD50 of 3000 mg/kg tributyl phosphonate. RfD = $3000 \times 4\text{E-}5 = 0.12 \text{ mg/kg/d}$.
- 456 Bintein, S., J. DeVillers, and Carcher. 1993. *Nonlinear Dependence of Fish Bioconcentration on n-octanol/water Partition Coefficient SAR and QSAR in Environmental Research*. Vol. 1, pp 29-39.
- 500 Slope factor calculated from dose factor and health effects conversion factor of 6.2×10^{-4} effects per rem.
- 501 Plant concentration ratio calculated using correlation with octanol-water partition coefficient of Travis and Arms (1988), reference number 238.
- 502 Meat transfer factor calculated using correlation with octanol-water partition coefficient of Travis and Arms (1988), reference number 238.
- 503 Milk transfer factor calculated using correlation with octanol-water partition coefficient of Travis and Arms (1988), reference number 238.

504 Fish bioaccumulation factor calculated using correlation with octanol-water partition coefficient of Bintein et al. (1993), reference number 456.

APPENDIX C

UNIT RISK FACTOR OUTPUT FILES

APPENDIX C

UNIT RISK FACTOR OUTPUT FILES

Calculation of unit risk factors (URFs) is performed using the MEPAS exposure assessment component, HAZDK. The results from each run of HAZDK are written to a file with the same prefix as the run file name with the extension ".INT" added to the prefix. The record structure and content of this file are described in this appendix. This file provides details of calculations for each run. The file has a minimum amount of text information, but all output is identified as to the transport mode, usage location, pollutant, exposure type (population or individual), and time period.

The following describes the record structure of the file, the subroutines in HAZDK that generate (write) each item in the file, and a summary of the content of each record.

<u>Record Description</u>	<u>Module Writing</u>	<u>Content of Record</u>
1. title record	HAZ	Name of case as defined by facil.id file parameter WUNIT(NU,1). This is the same name as the summary output (.HPI) file.
2. exposure flags	HAZ	Defines the exposure pathways selected for the overall run as parameter KEXPTH(25).
3. control flags	HAZ	Defines the control flags used for the current analysis: NPOL, ITIME, NTOPOS, IRIS, IHEAST, KRISKP, and HCOM. The parameter HCOM is the radionuclide risk conversion factor for total fatalities.
4. pollutants	HAZ	Defines the number of pollutants and their identification fields (CAS or radionuclide names). Parameters are NPOL, POLID([i,j],

6. populations	HAZ	Defines the populations exposed for each exposure pathway for each location.
7. results	MAXIN	Presents results for each transport pathway, each pollutant, each usage location, and each exposure pathway.
8. end flag	HAZ	Indicates the end of the file (999).

RECORD 1 Title Record

This record contains the file name for the output from the current run, as defined by parameter WUNIT(NU,1), given as the first name on the group 4 line in the .ID file. The format is A8, '.INT'.

RECORD 2 Exposure Flags

This record contains the 25 exposure flags as defined on the second record of the *.HIN file. There are 5 dummy positions at the start of the record followed by the 25 exposure flag values. The format is '0,0,0,0,0,' 25I2. The dummy positions are included to space the flags over the corresponding result values for each pathway. (This is useful when the result file is read by a spread-sheet program, and causes the flag to be lined up over the same column as the result values for each pathway.)

RECORD 3 Control Flags

This record contains the control flags used in the current analysis plus the radionuclide health effects conversion factor. The parameters are described below. The record format is 6(I2,','),E8.2.

NPOL	Integer	NPOL is the number of contaminants which are being modeled for the facility (maximum is 20 pollutants).
ITIME	Integer	ITIME is a control parameter that allows time-weighting to be bypassed. If ITIME is greater than 0, a time weighting is not included. The default is the inclusion of time weighting.

NTOPOS	Integer	NTOPOS gives the current ranking unit number when more than one ranking unit is being considered. NTOPOS = 0 when only one ranking unit is considered.
IRIS	Integer	IRIS is a flag to select use of chemical toxicity values by level of confidence in numerical values.
IHEAST	Integer	This flag is used to select the method for evaluating radiation health impacts. The default is to use EDE dose factors and dose-to-health effect conversion factors. The alternate method is to use EPA slope factors for radionuclides.
KRISKP	Integer	This flag is for selecting or deleting population and individual risk analyses from the current run. The flag has no effect on the content of the .INT file.
HCOM	Real	This parameter gives the radiation dose to health effect conversion factor used for the run (unless over-ridden by IHEAST). Units are effect/million person-rem.

RECORD 4 Pollutants Data Set

This record set contains the number of pollutants on the first record of the set, and the names and other inventory parameters for pollutants on the following records. The format of the first record is I3, and the format of the remaining records of the set is 3A4,E10.3,I3,I3 providing information on one pollutant per record. The number of records is determined by the number of pollutants, NPOL, with a maximum of 20 pollutants. The parameters on the pollutant records are defined below.

POLID(I,IP),I=1,3	Pollutant identification (CAS or radionuclide name)
QMASS(IP)	Total mass in inventory (mg or pCi)
IREFX(IP)	Toxicity selection flag

MTYPE(IP)

- Pollutant type:
1. radionuclide
 2. carcinogen
 3. inhalation carcinogen, oral noncarcinogen
 4. inhalation noncarcinogen, oral carcinogen
 5. noncarcinogen

RECORD 5 Transport flags

This record gives the transport pathway flags defining the transport and usage locations included in the present analysis. The format is 7I3. The flag usage is as indicated in Table C.1.

TABLE C.1. Transport Flag Usage

<u>Position</u>	<u>Transport Pathway</u>	<u>Description</u>
1.	groundwater	0 - groundwater transport not included >0, <=10 - number of groundwater usage locations included.
2.	sediment	0 - measured sediment not included >0, <=10 - number of measured sediment usage locations included.
3.	surface water	0 - surface transport not included >0, <=10 - number of surface water usage locations included.
4.	atmospheric	0 - atmospheric transport not included agricultural usages: >0, <=30 - number of agricultural usage locations included.
5.	measured soil	0 - measured soil not included >0, <=10 - number of measured soil usage locations included.
6.	measured foods	0 - measured foods not included >0, <=30 - number of measured food usage locations included.
7.	direct radiation	0 - direct radiation not included >0, <=30 - number of measured direct radiation usage locations included.

RECORD 6 Population Data

This record set provides the populations exposed to each exposure pathway. The record gives the transport pathway index, the location index, the location name, and two dummy values, followed by the population for each exposure pathway. The five initial parameters cause the population values to be in line with the result values for each exposure pathway. The parameters on the line are described in Table C.2. The format is 2I2,A20,'0,0,',1P25E10.3.

TABLE C.2. Contents of Record Type 6: Population

<u>Parameter</u>	<u>Format</u>	<u>Description</u>
Transport #	I2,	Index of transport pathways as given in Table C.1 for Record 3.
Location #	I2,	Usage location index for the current transport pathway.
Location Name	A20,	Name of usage location for populations on this record.
Dummy Values	'0,0,'	Spaces to cause results and population data to be lined up when the file is read by database software.
Populations	E10.3	The population exposed to each of the 25 exposure pathways. The record may contain less than 25 values when the transport pathway does not involve all 25 pathways.

RECORD 7 Results

This record type contains the results for one set of calculations involving one transport type, one usage location, one pollutant (or direct radiation indicated by a pollutant number of 0), and all 25 exposure pathways. The format is the same for all records as indicated in Table C.3. The general format provides all values with comma delimitation to allow reading by databases software.

The format of the results record is indicated in Table C.4. This table indicates the exposure pathways for which results are given on each record by transport type.

TABLE C.3. Contents of Record Type 7: Results

<u>Parameter</u>	<u>Format</u>	<u>Description</u>
Transport #	I2,	Index of transport pathways as given in Table C.1 for Record 3.
Location #	I2,	Usage location index for the current transport pathway.
Pollutant #	I2,	Pollutant number in the order given by Record 4 names, 0 indicating transport pathway of direct radiation (Transport # 7).
Time index #	I2,	Index of current 70-year time period.
Result type	I2,	Indicator for the type of results contained on this record: 1. health impact endpoint for an individual in the population 2. health impact endpoint for an individual.
Results	1P25E8.2,	Health impact results for each exposure pathway in the order indicated in Table C.4.

