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Salmon Site
Remedial Investigation Report

Volume III

Appendix C - Human Health Risk Assessment
Appendix D - Groundwater Modeling Data and Supporting
Documentation

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Appendix C

Human Health Risk Assessment

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List of Acronyms and Abbreviations

atm-m ³ /mol	Atmospheres - cubic meter per mole
bgs	Below ground surface
cm ²	Square centimeter(s)
DOE/NV	U.S. Department of Energy, Nevada Operations Office
EPA	U.S. Environmental Protection Agency
FS	Feasibility Study
ft	Foot (feet)
g	Gram(s)
g/m ²	Grams(s) per square meter(s)
HEAST	Health Effects Assessment Summary Tables
HI	Hazard index
HQ	Hazard quotient
hr	Hour
ILCR	Incremental lifetime cancer risk
IRIS	Integrated Risk Information System
Kg	Kilogram(s)
L	Liter(s)
L/cm ³	Liter(s) per cubic centimeter(s)
m	Meter(s)
m/sec	Meter(s) per second
m ²	Square meter(s)
m ³	Cubic meter(s)
MDEQ	Mississippi Department of Environmental Quality
mg	Milligram(s)
mg/d	Milligram(s) per day
mg/kg	Milligram(s) per kilogram(s)
mg/kg-d	Milligram(s) per kilogram(s) per day
mg/L	Milligram(s) per liter
min	Minute(s)
NCP	National Contingency Plan
pCi	Picocurie(s)
pCi/g	Picocurie(s) per gram

List of Acronyms and Abbreviations *(Continued)*

pCi/L	Picocurie(s) per liter
PCOC	Potential Contaminants of Concern
RAGS	Risk Assessment Guidance for Superfund
RfC	Reference concentration
RfD	Reference dose
RI	Remedial Investigation
RME	Reasonable maximum exposure
SF	Slope factor
UCL	Upper confidence limit
VOC	Volatile Organic Compound(s)
yr	Year

C.1.0 Introduction

This appendix addresses the human health effects of exposure to potential contaminants of concern (PCOC), both chemicals and radionuclides, in surface soil, subsurface soil, sediment, surface water, and groundwater at the Salmon Site.

A risk assessment is an interpretive link between a remedial investigation (RI) and a feasibility study (FS). The human health risk assessment is designed to use data collected during the RI to evaluate potential health effects at a site and to formulate the goals to be used in selecting remedial actions in the FS, if required. This risk assessment was performed in accordance with the U.S. Environmental Protection Agency's (EPA) Risk Assessment Guidance for Superfund (RAGS) (EPA, 1989).

This appendix consists of the following major elements: Identification of Potential Contaminants of Concern ([Section C.2.0](#)), Exposure Assessment ([Section C.3.0](#)), Toxicity Assessment ([Section C.4.0](#)), and Risk Characterization ([Section C.5.0](#)).

C.2.0 Identification of Potential Contaminants of Concern

The PCOCs for the Salmon Site were selected based on an evaluation of available information. This process evaluated historical site information, process knowledge of site activities, sample collection and analytical methods, analytical data results of RI samples collected, and quality of the data. Constituents evaluated in this analysis were selected based on technical judgment of those likely to be site-related.

C.2.1 Methodology for Selection of Potential Contaminants of Concern

The following sections summarize the analytical information available for each source area of concern at the Salmon Site. Included in this summary is a description of the medium sampled, a summary of the levels of PCOCs detected, and the statistical analysis, if any, for each medium. The selection process for each medium was different. The initial list of PCOCs for each medium is the same as those summarized in [Section 4.0](#) and [Appendix B](#) of the Salmon Site RI report. These differences are summarized in the following sections.

C.2.1.1 Surface and Subsurface Soils

For the Salmon Site human health risk assessment, subsurface soil is defined as 0.3 to 4.6 meters (m) (1 to 15 feet [ft]) below ground surface (bgs). The Mississippi Department of Environmental Quality (MDEQ) defines surface as 0 to 1.8 meters (0 to 6 ft). Because groundwater is shallow at the Salmon Site, U.S. Department of Energy, Nevada Operations Office (DOE/NV) used a more restrictive definition. The initial list of chemical PCOCs is the same as summarized in [Section 4.0](#) and [Appendix B](#). Metal identified as PCOCs were based on the analytical data presented in [Section 4.0](#) and screened against background. The initial analytical data sets for each PCOC by source area and sampling location were compiled from the *Baseline Ecological Risk Assessment Salmon Site Lamar County, Mississippi* (DOE/NV, 1995). One half of the detection limit was used for all non-detects. Using the Statistica® statistical software package, the following statistics were calculated for each source area and PCOC, assuming a normal distribution: maximum detected value, minimum detected value, mean, standard deviation, and 95 percent upper confidence limit (UCL) of the mean. The statistics for soil/sediment samples at the six source areas are summarized in [Section C.2.2](#).

For radiological PCOCs the initial list of radionuclides is the same as summarized in [Section 4.0](#) and [Appendix B](#). Using the Statistica® statistical software package, the following statistics were

calculated for each source area and PCOCs, assuming a normal distribution: maximum detected value, minimum detected value, mean, standard deviation, and 95 percent UCL of the mean. Short half-life daughters were eliminated from risk consideration as long as the parent toxicity values included risks due to the radioactive daughters. The analytical data for the radiological PCOCs are summarized in [Section C.2.2](#). The data summarized in [Section C.2.2](#) include any detected isotope whose activity exceeds the maximum activity for the same isotope in the reference area (background) samples (refer to [Section 3.0](#) for more details).

C.2.1.2 Surface Water

Surface water at the Salmon Site was not separated into source areas. Therefore, the statistical analysis for the surface water summarized in the *Baseline Ecological Risk Assessment Salmon Site Lamar County, Mississippi* (DOE/NV, 1995) was used in this human health risk assessment. The surface water analytical data are summarized in [Section C.2.2](#).

C.2.1.3 Groundwater

Groundwater at the Salmon Site was not separated into the six different source areas. For this risk assessment, the groundwater PCOCs and corresponding concentrations are the same as those developed in [Section 5.0](#). For on-site concentrations, the maximum detected groundwater concentration for each PCOCs was carried through this risk analysis. As part of the fate and transport analysis, groundwater concentrations were modeled to the site boundary. These concentrations were extremely small; therefore, there is no risk at the site boundary regardless of what potential receptors are present. [Section 5.0](#) in the main report presents groundwater fate and transport information in greater detail. The maximum groundwater concentrations for each of the PCOCs are summarized in [Section C.2.2](#).

C.2.1.4 PCOC Screening Criteria

Analytical results were screened using criteria from RAGS (EPA, 1989) to focus the risk assessment process onto those constituents that were PCOCs. The screening criteria were as follows:

- Blank contamination
- Comparison with background concentrations
- Frequency of detection
- Essential nutrients
- Short half-life radionuclides

The above screening criteria were applied to all of the soil analytical data. The remainder of this section is a discussion of the screening criteria and how they were applied to the Salmon Site data.

- A. Blank Contamination.** Because of the presence of several laboratory contaminants in virtually all environmental sampling efforts, the EPA has developed guidance for eliminating these contaminants from consideration as PCOCs. A chemical is not considered if the maximum sample concentration does not exceed 10 times the highest blank concentration for all common laboratory contaminants (these include: 2-butanone, acetone, methylene chloride, toluene, and phthalates) or does not exceed five times the highest blank concentration for other chemicals (EPA, 1989). This criterion was developed by the EPA to prevent the inclusion of chemicals that are most likely sampling or analytical artifacts. For the Salmon Site, this initial screen was performed in the analysis of the nature and extent of contamination, as reported in [Section 4.0](#).
- B. Comparison with Background.** Metals and certain radionuclides are present naturally in environmental media. If these constituents were present at naturally occurring levels, they were eliminated as PCOCs. This process is further defined in [Section C.2.2](#). Potassium-40 is naturally occurring and process knowledge of activities conducted indicate that it was not produced by any on-site activities. Therefore, it was eliminated as a PCOC in all cases.
- C. Frequency of Detection.** Constituents that are infrequently detected may be artifacts in the data due to sampling, analytical, or other problems (EPA, 1989). Constituents were eliminated from further consideration as PCOCs if they were detected in five percent or less of the data from a particular source area. Class A carcinogens were not eliminated on the basis of frequency of detection.
- D. Essential Nutrients.** Iron, magnesium, calcium, sodium, and potassium are essential nutrients that are generally toxic only at very high doses (EPA, 1989). Therefore, these constituents were eliminated as PCOCs.
- E. Short Half-life Radionuclides.** Selected radionuclides and radioactive decay chain products are designated in the Health Effects Assessment Summary Tables (HEAST)

(EPA, 1995) with the suffix “+D” to indicate that the cancer risk estimates for these radionuclides include the contributions from their short-lived decay products, assuming equal activity concentrations with the principal or parent radionuclide in the environment (EPA, 1995). Within a given source area, if the parent radionuclide was detected and a +D toxicity value exists, the +D was used in this risk assessment. All of the other short half-lived radionuclides that were detected in the given chain were eliminated as PCOCs.

C.2.2 *Potential Contaminants of Concern*

This section summarizes both the radiological and chemical PCOCs by media and source area. [Tables C.2-1](#) through [C.2-6](#) summarize the surface soil data, and [Tables C.2-7](#) through [C.2-11](#) summarize the subsurface soil data for each source area (Source Area 6 does not have any subsurface soil data). [Table C.2-12](#) summarizes the surface water data and [Table C.2-13](#) summarizes the groundwater data (both the maximum detected on-site concentration and the maximum concentration at the site boundary after transport modeling). [Table C.2-14](#) summarizes all of the surface soil PCOCs and [Table C.2-15](#) summarizes all of the subsurface soil PCOCs to be carried through this risk assessment by source area and media. [Table C.2-16](#) summarizes the surface soil PCOCs, for all source areas, to be carried through this risk assessment.

Table C.2-1
Evaluation of PCOC for the Salmon Site
Surface Soil at Source Area 1
 (Page 1 of 2)

Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Chemicals of Potential Concern (mg/kg)									
DDD	20	1	4.10E-02	1.70E-02	1.91E-02	5.24E-03	2.16E-02	No	Frequency of detection
DDE	20	1	2.10E-01	1.70E-02	2.76E-02	4.29E-02	4.77E-02	No	Frequency of detection
DDT	20	1	1.90E-01	1.70E-02	2.66E-02	3.85E-02	4.46E-02	No	Frequency of detection
Aluminum	23	23	7.51E+03	1.12E+03	3.93E+03	1.75E+03	4.69E+03	No	Less than background
Antimony	23	8	1.46E+01	6.10E+00	9.32E+00	3.63E+00	1.09E+01	Yes	
Aroclor-1254	20	1	1.10E+00	1.70E-01	2.27E-01	2.06E-01	3.23E-01	No	Frequency of detection
Arsenic	23	22	1.19E+01	2.70E-01	2.17E+00	2.19E+00	3.12E+00	Yes	
Barium	23	23	2.08E+02	4.50E+00	3.58E+01	4.96E+01	5.73E+01	Yes	
Benzoic Acid	21	8	1.80E+00	6.10E-02	6.69E-01	4.30E-01	8.64E-01	Yes	
Beryllium	23	4	2.90E-01	3.00E-02	6.33E-02	5.87E-02	8.87E-02	No	Less than background
Bis (2-Ethylhexyl) Phthalate	21	21	1.70E+00	4.40E-02	4.15E-01	4.49E-01	6.20E-01	Yes	
Calcium	23	23	2.23E+03	1.44E+02	5.68E+02	5.49E+02	8.06E+02	No	Essential Nutrient
Chromium	23	23	4.40E+01	2.90E+00	9.90E+00	8.54E+00	1.36E+01	Yes	
Cobalt	23	19	5.90E+00	1.00E+00	2.02E+00	1.23E+00	2.55E+00	No	Less than background
Copper	23	10	8.80E+00	3.15E-01	2.88E+00	2.68E+00	4.04E+00	No	Less than background
Cyanide	23	9	3.70E-01	7.00E-02	1.29E-01	9.01E-02	1.68E-01	Yes	
Ethylbenzene	20	1	7.00E-03	2.00E-03	3.48E-03	1.46E-03	4.16E-03	No	Frequency of detection
Iron	23	23	1.14E+04	3.53E+03	5.78E+03	1.74E+03	6.53E+03	No	Essential Nutrient
Lead	23	20	1.67E+01	2.60E+00	8.49E+00	4.65E+00	1.05E+01	No	Less than background
Magnesium	23	23	2.24E+02	4.98E+01	1.32E+02	4.15E+01	1.50E+02	No	Essential Nutrient
Manganese	23	23	6.36E+02	6.50E+00	1.13E+02	2.01E+02	2.00E+02	No	Less than background
Mercury	23	4	2.90E-01	2.50E-02	4.30E-02	5.49E-02	6.68E-02	Yes	
Nickel	23	6	1.31E+01	2.15E+00	3.48E+00	2.48E+00	4.55E+00	Yes	
Potassium	23	7	8.78E+02	3.11E+02	4.70E+02	2.10E+02	5.61E+02	No	Essential Nutrient
Sodium	23	7	1.54E+02	1.52E+01	3.71E+01	3.04E+01	5.03E+01	No	Essential Nutrient

Table C.2-1
Evaluation of PCOC for the Salmon Site
Surface Soil at Source Area 1
(Page 2 of 2)

Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Toluene	16	5	4.00E-03	1.00E-03	2.66E-03	6.51E-04	3.00E-03	Yes	
Vanadium	23	23	2.51E+01	5.70E+00	1.24E+01	3.89E+00	1.41E+01	No	Less than background
Xylene (Total)	15	8	1.30E-02	2.00E-03	3.50E-03	2.75E-03	5.02E-03	Yes	
Zinc	23	19	3.18E+01	1.05E+00	1.05E+01	8.53E+00	1.42E+01	Yes	
Radionuclides of Potential Concern (pCi/g)									
Gross Alpha	23	13	1.19E+01	2.90E+00	6.96E+00	2.59E+00	8.08E+00	No	Individual isotopes evaluated
Gross Beta	23	23	1.84E+01	8.97E+00	1.23E+01	2.81E+00	1.35E+01	No	Individual isotopes evaluated
Bismuth-212	22	10	4.20E-01	4.50E-02	1.93E-01	1.21E-01	2.46E-01	No	Less than background
Cesium-137+D	22	16	3.50E-01	1.00E-02	9.27E-02	1.04E-01	1.39E-01	Yes	
Lead-210+D	14	9	1.53E+00	4.00E-02	6.85E-01	4.89E-01	9.67E-01	No	Less than background
Lead-212	22	4	7.00E-01	1.00E-02	2.35E-01	2.13E-01	3.30E-01	No	Less than background
Mercury-203	1	1	3.00E-02	NA	NA	NA	NA	Yes	
Potassium-40	22	6	3.13E+00	2.45E-01	8.88E-01	8.47E-01	1.26E+00	No	Less than background
Protactinium-231	2	2	8.30E-01	6.40E-01	7.35E-01	1.34E-01	1.94E+00	Yes	
Protactinium-234	1	1	2.96E+00	NA	NA	NA	NA	Yes	
Radium-223	2	2	1.70E-01	9.00E-02	1.30E-01	5.66E-02	6.38E-01	Yes	
Radium-224	16	4	6.60E-01	9.00E-02	3.07E-01	1.41E-01	3.82E-01	Yes	
Radium-228+D	22	21	6.90E-01	5.00E-02	4.27E-01	1.32E-01	4.86E-01	Yes	
Thallium-208	16	13	1.83E+00	5.00E-03	2.64E-01	4.58E-01	5.09E-01	Yes	
Tin-113	1	1	2.00E-02	NA	NA	NA	NA	Yes	
Uranium-238+D	22	5	9.60E-01	1.50E-01	3.46E-01	2.01E-01	4.35E-01	Yes	

UCL = Upper Confidence Limit
mg/kg = Milligram(s) per kilogram
pCi/g = Picocurie(s) per gram
NA = Not Applicable

Table C.2-2
Evaluation of PCOC for the Salmon Site
Surface Soil at Source Area 2
 (Page 1 of 2)

Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Chemicals of Potential Concern (mg/kg)									
Acetone	11	1	9.70E-02	5.50E-03	2.28E-02	2.65E-02	4.06E-02	Yes	
Aluminum	11	11	9.21E+03	1.61E+03	4.13E+03	2.15E+03	5.57E+03	No	Less than background
Arsenic	11	11	4.00E+00	7.50E-01	1.70E+00	9.44E-01	2.33E+00	No	Less than background
Barium	11	11	4.38E+01	4.20E+00	2.29E+01	1.43E+01	3.25E+01	No	Less than background
Benzoic Acid	10	3	9.50E-01	8.70E-02	6.99E-01	3.28E-01	9.33E-01	Yes	
Beryllium	11	5	2.80E-01	3.00E-02	1.42E-01	1.25E-01	2.26E-01	No	Less than background
Bis (2-Ethylhexyl) Phthalate	10	5	1.90E-01	5.00E-02	1.26E-01	6.06E-02	1.69E-01	Yes	
Cadmium	11	2	1.40E+00	3.20E-01	4.80E-01	3.26E-01	6.99E-01	No	Less than background
Calcium	11	11	1.79E+03	1.50E+02	5.70E+02	4.64E+02	8.82E+02	No	Essential Nutrient
Chromium	11	11	7.70E+00	2.20E+00	5.33E+00	1.69E+00	6.47E+00	No	Less than background
Cobalt	11	8	9.30E+00	1.10E+00	4.01E+00	3.13E+00	6.12E+00	Yes	
Copper	11	2	1.40E+00	2.85E-01	7.45E-01	3.14E-01	9.56E-01	No	Less than background
Cyanide	11	3	1.80E-01	7.00E-02	9.55E-02	4.05E-02	1.23E-01	No	Less than background
Diesel	6	2	2.80E+01	1.20E+01	1.76E+01	8.07E+00	2.61E+01	Yes	
Iron	11	11	1.15E+04	3.72E+03	5.93E+03	2.49E+03	7.61E+03	No	Essential Nutrient
Lead	11	11	1.84E+01	4.60E+00	1.10E+01	4.28E+00	1.39E+01	No	Less than background
Magnesium	11	11	6.15E+02	6.87E+01	2.21E+02	1.60E+02	3.29E+02	No	Essential Nutrient
Manganese	11	11	9.94E+02	1.87E+01	3.51E+02	3.60E+02	5.93E+02	No	Less than background
Mercury	11	3	1.20E-01	2.50E-02	4.73E-02	3.59E-02	7.14E-02	Yes	
Methylene Chloride	11	1	1.00E-02	2.50E-03	3.36E-03	2.21E-03	4.85E-03	Yes	
Thallium	11	3	2.70E-01	1.05E-01	1.50E-01	6.74E-02	1.95E-01	Yes	
Toluene	11	1	3.00E-03	2.00E-03	2.68E-03	4.05E-04	2.95E-03	Yes	
Vanadium	11	11	1.74E+01	8.00E+00	1.10E+01	3.30E+00	1.32E+01	No	Less than background
Zinc	11	7	1.95E+01	1.35E+00	6.50E+00	5.29E+00	1.00E+01	No	Less than background

Table C.2-2
Evaluation of PCOC for the Salmon Site
Surface Soil at Source Area 2
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Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Radionuclides of Potential Concern (pCi/g)									
Gross Alpha	19	19	1.99E+01	1.91E+00	1.07E+01	5.66E+00	1.34E+01	No	Individual isotopes evaluated
Gross Beta	19	19	2.04E+01	3.42E+00	1.14E+01	6.08E+00	1.43E+01	No	Individual isotopes evaluated
Bismuth-212	11	7	7.50E-01	6.50E-02	3.19E-01	2.57E-01	4.91E-01	No	Short half-life daughter
Bismuth-214	1	1	5.90E-01	NA	NA	NA	NA	No	Short half-life daughter
Cesium-137+D	11	9	5.50E-01	1.00E-02	2.17E-01	2.06E-01	3.55E-01	No	Less than background
Lead-210+D	11	3	1.39E+00	9.50E-02	9.28E-01	4.39E-01	1.22E+00	No	Less than background
Lead-212	18	13	1.49E+00	1.50E-02	6.00E-01	4.14E-01	8.06E-01	No	Short half-life daughter
Lead-214	6	6	1.09E+00	3.80E-01	6.05E-01	2.75E-01	8.94E-01	No	Less than background
Potassium-40	14	7	6.96E+00	2.40E-01	2.37E+00	2.12E+00	3.59E+00	No	Less than background
Radium-223	1	1	3.70E-01	NA	NA	NA	NA	Yes	
Radium-224	15	1	7.70E-01	1.30E-01	3.30E-01	1.89E-01	4.35E-01	No	Short half-life daughter
Radium-226+D	11	6	1.29E+00	2.50E-02	4.10E-01	4.10E-01	6.85E-01	No	Less than background
Radium-228+D	11	7	1.25E+00	3.00E-02	4.69E-01	4.15E-01	7.48E-01	Yes	
Thallium-208	17	10	5.50E-01	1.00E-02	2.20E-01	1.87E-01	3.17E-01	No	Short half-life daughter
Thorium-228+D	2	2	3.47E+00	1.06E+00	2.27E+00	1.70E+00	1.76E+01	Yes	
Tritium	8	8	8.00E-02	-1.00E-02	1.01E-02	2.93E-02	3.46E-02	Yes	
Uranium-238+D	11	2	1.63E+00	1.45E-01	5.24E-01	5.39E-01	8.86E-01	Yes	

UCL = Upper Confidence Limit
 mg/kg = Milligram(s) per kilogram
 pCi/g = Picocurie(s) per gram
 NA = Not Applicable

Table C.2-3
Evaluation of PCOC for the Salmon Site
Surface Soil at Source Area 3
 (Page 1 of 3)

Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Chemicals of Potential Concern (mg/kg)									
Acenaphthylene	23	2	2.05E-01	7.70E-02	1.79E-01	3.04E-02	1.93E-01	Yes	
Acetone	33	13	9.00E-02	5.00E-03	2.92E-02	2.57E-02	3.83E-02	No	Laboratory Contaminant
Aluminum	21	21	1.88E+04	1.30E+03	5.12E+03	3.87E+03	6.88E+03	No	Less than background
Anthracene	23	1	3.60E-01	1.60E-01	1.94E-01	3.88E-02	2.11E-01	No	Frequency of detection
Arsenic	21	21	6.10E+00	4.90E-01	2.06E+00	1.36E+00	2.65E+00	No	Less than background
Barium	21	21	2.36E+02	7.00E+00	4.80E+01	4.80E+01	6.99E+01	Yes	
Benzo(a)Anthracene	23	1	1.20E+00	1.65E-01	2.60E-01	2.46E-01	3.66E-01	No	Frequency of detection
Benzo(a)Pyrene	23	2	5.20E-01	1.65E-01	2.07E-01	7.33E-02	2.39E-01	Yes	
Benzo(b)Fluoranthene	23	2	1.60E+00	1.65E-01	2.69E-01	3.06E-01	4.01E-01	Yes	
Benzo(k)Fluoranthene	23	2	3.50E-01	1.65E-01	1.97E-01	3.69E-02	2.12E-01	Yes	
Benzoic Acid	23	16	1.75E+00	1.10E-01	4.89E-01	4.17E-01	6.69E-01	Yes	
Beryllium	21	19	4.30E-01	3.00E-02	1.42E-01	1.06E-01	1.90E-01	No	Less than background
Bis (2-Ethylhexyl) Phthalate	23	5	3.60E-01	4.80E-02	1.79E-01	6.29E-02	2.06E-01	Yes	
Cadmium	21	2	1.30E+00	3.20E-01	4.31E-01	2.15E-01	5.30E-01	No	Less than background
Calcium	21	21	3.37E+03	2.15E+02	8.90E+02	8.34E+02	1.27E+03	No	Essential Nutrient
Chloroform	33	1	7.00E-03	2.50E-03	2.92E-03	7.72E-04	3.20E-03	No	Frequency of detection
Chromium	21	21	1.82E+01	2.10E+00	8.57E+00	4.46E+00	1.06E+01	No	Less than background
Chrysene	23	2	1.80E+00	1.65E-01	3.06E-01	4.00E-01	4.79E-01	Yes	
Cobalt	21	12	1.06E+01	7.00E-01	3.84E+00	3.00E+00	5.21E+00	No	Less than background
Copper	21	4	1.03E+01	3.00E-01	3.85E+00	2.50E+00	4.99E+00	Yes	
Cyanide	21	4	5.90E-01	6.00E-02	1.06E-01	1.15E-01	1.58E-01	Yes	
Dieldrin	29	2	3.20E-01	1.65E-02	2.94E-02	5.61E-02	5.08E-02	Yes	
Di-n-Octyl Phthalate	23	1	3.60E-01	5.90E-02	1.90E-01	4.73E-02	2.11E-01	No	Frequency of detection
Endosulfan II	29	1	3.80E-02	1.65E-02	1.89E-02	3.84E-03	2.03E-02	No	Frequency of detection
Ethylbenzene	33	3	3.00E-03	1.00E-03	2.71E-03	4.34E-04	2.87E-03	Yes	

Table C.2-3
Evaluation of PCOC for the Salmon Site
Surface Soil at Source Area 3
 (Page 2 of 3)

Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Heptachlor Epoxide	29	1	6.20E-02	8.00E-03	1.09E-02	9.85E-03	1.46E-02	No	Frequency of detection
Indeno(1,2,3-cd)Pyrene	23	2	2.05E-01	1.00E-01	1.80E-01	2.70E-02	1.92E-01	Yes	
Iron	21	21	1.62E+04	2.74E+03	7.80E+03	4.26E+03	9.74E+03	No	Essential Nutrient
Lead	21	21	8.52E+01	5.60E+00	1.86E+01	1.73E+01	2.65E+01	Yes	
Magnesium	21	21	1.18E+03	7.79E+01	3.00E+02	2.49E+02	4.13E+02	No	Essential Nutrient
Manganese	21	21	9.77E+02	3.37E+01	3.73E+02	3.22E+02	5.19E+02	No	Less than background
Mercury	21	5	7.00E-02	2.50E-02	3.69E-02	1.58E-02	4.41E-02	Yes	
Methylene Chloride	33	10	2.10E-02	1.00E-03	6.77E-03	6.16E-03	8.96E-03	No	Laboratory Contaminant
Nickel	21	3	1.18E+01	2.15E+00	3.11E+00	2.19E+00	4.11E+00	Yes	
Phenanthrene	23	1	3.60E-01	5.20E-02	1.89E-01	4.84E-02	2.10E-01	No	Frequency of detection
Phenol	23	1	3.60E-01	4.80E-02	1.89E-01	4.90E-02	2.10E-01	No	Frequency of detection
Potassium	21	2	7.74E+02	3.08E+02	3.79E+02	1.18E+02	4.33E+02	No	Essential Nutrient
Selenium	16	2	2.40E-01	1.05E-01	1.29E-01	4.19E-02	1.52E-01	No	Less than background
Toluene	33	10	6.00E-03	1.00E-03	2.67E-03	8.90E-04	2.98E-03	Yes	
Vanadium	21	21	3.40E+01	5.90E+00	1.41E+01	7.27E+00	1.74E+01	No	Less than background
Xylenes	33	6	6.50E-03	1.00E-03	4.14E-03	1.59E-03	4.70E-03	Yes	
Zinc	21	20	2.78E+02	1.75E+00	2.69E+01	6.03E+01	5.43E+01	Yes	
Radionuclides of Potential Concern (pCi/g)									
Gross Alpha	23	23	3.79E+01	5.86E+00	1.50E+01	7.41E+00	1.82E+01	No	Individual isotopes evaluated
Gross Beta	23	23	2.22E+01	6.78E+00	1.36E+01	3.50E+00	1.51E+01	No	Individual isotopes evaluated
Bismuth-212	10	3	6.10E-01	8.00E-02	2.72E-01	1.96E-01	4.12E-01	Yes	
Bismuth-214	1	1	1.06E+00	NA	NA	NA	NA	No	Short half-life daughter
Cesium-137+D	23	22	6.80E-01	4.00E-02	3.15E-01	2.11E-01	4.07E-01	No	Less than background
Lead-210+D	12	6	2.59E+00	1.55E-01	1.03E+00	8.17E-01	1.55E+00	Yes	
Lead-212	12	6	1.33E+00	1.00E-02	4.59E-01	4.67E-01	7.56E-01	Yes	