TABLE C.4. Order of Exposure Pathway Results and Transport Pathway Involved

<u>Master List #</u>	<u>Exposure Pathway Order</u>	<u>Transport Pathway(s)</u>
1	Drinking water	Groundwater, surface water
2	Shower dermal	Groundwater, surface water
3	Shower ingestion	Groundwater, surface water
4	Leafy vegetables	Atmospheric, groundwater, surface water
5	Other vegetables	Atmospheric, groundwater, surface water
6	Meat	Atmospheric, groundwater, surface water
7	Milk	Atmospheric, groundwater, surface water
8	Finfish	Surface water
9	Shellfish	Surface water
10	Swimming ingestion	Surface water
11	Swimming dermal	Surface water
12	Shoreline dermal	Surface water, sediment
13	Shoreline ingestion	Surface water, sediment
14	Soil ingestion	Atmospheric, measured soil
15	Soil dermal	Atmospheric, measured soil
16	Special food intake	Measured food
17	Shower inhalation	Groundwater, surface water
18	Air inhalation	Atmospheric
19	Soil resuspension	Atmospheric, measured soil
20	Swimming external	Surface water
21	Boating external	Surface water
22	Shoreline external	Surface water, sediment
23	Soil external	Atmospheric, measured soil
24	Air external	Atmospheric
25	Direct radiation field	Measured radiation

APPENDIX D

INPUT FILES: ID, HIN, DFL, AND SIF

APPENDIX D

INPUT FILES: ID, HIN, DFL, and SIF

Several files are needed for successful execution of the MEPAS exposure assessment component, HAZDK. The two primary files are the .ID file, which identifies names of other files to be used, and the .HIN file, which provides selection of exposure analyses to be performed and most receptor information. A default parameter change file (DFL file) is needed to set several exposure factors for simulation of the HSB RAM scenarios. For generation of unit risk factors, a summary intake factor file (.SIF) is also used to specify exposure scenario descriptions corresponding to the HSB RAM specifications for specific exposure pathways. These files are described in this appendix. The first section describes the general naming convention used for file-name prefixes. The next four sections describe the ID files (D.2), the HIN files (D.3), the SIF files (D.4), and the DFL files (D.5). Sample listings are presented in Section D.6. The grouping of pollutants for input to the runs (20 per run) are indicated in Section D.7.

D.1 RUN FILE NAME PREFIX NOMENCLATURE

This section describes the naming convention for establishing the prefix file name for each run. This convention is used in naming of the ID and HIN files, and for part of the naming conventions for several other files.

The runs required to complete the unit risk factor analyses are determined by the scenarios, media, and pollutant type to be considered. For example, the prefix for the industrial scenario for exposure to radionuclides in surface water would be INDSWRA. The nomenclature used for the run file prefixes are given in Table D.1.

TABLE D.1. Run Prefix Naming Conventions

<u>Scenario Prefix</u> <u>(3 characters)</u>	<u>Medium Prefix</u> <u>(2 characters)</u>	<u>Pollutant Type Prefix</u> <u>(2 characters)</u>
IND industrial	SL soil (mass)	NC noncarcinogenic chemicals
REC recreational	AR air	CC carcinogenic chemicals
RES residential	GW groundwater	RA radionuclides
AGR agricultural	SW surface water	
	SA soil (area)	

In addition to the seven characters described above, the prefix will end in a numerical value from 1-9 indicating the pollutant data set. Up to 20 pollutants will be included in each run. The grouping of pollutants by input set is given in Section D.7.

D.2 DESCRIPTION OF ID FILES

The ID files provide names of files to be used in the current MEPAS execution. The ID files prepared for calculation of the URFs were generated by a special computer program that wrote all 240 ID files.

The ID file is composed of groups of file names with a group number determining the use of the filename. The group usage for the HAZDK runs are described in Table D.2.

The WAT file is used for all groundwater and surface-water runs. The file name is determined by the medium and the pollutant set, and uses the same naming convention for these items as shown in Table D.1. For example, all WAT files for groundwater for carcinogenic chemical set 3 have the prefix GWCC3.

Atmospheric pathway analyses use the AIR and CNC files. These two files must have the same name for a given run. The files are determined by the medium (air or soil area), and by the pollutant set, using the same naming convention as described in Table D.1 for these items. For example, the soil (area) analysis for radionuclide set 4 would have a file name prefix of SARA4.

TABLE D.2. Filename Specification in ID Files

<u>Group Number</u>	<u>Position</u>	<u>Extension</u>	<u>File Name Description</u>
0	1	None	This set gives the facility name and is used only when more than one facility is included in a run. The name is set to the general run name as defined by the naming convention of Section D.1.
3	1	INT, HIN	This file name is used for the input file and the detailed output file. The name is set to the general run name as defined by the naming convention of Section D.1.
4	1	HPI, CSV	This file name is used for the primary output file (HPI) and a summary risk file (CSV), which is not used in the present analysis. The name is set to the general run name as defined by the naming convention of Section D.1.
	2	WAT	This file name is used for the groundwater and surface water transport pathways and gives the file name for input of water concentrations. The naming convention is described in the text of this section.
	3	AIR, CNC	This file name is used for air and soil (area) analyses and identifies the input files giving release rates (CNC) and atmospheric dispersion and deposition factors (AIR). The naming convention is described in the text of this section.
	4	POP	This file name identifies the input population distribution for the atmospheric and soil (area) analyses. The one file used for all analyses has the prefix UNITPOP.
6	1	DAT	Chemical database path name and file name. Set to ..\CHEMLIB.DAT in all ID files.
8	1	DFL	This file name is used to identify the input file from which default value changes will be read (DFL). This file is read in addition to the standard RISK.SET file. The naming convention for the DFL file name is described in the text of this section.
10	1	SIF	This file name identifies the SIF input file for the run. The naming convention for the SIF file name is described in the text of this section.

The DFL file is used to change default parameter values to tailor the calculation to the specific scenario defined by HSBRAM. The DFL file is read after the RISK.SET file, which is used to set the health effects conversion factor to 620 effects per million rem. The output file (.HPI) includes a list of all parameters changed by these two files. The DFL file name prefix is determined by the scenario and medium, using the naming convention given for these two items in Table D.1. The letters "DFL" are added at the end of the prefix. For example, the DFL file name for the residential scenario for soil (mass) is RESSLDFL.

The SIF files contain summary intake factors determined for each scenario, medium, and pollutant type. Each file contains factors for all pollutant types. The SIF file name prefix is determined by the scenario and medium, using the naming convention for these items as defined in Table D.1. The prefix ends with the letters "SIF." For example, the file name prefix for the agricultural scenario, for surface water is AGRSWSIF. Sample listings of ID files are given in Section D.6.

D.3 DESCRIPTION OF HIN FILES

The primary input file for the exposure assessment is the HIN file. This file gives the scope of the analysis, identifies the pollutants to be considered, and provides receptor location information. The structure of the HIN file is determined by the number of pollutants, the transport pathways, and the usage location definitions. A small program was written to generate the HIN files for each of the 240 runs required for the unit risk factor analyses.

The content of the HIN files is described in Table D.3, which indicates the record types and usage for the present analyses.

The pollutant information record is set according to the pollutant type for the run. Twelve pollutant data sets are used. For chemical noncarcinogen runs (NC1, NC2, and NC3) the toxicity parameter flag is set to 2 causing only

TABLE D.3. Content of HIN Files

<u>Record</u>	<u>Parameters</u>	<u>Description</u>
1	title	This record contains the file name prefix for the run.
2	exposure pathway flags	The flags indicate which exposure pathways are to be included in the run. The flags for a run are determined by the scenario and medium.
3	control parameters	The control parameters determine special characteristics of the current analysis. The first value gives the number of pollutants to be included. All other parameters are the same for all runs. These include no time discounting, performing individual risk analyses only, and reading SIF values from the SIF file.
4	pollutant information	This record contains the pollutant name (radionuclide name or chemical CAS number) and a flag to select the type of toxicity parameters to be used.
5	transport flags	These flags indicate the transport pathway to be included in the analysis. Seven values are included. A value of 1 causes the transport pathway to be included. Only one nonzero value is used for each run. The usage is as follows: 1 - groundwater 3 - surface water 4 - air and soil (area) 5 - soil (mass)
6	usage location data	The content of records in this data set depends on the scenario and medium selected.

reference dose analyses to be performed. For chemical carcinogen runs (CC1, CC2, and CC3) the flag is set to 1 so only slope factors analyses are performed. For radionuclides the flag is set to 1 so HEAST slope factors are used, if available. If radionuclide slope factors are not available, then the health effects conversion factor and dose factors are used. The number of records of this type is equal to the number of pollutant-specific (maximum of 20 per run).

The program for generating the HIN files reads files containing exposure flag records for each scenario and medium, pollutant data sets, and receptor location records for each scenario and medium. The appropriate combination of each of these items is then written to each HIN file. Sample listings of HIN files are given in Section D.6.

D.4 DESCRIPTION OF SIF FILES

The summary intake factors are provided in the SIF files. The structure of the SIF files are described in this section. The values for SIFs are presented in Section 3.0.

The order and content of SIF values in the SIF file are determined by the values given for transport parameter flags, KNPATH(i), $i=1,7$, given on record type 5 in the HIN file. In general, each SIF file has one title record and several record sets (three records each) giving SIF values for one usage location. The exception is the direct radiation pathway that has one record per location (this record type is not used in the URF analyses). The exposure pathways included for each transport type are described in the following text. The pathways are related back to the master list of pathways allowed in MEPAS that are listed in Table D.4.

TABLE D.4. Exposure Pathway Order in MEPAS Exposure Assessments

Selection Flag Position	Exposure Pathway	Transport Pathways Involved
Ingestion:		
1	Drinking Water	Groundwater and Surface Water
2	Showering dermal	Groundwater and Surface Water
3	Showering ingestion	Groundwater and Surface Water
4	Leafy Vegetables	Groundwater, Surface Water, Atmospheric
5	Other Vegetables	Groundwater, Surface Water, Atmospheric
6	Meat	Groundwater, Surface Water, Atmospheric
7	Milk	Groundwater, Surface Water, Atmospheric
8	Finfish	Surface Water
9	Shellfish	Surface Water
10	Swimming water intake	Surface Water
11	Swimming: dermal	Surface Water
12	Shoreline: dermal	Surface Water
13	Shoreline: ingestion	Surface Water
14	Soil ingestion	Atmospheric and Measured Soil
15	Soil dermal	Atmospheric and Measured Soil
16	Special food intake	Measured Food Concentration
Inhalation:		
17	Showering inhalation	Groundwater and Surface Water
18	Air inhalation	Atmospheric
19	Soil resuspension	Atmospheric and Measured Soil
External:		
20	Swimming: external	Surface Water
21	Boating: external	Surface Water
22	Shoreline: external	Surface Water
23	Soil: external	Atmospheric and Measured Soil
24	Air: external	Atmospheric
Direct Radiation:		
25	Direct Radiation	Measured Radiation Dose

Record 1 Title Record

The first record of all SIF files is a title record that is read and printed for information only. For the URF analyses, this record indicates the scenario and medium of interest.

Record Set 2 KNPATH(1) = NL > 0, Groundwater Transport Pathway

When groundwater usage locations are defined, KNPATH(1) gives the number of locations to be evaluated. For each usage location, 3 records are given with SIF values for eight exposure pathways. The first record gives SIF values for noncarcinogenic chemicals, the second for carcinogenic chemicals, and the third for radionuclides. The values for the eight exposure pathways are given in the order indicated in Table D.5.

TABLE D.5. Groundwater SIF Exposure Pathways

<u>Record Position</u>	<u>Exposure Pathway</u>	<u>Master List Position</u>
1	Drinking water	1
2	Showering: dermal contact	2
3	Showering: inadvertent ingestion	3
4	Leafy vegetable ingestion	4
5	Other vegetable ingestion	5
6	Meat ingestion	6
7	Milk ingestion	7
8	Showering: inhalation	17

Record Set 3 KNPATH(2) = NL > 0, Measured Sediment Pathway

When measured sediment exposures are included, KNPATH(2) gives the number of locations for which SIF values are defined. The SIF values are provided on three records for each location. The first record gives SIF values for noncarcinogenic chemicals, the second for carcinogenic chemicals, and the third for radionuclides. The order of SIF values on each of the three records is as indicated in Table D.6.

TABLE D.6. Measured Sediment SIF Exposure Pathways

<u>Record Position</u>	<u>Exposure Pathway</u>	<u>Master List Position</u>
1	Sediment ingestion	13
2	Sediment dermal contact	12
3	Sediment external	22

Record Set 4 KNPATH(3) = NL > 0, Surface Water Transport Pathway

When surface-water usage locations are defined, KNPATH(3) gives the number of usage locations for which SIF values are defined. There are 17 exposure pathways for which surface-water SIF values may be given. Three records are provided for each location. The first record gives SIF values for noncarcinogenic chemicals, the second for carcinogenic chemicals, and the third for radionuclides. The order of SIF values on each of the three records is as indicated in Table D.7. The master list positions are indicated in Table D.7.

TABLE D.7. Surface water SIF Exposure Pathways

<u>Record Position</u>	<u>Exposure Pathway</u>	<u>Master List Position</u>
1	Drinking water	1
2	Showering: dermal contact	2
3	Showering: inadvertent ingestion	3
4	Leafy vegetable ingestion	4
5	Other vegetable ingestion	5
6	Meat ingestion	6
7	Milk ingestion	7
8	Finfish ingestion	8
9	Shellfish ingestion	9
10	Swimming: inadvertent ingestion	10
11	Swimming: dermal contact	11
12	Shoreline: dermal sediment contact	12
13	Shoreline: sediment ingestion	13
14	Showering: inhalation	17
15	Swimming: external	20
16	Boating: external	21
17	Shoreline: external	22

Record Set 5 KNPATH(4) = NL > 0, Atmospheric Transport Pathway

When atmospheric releases are included, KNPATH(4) gives the number of agricultural usage locations for which SIF values are defined. The SIF records for the atmospheric pathway are defined in two sets: one for regional exposures (inhalation, etc.), and one for agricultural pathways (four agricultural products).

When the flag for inclusion of inhalation doses in the evaluation is set positive (IIN in first record of atmospheric data in the HIN file), then one set of SIF values is read. The set has three records (for the three pollutant types), and values for six exposure pathways, in the order given in Table D.8.

TABLE D.8. Regional Atmospheric SIF Exposure Pathways

<u>Record Position</u>	<u>Exposure Pathway</u>	<u>Master List Position</u>
1	Soil ingestion	14
2	Soil: dermal contact	15
3	Air inhalation	18
4	Inhalation of resuspended soil	19
5	Soil: external	23
6	Air: external	24

When agricultural pathways are selected (as indicated by a nonzero value for the parameter IAG on the first record of the atmospheric data in the HIN file), a set of SIF records is read for each agricultural usage location (given by the value of KNPATH[4]), as indicated in Table D.9.

TABLE D.9. Atmospheric Agricultural SIF Exposure Pathways

<u>Record Position</u>	<u>Exposure Pathway</u>	<u>Master List Position</u>
1	Leafy vegetable ingestion	4
2	Other vegetable ingestion	5
3	Meat ingestion	6
4	Milk ingestion	7

Record Set 6 KNPATH(5) = NL > 0, Measured Soil Pathway

When measured soil exposures are included, KNPATH(5) gives the number of locations for which SIF values are defined. The SIF values are provided on three records for each location. The first record gives SIF values for noncarcinogenic chemicals, the second for carcinogenic chemicals, and the third for radionuclides. The order of SIF values on each of the three records is as indicated in Table D.10.

TABLE D.10. Measured Soil SIF Exposure Pathways

<u>Record Position</u>	<u>Exposure Pathway</u>	<u>Master List Position</u>
1	Soil ingestion	14
2	Soil: dermal contact	15
3	Inhalation of resuspended soil	19
4	Soil external	23

Record Set 7 KNPATH(6) = NL > 0, Measured Foods Pathway

When measured food exposures are included, KNPATH(6) gives the number of locations for which SIF values are defined. The SIF values are provided on three records for each location. The first record gives SIF values for noncarcinogenic chemicals, the second for carcinogenic chemicals, and the third for radionuclides. Each record contains one SIF value for intake of the measured food representative of the usage location. This pathways was not used in the unit risk factor analyses.

Record Set 8 KNPATH(7) = NL > 0, Measured Direct Radiation Fields

Measured direct radiation exposures are indicated by a positive value KNPATH(7), which gives the number of locations for which SIF values are defined. One SIF value is provided for each usage location. The value is for exposure to external radiation. No values are necessary for chemicals because chemicals do not emit penetrating radiation. This pathway was not used in the unit risk factor analyses.

D.5 DESCRIPTION OF DFL FILES

The DFL files provide changes to default values necessary to simulate the HSBRAM exposure scenarios. The DFL files were used to evaluate the SIF value using preliminary runs of HAZDK. The calculated values (and hand calculation analysis results for some cases) were then entered into the SIF files for use in the final production runs. The DFL files are read by the

production runs, even though some of the values are not used directly in the analysis (the SIF values override the changed default values in some cases). Reading of the DFL files is allowed so that the output record (HPI files) contains a list of the change values upon which the SIF values were based.

The structure and content of DFL is described in this section. A listing of actual DFL files is given in Section D.6.

The files contain one descriptive record followed by parameter records. The parameters are identified by a read-control index, IWDAT, which specifies the parameters included on the current record. Up to five parameter values may be specified on a given record. The format of the three files is the same, with all records having the format shown in Table D.11. (This table lists those parameters that were used for the URF analysis.) If any parameter in a given set (record) is to be modified, then values must be given for each parameter in the set. If not given, or if zero, the parameter value will be set to zero.

Table D.12 gives a summary of the HAZDK input parameters that can be controlled by the user through the RISK.SET and DFL input file. These parameters are read by subroutine BLKREAD.