Table C.2-3
Evaluation of PCOC for the Salmon Site
Surface Soil at Source Area 3
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Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Lead-214	2	2	1.17E+00	1.05E+00	1.11E+00	8.49E-02	1.87E+00	No	Less than background
Potassium-40	22	21	6.08E+00	3.30E-01	3.54E+00	1.72E+00	4.31E+00	No	Less than background
Radium-224	1	1	9.70E-01	NA	NA	NA	NA	Yes	
Radium-226+D	23	14	1.22E+00	2.00E-02	6.37E-01	4.06E-01	8.13E-01	No	Less than background
Radium-228+D	22	17	1.46E+00	2.50E-02	7.01E-01	4.67E-01	9.08E-01	Yes	
Thallium-208	12	7	5.50E-01	5.00E-03	1.66E-01	1.84E-01	2.83E-01	Yes	
Thorium-234	4	4	3.56E+00	1.35E+00	2.62E+00	1.06E+00	4.30E+00	Yes	
Tritium	2	2	1.00E-01	3.00E-03	5.15E-02	6.86E-02	6.68E-01	Yes	
Uranium-238+D	10	5	1.31E+00	8.50E-02	5.02E-01	4.21E-01	8.02E-01	Yes	

UCL = Upper Confidence Limit
 mg/kg = Milligram(s) per kilogram
 pCi/g = Picocurie(s) per gram
 NA = Not Applicable

Table C.2-4
Evaluation of PCOC for the Salmon Site
Surface Soil at Source Area 4
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Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Chemicals of Potential Concern (mg/kg)									
Acetone	26	1	5.70E-02	5.00E-03	1.93E-02	1.22E-02	2.42E-02	No	Frequency of detection
Aluminum	28	28	1.70E+04	2.19E+03	5.43E+03	3.32E+03	6.71E+03	No	Less than background
Antimony	18	9	2.36E+01	6.10E+00	1.02E+01	4.59E+00	1.25E+01	Yes	
Arsenic	28	27	5.00E+00	3.45E-01	1.82E+00	1.09E+00	2.25E+00	No	Less than background
Barium	28	28	4.29E+02	1.00E+01	4.28E+01	7.70E+01	7.27E+01	Yes	
Benzoic Acid	25	11	1.70E+00	7.50E-02	6.35E-01	4.12E-01	8.06E-01	Yes	
Benzyl Alcohol	25	6	3.50E-01	1.70E-01	2.21E-01	6.89E-02	2.49E-01	Yes	
Beryllium	28	3	2.55E-01	3.00E-02	7.79E-02	7.01E-02	1.05E-01	No	Less than background
Bis (2-Ethylhexyl) Phthalate	25	16	2.00E-01	3.60E-02	1.07E-01	6.19E-02	1.33E-01	Yes	
Cadmium	28	6	1.01E+00	3.20E-01	4.38E-01	2.02E-01	5.17E-01	No	Less than background
Calcium	28	28	5.02E+03	1.99E+02	8.77E+02	1.00E+03	1.27E+03	No	Essential Nutrient
Chromium	28	28	2.89E+01	3.00E+00	8.12E+00	5.51E+00	1.03E+01	Yes	
Cobalt	28	16	4.90E+00	4.45E-01	2.14E+00	1.12E+00	2.58E+00	No	Less than background
Copper	28	18	9.95E+03	3.00E-01	3.68E+02	1.88E+03	1.10E+03	Yes	
Cyanide	28	8	6.80E-01	6.50E-02	1.30E-01	1.38E-01	1.84E-01	Yes	
Dieldrin	25	1	3.20E-01	1.60E-02	2.94E-02	6.05E-02	5.44E-02	No	Frequency of detection
Iron	28	28	1.97E+04	2.37E+03	7.36E+03	4.61E+03	9.15E+03	No	Essential Nutrient
Lead	28	28	1.20E+02	4.20E+00	1.87E+01	2.56E+01	2.86E+01	Yes	
Magnesium	28	28	1.50E+03	8.05E+01	3.38E+02	3.37E+02	4.69E+02	No	Essential Nutrient
Manganese	28	28	1.98E+02	1.61E+01	6.13E+01	4.50E+01	7.87E+01	No	Less than background
Mercury	28	7	2.10E-01	2.50E-02	4.50E-02	4.02E-02	6.06E-02	Yes	
Methylene Chloride	25	1	7.00E-03	2.50E-03	3.22E-03	1.09E-03	3.67E-03	No	Frequency of detection
Nickel	28	7	1.91E+01	2.15E+00	3.50E+00	3.31E+00	4.78E+00	Yes	
Phenol	25	1	3.40E-01	1.30E-01	1.85E-01	3.51E-02	2.00E-01	No	Frequency of detection
Selenium	28	5	6.90E-01	1.05E-01	1.56E-01	1.20E-01	2.03E-01	No	Less than background

Table C.2-4
Evaluation of PCOC for the Salmon Site
Surface Soil at Source Area 4
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Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Sodium	28	8	1.04E+02	5.65E+00	3.04E+01	2.27E+01	3.92E+01	No	Essential Nutrient
Styrene	22	1	2.50E-02	2.50E-03	4.43E-03	4.77E-03	6.55E-03	No	Frequency of detection
Toluene	25	7	9.00E-03	1.00E-03	2.82E-03	1.41E-03	3.40E-03	Yes	
Vanadium	28	28	2.91E+01	4.80E+00	1.29E+01	5.98E+00	1.52E+01	No	Less than background
Zinc	28	28	1.31E+02	4.40E+00	2.35E+01	3.33E+01	3.64E+01	Yes	
Radionuclides of Potential Concern (pCi/g)									
Gross Alpha	28	23	2.05E+01	4.06E+00	1.06E+01	4.88E+00	1.25E+01	No	Individual isotopes evaluated
Gross Beta	28	28	3.12E+01	9.26E+00	1.50E+01	5.01E+00	1.70E+01	No	Individual isotopes evaluated
Bismuth-212	21	16	1.01E+00	7.50E-02	3.60E-01	2.34E-01	4.66E-01	No	Short half-life daughter
Bismuth-214	1	1	5.00E-02	NA	NA	NA	NA	No	Less than background
Cesium-137+D	28	24	8.90E-01	1.00E-02	1.46E-01	1.97E-01	2.22E-01	Yes	
Lead-210+D	17	12	2.04E+00	3.25E-01	1.04E+00	4.79E-01	1.29E+00	No	Less than background
Lead-212	27	19	1.86E+00	1.00E-02	6.10E-01	5.33E-01	8.21E-01	No	Short half-life daughter
Potassium-40	28	12	7.16E+00	1.95E-01	1.82E+00	1.90E+00	2.56E+00	No	Less than background
Protactinium-231	2	1	9.60E-01	6.10E-01	7.85E-01	2.47E-01	3.01E+00	Yes	
Radium-223	7	7	4.20E-01	8.00E-02	2.26E-01	1.22E-01	3.38E-01	Yes	
Radium-224	22	12	1.23E+00	1.20E-01	4.11E-01	3.39E-01	5.61E-01	No	Short half-life daughter
Radium-226+D	28	6	9.60E-01	2.00E-02	3.52E-01	2.69E-01	4.56E-01	No	Less than background
Radium-228+D	28	27	1.76E+00	3.00E-02	5.97E-01	4.38E-01	7.67E-01	Yes	
Thallium-208	28	13	5.30E-01	5.00E-03	1.39E-01	1.53E-01	1.99E-01	No	Short half-life daughter
Thorium-228+D	7	7	4.35E+00	1.27E+00	2.39E+00	1.09E+00	3.40E+00	Yes	
Tin-113	1	1	3.00E-02	NA	NA	NA	NA	Yes	
Uranium-234	1	1	3.19E+00	NA	NA	NA	NA	Yes	
Uranium-238+D	28	4	1.80E+00	1.35E-01	4.26E-01	3.30E-01	5.53E-01	Yes	

UCL = Upper Confidence Limit
 mg/kg = Milligram(s) per kilogram

pCi/g = Picocurie(s) per gram
 NA = Not Applicable

Table C.2-5
Evaluation of PCOC for the Salmon Site
Surface Soil at Source Area 5
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Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Chemicals of Potential Concern (mg/kg)									
4,4'-DDE	10	1	2.05E-01	1.70E-02	4.42E-02	6.14E-02	8.81E-02	Yes	
4,4'-DDT	10	1	2.05E-01	1.70E-02	4.38E-02	6.10E-02	8.74E-02	Yes	
Acetone	13	4	7.80E-02	5.50E-03	2.90E-02	2.51E-02	4.42E-02	No	Laboratory Contaminant
Aluminum	10	10	7.52E+03	2.25E+03	5.10E+03	1.90E+03	6.46E+03	No	Less than background
Arsenic	10	10	5.70E+00	7.40E-01	1.72E+00	1.50E+00	2.79E+00	No	Less than background
Barium	10	10	1.07E+02	7.20E+00	5.27E+01	2.96E+01	7.39E+01	Yes	
Benzoic Acid	11	5	9.00E-01	6.90E-02	5.24E-01	4.04E-01	7.96E-01	Yes	
Beryllium	10	1	2.70E-01	3.00E-02	6.20E-02	7.39E-02	1.15E-01	No	Less than background
Bis (2-Ethylhexyl) Phthalate	11	9	1.85E-01	4.80E-02	1.01E-01	5.05E-02	1.35E-01	Yes	
Cadmium	10	1	8.60E-01	3.30E-01	4.03E-01	1.62E-01	5.19E-01	No	Less than background
Calcium	10	10	9.48E+03	2.95E+02	1.96E+03	3.07E+03	4.16E+03	No	Essential Nutrient
Chloroform	13	2	6.00E-03	2.50E-03	3.31E-03	1.01E-03	3.92E-03	Yes	
Chromium	10	10	2.43E+01	2.50E+00	7.32E+00	6.88E+00	1.22E+01	Yes	
Cobalt	10	7	5.20E+00	1.15E+00	3.13E+00	1.48E+00	4.19E+00	No	Less than background
Copper	10	2	5.30E+00	2.75E-01	1.26E+00	1.88E+00	2.61E+00	No	Less than background
Cyanide	10	2	1.70E-01	7.00E-02	9.20E-02	3.64E-02	1.18E-01	No	Less than background
Iron	10	10	1.04E+04	3.15E+03	5.58E+03	2.15E+03	7.11E+03	No	Essential Nutrient
Lead	10	10	6.36E+01	5.80E+00	1.75E+01	1.84E+01	3.07E+01	Yes	
Magnesium	10	10	5.53E+02	1.01E+02	2.78E+02	1.31E+02	3.72E+02	No	Essential Nutrient
Manganese	10	10	1.15E+03	3.83E+01	4.59E+02	3.52E+02	7.11E+02	Yes	
Mercury	10	3	8.00E-02	2.50E-02	4.55E-02	2.40E-02	6.26E-02	No	Less than background
Methylene Chloride	13	3	6.00E-03	2.50E-03	3.81E-03	1.23E-03	4.55E-03	No	Laboratory Contaminant
Selenium	10	1	6.50E-01	1.05E-01	1.89E-01	1.67E-01	3.08E-01	No	Less than background
Toluene	13	2	3.00E-03	2.00E-03	2.69E-03	3.84E-04	2.92E-03	Yes	
Vanadium	10	10	2.08E+01	5.60E+00	1.13E+01	4.61E+00	1.46E+01	No	Less than background
Zinc	10	5	2.44E+01	2.40E+00	7.90E+00	6.24E+00	1.24E+01	No	Less than background

Table C.2-5
Evaluation of PCOC for the Salmon Site
Surface Soil at Source Area 5
 (Page 2 of 2)

Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Radionuclides of Potential Concern (pCi/g)									
Gross Alpha	10	8	1.88E+01	4.09E+00	1.14E+01	4.99E+00	1.49E+01	No	Individual isotopes evaluated
Gross Beta	10	10	2.38E+01	1.33E+01	1.71E+01	2.69E+00	1.91E+01	No	Individual isotopes evaluated
Bismuth-212	7	7	4.40E-01	1.60E-01	3.37E-01	9.43E-02	4.24E-01	No	Less than background
Cesium-137+D	10	10	9.20E-01	4.00E-02	2.98E-01	2.86E-01	5.03E-01	Yes	
Lead-210+D	8	7	1.60E+00	4.00E-01	1.06E+00	4.59E-01	1.44E+00	No	Less than background
Lead-212	10	7	9.70E-01	1.50E-02	5.33E-01	3.00E-01	7.47E-01	No	Less than background
Potassium-40	10	7	5.82E+00	4.30E-01	3.01E+00	1.81E+00	4.31E+00	No	Less than background
Protactinium-231	1	1	7.30E-01	NA	NA	NA	NA	Yes	
Radium-223	2	2	2.50E-01	1.90E-01	2.20E-01	4.24E-02	6.01E-01	Yes	
Radium-224	10	4	7.70E-01	9.00E-02	3.55E-01	1.98E-01	4.96E-01	No	Short half-life daughter
Radium-228+D	10	9	8.20E-01	8.50E-02	4.82E-01	2.05E-01	6.28E-01	Yes	
Thallium-208	10	6	2.50E-01	5.00E-03	1.23E-01	9.22E-02	1.89E-01	No	Less than background
Thorium-228+D	1	1	8.30E-01	NA	NA	NA	NA	Yes	
Uranium-234	1	1	1.04E+01	NA	NA	NA	NA	Yes	
Uranium-235+D	1	1	9.00E-02	NA	NA	NA	NA	No	Less than background

UCL = Upper Confidence Limit
 mg/kg = Milligram(s) per kilogram
 pCi/g = Picocurie(s) per gram
 NA = Not Applicable

Table C.2-6
Evaluation of PCOC for the Salmon Site
Surface Soil at Source Area 6

Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Chemicals of Potential Concern (mg/kg)									
Aluminum	5	5	4.60E+03	2.63E+03	3.51E+03	9.44E+02	4.68E+03	Yes	
Arsenic	5	5	1.40E+00	9.10E-01	1.13E+00	2.16E-01	1.40E+00	No	Less than background
Barium	5	5	2.62E+01	1.35E+01	2.03E+01	4.64E+00	2.61E+01	No	Less than background
Benzoic Acid	5	1	9.00E-01	1.30E-01	7.36E-01	3.39E-01	1.16E+00	Yes	
Calcium	5	5	3.01E+02	2.35E+02	2.75E+02	2.60E+01	3.07E+02	No	Essential Nutrient
Chloroform	5	3	7.00E-03	3.00E-03	4.60E-03	1.82E-03	6.86E-03	Yes	
Chromium	5	5	6.90E+00	2.60E+00	4.50E+00	1.63E+00	6.52E+00	No	Less than background
Iron	5	5	4.52E+03	2.50E+03	3.51E+03	7.54E+02	4.44E+03	No	Essential Nutrient
Lead	5	5	2.31E+01	6.40E+00	1.44E+01	7.58E+00	2.38E+01	Yes	
Magnesium	5	5	2.09E+02	1.33E+02	1.61E+02	3.05E+01	1.98E+02	No	Essential Nutrient
Manganese	5	5	2.07E+02	4.38E+01	1.25E+02	6.61E+01	2.07E+02	No	Less than background
Mercury	5	2	7.00E-02	2.50E-02	4.30E-02	2.05E-02	6.84E-02	No	Less than background
Potassium	5	2	7.26E+02	3.27E+02	4.89E+02	2.16E+02	7.57E+02	No	Essential Nutrient
Vanadium	5	5	8.90E+00	5.30E+00	7.00E+00	1.69E+00	9.10E+00	No	Less than background
Radionuclides of Potential Concern (pCi/g)									
Gross Alpha	5	4	1.29E+01	3.41E+00	9.31E+00	3.76E+00	1.40E+01	No	Individual isotopes evaluated
Gross Beta	5	5	1.68E+01	1.27E+01	1.45E+01	1.53E+00	1.64E+01	No	Individual isotopes evaluated
Bismuth-212	4	2	2.60E-01	1.05E-01	1.80E-01	8.13E-02	3.09E-01	No	Less than background
Cesium-137+D	5	5	1.70E-01	1.00E-01	1.42E-01	3.11E-02	1.81E-01	No	Less than background
Lead-210+D	4	2	1.14E+00	7.50E-01	9.40E-01	1.89E-01	1.24E+00	No	Less than background
Potassium-40	5	1	2.78E+00	8.80E-01	1.38E+00	7.95E-01	2.37E+00	No	Less than background
Radium-223	1	1	1.50E-01	NA	NA	NA	NA	No	Less than background
Radium-224	5	1	1.46E+00	1.50E-02	3.83E-01	6.07E-01	1.14E+00	Yes	
Radium-228+D	5	5	4.30E-01	3.30E-01	3.96E-01	3.85E-02	4.44E-01	No	Less than background

UCL = Upper Confidence Limit
mg/kg = Milligram(s) per kilogram
pCi/g = Picocurie(s) per gram
NA = Not Applicable

Table C.2-7
Evaluation of PCOC for the Salmon Site
Subsurface Soil at Source Area 1
 (Page 1 of 2)

Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Chemicals of Potential Concern (mg/kg)									
2-Methylnaphthalene	12	3	4.90E+02	1.60E-01	5.02E+01	1.42E+02	1.40E+02	Yes	
Acenaphthene	11	1	1.10E+01	1.60E-01	1.15E+00	3.27E+00	3.34E+00	Yes	
Acetone	12	8	2.20E+01	5.00E-03	2.05E+00	6.32E+00	6.06E+00	No	Laboratory Contaminant
Aluminum	12	12	3.62E+03	3.04E+02	1.51E+03	1.11E+03	2.21E+03	No	Less than background
Arsenic	12	1	1.25E+00	1.30E-01	7.02E-01	4.68E-01	1.00E+00	No	Less than background
Barium	12	12	8.62E+01	1.40E+00	2.20E+01	2.55E+01	3.82E+01	Yes	
Benzene	11	1	8.40E-01	2.50E-03	7.86E-02	2.53E-01	2.48E-01	Yes	
Benzoic acid	10	1	8.00E-01	4.10E-02	7.24E-01	2.40E-01	8.96E-01	Yes	
Cadmium	12	1	1.40E+00	2.90E-01	5.90E-01	3.10E-01	7.87E-01	Yes	
Calcium	12	12	2.20E+04	1.04E+02	5.12E+03	7.44E+03	9.84E+03	No	Essential Nutrient
Chloromethane	10	1	6.00E-03	5.00E-03	5.10E-03	3.16E-04	5.33E-03	Yes	
Chromium	13	12	2.89E+02	6.00E-01	5.80E+01	1.07E+02	1.22E+02	Yes	
Cobalt	12	2	7.15E+00	5.50E-01	4.58E+00	2.74E+00	6.31E+00	Yes	
Copper	12	11	9.10E+00	8.80E-01	3.22E+00	2.27E+00	4.66E+00	Yes	
Cyanide	4	1	8.00E-02	2.50E-02	3.88E-02	2.75E-02	8.25E-02	Yes	
Dibenzofuran	11	1	3.30E+00	1.60E-01	4.50E-01	9.45E-01	1.08E+00	Yes	
Diesel	9	2	3.20E+04	1.20E+01	3.62E+03	1.06E+04	1.18E+04	Yes	
Ethylbenzene	11	1	6.50E-01	2.50E-03	6.14E-02	1.95E-01	1.93E-01	Yes	
Fluorene	12	2	2.20E+01	1.60E-01	3.30E+00	7.44E+00	8.03E+00	Yes	
Iron	12	12	7.43E+03	1.87E+02	2.64E+03	2.42E+03	4.18E+03	No	Essential Nutrient
Lead	12	11	3.13E+01	3.10E-01	9.96E+00	1.08E+01	1.68E+01	Yes	
Magnesium	12	11	5.98E+02	3.56E+01	2.25E+02	2.07E+02	3.56E+02	No	Essential Nutrient
Manganese	12	12	9.64E+01	2.00E+00	2.68E+01	3.07E+01	4.63E+01	No	Less than background
Methylene chloride	10	4	1.30E-02	2.50E-03	5.30E-03	4.40E-03	8.45E-03	No	Laboratory Contaminant

Table C.2-7
Evaluation of PCOC for the Salmon Site
Subsurface Soil at Source Area 1
 (Page 2 of 2)

Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Naphthalene	12	2	5.30E+01	1.60E-01	8.80E+00	2.02E+01	2.16E+01	Yes	
n-Nitrosodiphenylamine	11	1	1.80E+00	1.60E-01	3.13E-01	4.93E-01	6.44E-01	Yes	
Phenanthrene	10	1	1.65E-01	1.60E-01	1.65E-01	1.58E-03	1.66E-01	Yes	
Potassium	12	3	6.91E+02	6.95E+01	3.46E+02	2.62E+02	5.12E+02	No	Essential Nutrient
Sodium	12	12	1.16E+03	1.98E+01	2.76E+02	3.26E+02	4.83E+02	No	Essential Nutrient
Tetrachloroethene	12	5	3.60E+01	2.00E-03	5.17E+00	1.23E+01	1.30E+01	Yes	
Toluene	10	1	1.00E+00	2.50E-03	1.03E-01	3.15E-01	3.28E-01	Yes	
Xylene	12	3	5.10E+00	2.00E-03	7.69E-01	1.80E+00	1.91E+00	Yes	
Trichloroethene	10	4	4.60E-01	2.50E-03	4.86E-02	1.45E-01	1.52E-01	Yes	
Vanadium	12	8	1.39E+01	3.30E-01	4.75E+00	4.09E+00	7.35E+00	No	Less than background
Zinc	12	10	9.27E+01	1.95E+00	2.13E+01	3.10E+01	4.10E+01	Yes	
Radionuclides of Potential Concern (pCi/g)									
Gross Alpha	13	13	8.21E+00	1.62E+00	3.73E+00	2.77E+00	5.40E+00	No	Individual isotopes evaluated
Gross Beta	13	13	1.53E+01	1.69E+00	6.31E+00	4.15E+00	8.81E+00	No	Individual isotopes evaluated
Bismuth-212	1	1	1.16E+00	NA	NA	NA	NA	Yes	
Bismuth-214	2	2	1.03E+00	4.80E-01	7.55E-01	3.89E-01	4.25E+00	No	Short half-life daughter
Lead-210+D	10	2	2.38E+00	4.14E-01	8.64E-01	6.48E-01	1.33E+00	Yes	
Lead-212	17	15	1.25E+00	7.80E-02	5.20E-01	3.15E-01	6.82E-01	Yes	
Lead-214	14	6	8.60E-01	1.13E-01	4.64E-01	2.16E-01	5.89E-01	No	Less than background
Potassium-40	12	10	6.59E+00	7.35E-01	3.71E+00	1.88E+00	4.91E+00	No	Less than background
Radium-226+D	16	8	8.90E-01	1.40E-01	5.46E-01	2.08E-01	6.56E-01	Yes	
Radium-228+D	3	3	9.70E-01	8.90E-01	9.30E-01	4.00E-02	1.03E+00	Yes	
Thallium-208	6	6	3.60E-01	1.40E-01	2.55E-01	8.17E-02	3.41E-01	No	Less than background
Tritium	9	9	2.74E+00	3.00E-02	6.30E-01	1.02E+00	1.42E+00	Yes	

UCL = Upper Confidence Limit
 mg/kg = Milligram(s) per kilogram
 pCi/g = Picocurie(s) per gram
 NA = Not Applicable

Table C.2-8
Evaluation of PCOC for the Salmon Site
Subsurface Soil at Source Area 2
 (Page 1 of 3)

Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Chemicals of Potential Concern (mg/kg)									
1,1,2,2 Tetrachloroethane	43	1	5.00E-03	2.50E-03	2.68E-03	6.59E-04	2.89E-03	No	Frequency of detection
2-Methylnaphthalene	44	10	2.10E+02	6.40E-02	7.59E+00	3.39E+01	1.80E+01	Yes	
Acetone	42	11	3.50E-01	5.00E-03	3.34E-02	6.18E-02	5.29E-02	No	Laboratory Contaminant
Aluminum	34	34	1.06E+04	8.14E+02	5.53E+03	2.90E+03	6.55E+03	No	Less than background
Antimony	34	1	1.17E+01	2.25E+00	3.25E+00	1.90E+00	3.91E+00	No	Frequency of detection
Arsenic	34	24	6.10E+00	5.40E-01	2.15E+00	1.13E+00	2.55E+00	Yes	
Barium	34	34	1.97E+02	4.40E+00	3.55E+01	4.17E+01	5.01E+01	Yes	
Benzoic Acid	25	1	3.20E+00	3.65E-02	9.50E-01	6.65E-01	1.21E+00	No	Frequency of detection
Beryllium	34	5	5.40E-01	1.70E-01	2.32E-01	7.86E-02	2.59E-01	Yes	
Bis (2-Ethylhexyl) Phthalate	41	10	8.00E+00	3.30E-02	4.93E-01	1.30E+00	8.97E-01	Yes	
Butyl Benzyl Phthalate	37	1	6.50E-01	2.45E-02	1.74E-01	8.36E-02	2.02E-01	No	Frequency of detection
Cadmium	34	9	1.05E+01	2.90E-01	8.31E-01	1.84E+00	1.47E+00	Yes	
Calcium	34	34	1.47E+04	1.49E+02	2.01E+03	2.99E+03	3.06E+03	No	Essential Nutrient
Carbon Disulfide	41	1	5.00E-03	1.00E-03	2.65E-03	7.09E-04	2.87E-03	No	Frequency of detection
Chloromethane	41	1	2.00E-02	5.00E-03	5.61E-03	2.55E-03	6.41E-03	No	Frequency of detection
Chromium	34	34	2.48E+02	1.00E+00	3.26E+01	5.70E+01	5.25E+01	Yes	
Cobalt	34	20	5.78E+01	5.50E-01	3.09E+00	9.71E+00	6.48E+00	Yes	
Copper	34	24	1.59E+03	4.40E-01	5.72E+01	2.72E+02	1.52E+02	Yes	
Cyanide	34	3	1.30E-01	2.50E-02	3.04E-02	1.90E-02	3.71E-02	Yes	
Di-n-Butyl Phthalate	39	3	2.70E+00	1.65E-01	3.56E-01	5.75E-01	5.37E-01	Yes	
Ethylbenzene	41	3	5.00E-03	5.00E-04	2.67E-03	8.70E-04	2.95E-03	Yes	
Fluoranthene	39	1	6.50E-01	3.70E-02	1.97E-01	1.30E-01	2.38E-01	No	Frequency of detection
Fluorene	40	9	9.50E+00	7.00E-02	5.79E-01	1.54E+00	1.07E+00	Yes	
HpCDF	8	1	2.70E-03	1.20E-03	1.73E-03	7.01E-04	2.31E-03	Yes	
Iron	34	34	1.93E+04	1.24E+03	6.99E+03	3.79E+03	8.31E+03	No	Essential Nutrient

Table C.2-8
Evaluation of PCOC for the Salmon Site
Subsurface Soil at Source Area 2
 (Page 2 of 3)

Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Lead	34	34	1.99E+02	1.20E+00	1.62E+01	3.93E+01	2.99E+01	Yes	
Magnesium	34	34	8.81E+02	4.19E+01	3.02E+02	1.97E+02	3.71E+02	No	Essential Nutrient
Manganese	34	34	3.46E+03	3.50E+00	1.61E+02	5.87E+02	3.66E+02	Yes	
Mercury	34	6	6.50E+00	2.50E-02	4.04E-01	1.42E+00	8.99E-01	Yes	
Methylene Chloride	41	8	1.65E-02	5.00E-04	4.80E-03	3.72E-03	5.98E-03	No	Laboratory Contaminant
Naphthalene	48	11	1.50E+01	1.40E-02	6.26E-01	2.26E+00	1.28E+00	Yes	
Naphthalene, 1,2,3,4 Tetrahydro	1	1	1.60E+01	NA	NA	NA	NA	Yes	
Nickel	34	32	2.36E+01	8.50E-01	5.34E+00	4.52E+00	6.92E+00	Yes	
Phenanthrene	42	4	5.10E+00	6.50E-02	3.18E-01	7.67E-01	5.57E-01	Yes	
Potassium	34	17	6.97E+02	6.95E+01	2.58E+02	1.27E+02	3.03E+02	No	Essential Nutrient
Pyrene	37	1	6.50E-01	2.30E-02	1.74E-01	8.37E-02	2.02E-01	No	Frequency of detection
Selenium	34	3	4.00E-01	1.00E-01	1.34E-01	6.71E-02	1.57E-01	Yes	
Silver	34	5	6.38E+01	4.10E-01	3.97E+00	1.41E+01	8.87E+00	Yes	
Sodium	34	32	1.35E+03	1.77E+01	2.17E+02	3.08E+02	3.24E+02	No	Essential Nutrient
TCDF	8	1	1.10E-03	5.00E-04	6.38E-04	2.56E-04	8.52E-04	Yes	
Tetrachloroethene	41	2	2.80E-02	2.50E-03	3.74E-03	4.72E-03	5.23E-03	No	Frequency of detection
Thallium	34	4	3.40E-01	9.00E-02	1.19E-01	5.96E-02	1.39E-01	No	Less than background
Toluene	41	7	1.60E-02	1.50E-03	2.98E-03	2.20E-03	3.67E-03	Yes	
TPH	21	15	9.12E+03	2.48E+00	1.17E+03	2.29E+03	2.21E+03	Yes	
Trichloroethene	41	1	1.90E-02	2.50E-03	3.15E-03	2.82E-03	4.04E-03	No	Frequency of detection
Vanadium	34	32	2.73E+01	9.40E-01	1.37E+01	6.41E+00	1.60E+01	Yes	
Xylenes	28	5	1.30E-02	1.00E-03	3.57E-03	2.99E-03	4.73E-03	Yes	
Zinc	34	34	2.71E+03	1.80E+00	1.32E+02	4.73E+02	2.97E+02	Yes	