TABLE D.11. Structure of Records in Default Parameter Files

Entry	Columns	Format	Description
1	1-3	I3	IWDAT, data group indicator for which the data on this record will be applied (see following table for usage of IWDAT and parameter selection).
-	4	A	This entry must be a comma "," to start the free field data entry for the next 5 values.
2	5+	free	RLIST(1), value for first parameter to be set.
3	free	free	RLIST(2), value for the second parameter to be set.
4	free	free	RLIST(3), value for the third parameter to be set.
5	free	free	RLIST(4), value for the fourth parameter to be set.
6	free	free	RLIST(5), value for the fifth parameter to be set.
Not read			Optional descriptive information related to the current record, used for reference when viewing listing of this file. This information is not printed in the .HPI file.

The usage of the values given in the RLIST array are described in Table D.12 for each value of IWDAT used in the DFL and RISK.SET files for the URF analysis.

TABLE D.12. Summary of Parameters Usage in Default Parameter Files

Value of IWDAT	Parameter Name	Current MEPAS Value	Description of Input Parameter Usage
11	TFSH(1,3)	10.0	1st value: location 1 fish intake delay time (d)
	TFSH(2,3)	10.0	2nd value: location 2 fish intake delay time (d)
	TFSH(3,3)	10.0	3rd value: location 3 fish intake delay time (d)
	TFSH(4,3)	10.0	4th value: location 4 fish intake delay time (d)
	TFSH(5,3)	10.0	5th value: location 5 fish intake delay time (d)
44	TWTR(1,1)	0.5	1st value: water system transit time, location 1, for groundwater pathway (d)
	TWTR(2,1)	0.5	2nd value: water system transit time, location 2, for groundwater pathway (d)
	TWTR(3,1)	0.5	3rd value: water system transit time, location 3, for groundwater pathway (d)
	TWTR(4,1)	0.5	4th value: water system transit time, location 4, for groundwater pathway (d)
	TWTR(5,1)	0.5	5th value: water system transit time, location 5, for groundwater pathway (d)
48	TWTR(1,3)	0.5	1st value: water system transit time, location 1, for surface water pathway (d)
	TWTR(2,3)	0.5	2nd value: water system transit time, location 2, for surface water pathway (d)
	TWTR(3,3)	0.5	3rd value: water system transit time, location 3, for surface water pathway (d)
	TWTR(4,3)	0.5	4th value: water system transit time, location 4, for surface water pathway (d)
	TWTR(5,3)	0.5	5th value: water system transit time, location 5, for surface water pathway (d)
50	UDW(1,1)	2.0	1st value: drinking water intake rate, location 1, for groundwater pathway (L/d)
	UDW(2,1)	2.0	2nd value: drinking water intake rate, location 2, for groundwater pathway (L/d)
	UDW(3,1)	2.0	3rd value: drinking water intake rate, location 3, for groundwater pathway (L/d)
	UDW(4,1)	2.0	4th value: drinking water intake rate, location 4, for groundwater pathway (L/d)
	UDW(5,1)	2.0	5th value: drinking water intake rate, location 5, for groundwater pathway (L/d)

TABLE D.12. (contd)

Value of IWDAT	Parameter Name	Current MEPAS Value	Description of Input Parameter Usage
54	UDW(1,3)	2.0	1st value: drinking water intake rate, location 1, for surface water pathway (L/d)
	UDW(2,3)	2.0	2nd value: drinking water intake rate, location 2, for surface water pathway (L/d)
	UDW(3,3)	2.0	3rd value: drinking water intake rate, location 3, for surface water pathway (L/d)
	UDW(4,3)	2.0	4th value: drinking water intake rate, location 4, for surface water pathway (L/d)
	UDW(5,3)	2.0	5th value: drinking water intake rate, location 5, for surface water pathway (L/d)
56	UBRSH	20.0	1st value: inhalation rate while showering (m^3/d) (this value is used to evaluate UWB for use in the daily dose equations)
	UBW	0.01	2nd value: water intake while showering (l/d)
	UBR	20.0	3rd value: breathing rate (m^3/day)
	USW	0.10	4th value: ingestion rate of water while swimming (l/hr of swimming)
	USOIL	0.1	5th value: rate of inadvertent soil ingestion (g/d). (this value is used for all soil ingestion calculations, unless a different value is provided for the specific user location)
57	TEBOAT	0.5	1st value: time spent boating (hr/event)
	EVBOAT	0.066	2nd value: boating frequency (events/d)
58	UAG(1)	0.021	1st value: ingestion rate of leafy vegetables (kg/d)
	UAG(2)	0.13	2nd value: ingestion rate of other vegetables (kg/d)
	UAG(3)	0.065	3rd value: ingestion rate of meat (kg/d)
	UAG(4)	0.075	4th value: ingestion rate of milk (L/d)
59	UAQ(1)	0.0065	1st value: ingestion rate of fish (kg/d)
	UAQ(2)	0.0027	2nd value: ingestion rate of shell fish (kg/d)
62	HCOM	630.0	radiation dose to health effects conversion factor (effects per million person-rem)

TABLE D.12. (contd)

Value of IWDAT	Parameter Name	Current MEPAS Value	Description of Input Parameter Usage
64	TESHWR	0.167	1st value: duration of a shower exposure (hr/shower), 10 minutes
	EVSHWR	1.0	2nd value: shower frequency (showers/d)
65	TESWIM	0.5	1st value: duration of a swimming event (hr/event), 30 minutes
66	ASKIN(1)	2.0E4	1st value: area of skin exposed while showering (cm ²)
	ASKIN(2)	2.0E4	2nd value: area of skin exposed while swimming (cm ²)
	ASKIN(3)	5.8E3	3rd value: area of skin exposed to soil (cm ²)
	ADHFAC	1.0	4th value: soil adherence factor for absorption from contact with soil on skin (mg/cm ²)
	EVSOIL	1.0	5th value: soil dermal exposure frequency (d ⁻¹)
67	TEDIRD	24.0	1st value: daily exposure time to direct radiation field (hr/d)
68	ANDFC	0.5	1st value: Andelman indoor air inhalation factor for volatile chemicals (L/m ³)
	ANDFR	0.1	1st value: Andelman indoor air inhalation factor for Radon-222 (L/m ³)
69	TESHOR	2.0	1st value: shoreline exposure time (hr/event)
	EVSHOR	0.017	2nd value: shoreline frequency (events/d)
	USED	0.017	3rd value: shoreline sediment ingestion rate (g/hr)
	ASKIN(4)	10000.0	4th value: skin area for contact with shoreline sediments (cm ²)
70	TSS	0.01	1st value: thickness of shoreline sediments (m)
	RHOSS	1.5	2nd value: density of shoreline sediments (g/cm ³)
	TAS	0.01	1st value: thickness of soil receiving atmospheric deposition (m)
	RHOAS	1.5	2nd value: density of soil receiving atmospheric deposition (g/cm ³)

TABLE D.12. (contd)

Value of IWDAT	Parameter Name	Current MEPAS Value	Description of Input Parameter Usage
71	RESFAC	1.0E-6	1st value: resuspension factor for atmospheric pathway (m^{-1})
	UBRES	20.0	2nd value: inhalation rate for resuspension pathways (m^3/d)
72	TMS	0.01	1st value: thickness of measured soil contamination layer (m)
	RHOMS	1.5	2nd value: density of measured soil (g/cm^3)
	CML	1.0E-7	3rd value: airborne particulate mass loading factor (kg/m^3)
73	UEXT	24.0	1st value: daily exposure time to external radiation for atmospheric and measured soil pathways (hr/d)
74	SWF	0.2	1st value: shore width factor for shoreline external exposure (dimensionless)
	SBRF	0.5	2nd value: boating geometry factor for external exposure (dimensionless)
	SSRF	1.0	3rd value: soil reduction factor for external exposure for atmospheric and measured soil pathways (dimensionless)
75	SHO	1.0	1st value: shielding factor for outdoor exposure (dimensionless)
	FTO	0.17	2nd value: fraction of time spent outdoors for external exposure (dimensionless)
	SHI	1.0	3rd value: shielding factor for indoor exposure (dimensionless)
	FTI	0.83	4th value: fraction of time spent indoors for the external exposure pathway (dimensionless)
76	FREQ(1)	1.0	1st value: drinking water annual factor
	FREQ(2)	1.0	2nd value: shower dermal annual factor
	FREQ(3)	1.0	3rd value: shower ingestion annual factor
	FREQ(4)	1.0	4th value: leafy vegetable annual factor
	FREQ(5)	1.0	5th value: other vegetable annual factor

TABLE D.12. (contd)

Value of IWDAT	Parameter Name	Current MEPAS Value	Description of Input Parameter Usage
77	FREQ(6)	1.0	1st value: meat ingestion annual factor
	FREQ(7)	1.0	2nd value: milk ingestion annual factor
	FREQ(8)	1.0	3rd value: finfish ingestion annual factor
	FREQ(9)	1.0	4th value: shellfish ingestion annual factor
	FREQ(10)	1.0	5th value: swimming ingestion annual factor
78	FREQ(11)	1.0	1st value: swimming dermal annual factor
	FREQ(12)	1.0	2nd value: shoreline dermal annual factor
	FREQ(13)	1.0	3rd value: shoreline ingestion annual factor
	FREQ(14)	1.0	4th value: soil ingestion annual factor
	FREQ(15)	1.0	5th value: soil dermal annual factor
79	FREQ(16)	1.0	1st value: special foods annual factor
	FREQ(17)	1.0	2nd value: shower inhalation annual factor
	FREQ(18)	1.0	3rd value: air inhalation annual factor
	FREQ(19)	1.0	4th value: soil resuspension annual factor
	FREQ(20)	1.0	5th value: swimming external annual factor
80	FREQ(21)	1.0	1st value: swimming external annual factor
	FREQ(22)	1.0	2nd value: boating external annual factor
	FREQ(23)	1.0	3rd value: shoreline external annual factor
	FREQ(24)	1.0	4th value: air external annual factor
	FREQ(25)	1.0	5th value: direct radiation annual factor
999	Signals end of input		

D.6 SAMPLE FILE LISTINGS

This section presents sample input files illustrating the naming conventions and file structures. Samples are given for each of the input files (ID, HIN, DFL, and SIF).

D.6.1 Sample ID Files

Exhibit D.1 presents eight ID files to illustrate the file naming usages and the content for each scenario and medium. The exhibit indicates the scenario, medium, and pollutant set for each of the files.

D.6.2 Sample HIN Files

Sample HIN files are shown in Exhibit D.2 corresponding to the ID files given in Exhibit D.1.

D.6.3 Sample DFL Files

The unit risk factor analysis requires a total of 20 DFL files (for number of scenarios x 5 media). Exhibit D.3 is a listing of all 20 of these files.

D.6.4 Sample SIF Files

The unit risk factor analysis requires a total of 20 SIF files (for number of scenarios x 5 media). Exhibit D.4 is a listing of all 20 of these files.

EXHIBIT D.1. Sample ID File Listings

File: AGRSLNC1.ID, agricultural scenario, soil (mass), noncarcinogen set 1

```
5 RAPS/MEPAS
6 ..\CHEMLIB.DAT
7 ..\CHEMLIB.DAT
0 AGRSLNC1
3 1,
3 AGRSLNC1
8 1,
8 AGRSLDFL
4 1,
4 AGRSLNC1 ZEROES ZEROES
10 1,
10 AGRSLSIF
```

File: AGRSANC1.ID, agricultural scenario, soil (area), noncarcinogen set 1

```
5 RAPS/MEPAS
6 ..\CHEMLIB.DAT
7 ..\CHEMLIB.DAT
0 AGRSANC1
3 1,
3 AGRSANC1
8 1,
8 AGRSADFL
4 1,
4 AGRSANC1 ZEROES SANC1 UNITPOP
10 1,
10 AGRSASIF
```

File: AGRARNC1.ID, agricultural scenario, air, noncarcinogen set 1

```
5 RAPS/MEPAS
6 ..\CHEMLIB.DAT
7 ..\CHEMLIB.DAT
0 AGRARNC1
3 1,
3 AGRARNC1
8 1,
8 AGRARDFL
4 1,
4 AGRARNC1 ZEROES ARNC1 UNITPOP
10 1,
10 AGRARSIF
```

File: AGRGWNC1.ID, agricultural scenario, groundwater, noncarcinogen set 1

```
5 RAPS/MEPAS
6 ..\CHEMLIB.DAT
7 ..\CHEMLIB.DAT
0 AGRGWNC1
3 1,
3 AGRGWNC1
8 1,
8 AGRGWDFL
4 1,
4 AGRGWNC1 GWNC1 ZEROES
10 1,
10 AGRGWSIF
```


EXHIBIT D.1. (contd)

File: AGRSWNC1.ID, agricultural scenario, surface water, noncarcinogen set 1

```
5 RAPS/MEPAS
6 ..\CHEMLIB.DAT
7 ..\CHEMLIB.DAT
0 AGRSWNC1
3 1,
3 AGRSWNC1
8 1,
8 AGRSWDFL
4 1,
4 AGRSWNC1 SWNC1 ZEROES
10 1,
10 AGRWSIF
```

File: INDSLRA1.ID, industrial scenario, soil (mass), radionuclide set 4

```
5 RAPS/MEPAS
6 ..\CHEMLIB.DAT
7 ..\CHEMLIB.DAT
0 INDSLRA4
3 1,
3 INDSLRA4
8 1,
8 INSLDFL
4 1,
4 INDSLRA4 ZEROES ZEROES
10 1,
10 INDSLIF
```

File: RECSACC2.ID, recreational scenario, soil (area), carcinogen set 2

```
5 RAPS/MEPAS
6 ..\CHEMLIB.DAT
7 ..\CHEMLIB.DAT
0 RECSACC2
3 1,
3 RECSACC2
8 1,
8 RECSADFL
4 1,
4 RECSACC2 ZEROES SACC2 UNITPOP
10 1,
10 RECSASIF
```

File: RESGWRA1.ID, residential scenario, groundwater, radionuclide set 1

```
5 RAPS/MEPAS
6 ..\CHEMLIB.DAT
7 ..\CHEMLIB.DAT
0 RESGWRA1
3 1,
3 RESGWRA1
8 1,
8 RESGWDFL
4 1,
4 RESGWRA1 GWRA1 ZEROES
10 1,
10 RESGWSIF
```

EXHIBIT D.2. Sample HIN File Listings

File: AGRSLNC1.HIN, agricultural scenario, soil (mass), noncarcinogen set 1

AGRSLNC1

0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 1 0 0 0 1 0 0

20 1 0 0 0 2 2

7784181 0.000 2

13473900 0.000 2

7429905 0.000 2

506876 0.000 2

6484522 0.000 2

7440417 0.000 2

12788931 0.000 2

7440439 0.000 2

471341 0.000 2

7440702 0.000 2

10124375 0.000 2

56235 0.000 2

7440473 0.000 2

7758987 0.000 2

7440508 0.000 2

1809194 0.000 2

10421484 0.000 2

13943583 0.000 2

13520688 0.000 2

7782414 0.000 2

0 0 0 0 1 0 0

Soil Intake Site 1 100. 70. 30.

1.00

1.00

1.00

1.00

1.00

1.00

1.00

1.00

1.00

1.00

1.00

1.00

1.00

1.00

1.00

1.00

1.00

1.00

1.00

EXHIBIT D.2. Sample HIN File Listings

File: AGRSANC1.HIN, agricultural scenario, soil (area), noncarcinogen set 1

AGRSANC1

0 0 0 1 1 1 1 0 0 0 0 0 0 1 1 0 0 0 1 0 0 0 1 0 0

20 1 0 0 0 2 2

7784181	0.000	2
13473900	0.000	2
7429905	0.000	2
506876	0.000	2
6484522	0.000	2
7440417	0.000	2
12788931	0.000	2
7440439	0.000	2
471341	0.000	2
7440702	0.000	2
10124375	0.000	2
56235	0.000	2
7440473	0.000	2
7758987	0.000	2
7440508	0.000	2
1809194	0.000	2
10421484	0.000	2
13943583	0.000	2
13520688	0.000	2
7782414	0.000	2

0 0 0 1 0 0

1	1	160.0	0	7.E+01	3.E+01	0.				
AGR. LOCATION	1	1.0	100.	100.	100.	100.	70.	30.		

File: AGRARNC1.HIN, agricultural scenario, air, noncarcinogen set 1

AGRARNC1

0 0 0 1 1 1 1 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0

20 1 0 0 0 2 2

7784181	0.000	2
13473900	0.000	2
7429905	0.000	2
506876	0.000	2
6484522	0.000	2
7440417	0.000	2
12788931	0.000	2
7440439	0.000	2
471341	0.000	2
7440702	0.000	2
10124375	0.000	2
56235	0.000	2
7440473	0.000	2
7758987	0.000	2
7440508	0.000	2
1809194	0.000	2
10421484	0.000	2
13943583	0.000	2
13520688	0.000	2
7782414	0.000	2

0 0 0 1 0 0 0

1	1	160.0	0	7.E+01	3.E+01	0.				
AGR. LOCATION	1	1.0	100.	100.	100.	100.	70.	30.		