Table C.2-8
Evaluation of PCOC for the Salmon Site
Subsurface Soil at Source Area 2
 (Page 3 of 3)

Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Radionuclides of Potential Concern (pCi/g)									
Gross Alpha	38	38	1.84E+01	2.43E+00	9.92E+00	3.44E+00	1.11E+01	No	Individual isotopes evaluated
Gross Beta	38	38	4.07E+01	3.66E+00	1.28E+01	6.85E+00	1.51E+01	No	Individual isotopes evaluated
Bismuth-214	5	5	1.12E+00	2.40E-01	5.70E-01	3.82E-01	1.04E+00	No	Short half-life daughter
Cerium-141	1	1	1.70E-01	NA	NA	NA	NA	Yes	
Cesium-137+D	2	2	3.60E-01	3.40E-01	3.50E-01	1.41E-02	4.77E-01	Yes	
Lead-210+D	5	5	2.65E+00	1.34E+00	1.93E+00	5.84E-01	2.65E+00	Yes	
Lead-212	38	38	1.70E+00	2.60E-01	7.39E-01	3.64E-01	8.58E-01	Yes	
Lead-214	6	6	1.02E+00	6.60E-01	8.27E-01	1.46E-01	9.80E-01	No	Less than background
Potassium-40	12	12	1.05E+01	2.51E+00	6.78E+00	3.04E+00	8.71E+00	No	Less than background
Radium-224	1	1	1.71E+00	NA	NA	NA	NA	Yes	
Radium-226+D	25	25	1.38E+00	3.60E-01	6.84E-01	2.67E-01	7.94E-01	Yes	
Radium-228+D	3	3	1.32E+00	1.22E+00	1.27E+00	5.03E-02	1.40E+00	Yes	
Thallium-208	22	22	5.50E-01	1.30E-01	3.17E-01	1.16E-01	3.69E-01	Yes	
Thorium-234	5	5	4.17E+00	1.32E+00	2.35E+00	1.11E+00	3.73E+00	Yes	
Tritium	8	6	3.00E-02	4.00E-03	1.64E-02	1.11E-02	2.57E-02	Yes	
Uranium-235+D	1	1	4.10E-01	NA	NA	NA	NA	Yes	

UCL = Upper Confidence Limit
 mg/kg = Milligram(s) per kilogram
 pCi/g = Picocurie(s) per gram
 NA = Not Applicable

**Table C.2-9
Evaluation of PCOC for the Salmon Site
Subsurface Soil at Source Area 3**

Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Chemicals of Potential Concern (mg/kg)									
Di-n-Bityl Phthalate	8	4	1.60E+00	5.9E-01	1.06E+00	4.70E-01	1.09E+00	Yes	
Methylene chloride	4	4	1.20E-02	5.00E-03	9.00E-03	3.16E-03	1.40E-02	No	Laboratory Contaminant
Radionuclides of Potential Concern (pCi/g)									
Gross Alpha	4	4	1.58E+01	1.19E+00	6.08E+00	6.66E+00	1.67E+01	No	Individual isotopes evaluated
Gross Beta	4	4	1.36E+01	3.49E+00	8.39E+00	4.29E+00	1.52E+01	No	Individual isotopes evaluated
Bismuth-214	3	3	9.20E-01	6.10E-01	8.00E-01	1.66E-01	1.21E+00	No	Short half-life daughter
Lead-210+D	1	1	1.94E+00	NA	NA	NA	NA	Yes	
Lead-212	7	7	1.36E+00	5.90E-01	9.89E-01	2.77E-01	1.25E+00	Yes	
Lead-214	5	5	1.34E+00	6.90E-01	9.10E-01	2.49E-01	1.22E+00	No	Short half-life daughter
Potassium-40	6	6	1.26E+01	2.84E+00	6.21E+00	3.33E+00	9.70E+00	No	Less than background
Radium-226+D	5	5	1.13E+00	6.60E-01	8.88E-01	1.68E-01	1.10E+00	No	Less than background
Radium-228+D	2	2	1.33E+00	1.18E+00	1.26E+00	1.06E-01	2.21E+00	Yes	
Thallium-208	5	5	5.40E-01	3.10E-01	4.44E-01	9.37E-02	5.60E-01	Yes	
Thorium-234	2	2	1.94E+00	1.40E+00	1.67E+00	3.82E-01	5.10E+00	Yes	
Tritium	6	6	3.40E-01	1.40E-02	8.08E-02	1.28E-01	2.15E-01	Yes	

UCL = Upper Confidence Limit
mg/kg = Milligram(s) per kilogram
pCi/g = Picocurie(s) per gram
NA = Not Applicable

Table C.2-10
Evaluation of PCOC for the Salmon Site
Subsurface Soil at Source Area 4

Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Chemicals of Potential Concern (mg/kg)									
Acetone	8	6	6.50E-02	1.30E-02	3.48E-02	1.88E-02	5.04E-02	No	Laboratory Contaminant
Benzoic acid	8	1	8.00E-01	6.70E-02	7.08E-01	2.59E-01	9.25E-01	Yes	
Bis (2-ethylhexyl) Phthalate	8	1	1.65E-01	6.30E-02	1.52E-01	3.59E-02	1.82E-01	Yes	
Chloromethane	8	1	5.00E-03	5.00E-03	5.00E-03	NA ^c	NA	Yes	
Diesel	8	2	2.30E-01	1.25E-02	4.26E-02	7.62E-02	1.06E-01	Yes	
Di-n-octyl Phthalate	8	1	1.65E-01	4.00E-02	1.49E-01	4.40E-02	1.86E-01	Yes	
Methylene chloride	8	5	1.00E-02	2.50E-03	5.38E-03	2.81E-03	7.73E-03	No	Laboratory Contaminant
Radionuclides of Potential Concern (pCi/g)									
Gross Alpha	8	8	5.68E+01	4.22E+00	1.47E+01	1.74E+01	2.93E+01	No	Individual isotopes evaluated
Gross Beta	8	8	3.12E+01	9.15E+00	1.46E+01	7.00E+00	2.04E+01	No	Individual isotopes evaluated
Bismuth-212	1	1	1.64E+00	NA	NA	NA	NA	Yes	
Bismuth-214	4	4	5.42E+00	6.10E-01	2.30E+00	2.16E+00	5.73E+00	No	Short half-life daughter
Cesium-137+D	1	1	1.60E-01	NA	NA	NA	NA	Yes	
Lead-210+D	3	3	5.46E+00	2.20E+00	3.56E+00	1.70E+00	7.77E+00	Yes	
Lead-212	8	8	1.80E+00	5.50E-01	1.13E+00	3.81E-01	1.45E+00	Yes	
Lead-214	6	6	4.96E+00	5.30E-01	1.59E+00	1.73E+00	3.40E+00	No	Short half-life daughter
Potassium-40	8	8	1.06E+01	3.34E+00	7.57E+00	2.49E+00	9.65E+00	No	Less than background
Radium-226+D	6	6	5.15E+00	5.50E-01	1.67E+00	1.79E+00	3.55E+00	Yes	
Radium-228+D	4	4	1.77E+00	1.01E+00	1.37E+00	3.14E-01	1.87E+00	Yes	
Thallium-208	7	7	5.60E-01	2.60E-01	4.23E-01	1.15E-01	5.29E-01	Yes	
Thorium-234	1	1	6.34E+00	NA	NA	NA	NA	Yes	
Tritium	8	7	2.40E-02	1.50E-02	6.76E-03	1.32E-02	1.78E-02	Yes	

UCL = Upper Confidence Limit
mg/kg = Milligram(s) per kilogram
pCi/g = Picocurie(s) per gram
NA = Not Applicable

Table C.2-11
Evaluation of PCOC for the Salmon Site
Subsurface Soil at Source Area 5

Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Chemicals of Potential Concern (mg/kg)									
Acetone	2	2	6.10E-02	3.50E-02	4.80E-02	1.84E-02	2.13E-01	Yes	
Methylene chloride	2	2	1.00E-02	9.00E-03	9.50E-03	7.07E-04	1.59E-02	No	Laboratory Contaminant
Toluene	2	1	2.50E-03	2.00E-03	2.25E-03	3.54E-04	5.43E-03	Yes	
Radionuclides of Potential Concern (pCi/g)									
Gross Alpha	2	2	1.32E+01	9.93E+00	1.16E+01	2.31E+00	3.23E+01	No	Individual isotopes evaluated
Gross Beta	2	2	1.42E+01	1.11E+01	1.27E+01	2.19E+00	3.23E+01	No	Individual isotopes evaluated
Lead-210+D	2	2	1.22E+00	1.07E+00	1.15E+00	1.06E-01	2.10E+00	Yes	
Lead-214	2	2	7.50E-01	5.70E-01	6.60E-01	1.27E-01	1.80E+00	No	Less than background
Potassium-40	2	2	1.02E+01	7.34E+00	8.77E+00	2.02E+00	2.69E+01	No	Less than background
Radium-226+D	2	2	7.90E-01	5.00E-01	6.45E-01	2.05E-01	2.49E+00	Yes	
Thallium-208	2	2	4.10E-01	3.20E-01	3.65E-01	6.36E-02	9.37E-01	No	Less than background
Tritium	2	2	1.40E-02	8.00E-03	1.10E-02	4.24E-03	4.91E-02	Yes	

UCL = Upper Confidence Limit
mg/kg = Milligram(s) per kilogram
pCi/g = Picocurie(s) per gram

Table C.2-12
Evaluation of Potential Contaminants of Concern for the Salmon Site
Surface Water All Source Areas

Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Chemicals of Potential Concern (µg/L)									
Aluminum	14	14	4.16E+02	8.78E+01	2.04E+02	9.68E+01	2.60E+02	Yes	
Arsenic	14	1	2.20E+00	1.00E+00	1.09E+00	3.21E-01	1.27E+00	Yes	
Barium	14	14	9.04E+01	1.89E+01	3.46E+01	2.16E+01	4.71E+01	Yes	
Cadmium	14	1	3.00E+00	2.70E+00	2.72E+00	8.02E-02	2.77E+00	Yes	
Calcium	14	14	2.46E+04	5.73E+02	3.24E+03	6.26E+03	6.86E+03	No	Essential Nutrient
Cobalt	14	2	1.01E+01	6.00E+00	6.51E+00	1.32E+00	7.28E+00	Yes	
Iron	14	14	4.19E+03	1.11E+02	9.06E+02	1.20E+03	1.60E+03	No	Essential Nutrient
Lead	14	3	1.20E+00	1.00E+00	1.04E+00	7.45E-02	1.08E+00	Yes	
Magnesium	14	14	2.22E+03	3.63E+02	7.13E+02	4.65E+02	9.82E+02	No	Essential Nutrient
Manganese	14	14	5.76E+02	2.15E+01	1.09E+02	1.42E+02	1.91E+02	Yes	
Mercury	14	1	1.70E-01	1.00E-01	1.05E-01	1.87E-02	1.16E-01	No	Less than background
Silver	14	1	5.30E+00	3.50E+00	3.63E+00	4.81E-01	3.91E+00	No	Less than background
Sodium	14	14	5.64E+04	1.61E+03	7.12E+03	1.48E+04	1.57E+04	No	Essential Nutrient
Zinc	14	2	1.31E+01	3.00E+00	5.63E+00	2.53E+00	7.09E+00	Yes	
Radionuclides of Potential Concern (pCi/L)									
Tin-113	1	1	8.70E-03	NA	NA	NA	NA	Yes	
Tritium	14	5	7.00E-04	1.00E-04	2.48E-04	1.56E-04	3.38E-04	Yes	

Source: DOE/NV, 1995

UCL = Upper Confidence Limit
mg/kg = Milligram(s) per kilogram
pCi/g = Picocurie(s) per gram
NA = Not Applicable

Table C.2-13
Evaluation of PCOC for the Salmon Site
Sediment All Source Areas
(Page 1 of 2)

Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Chemicals of Potential Concern (mg/kg)									
2-Butanone	17	1	1.70E-01	5.00E-03	1.94E-02	3.94E-02	3.96E-02	Yes	
4-Methylphenol	14	1	2.20E+00	2.05E-01	4.75E-01	5.45E-01	7.90E-01	Yes	
Acetone	17	4	9.20E-01	7.00E-03	1.03E-01	2.23E-01	2.18E-01	No	Laboratory Contaminant
Aluminum	14	14	1.30E+01	8.44E-02	2.82E+00	3.79E+00	5.01E+00	Yes	
Arsenic	14	7	7.70E-03	1.30E-04	1.34E-03	2.15E-03	2.58E-03	Yes	
Barium	14	14	1.81E-01	1.40E-03	3.81E-02	5.18E-02	6.80E-02	No	Less than background
Benzoic Acid	14	1	1.00E+01	5.50E-01	2.12E+00	2.51E+00	3.57E+00	Yes	
Cadmium	14	2	9.00E-03	3.50E-04	1.28E-03	2.27E-03	2.59E-03	Yes	
Calcium	14	14	5.63E+00	1.83E-01	1.07E+00	1.58E+00	1.98E+00	No	Essential Nutrient
Chromium	14	10	1.48E-02	4.55E-04	4.41E-03	4.87E-03	7.22E-03	Yes	
Chrysene	1	1	2.05E-01	NA	NA	NA	NA	Yes	
Iron	14	14	1.30E+01	1.02E-01	3.13E+00	4.46E+00	5.70E+00	No	Essential Nutrient
Lead	14	14	2.02E-02	6.10E-04	5.45E-03	6.20E-03	9.03E-03	Yes	
Magnesium	14	14	1.38E+00	4.43E-02	2.45E-01	3.55E-01	4.50E-01	No	Essential Nutrient
Manganese	14	14	5.83E-01	8.00E-04	1.01E-01	1.50E-01	1.88E-01	Yes	
Mercury	14	2	3.00E-04	3.50E-05	8.25E-05	7.38E-05	1.25E-04	Yes	
Methylene Chloride	17	5	3.10E-02	1.00E-03	6.38E-03	7.20E-03	1.01E-02	No	Laboratory Contaminant
Toluene	17	2	2.20E-01	3.00E-03	1.82E-02	5.21E-02	4.50E-02	Yes	
Vanadium	14	8	2.77E-02	4.70E-04	5.21E-03	7.77E-03	9.70E-03	No	Less than background
Zinc	14	3	1.11E-01	1.10E-03	1.39E-02	2.92E-02	3.07E-02	Yes	
Radionuclides of Potential Concern (pCi/g)									
Gross Alpha	14	2	2.25E+01	2.94E+00	7.48E+00	5.56E+00	1.07E+01	No	Individual isotopes evaluated
Gross Beta	14	13	2.37E+01	2.95E+00	1.17E+01	4.88E+00	1.45E+01	No	Individual isotopes evaluated
Beryllium-7	1	1	2.40E+00	NA	NA	NA	NA	Yes	

Table C.2-13
Evaluation of PCOC for the Salmon Site
Sediment All Source Areas
 (Page 2 of 2)

Constituent	Frequency Sampled	Number of Detections	Maximum	Minimum	Mean	Standard Deviation	95 % UCL	Constituent of Concern	Reason for Exclusion
Bismuth-212	2	2	1.10E-01	9.00E-02	1.00E-01	1.41E-02	2.27E-01	Yes	
Bismuth-214	1	1	4.30E-01	NA	NA	NA	NA	No	Short half-life daughter
Cadmium-109	4	2	1.00E+00	3.35E-01	6.56E-01	2.83E-01	1.11E+00	Yes	
Cesium-137+D	16	8	1.09E+00	5.00E-03	1.81E-01	3.03E-01	3.56E-01	Yes	
Lead-210+D	9	2	9.56E+00	1.20E-01	1.54E+00	3.07E+00	3.90E+00	Yes	
Lead-212	12	7	1.05E+00	1.00E-02	3.57E-01	3.69E-01	5.92E-01	No	Less than background
Potassium-40	12	1	2.61E+00	1.30E-01	8.54E-01	8.91E-01	1.42E+00	No	Less than background
Radium-224	12	3	4.14E+00	8.50E-02	7.98E-01	1.14E+00	1.52E+00	Yes	
Radium-226+D	14	1	3.60E-01	1.00E-02	1.54E-01	1.02E-01	2.13E-01	Yes	
Radium-228+D	11	2	8.10E-01	1.50E-02	2.53E-01	2.76E-01	4.29E-01	No	Less than background
Thallium-208	6	5	1.30E-01	2.15E-02	7.03E-02	5.17E-02	1.34E-01	Yes	
Tritium	14	1	4.80E-01	1.50E-02	7.36E-02	1.19E-01	1.42E-01	Yes	
Uranium-238+D	12	2	1.44E+00	8.50E-02	4.43E-01	4.81E-01	7.49E-01	Yes	

Source: DOE/NV, 1995

UCL = Upper Confidence Limit
 mg/kg = Milligram(s) per kilogram
 pCi/g = Picocurie(s) per gram
 NA = Not Applicable

Table C.2-14
Evaluation of PCOC for the Salmon Site
Groundwater All Source Areas

Contaminant of Potential Concern	Maximum Contamination Level	Maximum Initial Concentration	Maximum Concentration at the Site Boundary
Alluvial Aquifer			
Arsenic	50 µg/L	62.7 µg/L	< MQL
Trichloroethene	5 µg/L	26.0 µg/L	< MQL
Tritium	20,000 pCi/L	88,200 pCi/L	< MQL
Local Aquifer			
Arsenic	50 µg/L	44.2 µg/L	ND
Tritium	20,000 pCi/L	960 pCi/L	ND

Maximum concentration at the site boundary based on the groundwater transport modeling, [Section 5.0](#), of the main text

Arsenic maximum contamination level under review

No Data, modeled concentrations did not reach the site boundary. Refer to [Section 5.0](#) for further information.

µg/L = Microgram(s) per liter

pCi/L = Picocurie(s) per liter

MQL = Minimum Quantitation Limit

Table C.2-15
PCOC for Surface Soil at Source Areas 1 Through 6
for the Salmon Risk Assessment

Source Area 1	Source Area 2	Source Area 3	Source Area 4	Source Area 5	Source Area 6
Chemicals of Potential Concern					
Antimony Arsenic Barium Benzoic Acid Bis (2-Ethylhexyl) Phthalate Chromium Cyanide Mercury Nickel Toluene Xylenes Zinc	Acetone Benzoic Acid Bis (2-Ethylhexyl) Phthalate Cobalt Mercury Methylene Chloride Thallium Toluene	Acenaphthylene Barium Benzo(a)Pyrene Benzo(b)Fluoranthene Benzo(k)Fluoranthene Benzoic Acid Bis (2-Ethylhexyl) Phthalate Chrysene Copper Cyanide Dieldrin Ethylbenzene Indeno(1,2,3-cd)Pyrene Lead Mercury Nickel Toluene Xylenes Zinc	Antimony Barium Benzoic Acid Benzyl Alcohol Bis (2-Ethylhexyl) Phthalate Chromium Copper Cyanide Lead Mercury Nickel Toluene Zinc	4,4'-DDE 4,4'-DDT Barium Benzoic Acid Bis (2-Ethylhexyl) Phthalate Chloroform Chromium Lead Manganese Toluene	Aluminum Benzoic Acid Chloroform Lead
Radionuclides of Potential Concern					
Cesium-137+D Mercury-203 Protactinium-231 Protactinium-234 Radium-223 Radium-224 Radium-228+D Thallium-208 Tin-113 Uranium-238+D	Radium-223 Radium-228+D Thorium-228+D Tritium Uranium-238+D	Bismuth-212 Lead-210+D Lead-212 Radium-224 Radium-228+D Thallium-208 Thorium-234 Tritium Uranium-238+D	Cesium-137+D Protactinium-231 Radium-223 Radium-228+D Thorium-228+D Tin-113 Uranium-234 Uranium-238+D	Cesium-137+D Protactinium-231 Radium-223 Radium-228+D Thorium-228+D Uranium-234	Radium-224

Table C.2-16
PCOC for Subsurface Soil at Source Areas 1 Through 6
for the Salmon Risk Assessment
 (Page 1 of 2)

Source Area 1	Source Area 2	Source Area 3	Source Area 4	Source Area 5
Chemicals of Potential Concern				
2-Methylnaphthalene Acenaphthene Barium Benzene Benzoic acid Cadmium Chloromethane Chromium Cobalt Copper Cyanide Dibenzofuran Ethylbenzene Fluorene Lead Naphthalene n-Nitrosodiphenylamine Phenanthrene Tetrachloroethene Toluene Xylenes Trichloroethene Zinc	2-Methylnaphthalene Arsenic Barium Beryllium Bis (2-Ethylhexyl) Phthalate Cadmium Chromium Cobalt Copper Cyanide Di-n-butyl Phthalate Ethylbenzene Fluorene HpCDF Lead Manganese Mercury Naphthalene Naphthalene, 1,2,3,4 tetrahydro Nickel Phenanthrene Selenium Silver TCDF Toluene Vanadium Total xylenes Zinc	Di-n-butyl Phthalate	Benzoic acid Bis (2-Ethylhexyl) Phthalate Chloromethane Di-n-octyl Phthalate	Acetone Toluene

Table C.2-16
PCOC for Subsurface Soil at Source Areas 1 Through 6
for the Salmon Risk Assessment
 (Page 2 of 2)

Source Area 1	Source Area 2	Source Area 3	Source Area 4	Source Area 5
Radionuclides of Potential Concern				
Bismuth-212 Lead-210+D Lead-212 Radium-226+D Radium-228+D Tritium	Cerium-141 Cesium-137+D Lead-210+D Lead-212 Radium-224 Radium-226+D Radium-228+D Thallium-208 Thorium-234 Tritium Uranium-235+D	Lead-210+D Lead-212 Radium-228+D Thallium-208 Thorium-234 Tritium	Bismuth-212 Cesium-137+D Lead-210+D Lead-212 Radium-226+D Radium-228+D Thallium-208 Thorium-234 Tritium	Lead-210+D Radium-226+D Tritium

C.3.0 Exposure Assessment

The exposure assessment estimates the type and magnitude of exposure to humans from the PCOC. The exposure pathways and calculations of chemical intakes are outlined for the Salmon Site in the following text.

C.3.1 Exposure Pathways

For exposure and potential risks to occur, complete exposure pathways must exist. A complete pathway requires the following elements (EPA, 1989):

- Source and mechanism for release of contamination
- Transport or retention medium
- Point of potential human contact (exposure point) with the contaminated medium
- Exposure route at the exposure point

If any one of these elements is missing, the pathway is not considered complete.

Contamination sources and the transport/retention media are the same as those addressed in [Section C.2.0](#) and [Section 4.0](#) of the main body of this report.

Exposure points are locations of human contact with contaminated media. Exposure points consider human activity patterns and the location of potentially exposed individuals relative to the location of contaminated media. For this assessment, contact with potentially contaminated media occurs as a result of recreational, residential, and park ranger exposure scenarios. To maintain the conservative methodology of RAGS (EPA, 1989), the contact point for soil contamination with all exposure scenarios is located at the contaminant source, and maximum on-site groundwater concentrations were carried through the risk analysis.

The following five exposure routes were examined:

- Ingestion
- Inhalation of dust
- Dermal contact
- External exposure for radionuclides
- Ingestion of home-grown produce (residential scenario only)

Because of existing surface institutional controls and subsurface restrictions, the Salmon Site has no current land use. However, there is the potential for a recreational user (e.g., hunter or hiker) to be found on site. The potential complete exposure pathways include exposure to surface soil, surface water, and sediment. Currently, there are no on-site residents. [Figure C.3-1](#) illustrates the recreational site conceptual model for the Salmon Site. [Table C.3-1](#) lists the complete human exposure pathways for recreational land use. This table indicates which pathways have been selected for risk characterization and presents the rationale for inclusion or exclusion of each pathway.

To maintain the conservative methodology of RAGS (EPA, 1989), a future on-site residential pathway is considered. For this future land use it is assumed there will be no surface institutional controls or subsurface restrictions. The potential complete exposure pathways include exposure to surface soil, subsurface soil, sediment, surface water, and on-site and off-site groundwater. [Figure C.3-2](#) illustrates the residential site conceptual model for the Salmon Site. [Table C.3-2](#) lists the complete human exposure pathways for future land use. This table indicates which pathways have been selected for risk characterization and presents the rationale for inclusion or exclusion of each pathway.

There is realistic potential for a future on-site park ranger (or caretaker) at the Salmon Site. To maintain the conservative methodology of RAGS (EPA, 1989), the potential complete exposure pathways include exposure to surface soil, surface water, and sediments. [Figure C.3-3](#) illustrates the occupational site conceptual model for the Salmon Site. [Table C.3-2](#) lists the complete human exposure pathways for future land use. This table indicates which pathways have been selected for risk characterization and presents the rationale for inclusion or exclusion of each pathway.

C.3.2 Quantification of Exposure

This section describes the estimation of exposures for the PCOCs that may come in contact with human receptors. The process involves the following:

- Identification of applicable human exposure models and input parameters
- Determination of the concentration of each constituent in environmental media at the point of human exposure
- Estimation of human intakes

Figure C.3-1
Site Conceptual Model Current Recreational Land Use

Table C.3-1
Potentially Complete Human Exposure Pathways for Current Land Use at the Salmon Site

Environmental Medium	Exposure Route	Potentially Exposed Population	Pathway Selected for Evaluation	Reason for Selection or Exclusion
Surface Soil	Inhalation Ingestion Dermal Contact	Residents Park Ranger	No	No current on-site residents or long term on-site workers are at the Salmon Site.
Surface Soil	Inhalation Ingestion Dermal Contact	Recreational	Yes	Potential intermittent recreational exposure is currently feasible.
Surface Water	Inhalation Ingestion Dermal Contact	Residents Park Ranger	No	No current on-site residents or long term on-site workers are at the Salmon Site.
Surface Water	Ingestion	Recreational	Yes	Potential intermittent recreational exposure is currently feasible.
Air ^a	Inhalation	Residents Recreational Park Ranger	No	No air sampling occurred.
Groundwater	Inhalation Ingestion Dermal Contact	Recreational	Yes	Current groundwater analytical data were used in the calculation of risk. The groundwater pathway is considered at the site boundary due to a lack of current residential wells in the potentially affected area.
Groundwater	Inhalation Ingestion Dermal Contact	Residents Park Ranger	No	No current on-site residents or long term on-site workers are at the Salmon Site.
Subsurface Soil	Inhalation Ingestion Dermal Contact	Recreational/Park Ranger	No	Direct or indirect exposure to subsurface soil at depth of contamination is improbable (i.e., no complete exposure pathway exists).
Subsurface Soil	Inhalation Ingestion Dermal Contact	Residents	No	No current on-site residents or long term on-site workers are at the Salmon Site.

^a Air refers specifically to evaluating exposure using air sample data. Potential exposure by inhalation to constituents from other media (e.g., soil) is presented with those media.