EXHIBIT D.2. (contd)

File: AGRGWNC1.HIN, agricultural scenario, groundwater, noncarcinogen set 1

```

AGRGWNC1
1 2 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0
20 1 0 0 0 0 2 2
7784181      0.000 2
13473900     0.000 2
7429905      0.000 2
506876       0.000 2
6484522      0.000 2
7440417      0.000 2
12788931     0.000 2
7440439      0.000 2
471341       0.000 2
7440702      0.000 2
10124375     0.000 2
56235        0.000 2
7440473      0.000 2
7758987      0.000 2
7440508      0.000 2
1809194      0.000 2
10421484     0.000 2
13943583     0.000 2
13520688     0.000 2
7782414      0.000 2
1 0 0 0 0 0 0
Drinking Water In 1  2  1  1.00  100.0  100.0  100.0  100.0  70.  30.

```

File: AGRSWNC1.HIN, agricultural scenario, surface water, noncarcinogen set 1

```

AGRSWNC1
1 2 1 1 1 1 1 1 0 1 2 1 1 0 0 0 2 0 0 1 1 1 0 0 0
20 1 0 0 0 0 2 2
7784181      0.000 2
13473900     0.000 2
7429905      0.000 2
506876       0.000 2
6484522      0.000 2
7440417      0.000 2
12788931     0.000 2
7440439      0.000 2
471341       0.000 2
7440702      0.000 2
10124375     0.000 2
56235        0.000 2
7440473      0.000 2
7758987      0.000 2
7440508      0.000 2
1809194      0.000 2
10421484     0.000 2
13943583     0.000 2
13520688     0.000 2
7782414      0.000 2
0 0 1 0 0 0 0
Surface Location  2  3  1  4  1.00  100.  100.0  100.0
100.0  100.0  100.0  100.  0.0  70.0  30.0  0.

```

EXHIBIT D.2. (contd)

File: INDSLRA1.HIN, industrial scenario, soil (mass), radionuclide set 4

INDSLRA1

0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 1 0 0 0 1 0 0

20 1 0 0 0 2 2

AG110M	0.000	1
AM241	0.000	1
AM243	0.000	1
NP239	0.000	1
PU239	0.000	1
AU195	0.000	1
BA133	0.000	1
BE7	0.000	1
BE10	0.000	1
CA45	0.000	1
C14	0.000	1
CD109	0.000	1
CE144	0.000	1
CF252	0.000	1
CM248	0.000	1
CM243	0.000	1
CM244	0.000	1
PU240	0.000	1
CM245	0.000	1
PU241	0.000	1

0 0 0 0 1 0 0

Soil Intake Site 1 100. 70. 20. 0.

1.0

1.0

1.0

1.0

1.0

1.0

1.0

1.0

1.0

1.0

1.0

1.0

1.0

1.0

1.0

1.0

1.0

1.0

1.0

1.0

EXHIBIT D.2. (contd)

File: RECSACC2.HIN, recreational scenario, soil (area), carcinogen set 2

```

RECSACC2
0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 1 0 0 0 1 0 0
20 1 0 0 0 2 2
15438310      0.000 1
7439921       0.000 1
7786303       0.000 1
10377603      0.000 1
7439976       0.000 1
108101        0.000 1
7440020       0.000 1
14797558      0.000 1
7697372       0.000 1
NITRITE       0.000 1
144627        0.000 1
7601549       0.000 1
7447407       0.000 1
7632044       0.000 1
7440224       0.000 1
7647145       0.000 1
1302427       0.000 1
10588019      0.000 1
62760         0.000 1
5329146       0.000 1
0 0 0 1 0 0
1 0 160.0 0 7.E+01 3.E+01 0.

```

File: RESGWRA1.HIN, residential scenario, groundwater, radionuclide set 1

```

RESGWRA1
1 2 1 1 1 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0
20 1 0 0 0 2 2
AG110M        0.000 1
AM241         0.000 1
AM243         0.000 1
NP239         0.000 1
PU239         0.000 1
AU195         0.000 1
BA133         0.000 1
BE7           0.000 1
BE10          0.000 1
CA45          0.000 1
C14           0.000 1
CD109         0.000 1
CE144         0.000 1
CF252         0.000 1
CM248         0.000 1
CM243         0.000 1
CM244         0.000 1
PU240         0.000 1
CM245         0.000 1
PU241         0.000 1
1 0 0 0 0 0 0
Drinking Water In 1 2 1 1.00 100.0 100.0 100.0 100.0 70. 30.

```

EXHIBIT D.3. Listings of DFL Files

File: INDSLDFL.DFL

Industrial Soil DFL file

56,10.,0.01,10.,0.1,0.05,
66,20000.,20000.,5000.,0.20,1.,
72,0.04,1.5,5.E-8,0.,0.,
73,8.,0.,0.,0.,0.,
74,0.2,0.5,0.8,0.,0.,
75,0.0,0.0,0.8,1.0,0.0
78,1.,1.,1.,0.4,0.4,
79,1.,1.,1.,0.4,1.,
80,1.0,1.0,0.4,1.,1.,
999

File: INDSADFL.DFL

Industrial Soil DFL file

56,20.,0.01,20.,0.1,0.05,
66,20000.,20000.,5000.,0.20,1.,
71,8.33E-10,20.,0.,0.,0.,
72,0.04,1.5,5.E-8,0.,0.,
73,8.,0.,0.,0.,0.,
75,0.0,0.0,0.8,1.0,0.0
78,1.,1.,1.,0.4,0.4,
79,1.,1.,1.,0.685,1.,
80,1.0,1.0,0.4,1.,1.,
999

File: INDARDFL.DFL

Industrial Air DFL file

56,15.,0.01,20.,0.1,0.050,
73,8.,0.,0.,0.,0.,
75,0.0,0.0,0.8,1.0,0.0
79,1.,1.,0.685,1.0,1.0,
80,1.,1.,1.,0.4,1.,
999

File: INDGWDFL.DFL

Industrial Groundwater DFL file

50,1.0,1.,1.,1.,1.,
56,20.,0.06,20.,0.1,0.05,
62,620.,0.,0.,0.,0.,
64,0.17,1.0,0.,0.,0.,
66,20000.,20000.,5000.,0.20,1.,
76,0.685,0.685,0.685,1.,1.,
79,1.,0.685,1.,1.,1.,
999

File: INDSWDFL.DFL

Industrial Surface water DFL file

54,1.0,1.,1.,1.,1.,
56,20.,0.06,20.,0.1,0.05,
62,620.,0.,0.,0.,0.,
64,0.17,1.0,0.,0.,0.,
66,20000.,20000.,5000.,0.20,1.,
76,0.685,0.685,0.685,1.,1.,
79,1.,0.685,1.,1.,1.,
999

EXHIBIT D.3. (contd)

File: RECSLDFL.DFL

Recreational Soil DFL file
56,20.,0.01,20.,0.1,0.255,
66,20000.,20000.,6188.,0.20,1.,
71,8.33E-10,20.,0.,0.,0.,
72,0.04,1.5,5.E-8,0.,0.,
73,8.,0.,0.,0.,0.,
75,0.0,0.0,0.8,1.0,0.0
78,1.,1.,1.,0.0192,0.0192,
79,1.,1.,1.,0.0192,1.,
80,1.0,1.0,0.0192,1.,1.,
999

File: RECSADFL.DFL

Recreational Soil DFL file
56,20.,0.01,20.,0.1,0.255,
66,20000.,20000.,6188.,0.20,1.,
71,8.33E-10,20.,0.,0.,0.,
72,0.04,1.5,5.E-8,0.,0.,
73,8.,0.,0.,0.,0.,
75,0.0,0.0,0.8,1.0,0.0
78,1.,1.,1.,0.0192,0.0192,
79,1.,1.,1.,0.0192,1.,
80,1.0,1.0,0.0192,1.,1.,
999

File: RECARDFL.DFL

Recreational Air DFL file
56,20.,0.01,20.,0.1,0.10,
66,20000.,20000.,5000.,0.20,1.,
71,8.33E-10,20.,0.,0.,0.,
72,0.04,1.5,5.E-8,0.,0.,
73,24.,0.,0.,0.,0.,
75,0.0,0.0,0.8,1.0,0.0
79,1.,1.,0.0192,1.,1.,
80,1.0,1.0,1.0,0.0192,1.,
999

File: RECGWDFL.DFL

Recreational Ground water DFL file
56,20.,0.060,20.,0.1,0.05,
64,0.17,1.0,0.,0.,0.,
66,20000.,20000.,5000.,0.20,1.,
75,0.,0.,0.8,1.0,0.,
76,0.0192,0.0192,0.0192,1.,1.,
79,1.,0.0192,1.,1.,1.,
999

EXHIBIT D.3. (contd)

File: RECSWDFL.DFL

Recreational Surface water DFL file

11,0.,0.,0.,0.,0.,
57,2.6,1.,0.,0.,0.,
59,0.027,0.,0.,0.,0.,
64,0.17,1.0,0.,0.,0.,
65,2.6,1.,0.,0.,0.,
66,20000.,20000.,5000.,0.20,1.,
69,2.6,1.0,0.039,5000.,0.,
75,0.,0.,0.8,1.0,0.,
76,0.0192,1.,1.,1.,1.,
77,1.,1.,1.,1.,0.0192,
78,0.0192,0.0192,0.0192,1.,1.,
79,1.,1.,1.,1.,0.0192,
80,0.0192,0.0192,1.,1.,1.,
999