Figure C.3-2
Site Conceptual Model Future Residential Scenario

Table C.3-2
Potentially Complete Human Exposure Pathways for Future Land Use at the Salmon Site

Environmental Medium	Exposure Route	Potentially Exposed Population	Pathway Selected for Evaluation	Reason for Selection or Exclusion
Surface Soil	Inhalation Ingestion Dermal Contact	Recreational	No	No future long-term on-site workers are planned at the Salmon Site. Recreational exposure is considered a current pathway. Future residential exposure is conservative.
Surface Soil	Inhalation Ingestion Dermal Contact Ingestion of Home-Grown Produce	Residents/Park Ranger ^a	Yes	Potential future residential exposure is feasible and conservative.
Surface Water	Inhalation Ingestion Dermal Contact	Recreational	No	Potential intermittent recreational exposure is feasible.
Surface Water	Ingestion	Residents	Yes	Potential intermittent residential and Park Ranger exposure is feasible and conservative.
Air ^b	Inhalation	Residents Recreational/Park Ranger	No	No air sampling occurred.
Groundwater	Inhalation Ingestion Dermal Contact	Residents	Yes	Current groundwater analytical data were used in the calculation of risk. The future groundwater pathway is considered both on site and at the site boundary.
Groundwater	Inhalation Ingestion Dermal Contact	Recreational/Park Ranger	No	No future, long-term on-site workers are planned at the Salmon Site. Recreational exposure is considered a current pathway. Future residential exposure is conservative.
Subsurface Soil	Inhalation Ingestion Dermal Contact Ingestion of Home-Grown Produce	Residents/Park Ranger	Yes	Direct or indirect exposure to subsurface soil at depth of contamination is improbable (i.e., no complete exposure pathway exists). However, upon removal of surface soil, a future residential receptor is the most conservative.
Subsurface Soil	Inhalation Ingestion Dermal Contact	Recreational/Park Ranger	No	No future, long-term on-site workers are planned at the Salmon Site. Recreational and Park Ranger exposure is not considered a current pathway. Future residential exposure is conservative.

^aPark Ranger, subsurface soil exposure does not include ingestion of home-grown produce.

^bAir refers specifically to evaluating exposure using air sample data. Potential exposure by inhalation to constituents from other media (e.g., soil) is presented with those media.

Figure C.3-3
Site Conceptual Model Park Ranger Land Use

For each potentially complete exposure pathway identified in [Section C.3.1](#), a reasonable maximum exposure (RME) scenario has been developed. The RME is the highest exposure that is reasonably expected to occur at a site (EPA, 1989). The intent of the RME, as defined by the EPA, is to estimate a conservative exposure case (i.e., well above the average case) that is still within the possible range of exposures. The RME is both protective and reasonable, but is not the worst possible case (EPA, 1991a).

C.3.2.1 Exposure Models

The primary source for the exposure models used in this risk assessment is RAGS (EPA, 1989). Shown below is the generalized equation for calculating chemical intakes:

$$I = C \frac{CR \times EFD}{BW \times AT} \quad (C-1)$$

where

I = Intake; the amount of chemical at the exchange boundary (milligrams per kilogram [mg/kg] body weight-day)

C = Chemical concentration at the exposure point; the concentration contacted over the exposure period (e.g., mg per liter [mg/L] water or mg/kg soil)

CR = Contact rate; the amount of contaminated medium contacted per unit time or event (e.g., mg per day [mg/day] soil ingestion rate or cubic meter [m³] per hour air inhalation rate)

EFD = Exposure frequency and duration; describes how often and how long exposure occurs. Often calculated using two terms (EF times ED)

EF = Exposure frequency (days/year [yr])

ED = Exposure duration (yr)

BW = Body weight; the average body weight over the exposure period kilogram (kg)

AT = Averaging time; period over which exposure is averaged (days)

The calculation of radiological intakes is similar to the calculation of chemical intakes. The primary differences is that body weight and averaging time are eliminated for the chemical intake equation. Pathway-specific exposure models are summarized in the following sections.

C.3.2.1.1 Ingestion of Soil and Groundwater

For estimating chemical intake from ingestion of groundwater and soil the following equation applies.

$$\text{Intake} = \frac{C_i \times EF \times F}{AT} \times \left[\left(\frac{IR \times ED}{BW} \right)_{\text{child}} + \left(\frac{IR \times ED}{BW} \right)_{\text{adult}} \right] \quad (\text{C-2})$$

where:

Intake = Intake of chemical through ingestion of medium (mg/kg-day)

C_i = Chemical concentration in medium i (mg/kg or mg/L)

IR = Ingestion rate for medium i and receptor (kg/day or liters [L]/day)

F = Fraction of ingested medium from contaminated source (unitless)

EF, ED, BW, and AT are defined in [Section C.3.2.1](#).

For the soil pathway, the child is considered to be exposed for 6 of 30 years; this is conservative because children ingest more dirt than adults when compared on the basis of body weight. For the groundwater pathway, the adult is modeled for 30 years; this is conservative because water ingestion is proportional to body weight.

For estimating radiological intake from ingestion of groundwater and soil the following equation applies.

$$\text{Intake} = C_i \times EF \times F \times C_f \times \left[(IR \times ED)_{\text{child}} + (IR \times ED)_{\text{adult}} \right] \quad (\text{C-3})$$

where:

Intake = Intake of radionuclide through ingestion of medium (picocuries [pCi])

C_i = Radionuclide concentration in medium i (pCi per gram [pCi/g] or pCi per Liter [pCi/L])

Cf = Conversion factor grams (g) to milligrams (mg).

F, EF, ED, and IR are defined above.

For the soil pathway, the child is considered to be exposed for 6 of 30 years; this is conservative because children ingest more dirt than adults when compared on the basis of body weight. For the groundwater pathway, the adult is modeled for 30 years; this is conservative because water ingestion is proportional to body weight.

C.3.2.1.2 Inhalation of Dust

For estimating a respirable particulate emission from wind erosion, assuming an unlimited reservoir, the equation is (EPA, 1985).

$$E_{10} = 0.036 (1-V) \left(\frac{[u]}{u_t}\right)^3 f(x) \quad (C-4)$$

where:

E_{10} = PM_{10} emission factor (grams per square meter [g/m^2] per hour [hr])

V = Fraction of contaminated surface vegetative cover (unitless, assumed to be 0.0)

[u] = Mean annual wind speed (meters per second [m/sec], 3.2 m/sec)

u_t = The threshold value of wind speed at 7 m (m/sec)

$f(x)$ = Function plotted in EPA, 1985 [$f(x) = 1.5$]
where $x = 0.886 u_t/[u]$

Once the PM_{10} emission factor is calculated, the emission rates for the individual potential contaminants of concern were calculated according to the following:

$$R_{10} = C \times E_{10} \times A \times C \quad (C-5)$$

where:

R_{10} = Emission rate of contaminant as PM_{10} (mg/hr)

C = Chemical concentration (mg/kg or pCi/g)

E_{10} = PM_{10} emission factor (g/m^2 -hr)

A = Site areas (square meters [m²], assumed to be 5,000 m²)

C = Conversion factor for kg to g

Once the dust concentration in air has been calculated for each PCOC, the chemical intake is

$$\text{Intake} = \frac{C_i \times BA \times IR \times ET \times EF \times ED}{BW \times AT} \quad (\text{C-6})$$

where:

C_i = Radionuclide-specific air concentration (pCi/m³)

BA = Bioavailability factor (unitless)

IR = Inhalation rate (m³/event, typically cubic meters per hour [m³/hr])

ET = Exposure time (hr/day)

EF, ED, BW, and AT are defined in [Section C.3.2.1](#).

The radiological intake is:

$$\text{Intake} = C_i \times BA \times IR \times ET \times EF \times ED \quad (\text{C-7})$$

where:

C_i = Chemical-specific air concentration (pCi/m³).

BA, IR, ET, EF, and ED are defined above.

C.3.2.1.3 Inhalation of VOCs While Showering

This section presents the methodology for estimating vapor phase concentrations in bathroom air as a result of showering. This model uses experimental results for trichloroethene to estimate the release of other volatile organic compounds by comparing their Henry's Law constants.

The average concentration of a volatile compound in the shower air over a period of t_s minutes is

$$C_s = C_{\text{infa}} \times \left[1 + \frac{1}{kt_s} (\exp^{-kt_s} - 1) \right] \quad (\text{C-8})$$

where:

C_s = Average concentration of a volatile compound in the shower air over a duration of t_s minutes (mg/m^3)

C_{infa} = Asymptotic concentration in air if shower ran for a long time (much longer than 5 minutes) (mg/m^3), calculated below:

$$C_{\text{infa}} = \frac{E \times F_w \times C_t}{F_a} \quad (\text{C-9})$$

t_s = Time in shower (minutes [min])

k = Rate constant for exponential function (1/min), $k = F_a/V_b$

E = Efficiency of release of a compound from water to air (unitless), defined below;
 $0 \leq E \leq 1$; if E has a calculated value greater than 1, then E must be set equal to 1:

$$E = \frac{E_{\text{TCE}} \times H}{H_{\text{TCE}}} \quad (\text{C-10})$$

F_w = Flow rate of water in shower (L/min)

C_t = Concentration of organic compound in shower water (mg/L)

F_a = Flow rate of air in shower (m^3/min)

V_b = Volume of bathroom (m^3)

E_{TCE} = Efficiency of release of trichloroethene from water to air (unitless)

H = Henry's Law constant for an organic compound (atmospheres - cubic meter per mole [$\text{atm}\cdot\text{m}^3/\text{mol}$]) (see [Table C.3-3](#))

H_{TCE} = Henry's Law constant for trichloroethene ($\text{atm}\cdot\text{m}^3/\text{mol}$)

Once the volatile organic carbon (VOC) air concentration has been calculated, the chemical intake while showering can be calculated using the intake equation in the previous section. For radionuclides, the inhalation for the showering pathway is not applicable.

Table C.3-3
Constituent-Specific Input Parameters
 (Page 1 of 3)

Constituent	Absorption Fraction ^a	Dermal Permeability Constant ^a (cm/hr)	Octanol-Water Partition Coefficient (K_{ow}) ^a L(water)/L(octanol)	Soil to Plant Partition Coefficient	Henry's Law Constant ^b (atm-m ³ /mol)
Chemical Potential Contaminants of Concern					
1,1-Dichloroethene	0.1	NA	2.13	NA	NA
2-Butanone	0.1	NA	0.29	NA	NA
2-Methylnaphthalene	0.15	NA	3.86	NA	NA
4,4'-DDD	0.05	NA	6.02	NA	NA
4,4'-DDE	0.05	NA	6.51	NA	NA
4,4'-DDT	0.05	NA	6.36	NA	NA
4-Methylphenol	0.1	NA	1.94	NA	NA
Acenaphthene	0.15	NA	3.92	NA	NA
Acetone	0.1	NA	-0.24	NA	NA
Aluminum	0.01	NA	NA	NA	NA
Antimony	0.01	NA	NA	NA	NA
Aroclor-1254 (PCB)	0.2	NA	6.3	NA	NA
Arsenic	0.03	0.001	NA	NA	NA
Barium	0.01	NA	NA	NA	NA
Benzene	0.1	NA	2.13	NA	NA
Benzo(a)pyrene	0.1	NA	5.97	NA	NA
Benzo(b)Fluoranthene	0.1	NA	6.12	NA	NA
Benzo(k)Fluoranthene	0.1	NA	6.84	NA	NA
Benzoic acid	0.1	NA	1.87	NA	NA
Benzyl Alcohol	0.1	NA	1.19	NA	NA
Beryllium	0.01	NA	NA	NA	NA
Bis (2-Ethylhexyl) Phthalate	0.1	NA	4.89	NA	NA
Cadmium	0.01	NA	NA	NA	NA
Chlorobenzene	0.1	NA	2.84	NA	NA
Chloroform	0.1	NA	1.97	NA	NA
Chloromethane	0.15	NA	0.91	NA	NA
Chromium	0.01	NA	NA	NA	NA
Cobalt	0.01	NA	NA	NA	NA
Copper	0.01	NA	NA	NA	NA
Cyanide	0.01	NA	NA	NA	NA
Di-n-Butyl Phthalate	0.1	NA	4.9	NA	NA
Di-n-Octyl Phthalate	0.1	NA	4.89	NA	NA

Table C.3-3
Constituent-Specific Input Parameters
 (Page 2 of 3)

Constituent	Absorption Fraction ^a	Dermal Permeability Constant ^a (cm/hr)	Octanol-Water Partition Coefficient (K_{ow}) ^a L(water)/L(octanol)	Soil to Plant Partition Coefficient	Henry's Law Constant ^b (atm-m ³ /mol)
Dibenzofuran	0.1	NA	4.12	NA	NA
Dieldrin	0.05	NA	4.56	NA	NA
Ethylbenzene	0.1	NA	3.15	NA	NA
Fluorene	0.15	NA	4.18	NA	NA
Indeno(1,2,3-cd) pyrene	0.1	NA	NA	NA	NA
Lead	0.01	NA	NA	NA	NA
HpCDF	0.1	NA	NA	NA	NA
Manganese	0.01	NA	NA	NA	NA
Mercury	0.01	NA	NA	NA	NA
Methylene chloride	0.1	NA	1.25	NA	NA
n-Nitrosodiphenylamine	0.1	NA	3.5	NA	NA
Naphthalene	0.15	NA	3.59	NA	NA
Naphthalene - 1,2,3,4-Tetrahydro	0.1	NA	NA	NA	NA
Nickel	0.01	NA	NA	NA	NA
Phenanthrene	0.15	NA	4.57	NA	NA
Phenol	0.1	NA	1.46	NA	NA
Selenium	0.01	NA	NA	NA	NA
Silver	0.01	NA	NA	NA	NA
Styrene	0.1	NA	NA	NA	NA
TCDF	0.1	NA	NA	NA	NA
Tetrachloroethene	0.1	NA	3.4	NA	NA
Thallium	0.01	NA	NA	NA	NA
Toluene	0.1	NA	2.69	NA	NA
Total xylenes	0.1	NA	3.2	NA	NA
Trichloroethene	0.1	0.016	2.29	NA	0.0103
Vanadium	0.01	NA	NA	NA	NA
Vinyl Chloride	0.1	0.001	1.38	NA	0.0819
Zinc	0.01	NA	NA	NA	NA

Table C.3-3
Constituent-Specific Input Parameters
 (Page 3 of 3)

Constituent	Absorption Fraction ^a	Dermal Permeability Constant ^a (cm/hr)	Octanol-Water Partition Coefficient (K_{ow}) ^a L(water)/L(octanol)	Soil to Plant Partition Coefficient	Henry's Law Constant ^b (atm·m ³ /mol)
Radiological Potential Contaminants of Concern					
Beryllium-7	NA	NA	NA	0.01	NA
Bismuth-212	NA	NA	NA	0.035	NA
Bismuth-214	NA	NA	NA	0.035	NA
Cadmium-109	NA	NA	NA	0.55	NA
Cesium-137+D	NA	NA	NA	0.08	NA
Lead-210+D	NA	NA	NA	0.045	NA
Lead-212	NA	NA	NA	0.045	NA
Lead-214	NA	NA	NA	0.045	NA
Mercury-203	NA	NA	NA	0.9	NA
Potassium-40	NA	NA	NA	1	NA
Protactinium-231	NA	NA	NA	2.50E-03	NA
Protactinium-234	NA	NA	NA	2.50E-03	NA
Radium-223	NA	NA	NA	0.015	NA
Radium-224	NA	NA	NA	0.015	NA
Radium-226+D	NA	NA	NA	0.015	NA
Radium-228+D	NA	NA	NA	0.015	NA
Thallium-208	NA	NA	NA	4.00E-03	NA
Thorium-228+D	NA	NA	NA	8.50E-04	NA
Thorium-234	NA	NA	NA	8.50E-04	NA
Tin-113	NA	NA	NA	0.03	NA
Tritium	NA	0.0015	-1.38	1	NA
Uranium-234	NA	NA	NA	8.50E-03	NA
Uranium-235+D	NA	NA	NA	8.50E-03	NA
Uranium-238+D	NA	NA	NA	8.50E-03	NA

^aEPA, 1992

^bEPA, 1986

NA = Not applicable, value not needed in the exposure calculations at the Salmon Site.

C.3.2.1.4 Dermal Contact Soil and Sediment

The following is the chemical intake equation for dermal absorption of chemicals due to contact with soil or sediment:

$$AD = \frac{C_i \times AF \times ABS \times CF}{AT} \times \left[\left(\frac{SA \times EF \times ED}{BW} \right)_{\text{adult}} + \left(\frac{SA \times EF \times ED}{BW} \right)_{\text{child}} \right] \quad (\text{C-11})$$

where:

AD = Absorbed dose (milligrams per kilogram per day [mg/kg-d])

C_i = Chemical concentration in medium i (mg/kg)

SA = Skin surface area available for contact (square centimeters [cm²]/event)

AF = Soil-to-skin adherence factor (mg/cm²)

ABS = Skin absorption factor (unitless) (see [Table C.3-2](#))

CF = Conversion factor (10⁻⁶ kg/mg)

EF = Exposure frequency (events/yr)

ED, BW, and AT are defined in [Section C.3.2.1](#).

Dermal exposure is not a major exposure pathway for radionuclides (or metals). However, external exposure to radionuclides is considered a major pathway. Refer to [Section C.3.2.1.7](#), the external exposure absorbed dose equation.

C.3.2.1.5 Dermal Contact With Groundwater

The following is the intake equation for dermal absorption of chemicals due to contact with groundwater:

$$AD = \frac{C_i \times SA \times PC \times CF \times ET \times EF \times ED}{BW \times AT} \quad (\text{C-12})$$

where:

AD = Absorbed dose (mg/kg-d)

C_i = Chemical concentration in shower water, adjusted for volatilization (mg/L)

SA = Skin surface area available for contact (cm²)

PC = Chemical-specific dermal permeability (EPA, 1992) (see [Table C.3-3](#) for specific values)

CF = Conversion factor (10⁻³ liters per cubic centimeter [L/cm³])

ET = Exposure time (hr/day)

EF, ED, BW, and AT are defined in [Section C.3.2.1](#).

The following is the intake equation for dermal absorption of radionuclides due to contact with groundwater;

$$AD = C_i \times SA \times PC \times CF \times ET \times EF \times ED \quad (C-13)$$

where:

AD = Absorbed dose (pCi); and

C_i = Radionuclide concentration in shower water, adjusted for volatilization (pCi/L).

SA, PC, CF, EF, ED, and ET are defined above.

C.3.2.1.6 Ingestion of Home-Grown Produce

The concentration of the chemical and radionuclides in fruits and vegetables when exposed to soil contamination only is (CEPA, 1995);

$$C_{fv} = K_{ps}^{rain} \times C + K_{ps} \times C \quad (C-14)$$

where:

C_{fv} = Concentration of the chemical in fruits and vegetables (mg [chemical]/kg of plant mass)

K_{ps}^{rain} = Plant-soil partition coefficient for surface soil due to rainsplash
(kg [soil]/kg [plant])

K_{ps} = The ratio of chemical concentration in exposed produce to the chemical concentration in the root zone soil (kg [soil]/kg [plant]), $K_{ps} = 7.7 \times K_{ow}^{-0.58}$ (CEPA, 1995)

C = the chemical concentration in soil (mg [chemical]/kg [soil])

Substituting K_{ps} into the above equation, the concentration of the chemical in fruits and vegetables is

$$C_{fv} = C_s \times (K_{ps}^{rain} + 7.7 \times K_{ow}^{-0.58}) \quad (C-15)$$

where:

C_{fv} = Concentration of the chemical in fruits and vegetables (mg [chemical]/kg of plant mass)

K_{ps}^{rain} = Plant-soil partition coefficient for surface soil due to rainsplash
(kg [soil]/kg [plant])

C_s = Chemical concentration in soil (mg [chemical]/kg [soil])

K_{ow} = Octanol-water partition coefficient (L[water]/L[octanol]) (see [Table C.3-3](#) for chemical specific values)

$$I_{fv}^g = C_s \times (K_{ps}^{rain} + 7.7 \times K_{ow}^{-0.58}) \times \left(\frac{IR_{fv}}{BW} \times f_{fv}^g \times f_{local}^v \right) \times \frac{EF \times ED}{AT} \quad (C-16)$$

Therefore, the intake of the above-ground produce and the associated PCOC can be calculated using the following equation (CEPA, 1992); where:

C_s = Chemical concentration in soil (mg/kg)

I_{fv}^g = Intake of the PCOC

IR_{fv} = Combined ingestion rate for fruits and vegetables (kg [food]/day)

f_{fv}^g = Fraction of fruits and vegetables consumed from contaminated site (unitless)

f_{local}^g = Fraction of fruits and vegetables grown locally (unitless)

BW, EF, ED, AT, K_{ps}^{rain} , C_s , and K_{ow} are defined above.

The following is the intake equation for radiological ingestion of home-grown produce;

$$I_{fv}^g = C_s \times (K_{ps}^{rain} + BV) \times IR_{fv} \times f_{fv}^g \times f_{local}^v \times EF \times ED \times CF \quad (C-17)$$

where:

C_s = Radionuclide concentration in soil (pCi/g)

BV = Plant-soil partition coefficient for soil radionuclides (ORNL, 1993)
(see [Table C.3-3](#) for specific values)

CF = Conversion factor (g/kg)

IR_{fv} , f_{fv}^g , f_{local}^g , EF , ED , and K_{ps}^{rain} are defined above.

C.3.2.1.7 External Exposure to Radionuclides

The following is the intake equation for external exposure of radionuclides due to contact with soil;

$$\text{Exposure} = C_i \times ET \times RF \times EF \times ED \times CF \quad (C-18)$$

where:

Exposure = Radiological dose due to external exposure (pCi-yr/g)

C_i = Radionuclide-specific soil concentration (pCi/g)

RF = Dose reduction factor (unitless)

CF = Conversion factor (yr/hr)

EF , ED , and ET are defined above.

C.3.2.2 Exposure Parameters

Two types of parameters are used in exposure models to estimate intake (EPA, 1989):

- Constituent-related parameters (e.g., K_{ow}), see [Table C.3-3](#)
- Parameters that describe the exposed population (e.g., contact rate, exposure frequency and duration, and body weight), see [Table C.3-4](#)

Table C.3-4
Exposure Parameters
 (Page 1 of 3)

Parameter	Value	Units	Reference/Rationale
Recreational/Residential Scenario Ingestion of Soil			
Ingestion Rate Adult Child	100 200	mg/d	EPA, 1991a
Fraction Ingested	1	unitless	Assumes all of soil intake from site
Exposure Frequency Residential Recreational	350 14	day/year	EPA, 1991a Assumes two weeks per year
Exposure Duration Adult Child	24 6	years	EPA, 1991a
Body Weight Adult Child	70 15	kg	EPA, 1991a
Averaging Time: Carcinogens Noncarcinogens Adult Child	25,550 8,760 2,190	days	EPA, 1989
Recreational/Residential Scenario Dermal Contact with Soil			
Adherence Factor	1.0	mg/cm ²	EPA, 1992
Absorption Fraction	Chemical-Specific	unitless	EPA, 1992 (see Table C.3-3)
Skin Surface Area Adult Child	5,000 2,000	cm ² /event	EPA, 1992
Exposure Frequency Residential Recreational	350 14	day/year	EPA, 1991a Assumes two weeks per year
Exposure Duration Adult Child	24 6	years	EPA, 1991a
Body Weight Adult Child	70 15	kg	EPA, 1991a
Averaging Time: Carcinogens Noncarcinogens Adult Child	25,550 8,760 2,190	days	EPA, 1989

Table C.3-4
Exposure Parameters
 (Page 2 of 3)

Parameter	Value	Units	Reference/Rationale
Recreational/Residential Scenario Inhalation of Dust			
Inhalation Rate	20	m ³ /d	EPA, 1991a
Exposure Frequency Residential Recreational	350 14	day/year	EPA, 1991a Assumes two weeks per year
Exposure Duration	30	years	EPA, 1991a
Body Weight	70	kg	EPA, 1991a
Averaging Time: Carcinogens Noncarcinogens	25,550 10,950	days	EPA, 1989
Residential Scenario Ingestion of Groundwater			
Ingestion Rate	2	L/d	EPA, 1991a
Fraction Ingested	1	unitless	Assumes all of soil intake from site
Exposure Frequency Residential Recreational	350 14	day/year	EPA, 1991a Assumes two weeks per year
Exposure Duration	30	years	EPA, 1991a
Body Weight	70	kg	EPA, 1991a
Averaging Time: Carcinogens Noncarcinogens	25,550 10,950	days	EPA, 1989
Residential Scenario Dermal Contact with Groundwater (Showering)			
Dermal Permeability Constant	Chemical-Specific	cm/hr	EPA, 1992, (see Table C.3-3)
Skin Surface Area	23,000	cm ²	EPA, 1992
Exposure Duration	30	years	EPA, 1991a
Exposure Frequency	350	day/year	EPA, 1991a
Exposure Time	0.25	hr/day	EPA, 1991a
Body Weight	70	kg	EPA, 1991a
Averaging Time: Carcinogens Noncarcinogens	25,550 10,950	days	EPA, 1989

Table C.3-4
Exposure Parameters
 (Page 3 of 3)

Parameter	Value	Units	Reference/Rationale
Residential Scenario Inhalation of VOCs (Showering)			
Inhalation Rate	0.6	m ³ /hr	EPA, 1991a
Exposure Frequency	350	day/year	EPA, 1991a
Exposure Duration	30	years	EPA, 1991a
Exposure Time	0.25	hr/day	EPA, 1991a
Body Weight	70	kg	EPA, 1991a
Averaging Time: Carcinogens Noncarcinogens	25,550 10,950	days	EPA, 1989
Park Ranger Ingestion of Soil			
Ingestion Rate	50	mg/day	EPA, 1991a
Fraction Ingested	1	unitless	Assumes all of soil intake from site
Exposure Frequency	26	day/year	Assumes one day every other week
Exposure Duration	25	years	EPA, 1991a
Body Weight	70	kg	EPA, 1991a
Averaging Time: Carcinogens Noncarcinogens	25,550 9,125	days	EPA, 1989
Park Ranger Dermal Contact with Soil			
Adherence Factor	1.0	mg/cm ²	EPA, 1992
Absorption Fraction	chemical specific	unitless	EPA, 1992 (see Table C.3-3)
Skin Surface Area	5,000	cm ² /event	EPA, 1992
Exposure Frequency	26	day/year	Assumes one day every other week
Exposure Duration	25	years	EPA, 1991a
Body Weight	70	kg	EPA, 1991a
Averaging Time: Carcinogens Noncarcinogens	25,550 9,125	days	EPA, 1989
Park Ranger Inhalation of Dust			
Inhalation Rate	20	m ³ /day	EPA, 1991a
Exposure Frequency	26	day/year	Assumes one day every other week
Exposure Duration	25	years	EPA, 1991a
Body Weight	70	kg	EPA, 1991a
Averaging Time: Carcinogens Noncarcinogens	25,550 9,125	days	EPA, 1989

cm² = Square centimeter(s)
 kg = Kilogram(s)
 m³ = Cubic meter(s)
 mg = Milligram(s)
 mg/cm² = Milligram(s) per square centimeter(s)

All values shown in the table apply to the RME scenario. The exposure parameters have been taken from EPA guidance (EPA, 1991a) and are based on best professional judgment using site-specific information where available. Upper-bound values are generally 90th or 95th percentile values, depending on the data available for each parameter. A combination of upper-bound and average exposure parameters were used to estimate the RME for each scenario. Most of the RME input parameters are from current EPA guidance (EPA, 1991a).

C.4.0 Toxicity Assessment

Toxicity information is given in the same units provided by the source material (dose rates and concentrations are primarily used). The EPA weight-of-evidence classification (cancer class) system for carcinogenicity is presented here for reference. The classification is as follows (EPA, 1989):

- Class A - Human carcinogen
- Class B1 - Probable human carcinogen; limited human data available
- Class B2 - Probable human carcinogen; sufficient evidence in animals; inadequate or no evidence in humans
- Class C - Possible human carcinogen
- Class D - Not classifiable as to human carcinogenicity
- Class E - Evidence of noncarcinogenicity for humans

Slope factors (SF) are typically calculated for potential carcinogens in Classes A, B1, and B2. Quantitative estimation of slope factors for chemicals in Class C proceeds on a case-by-case basis.

For chemicals, the primary source for toxicity values, both reference doses (RfD) and SF, is the Integrated Risk Information System (IRIS) (EPA, 1998). If a toxicity value for a given chemical is not available in IRIS, the secondary source is the HEAST (EPA, 1995). No surrogate values were developed for chemicals for which no toxicity information existed in either of the above references.