File: RESSLDFL.DFL

Residential Soil (mass)

56,15.,0.01,20.,0.1,0.255,
66,20000.,20000.,6188.,0.20,1.,
71,8.33E-10,20.,0.,0.,0.,
72,0.04,1.5,5.E-8,0.,0.,
73,24.,0.,0.,0.,0.,
75,0.0,0.0,0.0,0.8,1.0,0.0
78,1.,1.,1.,1.,0.4928,
79,1.,1.,1.,1.,1.,
80,1.,1.,1.,1.,1.,
999

File: RESSADFL.DFL

Residential Soil DFL file

56,20.,0.01,20.,0.1,0.255,
58,0.080,0.042,0.,0.,0.,
66,20000.,20000.,6188.,0.20,1.,
71,8.33E-10,20.,0.,0.,0.,
72,0.04,1.5,5.E-8,0.,0.,
73,24.,0.,0.,0.,0.,
75,0.0,0.0,0.0,0.8,1.0,0.0
78,1.,1.,1.,1.,0.4928,
79,1.,1.,1.,1.,1.,
80,1.,1.,1.,1.,1.,
999

File: RESARDFL.DFL

Residential Air DFL file

56,20.,0.01,20.,0.1,0.10,
58,0.080,0.042,0.,0.,0.,
72,0.04,1.5,5.E-8,0.,0.,
73,24.,0.,0.,0.,0.,
75,0.0,0.0,0.0,0.8,1.0,0.0
76,1.,1.,1.,1.,1.,
79,1.,1.,1.,1.,1.,
80,1.,1.,1.,1.,1.,
999

EXHIBIT D.3. (contd)

File: RESGWDFL.DFL

Recreational Ground water DFL file

56,15.,0.060,20.,0.1,0.05,
58,0.080,0.042,0.,0.,0.,
64,0.17,1.0,0.,0.,0.,
66,20000.,20000.,5000.,0.20,1.,
68,0.5,0.1,0.,0.,0.,
75,0.,0.,0.8,1.0,0.,
76,1.,1.,1.,1.,1.,
79,1.,1.,1.,1.,1.,
999

File: RESSWDFL.DFL

Residential Surface water DFL file

11,0.,0.,0.,0.,0.,
56,15.,0.06,20.,0.1,0.255,
57,2.6,1.,0.,0.,0.,
58,0.080,0.042,0.,0.,0.,
59,0.027,0.,0.,0.,0.,
64,0.17,1.0,0.,0.,0.,
65,2.6,1.,0.,0.,0.,
66,20000.,20000.,5000.,0.20,1.,
69,2.6,1.0,0.200,6188.,0.,
75,0.,0.,0.8,1.0,0.,
76,1.,1.,1.,1.,1.,
77,1.,1.,1.,1.,0.0192,
78,0.0192,0.0192,0.0192,1.,1.,
79,1.,1.,1.,1.,0.0192,
80,0.0192,0.0192,1.,1.,1.,
999

File: AGRSLDFL.DFL

Agricultural Soil (mass)

56,15.,0.01,20.,0.1,0.255,
66,20000.,20000.,6188.,0.20,1.,
71,8.33E-10,20.,0.,0.,0.,
72,0.04,1.5,5.E-8,0.,0.,
73,24.,0.,0.,0.,0.,
75,0.0,0.0,0.8,1.0,0.0
78,1.,1.,1.,1.,0.4928,
79,1.,1.,1.,1.,1.,
80,1.,1.,1.,1.,1.,
999

File: AGRSADFL.DFL

Agricultural Soil DFL file

56,20.,0.01,20.,0.1,0.255,
58,0.080,0.042,0.075,0.300,0.,
66,20000.,20000.,6188.,0.20,1.,
71,8.33E-10,20.,0.,0.,0.,
72,0.04,1.5,5.E-8,0.,0.,
73,24.,0.,0.,0.,0.,
75,0.0,0.0,0.8,1.0,0.0
76,1.,1.,1.,1.,1.,
77,1.,1.,1.,1.,1.,
78,1.,1.,1.,1.0,0.4928,
79,1.,1.,1.,1.,1.,
80,1.,1.,1.,1.,1.,
999

EXHIBIT D.3. (contd)

File: AGRARDFL.DFL

Agricultural Air DFL file

56,20.,0.01,20.,0.1,0.10,
58,0.080,0.042,0.075,0.300,0.,
72,0.04,1.5,5.E-8,0.,0.,
73,24.,0.,0.,0.,0.,
75,0.0,0.0,0.8,1.0,0.0
76,1.,1.,1.,1.,1.,
79,1.,1.,1.,1.,1.,
80,1.,1.,1.,1.,1.,
999

File: AGRGWDFL.DFL

Agricultural Ground water DFL file

56,15.,0.060,20.,0.1,0.05,
58,0.080,0.042,0.075,0.3,0.,
64,0.17,1.0,0.,0.,0.,
66,20000.,20000.,5000.,0.20,1.,
68,0.5,0.1,0.,0.,0.,
75,0.,0.,0.8,1.0,0.,
76,1.,1.,1.,1.,1.,
77,1.,1.,1.,1.,1.,
79,1.,1.,1.,1.,1.,
999

File: AGRSWDFL.DFL

Agricultural Surface water DFL file

11,0.,0.,0.,0.,0.,
56,15.,0.06,20.,0.1,0.255,
57,2.6,1.,0.,0.,0.,
58,0.080,0.042,0.075,0.3,0.,
59,0.027,0.,0.,0.,0.,
64,0.17,1.0,0.,0.,0.,
65,2.6,1.,0.,0.,0.,
66,20000.,20000.,5000.,0.20,1.,
69,2.6,1.0,0.200,6188.,0.,
75,0.,0.,0.8,1.0,0.,
76,1.,1.,1.,1.,1.,
77,1.,1.,1.,1.,0.0192,
78,0.0192,0.0192,0.0192,1.,1.,
79,1.,1.,1.,1.,0.0192,
80,0.0192,0.0192,1.,1.,1.,
999

EXHIBIT D.4. Listings of SIF Files

File: INDSLSIF.SIF

Industrial Soil SIF File

2.857E-7,5.714E-6,9.786E-9,0.,
8.163E-8,1.633E-6,2.796E-9,0.,
1.461E-1,2.922E+0,5.004E-3,1.870E4,

File: INDSASIF.SIF

SIF file: soil from air

4.762E-9,9.524E-8,0.,1.63E-10,0.,0.,
1.361E-9,2.721E-8,0.,4.658E-11,0.,0.,
2.435E-3,4.870E-2,0.,8.337E-5,1.870E+4,0.

File: INDARSIF.SIF

Industrial air SIF file

0.,0.,1.957E-1,0.,0.,0.,
0.,0.,5.592E-2,0.,0.,0.,
0.,0.,1.001E+5,0.,0.,2.338E+4

File: INDGWSIF.SIF

Industrial: groundwater SIFs

9.786E-3,3.327E-2,1.644E-05,0.,0.,0.,9.786E-02
2.796E-3,9.506E-3,4.753E-06,0.,0.,0.,2.796E-02
5.004E+3,1.701E+4,8.507E+00,0.,0.,0.,1.001E+04

File: INDSWSIF.SIF

Industrial: surface water SIFs

9.786E-3,3.327E-2,1.644E-05,0.,0.,0.,0.,0.,0.,0.,9.786E-02,0.,0.,0.,
2.796E-3,9.506E-3,4.753E-06,0.,0.,0.,0.,0.,0.,0.,2.796E-02,0.,0.,0.,
5.004E+3,1.701E+4,8.507E+00,0.,0.,0.,0.,0.,0.,0.,1.001E+04,0.,0.,0.,

File: RECSLSIF.SIF

Recreational Soil SIF File

6.98E-8,3.39E-7,3.388E-10,0.,
3.00E-8,1.452E-7,1.452E-10,0.,
2.52E-2,1.890E-1,1.890E-4,1.344E3,

File: RECSASIF.SIF

SIF file: soil from air, rec.

1.166E-9,5.658E-9,0.,4.57E-12,0.,0.,
4.996E-10,2.425E-9,0.,1.958E-12,0.,0.,
4.200E-4,3.150E-
3,0.,3.505E-6,1.346E+3,0.