The EPA classifies all radionuclides as Group A carcinogens. The HEAST (EPA, 1995) lists ingestion, inhalation and external exposure cancer slope factors for radionuclides in units of risk/pCi. Ingestion and inhalation slope factors are central estimates in a linear model of the age-averaged, lifetime attributable radiation cancer incidence (fatal and nonfatal cancer) risk per unit of activity inhaled or ingested, expressed as risk/pCi. External exposure slope factors are central estimates of lifetime attributable radiation cancer incidence risk for each year of exposure to external radiation from photon-emitting radionuclides distributed uniformly in a thick layer of soil and are expressed as risk/yr per pCi/gram soil. When combined with site-specific media

concentration data and appropriate exposure assumptions, SF can be used to estimate lifetime cancer risks to members of the general population due to radionuclide exposures. In most cases, cancer risks are limiting, exceeding both mutagenic and teratogenic risks.

Selected radionuclides and radioactive decay chain products are designated in HEAST with the suffix “+D” (e.g., uranium-238+D, radium-226+D, cesium-137+D) to indicate that cancer risk estimates for these radionuclides include the contributions from their short-lived decay products, assuming equal activity concentrations (i.e., secular equilibrium) with the principal or parent nuclide in the environment. Where possible, the “+D” SF was used to calculate risk at the Salmon Site. However, if the parent radionuclide was not detected (above the reference site concentrations) and short-lived decay products of the parent radionuclide were detected (above background), the slope factors for the short-lived daughters were used in the calculation of risk.

[Table C.4-1](#) summarizes the radiological toxicity information, including the half-lives of radionuclides of potential concern and the ingestion, inhalation, and external exposure SF.

[Table C.4-2](#) summarizes the chemical toxicity information including the constituent of potential concern RfDs, SF, and EPA cancer classification.

Table C.4-1
Summary of Radiological Toxicity Data for PCOC at the Salmon Site

Radionuclides	Half Life (years)	Ingestion (risk/pCi)	Inhalation (risk/pCi)	External Exposure (risk/yr per pCi/g soil)
Beryllium-7	1.50E-01	8.64E-14	1.78E-13	1.73E-07
Bismuth-212	1.15E-04	6.20E-13	3.65E-11	6.67E-07
Bismuth-214	3.79E-05	1.95E-13	1.46E-11	6.02E-06
Cadmium-109	1.27E+00	8.01E-12	1.85E-11	5.62E-10
Cesium-137+D	3.02E+01	3.16E-11	1.91E-11	2.09E-06
Lead-210+D	2.23E+01	1.01E-09	3.86E-09	1.45E-10
Lead-212	1.21E-03	1.80E-11	3.85E-11	3.00E-07
Lead-214	5.10E-05	2.94E-13	6.23E-12	7.09E-07
Mercury-203	1.30E-01	2.64E-12	3.03E-12	6.27E-07
Potassium-40	1.28E+09	1.25E-11	7.46E-12	6.11E-07
Protactinium-231	3.73E+04	1.49E-10	2.42E-08	2.71E-08
Protactinium-234	7.65E-04	2.13E-12	1.30E-12	6.60E-06
Radium-223	3.12E-02	2.34E-10	3.60E-09	2.44E-07
Radium-224	9.92E-03	1.49E-10	2.25E-09	2.48E-08
Radium-226+D	1.60E+03	2.96E-10	2.75E-09	6.74E-06
Radium-228+D	5.75E+00	2.48E-10	9.94E-10	3.28E-06
Thallium-208	5.80E-06	1.75E-14	1.36E-14	1.45E-05
Thorium-228+D	1.91E+00	2.31E-10	9.68E-08	6.20E-06
Thorium-234	6.60E-02	1.93E-11	1.90E-11	3.50E-09
Tin-113	3.20E-01	3.72E-12	6.61E-12	2.96E-09
Tritium	1.23E+01	7.15E-14	9.59E-14	0.00E+00
Uranium-234	2.45E+05	4.44E-11	1.40E-08	2.14E-11
Uranium-235+D	7.04E+08	4.70E-11	1.30E-08	2.65E-07
Uranium-238+D	4.47E+09	6.20E-11	1.24E-08	6.57E-08

Source: HEAST (EPA,1995)

Table C.4-2
Summary of Chemical Toxicity Data for PCOC at the Salmon Site
 (Page 1 of 2)

Chemical	Oral RfD (mg/kg-day)	Inhalation RfC (mg/kg-day)	Cancer Class	Oral Slope Factor (mg/kg-day)⁻¹	Inhalation Slope Factor (mg/kg-day)⁻¹
1,1-Dichloroethene	9.00E-03	ND	C	6.00E-01	1.80E-01
2-Butanone	6.00E-01	2.90E-01	D	NA	NA
2-Methylnaphthalene	ND	ND	ND	ND	ND
4,4'-DDD	ND	ND	B2	2.40E-01	ND
4,4'-DDE	ND	ND	B2	3.40E-01	ND
4,4'-DDT	ND	ND	B2	3.40E-01	3.40E-01
4-Methylphenol	ND	ND	C	ND	ND
Acenaphthene	6.00E-02	ND	ND	ND	ND
Acetone	1.00E-01	ND	D	NA	NA
Aluminum	ND	ND	D	NA	NA
Antimony	4.00E-04	ND	ND	ND	ND
Aroclor-1254 (PCB)	ND	ND	B2	7.70E+00	7.70E+00
Arsenic	3.00E-04	ND	A	1.50E+00	1.50E+01
Barium	7.00E-02	1.40E-04	ND	ND	ND
Benzene	ND	ND	A	2.90E-02	2.90E-02
Benzo(a)pyrene	ND	ND	B2	7.30E+00	ND
Benzo(b)Fluoranthene	ND	ND	B2	ND	ND
Benzo(k)Fluoranthene	ND	ND	B2	ND	ND
Benzoic acid	4.00E+00	ND	D	NA	NA
Benzyl Alcohol	ND	ND	D	NA	NA
Beryllium	5.00E-03	ND	B2	4.30E+00	8.40E+00
Bis (2-Ethylhexyl) Phthalate	2.00E-02	ND	B2	1.40E-02	ND
Cadmium	1.00E-03	ND	ND	ND	ND
Chlorobenzene	2.00E-02	5.70E-03	D	NA	NA
Chloroform	1.00E-02	ND	B2	6.10E-03	8.10E-02
Chloromethane	ND	ND	C	1.30E-02	6.30E-03
Chromium	1.00E+00	ND	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND
Copper	3.70E-02	ND	D	NA	NA
Cyanide	2.00E-02	ND	D	NA	NA
Di-n-butyl Phthalate	1.00E-01	ND	D	NA	NA
Di-n-octyl Phthalate	2.00E-02	ND	B2	1.40E-02	ND
Dibenzofuran	ND	ND	D	NA	NA
Dieldrin	5.00E-05	ND	B2	1.60E+01	1.60E+01
Ethylbenzene	1.00E-01	2.90E-01	D	NA	NA
Fluorene	4.00E-02	ND	D	NA	NA

Table C.4-2
Summary of Chemical Toxicity Data for PCOC at the Salmon Site
 (Page 2 of 2)

Chemical	Oral RfD (mg/kg-day)	Inhalation RfC (mg/kg-day)	Cancer Class	Oral Slope Factor (mg/kg-day) ⁻¹	Inhalation Slope Factor (mg/kg-day) ⁻¹
Lead	ND	ND	ND	ND	ND
HpCDF	ND	ND	ND	ND	ND
Manganese	1.40E-01	1.40E-05	D	NA	NA
Mercury	ND	8.60E-05	D	NA	NA
Methylene chloride	6.00E-02	8.60E-01	B2	7.50E-03	1.60E-03
n-Nitrosodiphenylamine	ND	ND	B2	1.50E+02	1.50E+02
Naphthalene	ND	ND	D	NA	NA
Naphthalene - 1,2,3,4-tetrahy	ND	ND	ND	ND	ND
Nickel	2.00E-02	ND	ND	ND	ND
Phenanthrene	ND	ND	D	NA	NA
Phenol	6.00E-01	ND	D	NA	NA
Selenium	5.00E-03	ND	D	NA	NA
Silver	5.00E-03	ND	D	NA	NA
Styrene	2.00E-01	2.90E-01	ND	ND	ND
TCDF	ND	ND	ND	ND	ND
Tetrachloroethene	1.00E-02	ND	ND	ND	ND
Thallium	9.00E-05	ND	D	NA	NA
Toluene	2.00E-01	1.10E-01	D	NA	NA
Total xylenes	2.00E+00	ND	D	NA	NA
Trichloroethene	ND	ND	ND	1.50E-02	1.00E-02
Vanadium	9.00E-03	ND	ND	ND	ND
Vinyl Chloride	ND	ND	A	1.9	ND
Zinc	3.00E-01	ND	D	NA	NA

Toxicity values from IRIS (EPA, 1998), where used for this table unless otherwise stated.

ND = No Data
 NA = Not Applicable

EPA, 1995
 CEPA, 1995

C.5.0 Risk Characterization

This section provides a characterization of the potential health risks associated with the intake of PCOCs. Risk characterization compares estimated potential cancer risks with reasonable levels of risk (SF) for carcinogens and compares estimated daily intake (rate) with reference levels (RfD) for noncarcinogens. Carcinogens may also pose a systemic (noncarcinogenic) hazard, and these potential hazards are characterized in the same manner as other noncarcinogens.

Estimation of potential risk from exposure to a PCOC is based on RAGS (EPA, 1989). This assessment employs a health-protective bias that leads to a conservative estimation of the risk. The exposure of individuals to an RME is described in [Section C.3.1](#) and evaluated in [Section C.3.2](#) to provide estimates of daily intakes. These estimated intakes (rates) are evaluated with the individual chemical toxicological values ([Table C.4-2](#)) to determine the potential carcinogenic risks and the potential noncarcinogenic hazards to human health.

C.5.1 Estimation of Carcinogenic Risk

In evaluating the calculated exposure from a potentially carcinogenic PCOC, a reasonable level of risk must be selected. The EPA used an incremental lifetime cancer risk (ILCR) (also referred to as excess cancer risk) of one in one million (1×10^{-6}) as the lower bound of an acceptable range. The upper bound of an acceptable ILCR recommended by the EPA for drinking water is 1 in 10,000 (1×10^{-4}) (EPA, 1987). In addition, the EPA specifies a risk range of 10^{-6} to 10^{-4} associated with the consideration and selection of remedial alternatives for contaminated media in the National Contingency Plan (NCP) (CFR, 1990).

Based on the regulatory precedents cited above, a reasonable and appropriate ILCR range would be from 10^{-6} to 10^{-4} . As implemented under the NCP, pathway risks greater than 10^{-6} ILCR must receive risk management consideration (CFR, 1990). The quantitative risk assessment is one of many factors that are considered in the decision-making process for remediation. Therefore, there is no single risk value that defines "acceptable" and "unacceptable" risk. The purpose of this risk assessment is to present quantitative and qualitative estimates of potential risk; thus, all pathway risks greater than the lower bound of 10^{-6} will be examined.

Cumulative site ILCRs were developed for subsurface soil and groundwater PCOCs. These cumulative ILCRs included all media and pathways that were appropriate to combine. Combined pathways occur when there is potential for an individual to be exposed to multiple

pathways at the same given instant in time. Where the cumulative ILCR site risk to an individual based on the RME for both current and future land use is less than 10^{-4} , action generally is not warranted unless there are adverse environmental impacts (EPA, 1991b).

The carcinogenic risk is estimated as the probability of an additional incidence of cancer. This risk is:

$$\text{ILCR} = \text{SF} \times \text{Intake} \quad (\text{C-19})$$

where:

ILCR = Incremental lifetime cancer risk (unitless)

SF = Carcinogenic SF $[(\text{mg/kg-d})^{-1}$ for chemicals; for radionuclides $(\text{pCi})^{-1}$ or $(\text{pCi-yr/g})^{-1}$ for external exposure]

Intake = Chronic daily intake (mg/kg-day) for chemicals or $(\text{pCi}$ and $\text{pCi-yr/g})$ for radionuclides

The carcinogenic SF for the PCOCs are presented in [Tables C.4-1](#) and [C.4-2](#). For chemicals, these are the most recent values cited in the EPA's IRIS (EPA, 1998), and the HEAST (EPA, 1995). For radionuclides, all of the SF are from HEAST (EPA, 1995). Surrogate values for constituents were not derived if no SF existed in the IRIS or the HEAST.

For a given pathway and medium with exposure to several carcinogens, the following equation was used to sum the cancer risk:

$$\text{Risk}_{t,p} = \sum_{i=1}^I \text{ILCR}_p(\text{chem}_i) \quad (\text{C-20})$$

where:

$\text{Risk}_{t,p}$ = Total cancer risk for pathway p (unitless)

$\text{ILCR}_p(\text{chem}_i)$ = Individual cancer risk for constituent i through exposure pathway p (unitless)

Estimates of ILCRs are provided for each exposure scenario and pathway in [Section C.5.3](#).

C.5.2 Estimation of Noncarcinogenic Risk

Constituents that pose a health threat other than cancer were evaluated by comparing an exposure level or intake to an acceptable level or RfD. The ratio of estimated daily intake to the RfD is termed the hazard quotient (HQ) and is defined as:

$$HQ_{i,p} = \frac{I_{i,p}}{RfD_i} \quad (C-21)$$

where:

$HQ_{i,p}$ = Individual HQ for exposure to constituent i through exposure pathway p (unitless)

$I_{i,p}$ = Daily intake via a specific pathway p for constituent i (mg/kg-d)

RfD_i = RfD for exposure by the specific pathway (limited to oral and inhalation values) for constituent i (mg/kg-d)

The RfD is an estimate of the intake level to which a human population, including sensitive subpopulations, may be chronically exposed without a significant risk of adverse health effects (EPA, 1989). The RfDs for the PCOCs are listed in [Table C.4-2](#). Because the HQ does not define intake response relationships, its numerical value should not be construed as a direct estimate of risk, but it does suggest that a given situation should be more closely scrutinized. The concept of the HQ implies the existence of a threshold for systemic health effects. The HQ is a numerical indication of the fraction of acceptable limits of exposure or the degree to which acceptable exposure levels are exceeded. As this quotient increases toward unity, concern for the potential hazard of the constituent increases. A value above unity is an indication of risk, although a direct correlation to the magnitude of the risk cannot be drawn. The RfD used in this risk assessment are the most recent values cited in the IRIS (EPA, 1998) and HEAST (EPA, 1995). No surrogate values were derived.

In the case of simultaneous exposure to several constituents, the hazard index (HI) is calculated to evaluate the potential risk from exposure to the mixture by summing the HQ for each chemical, medium, and pathway. The total HI incorporates the assumption of additive effects when dealing with a mixture of components. The HI formula is as follows (EPA, 1989):

$$HI = \sum_{i=1}^I HQ_i \quad (C-22)$$

where:

HI = Hazard index (unitless)

HQ_i = Hazard quotient for exposure to constituent i (unitless)

Summation of the individual HQ could result in an HI that exceeds 1, even if no single chemical exceeds its acceptable level. Mechanistically, it is not appropriate to sum HQ unless the constituents that make up the mixture have similar effects on the identical organ. Consequently, the summing of HQ for a mixture of compounds that are not expected to include the same type of effects could overestimate the potential risk. The EPA recommends that if the total HI is greater than unity, the components of the mixture should be grouped by critical effect, and separate hazard indices should be calculated for each effect.

C.5.3 Results of the Human Health Risk Assessment

The results of the human health risk assessment are summarized below. [Tables C.5-1](#) through [C.5-12](#) present the surface soil results for each of the six source areas. [Tables C.5-13](#) through [C.5-22](#) present the subsurface soil results for each of the six source areas. [Tables C.5-23](#) and [C.5-24](#) present the surface water results, [Tables C.5-25](#) and [C.5-26](#) presents sediment results, and [Tables C.5-27](#) and [C.5-28](#) list the groundwater results.

C.5.3.1 Source Area 1

Potential risks due to contact with surface soil at Source Area 1 are summarized in [Tables C.5-1](#) (lifetime cancer risks) and [C.5-2](#) (hazard quotients). The surface soil pathways identified at Source Area 1 include incidental soil ingestion (chemicals and radionuclides), dermal contact (chemicals), inhalation of dust (chemicals and radionuclides), external exposure (radionuclides), and ingestion of home-grown produce (chemicals and radionuclides). The ingestion of home-grown produce pathway is only applicable to the residential scenario.

The surface soil pathway with highest risk is external exposure to radionuclides. The ILCR for the recreational scenario external exposure to radionuclides is 2.7×10^{-5} , with protactinium-234 (1.8×10^{-5}) contributing most of the risk. The ILCR for the residential scenario external

Table C.5-1
Estimated Daily Intakes and Incremental Lifetime Cancer Risks for
Surface Soils at Source Area 1, Salmon Site
(Page 1 of 4)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Current Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Recreational	Incidental Ingestion of Soil	Arsenic Bis (2-Ethylhexyl) Phthalate Total	2.0E-07 3.9E-08	2.9E-07 5.4E-10 2.9E-07
Recreational	Dermal Contact with Soil	Arsenic Bis (2-Ethylhexyl) Phthalate Total	1.3E-07 8.5E-08	1.9E-07 1.2E-09 1.9E-07
Recreational	Inhalation of Dust	Arsenic Bis (2-Ethylhexyl) Phthalate Total	4.1E-10 8.2E-11	6.2E-10 1.1E-12 6.2E-10
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Recreational	Incidental Ingestion of Soil	Cesium-137+D Mercury-203 Protactinium-231 Protactinium-234 Radium-223 Radium-224 Radium-228+D Thallium-208 Tin-113 Uranium-238+D Total	7.0E+00 1.5E+00 4.2E+01 1.5E+02 8.6E+00 1.9E+01 2.4E+01 2.6E+01 1.0E+00 2.2E+01	2.2E-10 4.0E-12 6.2E-09 3.2E-10 2.0E-09 2.9E-09 6.1E-09 4.5E-13 3.7E-12 1.4E-09 1.9E-08
Recreational	External Exposure	Cesium-137+D Mercury-203 Protactinium-231 Protactinium-234 Radium-223 Radium-224 Radium-228+D Thallium-208 Tin-113 Uranium-238+D Total	1.3E-01 2.8E-02 7.6E-01 2.7E+00 1.6E-01 3.5E-01 4.5E-01 4.7E-01 1.8E-02 4.0E-01	2.7E-07 1.7E-08 2.1E-08 1.8E-05 3.8E-08 8.7E-09 1.5E-06 6.8E-06 5.4E-11 2.6E-08 2.7E-05

Table C.5-1
Estimated Daily Intakes and Incremental Lifetime Cancer Risks for
Surface Soils at Source Area 1, Salmon Site
(Page 2 of 4)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Recreational	Inhalation of Dust	Cesium-137+D	1.6E-02	3.1E-13
		Mercury-203	3.5E-03	1.1E-14
		Protactinium-231	9.8E-02	2.4E-09
		Protactinium-234	3.5E-01	4.5E-13
		Radium-223	2.0E-02	7.2E-11
		Radium-224	4.5E-02	1.0E-10
		Radium-228+D	5.7E-02	5.7E-11
		Thallium-208	6.0E-02	8.2E-16
		Tin-113	2.4E-03	1.6E-14
		Uranium-238+D	5.1E-02	6.4E-10
		Total		3.2E-09
Future Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Residential	Incidental Ingestion of Soil	Arsenic	4.9E-06	7.3E-06
		Bis (2-Ethylhexyl) Phthalate	9.7E-07	1.4E-08
		Total		7.3E-06
Residential	Dermal Contact with Soil	Arsenic	1.7E-06	2.5E-06
		Bis (2-Ethylhexyl) Phthalate	1.1E-06	1.5E-08
		Total		2.5E-06
Residential	Inhalation of Dust	Arsenic	1.0E-08	1.5E-08
		Bis (2-Ethylhexyl) Phthalate	2.0E-09	2.9E-11
		Total		1.5E-08
Residential	Ingestion of Home-Grown Produce	Bis (2-Ethylhexyl) Phthalate	1.6E-05	2.3E-07
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Residential	Incidental Ingestion of Soil	Cesium-137+D	1.7E+02	5.5E-09
		Mercury-203	3.8E+01	1.0E-10
		Protactinium-231	1.0E+03	1.6E-07
		Protactinium-234	3.7E+03	7.9E-09
		Radium-223	2.1E+02	5.0E-08
		Radium-224	4.8E+02	7.2E-08
		Radium-228+D	6.1E+02	1.5E-07
		Thallium-208	6.4E+02	1.1E-11
		Tin-113	2.5E+01	9.4E-11
		Uranium-238+D	5.5E+02	3.4E-08
		Total		4.8E-07

Table C.5-1
Estimated Daily Intakes and Incremental Lifetime Cancer Risks for
Surface Soils at Source Area 1, Salmon Site
(Page 3 of 4)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Residential	External Exposure	Cesium-137+D	3.2E+00	6.7E-06
		Mercury-203	6.9E-01	4.3E-07
		Protactinium-231	1.9E+01	5.2E-07
		Protactinium-234	6.8E+01	4.5E-04
		Radium-223	3.9E+00	9.5E-07
		Radium-224	8.8E+00	2.2E-07
		Radium-228+D	1.1E+01	3.7E-05
		Thallium-208	1.2E+01	1.7E-04
		Tin-113	4.6E-01	1.4E-09
		Uranium-238+D	1.0E+01	6.6E-07
		Total		6.6E-04
Residential	Inhalation of Dust	Cesium-137+D	4.1E-01	7.8E-12
		Mercury-203	8.8E-02	2.7E-13
		Protactinium-231	2.4E+00	5.9E-08
		Protactinium-234	8.7E+00	1.1E-11
		Radium-223	5.0E-01	1.8E-09
		Radium-224	1.1E+00	2.5E-09
		Radium-228+D	1.4E+00	1.4E-09
		Thallium-208	1.5E+00	2.0E-14
		Tin-113	5.9E-02	3.9E-13
		Uranium-238+D	1.3E+00	1.6E-08
		Total		8.1E-08
Residential	Ingestion of Home-Grown Produce	Cesium-137+D	1.9E+04	6.1E-07
		Mercury-203	3.7E+04	9.7E-08
		Protactinium-231	3.6E+04	5.3E-06
		Protactinium-234	1.3E+05	2.7E-07
		Radium-223	2.4E+04	5.5E-06
		Radium-224	5.3E+04	7.9E-06
		Radium-228+D	6.7E+04	1.7E-05
		Thallium-208	3.3E+05	5.8E-09
		Tin-113	3.8E+02	1.4E-09
		Uranium-238+D	8.2E+03	5.1E-07
		Total		3.7E-05
Chemicals of Potential Concern (intake units mg/kg-d)				
Park Ranger	Incidental Ingestion of Soil	Arsenic	5.7E-08	8.5E-08
		Bis (2-Ethylhexyl) Phthalate	1.1E-08	1.6E-10
		Total		8.5E-08
Park Ranger	Dermal Contact with Soil	Arsenic	1.7E-07	2.6E-07
		Bis (2-Ethylhexyl) Phthalate	1.1E-07	1.6E-09
		Total		2.6E-07
Park Ranger	Inhalation of Dust	Arsenic	2.1E-10	3.2E-10
		Bis (2-Ethylhexyl) Phthalate	4.2E-11	5.9E-13
		Total		3.2E-10

Table C.5-1
Estimated Daily Intakes and Incremental Lifetime Cancer Risks for
Surface Soils at Source Area 1, Salmon Site
(Page 4 of 4)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Park Ranger	Incidental Ingestion of Soil	Cesium-137+D	4.5E+00	1.4E-10
		Mercury-203	9.8E-01	2.6E-12
		Protactinium-231	2.7E+01	4.0E-09
		Protactinium-234	9.6E+01	2.0E-10
		Radium-223	5.5E+00	1.3E-09
		Radium-224	1.2E+01	1.9E-09
		Radium-228+D	1.6E+01	3.9E-09
		Thallium-208	1.7E+01	2.9E-13
		Tin-113	6.5E-01	2.4E-12
		Uranium-238+D	1.4E+01	8.8E-10
		Total		1.2E-08
Park Ranger	External Exposure	Cesium-137+D	6.6E-02	1.4E-07
		Mercury-203	1.4E-02	8.9E-09
		Protactinium-231	3.9E-01	1.1E-08
		Protactinium-234	1.4E+00	9.3E-06
		Radium-223	8.1E-02	2.0E-08
		Radium-224	1.8E-01	4.5E-09
		Radium-228+D	2.3E-01	7.6E-07
		Thallium-208	2.4E-01	3.5E-06
		Tin-113	9.5E-03	2.8E-11
		Uranium-238+D	2.1E-01	1.4E-08
		Total		1.4E-05
Park Ranger	Inhalation of Dust	Cesium-137+D	8.5E-03	1.6E-13
		Mercury-203	1.8E-03	5.5E-15
		Protactinium-231	5.1E-02	1.2E-09
		Protactinium-234	1.8E-01	2.3E-13
		Radium-223	1.0E-02	3.7E-11
		Radium-224	2.3E-02	5.2E-11
		Radium-228+D	3.0E-02	2.9E-11
		Thallium-208	3.1E-02	4.2E-16
		Tin-113	1.2E-03	8.0E-15
		Uranium-238+D	2.6E-02	3.3E-10
		Total		1.7E-09

Table C.5-2
Estimated Daily Intakes and Hazard Quotients
for Surface Soils at Source Area 1, Salmon Site
(Page 1 of 3)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Current Exposure Pathways				
Recreational	Incidental Ingestion of Soil	Antimony	6.2E-06	1.5E-02
		Arsenic	1.8E-06	5.9E-03
		Barium	3.2E-05	4.6E-04
		Benzoic Acid	4.9E-07	1.2E-07
		Bis (2-Ethylhexyl) Phthalate	3.5E-07	1.8E-05
		Chromium	7.7E-06	7.7E-06
		Cyanide	9.5E-08	4.7E-06
		Nickel	2.6E-06	1.3E-04
		Toluene	1.7E-09	8.5E-09
		Total xylenes	2.8E-09	1.4E-09
		Zinc	8.0E-06	2.7E-05
		Total		2.2E-02
Recreational	Dermal Contact with Soil	Antimony	8.6E-07	2.1E-03
		Arsenic	7.4E-07	2.5E-03
		Barium	4.5E-06	6.4E-05
		Benzoic Acid	6.8E-07	1.7E-07
		Bis (2-Ethylhexyl) Phthalate	4.9E-07	2.4E-05
		Chromium	1.1E-06	1.1E-06
		Cyanide	1.3E-08	6.6E-07
		Nickel	3.6E-07	1.8E-05
		Toluene	2.4E-09	1.2E-08
		Total xylenes	3.9E-09	2.0E-09
		Zinc	1.1E-06	3.7E-06
		Total		4.7E-03
Recreational	Inhalation of Dust	Barium	1.8E-08	1.3E-04
		Mercury	2.1E-11	2.4E-07
		Toluene	9.2E-13	8.4E-12
		Total		1.3E-04

Table C.5-2
Estimated Daily Intakes and Hazard Quotients
for Surface Soils at Source Area 1, Salmon Site
(Page 2 of 3)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Future Exposure Pathways				
Residential	Incidental Ingestion of Soil	Antimony	1.5E-04	3.9E-01
		Arsenic	4.4E-05	1.5E-01
		Barium	8.1E-04	1.2E-02
		Benzoic Acid	1.2E-05	3.1E-06
		Bis (2-Ethylhexyl) Phthalate	8.8E-06	4.4E-04
		Chromium	1.9E-04	1.9E-04
		Cyanide	2.4E-06	1.2E-04
		Nickel	6.4E-05	3.2E-03
		Toluene	4.3E-08	2.1E-07
		Total xylenes	7.1E-08	3.6E-08
		Zinc	2.0E-04	6.7E-04
		Total		5.5E-01
Residential	Dermal Contact with Soil	Antimony	1.6E-05	4.0E-02
		Arsenic	1.4E-05	4.6E-02
		Barium	8.4E-05	1.2E-03
		Benzoic Acid	1.3E-05	3.2E-06
		Bis (2-Ethylhexyl) Phthalate	9.1E-06	4.6E-04
		Chromium	2.0E-05	2.0E-05
		Cyanide	2.5E-07	1.2E-05
		Nickel	6.7E-06	3.4E-04
		Toluene	4.4E-08	2.2E-07
		Total xylenes	7.4E-08	3.7E-08
		Zinc	2.1E-05	7.0E-05
		Total		8.8E-02
Residential	Inhalation of Dust	Barium	4.4E-07	3.1E-03
		Mercury	5.1E-10	6.0E-06
		Toluene	2.3E-11	2.1E-10
		Total		3.1E-03
Residential	Ingestion of Home-Grown Produce	Benzoic Acid	2.8E-02	6.9E-03
		Bis (2-Ethylhexyl) Phthalate	3.8E-05	1.9E-03
		Toluene	2.7E-06	1.3E-05
		Total xylenes	2.3E-06	1.2E-06
		Total		8.8E-03
Park Ranger	Incidental Ingestion of Soil	Antimony	5.5E-07	1.4E-03
		Arsenic	1.6E-07	5.3E-04
		Barium	2.9E-06	4.2E-05
		Benzoic Acid	4.4E-08	1.1E-08
		Bis (2-Ethylhexyl) Phthalate	3.2E-08	1.6E-06
		Chromium	6.9E-07	6.9E-07
		Cyanide	8.5E-09	4.3E-07
		Nickel	2.3E-07	1.2E-05
		Toluene	1.5E-10	7.6E-10
		Total xylenes	2.6E-10	1.3E-10
		Zinc	7.2E-07	2.4E-06
		Total		2.0E-03

Table C.5-2
Estimated Daily Intakes and Hazard Quotients
for Surface Soils at Source Area 1, Salmon Site
 (Page 3 of 3)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Park Ranger	Dermal Contact with Soil	Antimony	5.5E-07	1.4E-03
		Arsenic	4.8E-07	1.6E-03
		Barium	2.9E-06	4.2E-05
		Benzoic Acid	4.4E-07	1.1E-07
		Bis (2-Ethylhexyl) Phthalate	3.2E-07	1.6E-05
		Chromium	6.9E-07	6.9E-07
		Cyanide	8.5E-09	4.3E-07
		Nickel	2.3E-07	1.2E-05
		Toluene	1.5E-09	7.6E-09
		Total xylenes	2.6E-09	1.3E-09
		Zinc	7.2E-07	2.4E-06
		Total		3.0E-03
Park Ranger	Inhalation of Dust	Barium	1.1E-08	7.8E-05
		Mercury	1.3E-11	1.5E-07
		Toluene	5.7E-13	5.2E-12
		Total		7.8E-05

Table C.5-3
Estimated Daily Intakes and Incremental Lifetime Cancer
Risks for Surface Soils at Source Area 2, Salmon Site
(Page 1 of 3)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Current Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Recreational	Incidental Ingestion of Soil	Bis (2-Ethylhexyl) Phthalate Methylene Chloride Total	1.1E-08 3.0E-10	1.5E-10 2.3E-12 1.5E-10
Recreational	Dermal Contact with Soil	Bis (2-Ethylhexyl) Phthalate Methylene Chloride Total	2.3E-08 6.7E-10	3.3E-10 5.0E-12 3.3E-10
Recreational	Inhalation of Dust	Methylene Chloride	6.40E-13	1.0E-15
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Recreational	Incidental Ingestion of Soil	Radium-223 Radium-228+D Thorium-228+D Tritium Uranium-238+D Total	1.9E+01 3.8E+01 1.7E+02 1.7E+00 4.5E+01	4.4E-09 9.4E-09 4.0E-08 1.2E-13 2.8E-09 5.7E-08
Recreational	External Exposure	Radium-223 Radium-228+D Thorium-228+D Uranium-238+D Total	3.4E-01 6.9E-01 3.2E+00 8.1E-01	8.3E-08 2.3E-06 2.0E-05 5.3E-08 2.2E-05
Recreational	Inhalation of Dust	Radium-223 Radium-228+D Thorium-228+D Tritium Uranium-238+D Total	4.4E-02 8.8E-02 4.1E-01 4.1E-03 1.0E-01	1.6E-10 8.8E-11 4.0E-08 3.9E-16 1.3E-09 4.1E-08
Future Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Residential	Incidental Ingestion of Soil	Bis (2-Ethylhexyl) Phthalate Methylene Chloride Total	2.6E-07 7.6E-09	3.7E-09 5.7E-11 3.7E-09
Residential	Dermal Contact with Soil	Bis (2-Ethylhexyl) Phthalate Methylene Chloride Total	3.0E-07 8.6E-09	4.2E-09 6.4E-11 4.2E-09
Residential	Inhalation of Dust	Methylene Chloride	1.60E-11	2.6E-14
Residential	Ingestion of Home-Grown Produce	Bis (2-Ethylhexyl) Phthalate Methylene Chloride Total	4.4E-06 1.3E-05	6.2E-08 9.4E-08 1.6E-07

Table C.5-3
Estimated Daily Intakes and Incremental Lifetime Cancer
Risks for Surface Soils at Source Area 2, Salmon Site
(Page 2 of 3)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Residential	Incidental Ingestion of Soil	Radium-223 Radium-228+D Thorium-228+D Tritium Uranium-238+D Total	4.7E+02 9.4E+02 4.4E+03 4.4E+01 1.1E+03	1.1E-07 2.3E-07 1.0E-06 3.1E-12 6.9E-08 1.4E-06
Residential	External Exposure	Radium-223 Radium-228+D Thorium-228+D Uranium-238+D Total	8.5E+00 1.7E+01 8.0E+01 2.0E+01	2.1E-06 5.6E-05 4.9E-04 1.3E-06 5.5E-04
Residential	Inhalation of Dust	Radium-223 Radium-228+D Thorium-228+D Tritium Uranium-238+D Total	1.1E+00 2.2E+00 1.0E+01 1.0E-01 2.6E+00	3.9E-09 2.2E-09 9.9E-07 9.8E-15 3.2E-08 1.0E-06
Residential	Ingestion of Home-Grown Produce	Radium-223 Radium-228+D Thorium-228+D Tritium Uranium-238+D Total	2.2E+04 4.4E+04 4.7E+04 1.1E+05 3.4E+04	5.1E-06 1.1E-05 1.1E-05 7.9E-09 2.1E-06 2.9E-05
Chemicals of Potential Concern (intake units mg/kg-d)				
Park Ranger	Incidental Ingestion of Soil	Bis (2-Ethylhexyl) Phthalate Methylene Chloride Total	3.1E-09 8.8E-11	4.3E-11 6.6E-13 4.4E-11
Park Ranger	Dermal Contact with Soil	Bis (2-Ethylhexyl) Phthalate Methylene Chloride Total	3.1E-08 8.8E-10	4.3E-10 6.6E-12 4.4E-10
Park Ranger	Inhalation of Dust	Methylene Chloride	3.3E-13	5.3E-16

Table C.5-3
Estimated Daily Intakes and Incremental Lifetime Cancer
Risks for Surface Soils at Source Area 2, Salmon Site
(Page 3 of 3)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Park Ranger	Incidental Ingestion of Soil	Radium-223	1.2E+01	2.8E-09
		Radium-228+D	2.4E+01	6.0E-09
		Thorium-228+D	1.1E+02	2.6E-08
		Tritium	1.1E+00	8.0E-14
		Uranium-238+D	2.9E+01	1.8E-09
		Total		3.7E-08
Park Ranger	External Exposure	Radium-223	1.8E-01	4.3E-08
		Radium-228+D	3.5E-01	1.2E-06
		Thorium-228+D	1.6E+00	1.0E-05
		Uranium-238+D	4.2E-01	2.8E-08
		Total		1.2E-05
Park Ranger	Inhalation of Dust	Radium-223	2.3E-02	8.1E-11
		Radium-228+D	4.6E-02	4.5E-11
		Thorium-228+D	2.1E-01	2.0E-08
		Tritium	2.1E-03	2.0E-16
		Uranium-238+D	5.4E-02	6.7E-10
		Total		2.1E-08

Table C.5-4
Estimated Daily Intakes and Hazard Quotients
for Surface Soils at Source Area 2, Salmon Site
(Page 1 of 2)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Current Exposure Pathways				
Recreational	Incidental Ingestion of Soil	Acetone	2.3E-08	2.3E-07
		Benzoic Acid	5.3E-07	1.3E-07
		Bis (2-Ethylhexyl) Phthalate	9.6E-08	4.8E-06
		Methylene Chloride	2.7E-09	4.6E-08
		Thallium	1.1E-07	1.2E-03
		Toluene	1.7E-09	8.4E-09
		Total		1.2E-03
Recreational	Dermal Contact with Soil	Acetone	3.2E-08	3.2E-07
		Benzoic Acid	7.3E-07	1.8E-07
		Bis (2-Ethylhexyl) Phthalate	1.3E-07	6.6E-06
		Methylene Chloride	3.8E-09	6.4E-08
		Thallium	1.5E-08	1.7E-04
		Toluene	2.3E-09	1.2E-08
		Total		1.8E-04
Recreational	Inhalation of Dust	Mercury	2.20E-11	2.6E-07
		Methylene Chloride	1.49E-12	1.7E-12
		Toluene	9.10E-13	8.3E-12
		Total		2.6E-07
Future Exposure Pathways				
Residential	Incidental Ingestion of Soil	Acetone	5.8E-07	5.8E-06
		Benzoic Acid	1.3E-05	3.3E-06
		Bis (2-Ethylhexyl) Phthalate	2.4E-06	1.2E-04
		Methylene Chloride	6.9E-08	1.1E-06
		Thallium	2.8E-06	3.1E-02
		Toluene	4.2E-08	2.1E-07
		Total		3.1E-02
Residential	Dermal Contact with Soil	Acetone	6.0E-07	6.0E-06
		Benzoic Acid	1.4E-05	3.4E-06
		Bis (2-Ethylhexyl) Phthalate	2.5E-06	1.2E-04
		Methylene Chloride	7.2E-08	1.2E-06
		Thallium	2.9E-07	3.2E-03
		Toluene	4.4E-08	2.2E-07
		Total		3.3E-03
Residential	Inhalation of Dust	Mercury	5.5E-10	6.4E-06
		Methylene Chloride	3.7E-11	4.3E-11
		Toluene	2.3E-11	2.1E-10
		Total		6.4E-06
Residential	Ingestion of Home-Grown Produce	Acetone	1.8E-03	1.8E-02
		Benzoic Acid	3.0E-02	7.5E-03
		Bis (2-Ethylhexyl) Phthalate	1.0E-05	5.1E-04
		Methylene Chloride	2.9E-05	4.9E-04
		Toluene	2.6E-06	1.3E-05
		Total		2.6E-02

Table C.5-4
Estimated Daily Intakes and Hazard Quotients
for Surface Soils at Source Area 2, Salmon Site
(Page 2 of 2)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Park Ranger	Incidental Ingestion of Soil	Acetone	2.1E-09	2.1E-08
		Benzoic Acid	4.7E-08	1.2E-08
		Bis (2-Ethylhexyl) Phthalate	8.6E-09	4.3E-07
		Methylene Chloride	2.5E-10	4.1E-09
		Thallium	9.9E-09	1.1E-04
		Toluene	1.5E-10	7.5E-10
		Total		1.1E-04
Park Ranger	Dermal Contact with Soil	Acetone	2.1E-08	2.1E-07
		Benzoic Acid	4.7E-07	1.2E-07
		Bis (2-Ethylhexyl) Phthalate	8.6E-08	4.3E-06
		Methylene Chloride	2.5E-09	4.1E-08
		Thallium	9.9E-09	1.1E-04
		Toluene	1.5E-09	7.5E-09
		Total		1.1E-04
Park Ranger	Inhalation of Dust	Mercury	1.1E-11	1.3E-07
		Methylene Chloride	7.7E-13	9.0E-13
		Toluene	4.7E-13	4.3E-12
		Total		1.3E-07

Table C.5-5
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Surface Soils at Source Area 3, Salmon Site
(Page 1 of 4)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Current Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Recreational	Incidental Ingestion of Soil	Benzo(a)Pyrene	1.5E-08	1.1E-07
		Bis (2-Ethylhexyl) Phthalate	1.3E-08	1.8E-10
		Dieldrin	3.2E-09	5.1E-08
		Total		1.6E-07
Recreational	Dermal Contact with Soil	Benzo(a)Pyrene	3.3E-08	2.4E-07
		Bis (2-Ethylhexyl) Phthalate	2.8E-08	4.0E-10
		Dieldrin	3.5E-09	5.6E-08
		Total		3.0E-07
Recreational	Inhalation of Dust	Dieldrin	6.7E-11	1.1E-09
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Recreational	Incidental Ingestion of Soil	Bismuth-212	2.1E+01	1.3E-11
		Lead-210+D	7.8E+01	7.9E-08
		Lead-212	3.8E+01	6.9E-10
		Radium-224	4.9E+01	7.3E-09
		Radium-228+D	4.6E+01	1.1E-08
		Thallium-208	1.4E+01	2.5E-13
		Thorium-234	1.8E+02	3.5E-09
		Tritium	5.0E+00	3.6E-13
		Uranium-238+D	4.0E+01	2.5E-09
		Total		1.0E-07
Recreational	External Exposure	Bismuth-212	3.8E-01	2.5E-07
		Lead-210+D	1.4E+00	2.1E-10
		Lead-212	6.9E-01	2.1E-07
		Radium-224	8.9E-01	2.2E-08
		Radium-228+D	8.3E-01	2.7E-06
		Thallium-208	2.6E-01	3.8E-06
		Thorium-234	3.3E+00	1.1E-08
		Uranium-238+D	7.4E-01	4.8E-08
		Total		7.1E-06
Recreational	Inhalation of Dust	Bismuth-212	4.9E-02	1.8E-12
		Lead-210+D	1.8E-01	7.1E-10
		Lead-212	8.9E-02	3.4E-12
		Radium-224	1.1E-01	2.6E-10
		Radium-228+D	1.1E-01	1.1E-10
		Thallium-208	3.3E-02	4.5E-16
		Thorium-234	4.2E-01	8.0E-12
		Tritium	1.2E-02	1.1E-15
		Uranium-238+D	9.5E-02	1.2E-09
		Total		2.3E-09

Table C.5-5
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Surface Soils at Source Area 3, Salmon Site
(Page 2 of 4)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Future Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Residential	Incidental Ingestion of Soil	Benzo(a)Pyrene Bis (2-Ethylhexyl) Phthalate Dieldrin Total	3.7E-07 3.2E-07 7.9E-08	2.7E-06 4.5E-09 1.3E-06 4.0E-06
Residential	Dermal Contact with Soil	Benzo(a)Pyrene Bis (2-Ethylhexyl) Phthalate Dieldrin Total	4.2E-07 3.6E-07 4.5E-08	3.1E-06 5.1E-09 7.2E-07 3.8E-06
Residential	Inhalation of Dust	Dieldrin	1.7E-09	2.7E-08
Residential	Ingestion of Home-Grown Produce	Benzo(a)Pyrene Bis (2-Ethylhexyl) Phthalate Dieldrin Total	3.2E-05 5.4E-06 1.9E-06	2.3E-04 7.5E-08 3.0E-05 2.6E-04
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Residential	Incidental Ingestion of Soil	Bismuth-212 Lead-210+D Lead-212 Radium-224 Radium-228+D Thallium-208 Thorium-234 Tritium Uranium-238+D Total	5.2E+02 2.0E+03 9.5E+02 1.2E+03 1.1E+03 3.6E+02 4.5E+03 1.3E+02 1.0E+03	3.2E-10 2.0E-06 1.7E-08 1.8E-07 2.8E-07 6.2E-12 8.7E-08 9.0E-12 6.3E-08 2.6E-06
Residential	External Exposure	Bismuth-212 Lead-210+D Lead-212 Radium-224 Radium-228+D Thallium-208 Thorium-234 Uranium-238+D Total	9.5E+00 3.6E+01 1.7E+01 2.2E+01 2.1E+01 6.5E+00 8.2E+01 1.8E+01	6.3E-06 5.2E-09 5.2E-06 5.5E-07 6.8E-05 9.4E-05 2.9E-07 1.2E-06 1.8E-04

Table C.5-5
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Surface Soils at Source Area 3, Salmon Site
(Page 3 of 4)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Residential	Inhalation of Dust	Bismuth-212	1.2E+00	4.4E-11
		Lead-210+D	4.6E+00	1.8E-08
		Lead-212	2.2E+00	8.6E-11
		Radium-224	2.9E+00	6.4E-09
		Radium-228+D	2.7E+00	2.7E-09
		Thallium-208	8.3E-01	1.1E-14
		Thorium-234	1.0E+01	2.0E-10
		Tritium	2.9E-01	2.8E-14
		Uranium-238+D	2.4E+00	2.9E-08
		Total		5.6E-08
Residential	Ingestion of Home-Grown Produce	Bismuth-212	5.1E+04	3.1E-08
		Lead-210+D	2.4E+05	2.4E-04
		Lead-212	1.2E+05	2.1E-06
		Radium-224	5.7E+04	8.5E-06
		Radium-228+D	5.3E+04	1.3E-05
		Thallium-208	6.7E+03	1.2E-10
		Thorium-234	4.8E+04	9.3E-07
		Tritium	3.2E+05	2.3E-08
		Uranium-238+D	3.0E+04	1.9E-06
		Total		2.7E-04
Chemicals of Potential Concern (intake units mg/kg-d)				
Park Ranger	Incidental Ingestion of Soil	Benzo(a)Pyrene	4.3E-09	3.2E-08
		Bis (2-Ethylhexyl) Phthalate	3.7E-09	5.2E-11
		Dieldrin	9.2E-10	1.5E-08
		Total		4.6E-08
Park Ranger	Dermal Contact with Soil	Benzo(a)Pyrene	4.5E-08	3.3E-07
		Bis (2-Ethylhexyl) Phthalate	3.9E-08	5.4E-10
		Dieldrin	4.8E-09	7.7E-08
		Total		4.1E-07
Park Ranger	Inhalation of Dust	Dieldrin	3.5E-11	5.5E-10
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Park Ranger	Incidental Ingestion of Soil	Bismuth-212	1.3E+01	8.3E-12
		Lead-210+D	5.0E+01	5.1E-08
		Lead-212	2.5E+01	4.4E-10
		Radium-224	3.2E+01	4.7E-09
		Radium-228+D	3.0E+01	7.3E-09
		Thallium-208	9.2E+00	1.6E-13
		Thorium-234	1.2E+02	2.2E-09
		Tritium	3.3E+00	2.3E-13
		Uranium-238+D	2.6E+01	1.6E-09
		Total		6.7E-08

Table C.5-5
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Surface Soils at Source Area 3, Salmon Site
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Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Park Ranger	External Exposure	Bismuth-212	2.0E-01	1.3E-07
		Lead-210+D	7.4E-01	1.1E-10
		Lead-212	3.6E-01	1.1E-07
		Radium-224	4.6E-01	1.1E-08
		Radium-228+D	4.3E-01	1.4E-06
		Thallium-208	1.3E-01	1.9E-06
		Thorium-234	1.7E+00	5.9E-09
		Uranium-238+D	3.8E-01	2.5E-08
		Total		3.6E-06
Park Ranger	Inhalation of Dust	Bismuth-212	2.5E-02	9.2E-13
		Lead-210+D	9.4E-02	3.6E-10
		Lead-212	4.6E-02	1.8E-12
		Radium-224	5.9E-02	1.3E-10
		Radium-228+D	5.5E-02	5.5E-11
		Thallium-208	1.7E-02	2.3E-16
		Thorium-234	2.2E-01	4.1E-12
		Tritium	6.1E-03	5.8E-16
		Uranium-238+D	4.9E-02	6.1E-10
		Total		1.2E-09

Table C.5-6
Estimated Daily Intakes and Hazard Quotients
for Surface Soils at Source Area 3, Salmon Site
(Page 1 of 3)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Current Exposure Pathways				
Recreational	Incidental Ingestion of Soil	Acenaphthylene	1.1E-07	1.8E-06
		Barium	4.0E-05	5.7E-04
		Benzoic Acid	3.8E-07	9.5E-08
		Bis (2-Ethylhexyl) Phthalate	1.2E-07	5.8E-06
		Copper	2.8E-06	7.6E-05
		Cyanide	9.0E-08	4.5E-06
		Dieldrin	2.9E-08	5.7E-04
		Ethylbenzene	1.6E-09	1.6E-08
		Indeno(1,2,3-cd)Pyrene	1.1E-07	2.7E-06
		Nickel	2.3E-06	1.2E-04
		Toluene	1.7E-09	8.4E-09
		Total Xylenes	2.7E-09	1.3E-09
		Zinc	3.1E-05	1.0E-04
		Total		1.5E-03
Recreational	Dermal Contact with Soil	Acenaphthylene	2.3E-07	3.8E-06
		Barium	5.5E-06	7.8E-05
		Benzoic Acid	5.3E-07	1.3E-07
		Bis (2-Ethylhexyl) Phthalate	1.6E-07	8.1E-06
		Copper	3.9E-07	1.1E-05
		Cyanide	1.2E-08	6.2E-07
		Dieldrin	2.0E-08	4.0E-04
		Ethylbenzene	2.3E-09	2.3E-08
		Indeno(1,2,3-cd)Pyrene	2.3E-07	5.7E-06
		Nickel	3.2E-07	1.6E-05
		Toluene	2.3E-09	1.2E-08
		Total Xylenes	3.7E-09	1.8E-09
		Zinc	4.3E-06	1.4E-05
		Total		5.4E-04
Recreational	Inhalation of Dust	Barium	2.2E-08	1.5E-04
		Ethylbenzene	8.8E-13	3.0E-12
		Mercury	1.4E-11	1.6E-07
		Toluene	9.2E-13	8.3E-12
		Total		1.5E-04

Table C.5-6
Estimated Daily Intakes and Hazard Quotients
for Surface Soils at Source Area 3, Salmon Site
(Page 2 of 3)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Future Exposure Pathways				
Residential	Incidental Ingestion of Soil	Acenaphthylene	2.7E-06	4.5E-05
		Barium	9.9E-04	1.4E-02
		Benzoic Acid	9.5E-06	2.4E-06
		Bis (2-Ethylhexyl) Phthalate	2.9E-06	1.5E-04
		Copper	7.1E-05	1.9E-03
		Cyanide	2.2E-06	1.1E-04
		Dieldrin	7.2E-07	1.4E-02
		Ethylbenzene	4.1E-08	4.1E-07
		Indeno(1,2,3-cd)Pyrene	2.7E-06	6.8E-05
		Nickel	5.8E-05	2.9E-03
		Toluene	4.2E-08	2.1E-07
		Total Xylenes	6.7E-08	3.3E-07
		Zinc	7.7E-04	3.8E-03
		Total		3.8E-02
Residential	Dermal Contact with Soil	Acenaphthylene	4.3E-06	7.1E-05
		Barium	1.0E-04	1.5E-03
		Benzoic Acid	9.9E-06	2.5E-06
		Bis (2-Ethylhexyl) Phthalate	3.0E-06	1.5E-04
		Copper	7.4E-06	2.0E-04
		Cyanide	2.3E-07	1.2E-05
		Dieldrin	3.7E-07	7.5E-03
		Ethylbenzene	4.2E-08	4.2E-07
		Indeno(1,2,3-cd)Pyrene	4.2E-06	1.1E-04
		Nickel	6.1E-06	3.0E-04
		Toluene	4.4E-08	2.2E-07
		Total Xylenes	6.9E-08	3.5E-07
		Zinc	8.0E-05	4.0E-04
		Total		1.0E-02
Residential	Inhalation of Dust	Barium	5.4E-07	3.8E-03
		Ethylbenzene	2.2E-11	7.6E-11
		Mercury	3.4E-10	3.9E-06
		Toluene	2.3E-11	2.1E-10
		Total		3.9E-03
Park Ranger	Incidental Ingestion of Soil	Acenaphthylene	9.8E-09	1.6E-07
		Barium	3.6E-06	5.1E-05
		Benzoic Acid	3.4E-08	8.5E-09
		Bis (2-Ethylhexyl) Phthalate	1.0E-08	5.2E-07
		Copper	2.5E-07	6.9E-06
		Cyanide	8.0E-09	4.0E-07
		Dieldrin	2.6E-09	5.2E-05
		Ethylbenzene	1.5E-10	1.5E-09
		Indeno(1,2,3-cd)Pyrene	9.8E-09	2.4E-07
		Nickel	2.1E-07	1.0E-05
		Toluene	1.5E-10	7.6E-10
		Xylenes	2.4E-10	1.2E-10
		Zinc	2.8E-06	9.2E-06
		Total		1.3E-04

Table C.5-6
Estimated Daily Intakes and Hazard Quotients
for Surface Soils at Source Area 3, Salmon Site
(Page 3 of 3)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Park Ranger	Dermal Contact with Soil	Acenaphthylene	1.5E-07	2.5E-06
		Barium	3.7E-06	5.3E-05
		Benzoic Acid	3.5E-07	8.9E-08
		Bis (2-Ethylhexyl) Phthalate	1.1E-07	5.4E-06
		Copper	2.6E-07	7.1E-06
		Cyanide	8.4E-09	4.2E-07
		Dieldrin	1.3E-08	2.7E-04
		Ethylbenzene	1.5E-09	1.5E-08
		Indeno(1,2,3-cd)Pyrene	1.5E-07	3.8E-06
		Nickel	2.2E-07	1.1E-05
		Toluene	1.6E-09	7.9E-09
		Xylenes	2.5E-09	1.2E-09
		Zinc	2.9E-06	9.6E-06
		Total		3.6E-04
Park Ranger	Inhalation of Dust	Barium	1.1E-08	7.9E-05
		Ethylbenzene	4.5E-13	1.6E-12
		Mercury	7.0E-12	8.1E-08
		Toluene	4.7E-13	4.3E-12
		Total		7.9E-05

Table C.5-7
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Surface Soils at Source Area 4, Salmon Site
(Page 1 of 3)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Current Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Recreational	Incidental Ingestion of Soil	Bis (2-Ethylhexyl) Phthalate	8.3E-09	1.2E-10
Recreational	Dermal Contact with Soil	Bis (2-Ethylhexyl) Phthalate	1.8E-08	2.6E-10
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Recreational	Incidental Ingestion of Soil	Cesium-137+D	1.1E+01	3.5E-10
		Protactinium-231	4.8E+01	7.2E-09
		Radium-223	1.7E+01	4.0E-09
		Radium-228+D	3.9E+01	9.6E-09
		Thorium-228+D	1.7E+02	4.0E-08
		Tin-113	1.5E+00	5.6E-12
		Uranium-234	1.6E+02	7.1E-09
		Uranium-238+D	2.8E+01	1.7E-09
		Total		7.1E-08
Recreational	External Exposure	Cesium-137+D	2.0E-01	4.3E-07
		Protactinium-231	8.8E-01	2.4E-08
		Radium-223	3.1E-01	7.6E-08
		Radium-228+D	7.0E-01	2.3E-06
		Thorium-228+D	3.1E+00	1.9E-05
		Tin-113	2.8E-02	8.2E-11
		Uranium-234	2.9E+00	6.3E-11
		Uranium-238+D	5.1E-01	3.3E-08
		Total		2.2E-05
Recreational	Inhalation of Dust	Cesium-137+D	2.6E-02	5.0E-13
		Protactinium-231	1.1E-01	2.7E-09
		Radium-223	4.0E-02	1.4E-10
		Radium-228+D	9.0E-02	9.0E-11
		Thorium-228+D	4.0E-01	3.9E-08
		Tin-113	3.5E-03	2.3E-14
		Uranium-234	3.8E-01	5.3E-09
		Uranium-238+D	6.5E-02	8.1E-10
		Total		4.8E-08
Future Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Residential	Incidental Ingestion of Soil	Bis (2-Ethylhexyl) Phthalate	2.1E-07	2.9E-09
Residential	Dermal Contact with Soil	Bis (2-Ethylhexyl) Phthalate	2.3E-07	3.3E-09