File: RECARSIF.SIF

Recreational Air SIF file

0.,0.,5.476E-3,0.,0.,0.,
0.,0.,2.347E-3,0.,0.,0.,
0.,0.,4.200E+3,0.,0.,5.040E+3

File: RECGWSIF.SIF

Recreational: groundwater SIFs

5.486E-4,9.326E-4,4.663E-07,0.,0.,0.,2.743E-03
2.351E-4,3.997E-4,1.998E-07,0.,0.,0.,1.176E-03
4.208E+2,7.153E+2,3.577E-01,0.,0.,0.,4.208E+02

File: RECSWSIF.SIF

Recreational: surface water SIFs

5.486E-4,0.0,0.0,0.,0.,0.,3.857E-4,0.,7.131E-5,1.426E-2,3.388E-7,6.982E-8,0.,0.,0.,
2.351E-4,0.0,0.0,0.,0.,0.,1.653E-4,0.,3.056E-5,6.113E-3,1.452E-7,2.992E-8,0.,0.,0.,
4.208E+2,0.0,0.0,0.,0.,0.,2.959E+2,0.,5.470E+1,1.094E+4,2.500E-2,2.520E-2,0.,5.470E+02,2.735E+2,1.094E+2,

EXHIBIT D.4. (contd)

File: RESSLIF.SIF

Residential Soil (mass) SIF File

3.643E-6,8.713E-6,1.429E-8,0.,
1.561E-6,3.734E-6,6.122E-9,0.,
1.315E+0,4.860E+0,1.096E-2,2.104E5,

File: RESSASIF.SIF

Residential Soil (area) SIF file

6.071E-8,1.452E-7,0.,2.380E-10,0.,0.,
2.602E-8,6.223E-8,0.,1.020E-10,0.,0.,
2.192E-2,8.100E-2,0.,1.826E-4,2.104E+5,0.,
1.143E-3,6.000E-4,
4.898E-4,2.571E-4,
8.766E+2,4.602E+2,

File: RESARSIF.SIF

Residential air SIF file

0.,0.,2.857E-1,0.,0.,0.,
0.,0.,1.224E-1,0.,0.,0.,
0.,0.,2.192E+5,0.,0.,2.630E+5
1.143E-3,6.000E-4,
4.898E-4,2.571E-4,
8.766E+2,4.602E+2,

File: RESGWSIF.SIF

Residential groundwater SIFs

2.857E-2,4.857E-2,1.457E-04,1.143E-3,6.000E-4,0.,0.,1.071E-01,
1.224E-2,2.082E-2,6.245E-05,4.898E-4,2.571E-4,0.,0.,4.592E-02,
2.192E+4,3.726E+4,1.118E+02,8.766E+2,4.602E+2,0.,0.,1.644E+04,

File: RESSWSIF.SIF

Residential surface water SIFs

2.857E-2,4.857E-2,1.457E-04,1.143E-3,6.000E-4,0.,0.,3.857E-4,0.,7.131E-5,1.426E-2,3.395E-7,6.982E-8,1.071E-0
1,0.,0.,0.,
1.224E-2,2.082E-2,6.245E-05,4.898E-4,2.571E-4,0.,0.,1.653E-4,0.,3.056E-5,6.113E-3,1.455E-7,2.992E-8,4.592E-0
2,0.,0.,0.,
2.192E+4,3.726E+4,1.118E+02,8.766E+2,4.602E+2,0.,0.,2.959E+2,0.,5.470E+1,1.094E+4,2.520E-2,2.520E-2,1.644E+0
4,5.470E+2,2.735E+2,1.094E+2

File: AGRSLIF.SIF

Agricultural Soil (mass) SIF File

3.643E-6,8.713E-6,1.429E-8,0.,
1.561E-6,3.734E-6,6.122E-9,0.,
1.315E+0,4.860E+0,1.096E-2,2.104E5,

File: AGRSASIF.SIF

Agricultural Soil (area) SIF file

6.071E-8,1.452E-7,0.,2.380E-10,0.,0.,
2.602E-8,6.223E-8,0.,1.020E-10,0.,0.,
2.192E-2,8.100E-2,0.,1.826E-4,2.104E+5,0.,
1.143E-3,6.000E-4,1.071E-3,4.286E-3,
4.898E-4,2.571E-4,4.592E-4,1.837E-3,
8.766E+2,4.602E+2,8.218E+2,3.287E+3,

EXHIBIT D.4. (contd)

File: AGRARSIF.SIF

Agricultural air SIF file

0.,0.,2.857E-1,0.,0.,0.,
0.,0.,1.224E-1,0.,0.,0.,
0.,0.,2.192E+5,0.,0.,2.630E+5
1.143E-3,6.000E-4,1.071E-3,4.286E-3
4.898E-4,2.571E-4,4.592E-4,1.837E-3
8.766E+2,4.602E+2,8.218E+2,3.287E+3

File: AGRGWSIF.SIF

Agricultural groundwater SIFs

2.857E-2,4.857E-2,1.457E-04,1.143E-3,6.000E-4,1.071E-3,4.286E-3,1.071E-01,
1.224E-2,2.082E-2,6.245E-05,4.898E-4,2.571E-4,4.592E-4,1.837E-3,4.592E-02,
2.192E+4,3.726E+4,1.118E+02,8.766E+2,4.602E+2,8.218E+2,3.287E+3,1.644E+04,

File: AGRSWSIF.SIF

Agricultural surface water SIFs

2.857E-2,4.857E-2,1.457E-04,1.143E-3,6.000E-4,1.071E-3,4.286E-3,3.857E-4,0.,7.131E-5,1.426E-2,3.395E-7,6.982
E-8,1.071E-01,0.,0.,0.,
1.224E-2,2.082E-2,6.245E-05,4.898E-4,2.571E-4,4.592E-4,1.837E-3,1.653E-4,0.,3.056E-5,6.113E-3,1.455E-7,2.992
E-8,4.592E-02,0.,0.,0.,
2.192E+4,3.726E+4,1.118E+02,8.766E+2,4.602E+2,8.218E+2,3.287E+3,2.959E+2,0.,5.470E+1,1.094E+4,2.520E-2,2.520
E-2,1.644E+04,5.470E+2,2.735E+2,1.094E+2

D.7 POLLUTANT SETS FOR INPUT

This section presents the groupings of pollutants as used in the input files (.HIN). The chemicals were grouped in alphabetical order with two sets of 20 and one set of 7 (total of 47 chemicals). Radionuclides were grouped to include the progeny in the same group as the parent radionuclides. There are 6 radionuclide groups: 5 sets of 20 and one set of 1 (total of 101 radionuclides). The groupings of chemicals are indicated in Table D.13 and the groupings of radionuclides are indicated in Table D.14.

TABLE D.13. Chemical Pollutant Groupings

Set 1	Set 2	Set 3
Aluminum fluoride	Iron (as ferric ion)	Sulfate (ionic)
Aluminum nitrate	Lead (ionic)	Sulfuric acid
Aluminum (ionic)	Magnesium (ionic)	Tributyl phosphate
Ammonium carbonate	Magnesium nitrate	Tributyl phosphonate
Ammonium nitrate	Mercury (ionic)	Trichloroethylene
Beryllium (ionic)	Methyl isobutyl ketone	Uranium (ionic)
Butyl phosphates	Nickel (ionic)	Zinc (ionic)
Cadmium (ionic)	Nitrate	
Calcium carbonate	Nitric acid	
Calcium (ionic)	Nitrite	
Calcium nitrate	Oxalate (ionic)	
Carbon tetrachloride	Phosphate (ionic)	
Chromium IV (ionic)	Potassium (ionic)	
Copper sulfate	Potassium borate	
Copper (ionic)	Silver (ionic)	
Dibutyl phosphonate	Sodium (ionic)	
Ferric nitrate	Sodium aluminate	
Ferrocyanide (ionic)	Sodium dichromate	
Ferrous nitrate	Sodium oxalate	
Fluoride (ionic)	Sodium sulfamate	

TABLE D.14. Radionuclide Groupings

<u>Set 1</u>	<u>Set 2</u>	<u>Set 3</u>	<u>Set 4</u>	<u>Set 5</u>	<u>Set 6</u>
AG110M	CL36	M093	ZN65	SE79	U236
AM241	C057	NB93M	PU238	SM147	
AM243	C058	ZR93	PU242	SM151	
NP239	C060	NB94	U238	SN113	
PU239	CS134	NB95	TH234	SN123	
AU195	CS137	NI59	U234	SR85	
BA133	ES254	NI63	TH230	SR90	
BE7	CF250	NP237	RA226	Y90	
BE10	CM246	PA233	RN222	TA182	
CA45	EU152	U233	PB210	TC99	
C14	EU154	TH229	BI210	U232	
CD109	EU155	RA225	PO210	TH232	
CE144	FE55	AC225	RE187	RA228	
CF252	GE68	U235	RU103	TH228	
CM248	H3	TH231	RU106	RA224	
CM243	I129	PA231	S35	PB212	
CM244	K40	AC227	SB122	TL204	
PU240	KR85	TH227	SB124	TM170	
CM245	MN54	RA223	SC46	V49	
PU241	NA22	PM147	SE75	Y88	

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