Table C.5-7
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Surface Soils at Source Area 4, Salmon Site
(Page 2 of 3)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Residential	Ingestion of Home-Grown Produce	Bis (2-Ethylhexyl) Phthalate	3.4E-06	4.7E-08
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Residential	Incidental Ingestion of Soil	Cesium-137+D Protactinium-231 Radium-223 Radium-228+D Thorium-228+D Tin-113 Uranium-234 Uranium-238+D Total	2.8E+02 1.2E+03 4.3E+02 9.7E+02 4.3E+03 3.8E+01 4.0E+03 7.0E+02	8.8E-09 1.8E-07 1.0E-07 2.4E-07 9.9E-07 1.4E-10 1.8E-07 4.3E-08 1.7E-06
Residential	External Exposure	Cesium-137+D Protactinium-231 Radium-223 Radium-228+D Thorium-228+D Tin-113 Uranium-234 Uranium-238+D Total	5.1E+00 2.2E+01 7.8E+00 1.8E+01 7.8E+01 6.9E-01 7.3E+01 1.3E+01	1.1E-05 6.0E-07 1.9E-06 5.8E-05 4.8E-04 2.0E-09 1.6E-09 8.4E-07 5.5E-04
Residential	Inhalation of Dust	Cesium-137+D Protactinium-231 Radium-223 Radium-228+D Thorium-228+D Tin-113 Uranium-234 Uranium-238+D Total	6.6E-01 2.8E+00 1.0E+00 2.3E+00 1.0E+01 8.8E-02 9.4E+00 1.6E+00	1.3E-11 6.9E-08 3.6E-09 2.2E-09 9.7E-07 5.8E-13 1.3E-07 2.0E-08 1.2E-06
Residential	Ingestion of Home-Grown Produce	Cesium-137+D Protactinium-231 Radium-223 Radium-228+D Thorium-228+D Tin-113 Uranium-234 Uranium-238+D Total	5.9E+04 1.8E+04 2.0E+04 4.5E+04 4.6E+04 3.2E+03 1.2E+05 2.1E+04	1.9E-06 2.7E-06 4.6E-06 1.1E-05 1.1E-05 1.2E-08 5.4E-06 1.3E-06 3.8E-05
Chemicals of Potential Concern (intake units mg/kg-d)				
Park Ranger	Incidental Ingestion of Soil	Bis (2-Ethylhexyl) Phthalate	2.4E-09	3.4E-11
Park Ranger	Dermal Contact with Soil	Bis (2-Ethylhexyl) Phthalate	2.4E-08	3.4E-10

Table C.5-7
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Surface Soils at Source Area 4, Salmon Site
(Page 3 of 3)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Park Ranger	Incidental Ingestion of Soil	Cesium-137+D	7.2E+00	2.3E-10
		Protactinium-231	3.1E+01	4.6E-09
		Radium-223	1.1E+01	2.6E-09
		Radium-228+D	2.5E+01	6.2E-09
		Thorium-228+D	1.1E+02	2.6E-08
		Tin-113	9.8E-01	3.6E-12
		Uranium-234	1.0E+02	4.6E-09
		Uranium-238+D	1.8E+01	1.1E-09
		Total		4.5E-08
Park Ranger	External Exposure	Cesium-137+D	1.1E-01	2.2E-07
		Protactinium-231	4.6E-01	1.2E-08
		Radium-223	1.6E-01	3.9E-08
		Radium-228+D	3.6E-01	1.2E-06
		Thorium-228+D	1.6E+00	1.0E-05
		Tin-113	1.4E-02	4.2E-11
		Uranium-234	1.5E+00	3.2E-11
		Uranium-238+D	2.6E-01	1.7E-08
		Total		1.1E-05
Park Ranger	Inhalation of Dust	Cesium-137+D	1.4E-02	2.6E-13
		Protactinium-231	5.8E-02	1.4E-09
		Radium-223	2.1E-02	7.4E-11
		Radium-228+D	4.7E-02	4.6E-11
		Thorium-228+D	2.1E-01	2.0E-08
		Tin-113	1.8E-03	1.2E-14
		Uranium-234	1.9E-01	2.7E-09
		Uranium-238+D	3.4E-02	4.2E-10
		Total		2.5E-08

Table C.5-8
Estimated Daily Intakes and Hazard Quotients
for Surface Soils at Source Area 4, Salmon Site
(Page 1 of 2)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Current Exposure Pathways				
Recreational	Incidental Ingestion of Soil	Antimony	7.1E-06	1.8E-02
		Barium	4.1E-05	5.9E-04
		Benzoic Acid	4.6E-07	1.1E-07
		Benzyl Alcohol	1.4E-07	3.5E-08
		Bis (2-Ethylhexyl) Phthalate	7.5E-08	3.8E-06
		Chromium	5.8E-06	5.8E-06
		Copper	6.2E-04	1.7E-02
		Cyanide	1.0E-07	5.2E-06
		Nickel	2.7E-06	1.4E-04
		Toluene	1.9E-09	9.6E-09
		Zinc	2.1E-05	6.9E-05
		Total		3.5E-02
Recreational	Dermal Contact with Soil	Antimony	9.8E-07	2.5E-03
		Barium	5.7E-06	8.2E-05
		Benzoic Acid	6.3E-07	1.6E-07
		Benzyl Alcohol	2.0E-07	4.9E-08
		Bis (2-Ethylhexyl) Phthalate	1.0E-07	5.2E-06
		Chromium	8.1E-07	8.1E-07
		Copper	8.6E-05	2.3E-03
		Cyanide	1.4E-08	7.2E-07
		Nickel	3.8E-06	1.9E-04
		Toluene	2.7E-09	1.3E-08
		Zinc	2.9E-06	9.5E-06
		Total		5.1E-03
Recreational	Inhalation of Dust	Barium	2.2E-08	1.6E-04
		Mercury	1.9E-11	2.2E-07
		Toluene	1.0E-12	9.5E-12
		Total		1.6E-04
Future Exposure Pathways				
Residential	Incidental Ingestion of Soil	Antimony	1.8E-04	4.4E-01
		Barium	1.0E-03	1.5E-02
		Benzoic Acid	1.1E-05	2.9E-06
		Benzyl Alcohol	3.5E-06	8.8E-07
		Bis (2-Ethylhexyl) Phthalate	1.9E-06	9.4E-05
		Chromium	1.5E-04	1.5E-04
		Copper	1.6E-02	4.2E-01
		Cyanide	2.6E-06	1.3E-04
		Nickel	6.8E-05	3.4E-03
		Toluene	4.8E-08	2.4E-07
		Zinc	5.2E-04	1.7E-03
		Total		8.8E-01

Table C.5-8
Estimated Daily Intakes and Hazard Quotients
for Surface Soils at Source Area 4, Salmon Site
(Page 2 of 2)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Residential	Dermal Contact with Soil	Antimony	1.8E-05	4.6E-02
		Barium	1.1E-04	1.5E-03
		Benzoic Acid	1.2E-05	3.0E-06
		Benzyl Alcohol	3.7E-06	9.2E-07
		Bis (2-Ethylhexyl) Phthalate	2.0E-06	9.8E-05
		Chromium	1.5E-05	1.5E-05
		Copper	1.6E-03	4.4E-02
		Cyanide	2.7E-07	1.4E-05
		Nickel	7.1E-06	3.5E-04
		Toluene	5.0E-08	2.5E-07
		Zinc	5.4E-05	1.8E-04
		Total		9.2E-02
Residential	Inhalation of Dust	Barium	5.6E-07	4.0E-03
		Mercury	4.7E-10	5.4E-06
		Toluene	2.6E-11	2.4E-10
		Total		4.0E-03
Residential	Ingestion of Home-Grown Produce	Benzoic Acid	2.1E-03	5.3E-04
		Benzyl Alcohol	6.6E-04	1.7E-04
		Bis (2-Ethylhexyl) Phthalate	8.1E-06	4.0E-04
		Toluene	3.1E-06	1.5E-05
		Total		1.1E-03
Park Ranger	Incidental Ingestion of Soil	Antimony	6.4E-07	1.6E-03
		Barium	3.7E-06	5.3E-05
		Benzoic Acid	4.1E-08	1.0E-08
		Benzyl Alcohol	1.3E-08	3.2E-09
		Bis (2-Ethylhexyl) Phthalate	6.8E-09	3.4E-07
		Chromium	5.2E-07	5.2E-07
		Copper	5.6E-05	1.5E-03
		Cyanide	9.4E-09	4.7E-07
		Nickel	2.4E-07	1.2E-05
		Toluene	1.7E-10	8.7E-10
		Zinc	1.9E-06	6.2E-06
		Total		3.2E-03
Park Ranger	Dermal Contact with Soil	Antimony	6.4E-07	1.6E-03
		Barium	3.7E-06	5.3E-05
		Benzoic Acid	4.1E-07	1.0E-07
		Benzyl Alcohol	1.3E-07	3.2E-08
		Bis (2-Ethylhexyl) Phthalate	6.8E-08	3.4E-06
		Chromium	5.2E-07	5.2E-07
		Copper	5.6E-05	1.5E-03
		Cyanide	9.4E-09	4.7E-07
		Nickel	2.4E-06	1.2E-04
		Toluene	1.7E-09	8.7E-09
		Zinc	1.9E-06	6.2E-06
		Total		3.3E-03
Park Ranger	Inhalation of Dust	Barium	1.2E-08	8.2E-05
		Mercury	9.6E-12	1.1E-07
		Toluene	5.4E-13	4.9E-12
		Total		8.2E-05

Table C.5-9
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Surface Soils at Source Area 5, Salmon Site
(Page 1 of 4)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimate d Intake (mg/kg-d)	ILCR
Current Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Recreational	Incidental Ingestion of Soil	4,4'-DDE	5.5E-09	1.9E-09
		4,4'-DDT	5.5E-09	1.9E-09
		Bis (2-Ethylhexyl) Phthalate	8.5E-09	1.2E-10
		Chloroform	2.5E-10	1.5E-12
		Total		3.9E-09
Recreational	Dermal Contact with Soil	4,4'-DDE	6.1E-09	2.1E-09
		4,4'-DDT	6.0E-09	2.0E-09
		Bis (2-Ethylhexyl) Phthalate	1.9E-08	2.6E-10
		Chloroform	5.4E-10	3.3E-12
		Total		4.4E-09
Recreational	Inhalation of Dust	4,4'-DDT	1.2E-11	3.9E-12
		Chloroform	5.2E-13	4.2E-14
		Total		4.0E-12
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Recreational	Incidental Ingestion of Soil	Cesium-137+D	2.5E+01	8.0E-10
		Protactinium-231	3.7E+01	5.5E-09
		Radium-223	1.3E+01	2.9E-09
		Radium-228+D	3.2E+01	7.9E-09
		Thorium-228+D	4.2E+01	9.7E-09
		Uranium-234	5.2E+02	2.3E-08
		Total		5.0E-08
Recreational	External Exposure	Cesium-137+D	4.6E-01	9.7E-07
		Protactinium-231	6.7E-01	1.8E-08
		Radium-223	2.3E-01	5.6E-08
		Radium-228+D	5.8E-01	1.9E-06
		Thorium-228+D	7.6E-01	4.7E-06
		Uranium-234	9.6E+00	2.0E-10
		Total		7.7E-06
Recreational	Inhalation of Dust	Cesium-137+D	5.9E-02	1.1E-12
		Protactinium-231	8.6E-02	2.1E-09
		Radium-223	2.9E-02	1.1E-10
		Radium-228+D	7.4E-02	7.4E-11
		Thorium-228+D	9.8E-02	9.5E-09
		Uranium-234	1.2E+00	1.7E-08
		Total		2.9E-08

Table C.5-9
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Surface Soils at Source Area 5, Salmon Site
(Page 2 of 4)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Future Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Residential	Incidental Ingestion of Soil	4,4'-DDE	1.4E-07	4.7E-08
		4,4'-DDT	1.4E-07	4.7E-08
		Bis (2-Ethylhexyl) Phthalate	2.1E-07	3.0E-09
		Chloroform	6.1E-09	3.7E-11
		Total		9.1E-08
Residential	Dermal Contact with Soil	4,4'-DDE	7.8E-08	2.6E-08
		4,4'-DDT	7.7E-08	2.6E-08
		Bis (2-Ethylhexyl) Phthalate	2.4E-07	3.3E-09
		Chloroform	6.9E-09	4.2E-11
		Total		5.5E-08
Residential	Inhalation of Dust	4,4'-DDT	2.4E-07	8.2E-08
		Chloroform	3.4E-08	2.7E-09
		Total		8.4E-08
Residential	Ingestion of Home-Grown Produce	4,4'-DDE	7.4E-07	2.5E-07
		4,4'-DDT	7.8E-07	2.6E-07
		Bis (2-Ethylhexyl) Phthalate	3.5E-06	4.9E-08
		Chloroform	3.9E-06	2.4E-08
		Total		5.8E-07

Table C.5-9
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Surface Soils at Source Area 5, Salmon Site
(Page 3 of 4)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Residential	Incidental Ingestion of Soil	Cesium-137+D Protactinium-231 Radium-223 Radium-228+D Thorium-228+D Uranium-234 Total	6.3E+02 9.2E+02 3.2E+02 7.9E+02 1.0E+03 1.3E+04	2.0E-08 1.4E-07 7.4E-08 2.0E-07 2.4E-07 5.8E-07 1.3E-06
Residential	External Exposure	Cesium-137+D Protactinium-231 Radium-223 Radium-228+D Thorium-228+D Uranium-234 Total	1.2E+01 1.7E+01 5.7E+00 1.4E+01 1.9E+01 2.4E+02	2.4E-05 4.5E-07 1.4E-06 4.7E-05 1.2E-04 5.1E-09 1.9E-04
Residential	Inhalation of Dust	Cesium-137+D Protactinium-231 Radium-223 Radium-228+D Thorium-228+D Uranium-234 Total	1.5E+00 2.2E+00 7.4E-01 1.9E+00 2.4E+00 3.1E+01	2.8E-11 5.2E-08 2.7E-09 1.8E-09 2.4E-07 4.3E-07 7.2E-07
Residential	Ingestion of Home-Grown Produce	Cesium-137+D Protactinium-231 Radium-223 Radium-228+D Thorium-228+D Uranium-234 Total	1.3E+05 1.4E+04 1.5E+04 3.7E+04 1.1E+04 4.0E+05	4.2E-06 2.0E-06 3.4E-06 9.2E-06 2.6E-06 1.8E-05 3.9E-05
Chemicals of Potential Concern (intake units mg/kg-d)				
Park Ranger	Incidental Ingestion of Soil	4,4'-DDE 4,4'-DDT Bis (2-Ethylhexyl) Phthalate Chloroform Total	1.6E-09 1.6E-09 2.5E-09 7.1E-11	5.4E-10 5.4E-10 3.4E-11 4.3E-13 1.1E-09
Park Ranger	Dermal Contact with Soil	4,4'-DDE 4,4'-DDT Bis (2-Ethylhexyl) Phthalate Chloroform Total	8.0E-09 7.9E-09 2.5E-08 7.1E-10	2.7E-09 2.7E-09 3.4E-10 4.3E-12 5.8E-09
Park Ranger	Inhalation of Dust	4,4'-DDT Chloroform Total	5.9E-12 2.7E-13	2.0E-12 2.2E-14 2.0E-12

Table C.5-9
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Surface Soils at Source Area 5, Salmon Site
(Page 4 of 4)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Park Ranger	Incidental Ingestion of Soil	Cesium-137+D	1.6E+01	5.2E-10
		Protactinium-231	2.4E+01	3.5E-09
		Radium-223	8.1E+00	1.9E-09
		Radium-228+D	2.0E+01	5.1E-09
		Thorium-228+D	2.7E+01	6.2E-09
		Uranium-234	3.4E+02	1.5E-08
		Total		3.2E-08
Park Ranger	External Exposure	Cesium-137+D	2.4E-01	5.0E-07
		Protactinium-231	3.5E-01	9.4E-09
		Radium-223	1.2E-01	2.9E-08
		Radium-228+D	3.0E-01	9.8E-07
		Thorium-228+D	3.9E-01	2.4E-06
		Uranium-234	4.9E+00	1.1E-10
		Total		4.0E-06
Park Ranger	Inhalation of Dust	Cesium-137+D	3.1E-02	5.8E-13
		Protactinium-231	4.4E-02	1.1E-09
		Radium-223	1.5E-02	5.5E-11
		Radium-228+D	3.8E-02	3.8E-11
		Thorium-228+D	5.1E-02	4.9E-09
		Uranium-234	6.3E-01	8.9E-09
		Total		1.5E-08

Table C.5-10
Estimated Daily Intakes and Hazard Quotients
for Surface Soils at Source Area 5, Salmon Site
(Page 1 of 2)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Current Exposure Pathways				
Recreational	Incidental Ingestion of Soil	Barium	4.2E-05	6.0E-04
		Benzoic Acid	4.5E-07	1.1E-07
		Bis (2-Ethylhexyl) Phthalate	7.7E-08	3.8E-06
		Chloroform	2.2E-09	2.2E-07
		Chromium	6.9E-06	6.9E-06
		Manganese	4.0E-04	2.9E-03
		Toluene	1.7E-09	8.3E-09
		Total		3.5E-03
Recreational	Dermal Contact with Soil	Barium	5.8E-06	8.3E-05
		Benzoic Acid	6.3E-07	1.6E-07
		Bis (2-Ethylhexyl) Phthalate	1.1E-07	5.3E-06
		Chloroform	3.1E-09	3.1E-07
		Chromium	9.6E-07	9.6E-07
		Manganese	5.6E-05	4.0E-04
		Toluene	2.3E-09	1.1E-08
		Total		4.9E-04
Recreational	Inhalation of Dust	Barium	2.3E-08	1.6E-04
		Manganese	2.2E-07	1.6E-02
		Toluene	9.0E-13	8.2E-12
		Total		1.6E-02
Future Exposure Pathways				
Residential	Incidental Ingestion of Soil	Barium	1.0E-03	1.5E-02
		Benzoic Acid	1.1E-05	2.8E-06
		Bis (2-Ethylhexyl) Phthalate	1.9E-06	9.6E-05
		Chloroform	5.5E-08	5.5E-06
		Chromium	1.7E-04	1.7E-04
		Manganese	1.0E-02	7.2E-02
		Toluene	4.1E-08	2.1E-07
		Total		8.7E-02
Residential	Dermal Contact with Soil	Barium	1.1E-04	1.6E-03
		Benzoic Acid	1.2E-05	2.9E-06
		Bis (2-Ethylhexyl) Phthalate	2.0E-06	1.0E-04
		Chloroform	5.8E-08	5.8E-06
		Chromium	1.8E-05	1.8E-05
		Manganese	1.0E-03	7.5E-03
		Toluene	4.3E-08	2.2E-07
		Total		9.2E-03
Residential	Inhalation of Dust	Barium	6.2E-09	4.4E-05
		Manganese	2.2E-07	1.6E-02
		Toluene	4.7E-10	4.2E-09
		Total		1.6E-02

Table C.5-10
Estimated Daily Intakes and Hazard Quotients
for Surface Soils at Source Area 5, Salmon Site
(Page 2 of 2)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Residential	Ingestion of Home-Grown Produce	Benzoic Acid	2.1E-03	5.3E-04
		Bis (2-Ethylhexyl) Phthalate	8.2E-06	4.1E-04
		Chloroform	9.1E-06	9.1E-04
		Toluene	2.6E-06	1.3E-05
		Total		1.9E-03
Park Ranger	Incidental Ingestion of Soil	Barium	3.8E-06	5.4E-05
		Benzoic Acid	4.1E-08	1.0E-08
		Bis (2-Ethylhexyl) Phthalate	6.9E-09	3.4E-07
		Chloroform	2.0E-10	2.0E-08
		Chromium	6.2E-07	6.2E-07
		Manganese	3.6E-05	2.6E-04
		Toluene	1.5E-10	7.4E-10
Park Ranger	Dermal Contact with Soil	Total		3.1E-04
		Barium	3.8E-06	5.4E-05
		Benzoic Acid	4.1E-07	1.0E-07
		Bis (2-Ethylhexyl) Phthalate	6.9E-08	3.4E-06
		Chloroform	2.0E-09	2.0E-07
		Chromium	6.2E-07	6.2E-07
		Manganese	3.6E-05	2.6E-04
Park Ranger	Inhalation of Dust	Toluene	1.5E-09	7.4E-09
		Total		3.2E-04
		Barium	1.2E-08	8.4E-05
		Manganese	1.1E-07	8.1E-03
Park Ranger	Inhalation of Dust	Toluene	4.6E-13	4.2E-12
		Total		8.1E-03

Table C.5-11
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Surface Soils at Source Area 6, Salmon Site

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Current Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Recreational	Incidental Ingestion of Soil	Chloroform	4.4E-10	2.7E-12
Recreational	Dermal Contact with Soil	Chloroform	9.6E-10	5.9E-12
Recreational	Inhalation of Dust	Chloroform	9.2E-13	7.5E-14
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Recreational	Incidental Ingestion of Soil	Radium-224	5.7E+01	8.5E-09
Recreational	External Exposure	Radium-224	1.0E+00	2.6E-08
Recreational	Inhalation of Dust	Radium-224	1.3E-01	3.0E-10
Future Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Residential	Incidental Ingestion of Soil	Chloroform	1.1E-08	6.7E-11
Residential	Dermal Contact with Soil	Chloroform	1.2E-08	7.5E-11
Residential	Inhalation of Dust	Chloroform	2.3E-11	1.9E-12
Residential	Ingestion of Home-Grown Produce	Chloroform	7.0E-06	4.3E-08
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Residential	Incidental Ingestion of Soil	Radium-224	1.4E+03	2.1E-07
Residential	External Exposure	Radium-224	2.6E+01	6.5E-07
Residential	Inhalation of Dust	Radium-224	3.4E+00	7.6E-09
Residential	Ingestion of Home-Grown Produce	Radium-224	6.7E+04	1.0E-05
Chemicals of Potential Concern (intake units mg/kg-d)				
Park Ranger	Incidental Ingestion of Soil	Chloroform	1.3E-10	7.8E-13
Park Ranger	Dermal Contact with Soil	Chloroform	1.3E-09	7.8E-12
Park Ranger	Inhalation of Dust	Chloroform	4.8E-13	3.9E-14
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Park Ranger	Incidental Ingestion of Soil	Radium-224	3.7E+01	5.5E-09
Park Ranger	External Exposure	Radium-224	5.4E-01	1.3E-08
Park Ranger	Inhalation of Dust	Radium-224	6.9E-02	1.6E-10

Table C.5-12
Estimated Daily Intakes and Hazard Quotients
for Surface Soils at Source Area 6, Salmon Site

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Current Exposure Pathways				
Recreational	Incidental Ingestion of Soil	Benzoic Acid Chloroform Total	5.1E-07 4.0E-09	1.3E-07 4.0E-07 5.3E-07
Recreational	Dermal Contact with Soil	Benzoic Acid Chloroform Total	7.1E-07 5.5E-09	1.8E-07 5.5E-07 7.3E-07
Future Exposure Pathways				
Residential	Incidental Ingestion of Soil	Benzoic Acid Chloroform Total	1.3E-05 9.9E-08	3.2E-06 9.9E-06 1.3E-05
Residential	Dermal Contact with Soil	Benzoic Acid Chloroform Total	1.3E-05 1.0E-07	3.3E-06 1.0E-05 1.3E-05
Residential	Ingestion of Home-Grown Produce	Benzoic Acid Chloroform Total	2.4E-03 1.6E-05	6.0E-04 1.6E-03 2.2E-03
Park Ranger	Incidental Ingestion of Soil	Benzoic Acid Chloroform Total	4.6E-08 3.6E-10	1.1E-08 3.6E-08 4.7E-08
Park Ranger	Dermal Contact with Soil	Benzoic Acid Chloroform Total	4.6E-07 3.6E-09	1.1E-07 3.6E-07 4.7E-07

Table C.5-13
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Subsurface Soils at Source Area 1, Salmon Site

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Future Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Residential	Incidental Ingestion of Soil	Benzene Chloromethane n-Nitrosodiphenylamine Total	3.9E-07 8.3E-09 9.1E-06 Total	1.1E-08 1.1E-10 4.9E-09 1.6E-08
Residential	Dermal Contact with Soil	Benzene Chloromethane n-Nitrosodiphenylamine Total	8.6E-07 2.8E-08 2.2E-07 Total	2.5E-08 3.6E-10 1.1E-09 2.6E-08
Residential	Inhalation of Dust	Benzene Chloromethane Total	8.8E-10 1.9E-11 Total	2.6E-11 1.2E-13 2.6E-11
Residential	Ingestion of Home-Grown Produce	Benzene Chloromethane n-Nitrosodiphenylamine Total	2.0E-04 2.2E-05 1.8E-04 Total	5.8E-06 2.8E-07 3.8E-07 6.5E-06
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Residential	Incidental Ingestion of Soil	Bismuth-212 Lead-210+D Lead-212 Radium-226+D Radium-228+D Tritium Total	1.57E+03 1.7E+03 8.6E+02 8.3E+02 1.2E+03 1.8E+03 Total	9.1E-10 1.7E-06 1.5E-08 2.4E-07 3.0E-07 1.3E-10 2.3E-06
Residential	External Exposure	Bismuth-212 Lead-210+D Lead-212 Radium-226+D Radium-228+D Tritium Total	2.7E+01 3.1E+01 1.6E+01 1.5E+01 2.2E+01 2.2E+01 Total	1.8E-05 4.4E-09 4.7E-06 1.0E-04 7.3E-05 2.0E-04
Residential	Inhalation of Dust	Bismuth-212 Lead-210+D Lead-212 Radium-226+D Radium-228+D Tritium Total	5.9E-02 6.7E-02 3.5E-02 2.5E-01 3.3E-02 4.9E-02 7.2E-02	2.1E-12 2.6E-10 1.3E-12 1.9E-12 9.2E-11 4.9E-11 6.9E-15 4.1E-10
Residential	Ingestion of Home-Grown Produce	Bismuth-212 Lead-210+D Lead-212 Radium-226+D Radium-228+D Tritium Total	1.4E+05 2.1E+05 1.1E+05 3.9E+04 5.7E+04 4.5E+06 Total	8.8E-08 2.1E-04 1.9E-06 1.1E-05 1.4E-05 3.2E-07 2.4E-04

Table C.5-14
Estimated Daily Intakes and Hazard Quotients
for Subsurface Soils at Source Area 1, Salmon Site

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Future Exposure Pathways				
Residential	Incidental Ingestion of Soil	Acenaphthene	4.7E-05	7.9E-04
		Barium	5.4E-04	7.7E-03
		Benzoic acid	1.1E-05	2.8E-06
		Cadmium	1.1E-05	1.1E-02
		Chromium	1.7E-03	1.7E-03
		Copper	6.6E-05	1.8E-03
		Cyanide	1.1E-06	5.7E-05
		Ethylbenzene	2.7E-06	2.7E-05
		Fluorene	1.1E-04	2.8E-03
		Tetrachloroethene	1.8E-04	1.8E-02
		Toluene	4.6E-06	2.3E-05
		Total xylenes	2.7E-05	1.4E-05
		Zinc	5.8E-04	1.9E-03
		Total		4.6E-02
Residential	Dermal Contact with Soil	Acenaphthene	9.8E-05	1.6E-03
		Barium	7.5E-05	1.1E-03
		Benzoic acid	1.6E-05	3.9E-06
		Cadmium	1.5E-06	1.5E-03
		Chromium	2.4E-04	2.4E-04
		Copper	9.2E-06	2.5E-04
		Cyanide	1.6E-07	7.9E-06
		Ethylbenzene	3.8E-06	3.8E-05
		Fluorene	2.4E-04	5.9E-03
		Tetrachloroethene	2.5E-04	2.5E-02
		Toluene	6.4E-06	3.2E-05
		Total xylenes	3.8E-05	1.9E-05
		Zinc	8.0E-05	2.7E-04
		Total		3.7E-02
Residential	Inhalation of Dust	Barium	3.2E-07	2.3E-03
		Ethylbenzene	1.6E-09	5.5E-09
		Toluene	2.7E-09	2.5E-08
		Total		2.3E-03
Residential	Ingestion of Home-Grown Produce	Benzoic acid	2.1E-03	5.3E-04
		Ethylbenzene	9.5E-05	9.5E-04
		Fluorene	1.1E-03	2.7E-02
		Tetrachloroethene	4.6E-03	4.6E-01
		Toluene	2.9E-04	1.5E-03
		Total Xylenes	8.8E-04	4.4E-04
		Total		5.0E-01

Table C.5-15
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Subsurface Soils at Source Area 2, Salmon Site
(Page 1 of 2)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Future Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Residential	Incidental Ingestion of Soil	Arsenic Beryllium Bis (2-Ethylhexyl) Phthalate Total	4.0E-06 4.1E-07 1.4E-06	6.0E-06 1.7E-06 2.0E-08 7.7E-06
Residential	Dermal Contact with Soil	Arsenic Beryllium Bis (2-Ethylhexyl) Phthalate Total	1.4E-06 4.6E-08 1.6E-06	2.0E-06 2.0E-07 2.2E-08 2.2E-06
Residential	Inhalation of Dust	Arsenic Beryllium Total	7.2E-08 1.2E-08	1.1E-06 1.0E-07 1.2E-06
Residential	Ingestion of Home-Grown Produce	Bis (2-Ethylhexyl) Phthalate	2.3E-05	3.3E-07
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Residential	Incidental Ingestion of Soil	Cerium-141 Cesium-137+D Lead-210+D Lead-212 Radium-224 Radium-226+D Radium-228+D Thallium-208 Thorium-234 Tritium Uranium-235+D Total	2.1E+02 4.5E+02 3.3E+03 1.1E+03 2.2E+03 1.0E+03 1.7E+03 4.6E+02 4.7E+03 3.2E+01 5.2E+02	1.7E-09 1.4E-08 3.4E-06 1.9E-08 3.2E-07 3.0E-07 4.1E-07 8.1E-12 9.1E-08 2.3E-12 2.4E-08 4.6E-06
Residential	External Exposure	Cerium-141 Cesium-137+D Lead-210+D Lead-212 Radium-224 Radium-226+D Radium-228+D Thallium-208 Thorium-234 Uranium-235+D Total	3.9E+00 8.3E+00 6.1E+01 2.0E+01 3.9E+01 1.8E+01 3.0E+01 8.5E+00 8.6E+01 9.4E+00	2.2E-09 1.7E-05 8.8E-09 5.9E-06 9.7E-07 1.2E-04 1.0E-04 1.2E-04 3.0E-07 2.5E-06 3.7E-04

Table C.5-15
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Subsurface Soils at Source Area 2, Salmon Site
(Page 2 of 2)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Residential	Inhalation of Dust	Cerium-141	5.0E-01	9.3E-12
		Cesium-137+D	1.1E+00	2.0E-11
		Lead-210+D	7.8E+00	3.0E-08
		Lead-212	2.5E+00	9.7E-11
		Radium-224	5.0E+00	1.1E-08
		Radium-226+D	2.3E+00	6.4E-09
		Radium-228+D	3.9E+00	3.9E-09
		Thallium-208	1.1E+00	1.5E-14
		Thorium-234	1.1E+01	2.1E-10
		Tritium	7.6E-02	7.3E-15
		Uranium-235+D	1.2E+00	1.6E-08
		Total		6.8E-08
Residential	Ingestion of Home-Grown Produce	Cerium-141	3.0E+05	2.4E-06
		Cesium-137+D	9.6E+04	3.0E-06
		Lead-210+D	4.1E+05	4.1E-04
		Lead-212	1.3E+05	2.4E-06
		Radium-224	1.0E+05	1.5E-05
		Radium-226+D	4.7E+04	1.4E-05
		Radium-228+D	7.8E+04	1.9E-05
		Thallium-208	8.7E+03	1.5E-10
		Thorium-234	5.1E+04	9.8E-07
		Tritium	8.2E+04	5.9E-09
		Uranium-235+D	1.6E+04	7.3E-07
		Total		4.7E-04

Table C.5-16
Estimated Daily Intakes and Hazard Quotients
for Subsurface Soils at Source Area 2, Salmon Site
(Page 1 of 2)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Future Exposure Pathways				
Residential	Incidental Ingestion of Soil	Arsenic	3.6E-05	1.2E-01
		Barium	7.1E-04	1.0E-02
		Beryllium	3.7E-06	7.3E-04
		Bis (2-Ethylhexyl) Phthalate	1.3E-05	6.3E-04
		Cadmium	2.1E-05	2.1E-02
		Chromium	7.4E-04	7.4E-04
		Copper	2.2E-03	5.8E-02
		Cyanide	5.2E-07	2.6E-05
		Di-n-butyl Phthalate	7.6E-06	7.6E-05
		Ethylbenzene	4.2E-08	4.2E-07
		Fluorene	1.5E-05	3.8E-04
		Manganese	5.2E-03	3.7E-02
		Nickel	9.8E-05	4.9E-03
		Selenium	2.2E-06	4.5E-04
		Silver	1.3E-04	2.5E-02
		Toluene	5.2E-08	5.2E-06
		Vanadium	2.3E-04	2.3E-02
		Total Xylenes	7.4E-09	7.4E-07
		Zinc	4.7E-04	4.7E-02
		Total		3.5E-01
Residential	Dermal Contact with Soil	Arsenic	1.1E-05	3.8E-02
		Barium	7.4E-05	1.1E-03
		Beryllium	3.8E-07	7.6E-05
		Bis (2-Ethylhexyl) Phthalate	1.3E-05	6.6E-04
		Cadmium	2.2E-06	2.2E-03
		Chromium	7.7E-05	7.7E-05
		Copper	2.2E-04	6.1E-03
		Cyanide	5.5E-08	2.7E-06
		Di-n-butyl Phthalate	7.9E-06	7.9E-05
		Ethylbenzene	4.3E-08	4.3E-07
		Fluorene	2.4E-05	5.9E-04
		Manganese	5.4E-04	3.9E-03
		Nickel	1.0E-05	5.1E-04
		Selenium	2.3E-07	4.6E-05
		Silver	1.3E-05	2.6E-03
		Toluene	5.4E-08	5.4E-06
		Vanadium	2.4E-05	2.4E-03
		Total Xylenes	7.0E-08	7.0E-06
		Zinc	4.4E-04	4.4E-02
		Total		1.0E-01
Residential	Inhalation of Dust	Barium	3.3E-06	2.4E-02
		Ethylbenzene	3.2E-10	1.1E-09
		Manganese	2.4E-05	1.7E+00
		Mercury	6.0E-08	7.0E-04
		Toluene	3.1E-10	2.8E-09
		Total		1.8E+00

Table C.5-16
Estimated Daily Intakes and Hazard Quotients
for Subsurface Soils at Source Area 2, Salmon Site
 (Page 2 of 2)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Residential	Ingestion of Home-Grown Produce	Bis (2-Ethylhexyl) Phthalate	5.5E-05	2.7E-03
		Di-n-butyl Phthalate	3.6E-05	3.6E-04
		Ethylbenzene	1.4E-06	1.4E-05
		Fluorene	1.4E-04	3.6E-03
		Toluene	3.3E-06	3.3E-04
		Total Xylenes (total)	7.2E-06	7.2E-04
		Total		7.8E-03

Table C.5-17
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Subsurface Soils at Source Area 3, Salmon Site

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Future Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
No Carcinogenic Chemicals of Potential Concern				
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Residential	Incidental Ingestion of Soil	Lead-210+D	2.4E+03	2.5E-06
		Lead-212	1.6E+03	2.8E-08
		Radium-228+D	1.7E+03	4.2E-07
		Thallium-208	6.8E+02	1.2E-11
		Thorium-234	2.4E+03	4.7E-08
		Tritium	2.7E+02	1.9E-11
		Total		3.0E-06
Residential	External Exposure	Lead-210+D	4.5E+01	6.5E-09
		Lead-212	2.9E+01	8.6E-06
		Radium-228+D	3.1E+01	1.0E-04
		Thallium-208	1.2E+01	1.8E-04
		Thorium-234	4.5E+01	1.6E-07
		Total		2.9E-04
Residential	Inhalation of Dust	Lead-210+D	5.7E+00	2.2E-08
		Lead-212	3.7E+00	1.4E-10
		Radium-228+D	3.9E+00	3.9E-09
		Thallium-208	1.6E+00	2.2E-14
		Thorium-234	5.7E+00	1.1E-10
		Tritium	6.3E-01	6.1E-14
Residential	Ingestion of Home-Grown Produce	Total		2.6E-08
		Lead-210+D	3.0E+05	3.0E-04
		Lead-212	1.9E+05	3.5E-06
		Radium-228+D	7.8E+04	1.9E-05
		Thallium-208	1.3E+04	2.2E-10
		Thorium-234	2.6E+04	5.1E-07
		Tritium	6.9E+05	4.9E-08
		Total		3.2E-04

Table C.5-18
Estimated Daily Intakes and Hazard Quotients
for Subsurface Soils at Source Area 3, Salmon Site

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Future Exposure Pathways				
Residential	Incidental Ingestion of Soil	Di-n-butyl Phthalate	1.54E-05	1.5E-04
Residential	Dermal Contact with Soil	Di-n-butyl Phthalate	1.61E-05	1.6E-04
Residential	Ingestion of Home-Grown Produce	Di-n-butyl Phthalate	3.50E-02	3.5E-01

Table C.5-19
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Subsurface Soils at Source Area 4, Salmon Site
(Page 1 of 2)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kd-d)	ILCR
Future Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Residential	Incidental Ingestion of Soil	Bis (2-Ethylhexyl) Phthalate	2.6E-07	3.6E-09
		Chloromethane	7.8E-09	1.0E-10
		Di-n-octyl Phthalate	2.6E-07	3.6E-09
		Total		7.3E-09
Residential	Dermal Contact with Soil	Bis (2-Ethylhexyl) Phthalate	2.9E-07	4.1E-09
		Chloromethane	1.3E-08	1.7E-10
		Di-n-octyl Phthalate	1.5E-07	2.0E-09
		Total		6.3E-09
Residential	Inhalation of Dust	Chloromethane	1.6E-11	1.0E-13
Residential	Ingestion of Home-Grown Produce	Bis (2-Ethylhexyl) Phthalate	4.3E-06	6.0E-08
		Chloromethane	2.0E-05	2.7E-07
		Di-n-octyl Phthalate	6.1E-06	8.6E-08
		Total		4.2E-07
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Residential	Incidental Ingestion of Soil	Bismuth-212	2.1E+03	1.3E-09
		Cesium-137+D	2.0E+02	6.4E-09
		Lead-210+D	6.9E+03	6.9E-06
		Lead-212	1.8E+03	3.3E-08
		Radium-226+D	4.5E+03	1.3E-06
		Radium-228+D	2.2E+03	5.5E-07
		Thallium-208	6.7E+02	1.2E-11
		Thorium-234	8.0E+03	1.5E-07
		Tritium	2.2E+01	1.6E-12
		Total		9.0E-06
Residential	External Exposure	Bismuth-212	3.8E+01	2.5E-05
		Cesium-137+D	3.7E+00	7.7E-06
		Lead-210+D	1.3E+02	1.8E-08
		Lead-212	3.3E+01	1.0E-05
		Radium-226+D	8.2E+01	5.5E-04
		Radium-228+D	4.1E+01	1.3E-04
		Thallium-208	1.2E+01	1.8E-04
		Thorium-234	1.5E+02	5.1E-07
		Total		9.0E-04

Table C.5-19
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Subsurface Soils at Source Area 4, Salmon Site
(Page 2 of 2)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kd-d)	ILCR
Residential	Inhalation of Dust	Bismuth-212	4.8E+00	1.8E-10
		Cesium-137+D	4.7E-01	9.0E-12
		Lead-210+D	1.6E+01	6.2E-08
		Lead-212	4.3E+00	1.6E-10
		Radium-226+D	1.0E+01	2.9E-08
		Radium-228+D	5.2E+00	5.2E-09
		Thallium-208	1.6E+00	2.1E-14
		Thorium-234	1.9E+01	3.6E-10
		Tritium	5.3E-02	5.0E-15
		Total		9.7E-08
Residential	Ingestion of Home-Grown Produce	Bismuth-212	2.0E+05	1.2E-07
		Cesium-137+D	4.3E+04	1.3E-06
		Lead-210+D	8.4E+05	8.5E-04
		Lead-212	2.2E+05	4.0E-06
		Radium-226+D	2.1E+05	6.2E-05
		Radium-228+D	1.0E+05	2.6E-05
		Thallium-208	1.2E+04	2.2E-10
		Thorium-234	8.6E+04	1.7E-06
		Tritium	5.7E+04	4.1E-09
		Total		9.5E-04

Table C.5-20
Estimated Daily Intakes and Hazard Quotients
for Subsurface Soils at Source Area 4, Salmon Site

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Future Exposure Pathways				
Residential	Incidental Ingestion of Soil	Benzoic acid Bis (2-Ethylhexyl) Phthalate Di-n-octyl Phthalate Total	1.1E-05 2.3E-06 2.3E-06	2.8E-06 1.2E-04 1.2E-04 2.4E-04
Residential	Dermal Contact with Soil	Benzoic acid Bis (2-Ethylhexyl) Phthalate Di-n-octyl Phthalate Total	1.2E-05 2.4E-06 1.2E-06	2.9E-06 1.2E-04 6.1E-05 1.8E-04
Residential	Ingestion of Home-Grown Produce	Benzoic acid Bis (2-Ethylhexyl) Phthalate Di-n-octyl Phthalate Total	2.1E-03 1.0E-05 1.4E-05	5.3E-04 5.0E-04 7.2E-04 1.8E-03

Table C.5-21
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Subsurface Soils at Source Area 5, Salmon Site

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (md/kg-d)	ILCR
Future Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
No Carcinogenic Chemicals of Potential Concern				
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Residential	Incidental Ingestion of Soil	Lead-210+D	1.5E+03	1.6E-06
		Radium-226+D	1.0E+03	2.9E-07
		Tritium	1.8E+01	1.3E-12
		Total		1.9E-06
Residential	External Exposure	Lead-210+D	2.8E+01	4.1E-09
		Radium-226+D	1.8E+01	1.2E-04
		Total		1.2E-04
Residential	Inhalation of Dust	Lead-210+D	3.89E+00	1.5E-08
		Radium-226+D	2.52E+00	6.9E-09
		Tritium	4.46E-02	4.3E-15
		Total		2.2E-08
Residential	Ingestion of Home-Grown Produce	Lead-210+D	1.9E+05	1.9E-04
		Radium-226+D	4.6E+04	1.4E-05
		Tritium	4.5E+04	3.2E-09
		Total		2.0E-04

Table C.5-22
Estimated Daily Intakes and Hazard Quotients
for Subsurface Soils at Source Area 5, Salmon Site

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Future Exposure Pathways				
Residential	Incidental Ingestion of Soil	Acetone	8.6E-07	8.6E-06
		Toluene	3.5E-08	1.8E-07
		Total		8.8E-06
Residential	Dermal Contact with Soil	Acetone	8.99E-07	9.0E-06
		Toluene	3.69E-08	1.8E-07
		Total		9.2E-06
Residential	Inhalation of Dust	Toluene	2.1 E-11	1.9E-10
Residential	Ingestion of Home-Grown Produce	Acetone	2.7E-03	2.7E-02
		Toluene	2.2E-06	1.1E-05
		Total		2.7E-02

Table C.5-23
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Surface Water at All Source Areas, Salmon Site

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Current Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Recreational	Incidental Ingestion	Arsenic	1.9E-09	2.9E-09
Radionuclides of Potential Concern (intake units pCi)				
Recreational	Incidental Ingestion	Tritium	8.6E-01	6.1E-14
Future Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Residential	Incidental Ingestion	Arsenic	7.1E-09	1.1E-08
Radionuclides of Potential Concern (intake units pCi)				
Residential	Incidental Ingestion	Tritium	3.2E+00	2.3E-13

Table C.5-24
Estimated Daily Intakes and Hazard Quotients
for Surface Water at All Source Areas, Salmon Site

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Current Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Recreational	Incidental Ingestion	Aluminum	4.2E-06	4.2E-06
		Arsenic	1.5E-08	4.9E-05
		Total		5.3E-05
Future Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Residential	Incidental Ingestion	Aluminum	1.6E-05	1.6E-05
		Arsenic	5.5E-08	1.8E-04
		Total		2.0E-04

Table C.5-25
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Sediment at All Source Areas, Salmon Site
(Page 1 of 4)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Current Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Recreational	Incidental Ingestion of Soil	Arsenic	1.6E-10	2.4E-10
Recreational	Dermal Contact with Soil	Arsenic	1.1E-10	1.6E-10
Recreational	Inhalation of Dust	Arsenic	3.7E-13	5.5E-12
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Recreational	Incidental Ingestion of Soil	Beryllium-7	1.2E+02	1.0E-11
		Bismuth-212	5.5E+00	3.4E-12
		Cadmium-109	5.0E+01	4.0E-10
		Cesium-137+D	1.8E+01	5.7E-10
		Lead-210+D	2.0E+02	2.0E-07
		Radium-224	7.7E+01	1.1E-08
		Radium-226+D	2.2E+01	6.4E-09
		Thallium-208	6.8E+00	1.2E-13
		Tritium	7.2E+00	5.1E-13
		Uranium-238+D	3.8E+01	2.3E-09
		Total		2.2E-07
Recreational	External Exposure	Beryllium-7	2.2E+00	3.8E-07
		Bismuth-212	1.0E-01	6.7E-08
		Cadmium-109	9.2E-01	5.2E-10
		Cesium-137+D	3.3E-01	6.8E-07
		Lead-210+D	3.6E+00	5.2E-10
		Radium-224	1.4E+00	3.5E-08
		Radium-226+D	3.9E-01	2.7E-06
		Thallium-208	1.2E-01	1.8E-06
		Uranium-238+D	6.9E-01	4.5E-08
		Total		5.7E-06
Recreational	Inhalation of Dust	Beryllium-7	2.8E-01	5.0E-14
		Bismuth-212	1.3E-02	4.7E-13
		Cadmium-109	1.2E-01	2.2E-12
		Cesium-137+D	4.2E-02	8.0E-13
		Lead-210+D	4.6E-01	1.8E-09
		Radium-224	1.8E-01	4.0E-10
		Radium-226+D	5.1E-02	1.4E-10
		Thallium-208	1.6E-02	2.1E-16
		Tritium	1.7E-02	1.6E-15
		Uranium-238+D	8.8E-02	1.1E-09
		Total		3.4E-09

Table C.5-25
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Sediment at All Source Areas, Salmon Site
(Page 2 of 4)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Future Exposure Pathways				
Chemicals of Potential Concern (intake units mg/kg-d)				
Residential	Incidental Ingestion of Soil	Arsenic	4.0E-09	6.1E-09
Residential	Dermal Contact with Soil	Arsenic	2.7E-09	4.0E-09
Residential	Inhalation of Dust	Arsenic	8.8E-10	1.3E-08
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Residential	Incidental Ingestion of Soil	Beryllium-7	3.0E+03	2.6E-10
		Bismuth-212	1.4E+02	8.6E-11
		Cadmium-109	1.3E+03	1.0E-08
		Cesium-137+D	4.5E+02	1.4E-08
		Lead-210+D	4.9E+03	5.0E-06
		Radium-224	1.9E+03	2.9E-07
		Radium-226+D	5.4E+02	1.6E-07
		Thallium-208	1.7E+02	3.0E-12
		Tritium	1.8E+02	1.3E-11
		Uranium-238+D	9.4E+02	5.8E-08
		Total		5.5E-06
Residential	External Exposure	Beryllium-7	5.5E+01	9.5E-06
		Bismuth-212	2.5E+00	1.7E-06
		Cadmium-109	2.3E+01	1.3E-08
		Cesium-137+D	8.2E+00	1.7E-05
		Lead-210+D	9.0E+01	1.3E-08
		Radium-224	3.5E+01	8.7E-07
		Radium-226+D	9.9E+00	6.6E-05
		Thallium-208	3.1E+00	4.5E-05
		Uranium-238+D	1.7E+01	1.1E-06
		Total		1.4E-04
Residential	Inhalation of Dust	Beryllium-7	3.2E-01	5.8E-14
		Bismuth-212	3.2E-01	1.2E-11
		Cadmium-109	2.9E+00	5.5E-11
		Cesium-137+D	1.2E+00	2.2E-11
		Lead-210+D	1.2E+01	4.4E-08
		Radium-224	2.4E+00	5.4E-09
		Radium-226+D	6.3E-01	1.7E-09
		Thallium-208	3.3E+01	4.5E-13
		Tritium	4.2E-01	4.0E-14
		Uranium-238+D	2.2E+00	2.7E-08
		Total		7.9E-08

Table C.5-25
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Sediment at All Source Areas, Salmon Site
(Page 3 of 4)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Residential	Ingestion of Home-Grown Produce	Beryllium-7	1.0E+015	8.9E-09
		Bismuth-212	1.3E+04	8.4E-09
		Cadmium-109	1.8E+06	1.4E-05
		Cesium-137+D	9.5E+04	3.0E-06
		Lead-210+D	6.0E+05	6.1E-04
		Radium-224	8.9E+04	1.3E-05
		Radium-226+D	2.5E+04	7.5E-06
		Thallium-208	3.2E+03	5.5E-11
		Tritium	4.6E+05	3.3E-08
		Uranium-238+D	2.8E+04	1.8E-06
		Total		6.5E-04
Chemicals of Potential Concern (intake units mg/kg-d)				
Park Ranger	Incidental Ingestion of Soil	Arsenic	4.7E-11	7.0E-11
Park Ranger	Dermal Contact with Soil	Arsenic	1.4E-10	2.1E-10
Part Ranger	Inhalation of Dust	Arsenic	1.9E-13	2.8E-12
Radionuclides of Potential Concern (intake units pCi or pCi-yr/g for external exposure only)				
Park Ranger	Incidental Ingestion of Soil	Beryllium-7	7.8E+01	6.7E-12
		Bismuth-212	3.6E+00	2.2E-12
		Cadmium-109	3.3E+01	2.6E-10
		Cesium-137+D	1.2E+01	3.7E-10
		Lead-210+D	1.3E+02	1.3E-07
		Radium-224	4.9E+01	7.4E-09
		Radium-226+D	1.4E+01	4.1E-09
		Thallium-208	4.4E+00	7.6E-14
		Tritium	4.6E+00	3.3E-13
		Uranium-238+D	2.4E+01	1.5E-09
		Total		1.4E-07
Park Ranger	External Exposure	Beryllium-7	1.1E+00	2.0E-07
		Bismuth-212	5.2E-02	3.5E-08
		Cadmium-109	4.7E-01	2.7E-10
		Cesium-137+D	1.7E-01	3.5E-07
		Lead-210+D	1.8E+00	2.7E-10
		Radium-224	7.2E-01	1.8E-08
		Radium-226+D	2.0E-01	1.4E-06
		Thallium-208	6.4E-02	9.2E-07
		Uranium-238+D	3.6E-01	2.3E-08
		Total		2.9E-06

Table C.5-25
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Sediment at All Source Areas, Salmon Site
(Page 4 of 4)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Park Ranger	Inhalation of Dust	Beryllium-7	1.5E-01	2.6E-14
		Bismuth-212	6.7E-03	2.4E-13
		Cadmium-109	6.1E-02	1.1E-12
		Cesium-137+D	2.2E-02	4.1E-13
		Lead-210+D	2.4E-01	9.2E-10
		Radium-224	9.2E-02	2.1E-10
		Radium-226+D	2.6E-02	7.2E-11
		Thallium-208	8.2E-03	1.1E-16
		Tritium	8.7E-03	8.3E-16
		Uranium-238+D	4.6E-02	5.7E-10
		Total		1.8E-09

Table C.5-26
Estimated Daily Intakes and Hazard Quotients
for Sediments at All Source Areas, Salmon Site
(Page 1 of 2)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Current Exposure Pathways				
Recreational	Incidental Ingestion of Soil	2-Butanone	2.2E-08	3.7E-08
		Arsenic	1.5E-09	4.9E-06
		Benzoic Acid	2.0E-06	5.1E-07
		Cadmium	1.5E-09	1.5E-06
		Chromium	4.1E-09	4.1E-09
		Manganese	1.1E-07	7.6E-07
		Toluene	2.5E-08	1.3E-07
		Zinc	1.7E-08	5.8E-08
		Total		7.8E-06
Recreational	Dermal Contact with Soil	2-Butanone	3.1E-08	5.2E-08
		Arsenic	6.1E-10	2.0E-06
		Benzoic Acid	2.8E-06	7.0E-07
		Cadmium	2.0E-10	2.0E-07
		Chromium	5.7E-10	5.7E-10
		Manganese	1.5E-08	1.1E-07
		Toluene	3.5E-08	1.8E-07
		Zinc	2.4E-09	8.0E-09
		Total		3.3E-06
Recreational	Inhalation of Dust	2-Butanone	1.3E-11	4.5E-11
		Manganese	6.2E-11	4.5E-06
		Mercury	4.2E-13	4.8E-09
		Toluene	1.5E-11	1.4E-10
		Total		4.5E-06
Future Exposure Pathways				
Residential	Incidental Ingestion of Soil	2-Butanone	5.6E-07	9.3E-07
		Arsenic	3.7E-08	1.2E-04
		Benzoic Acid	5.1E-05	1.3E-05
		Cadmium	3.7E-08	3.7E-05
		Chromium	1.0E-07	1.0E-07
		Manganese	2.7E-06	1.9E-05
		Toluene	6.4E-07	3.2E-06
		Zinc	4.4E-07	2.2E-07
		Total		1.9E-04

Table C.5-26
Estimated Daily Intakes and Hazard Quotients
for Sediments at All Source Areas, Salmon Site
(Page 2 of 2)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Residential	Dermal Contact with Soil	2-Butanone	7.8E-07	1.3E-06
		Arsenic	1.5E-08	5.1E-05
		Benzoic Acid	7.0E-05	1.8E-05
		Cadmium	5.1E-09	5.1E-06
		Chromium	1.4E-08	1.4E-08
		Manganese	3.7E-07	2.6E-06
		Toluene	8.8E-07	4.4E-06
		Zinc	6.0E-08	3.0E-08
		Total		8.2E-05
Residential	Inhalation of Dust	2-Butanone	1.2E-06	4.0E-06
		Manganese	3.9E-08	2.8E-03
		Mercury	6.7E-09	7.7E-05
		Toluene	9.0E-09	8.2E-08
		Total		2.9E-03
Residential	Ingestion of Home-Grown Produce	2-Butanone	8.6E-04	1.4E-03
		Benzoic Acid	9.5E-03	2.4E-03
		Toluene	4.0E-05	2.0E-04
		Total		4.0E-03
Park Ranger	Incidental Ingestion of Soil	2-Butanone	2.0E-09	3.4E-09
		Arsenic	1.3E-10	4.4E-07
		Benzoic Acid	1.8E-07	4.5E-08
		Cadmium	1.3E-10	1.3E-07
		Chromium	3.7E-10	3.7E-10
		Manganese	9.6E-09	6.8E-08
		Toluene	2.3E-09	1.1E-08
		Zinc	1.6E-09	5.2E-09
		Total		7.0E-07
Park Ranger	Dermal Contact with Soil	2-Butanone	2.0E-08	3.4E-08
		Arsenic	3.9E-10	1.3E-06
		Benzoic Acid	1.8E-06	4.5E-07
		Cadmium	1.3E-10	1.3E-07
		Chromium	3.7E-10	3.7E-10
		Manganese	9.6E-09	6.8E-08
		Toluene	2.3E-08	1.1E-07
		Zinc	1.6E-09	5.2E-09
		Total		2.1E-06
Park Ranger	Inhalation of Dust	2-Butanone	6.8E-12	2.3E-11
		Manganese	3.2E-11	2.3E-06
		Mercury	2.1E-13	2.5E-09
		Toluene	7.7E-12	7.0E-11
		Total		2.3E-06

Table C.5-27
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Groundwater at All Source Areas, Salmon Site
(Page 1 of 2)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Future Exposure Pathways				
Alluvial Aquifer				
Chemicals of Potential Concern (intake units mg/kg-d)				
Residential	Ingestion of Groundwater	Arsenic Trichloroethene Vinyl Chloride Total	9.0E-05 3.1E-04 3.5E-05	1.4E-04 4.6E-06 6.7E-05 2.1E-04
Residential	Dermal Contact with Groundwater While Showering	Arsenic Trichloroethene Vinyl Chloride Total	2.6E-07 1.4E-05 1.0E-07	3.9E-07 2.1E-07 1.9E-07 7.9E-07
Residential	Inhalation of VOCs while Showering	Trichloroethene	3.1E-05	3.1E-07
Residential	Ingestion of Home-Grown Produce	Trichloroethene Vinyl Chloride Total	1.6E-05 7.7E-07	2.4E-07 1.5E-06 1.7E-06
Radionuclides of Potential Concern (intake units pCi)				
Residential	Ingestion of Groundwater	Tritium	1.9E+09	1.3E-04
Residential	Dermal Contact with Groundwater While Showering	Tritium	8.0E+06	5.6E-07
Residential	Ingestion of Home-Grown Produce	Tritium	2.8E+06	2.0E-07
Local Aquifer				
Chemicals of Potential Concern (intake units mg/kg-d)				
Residential	Ingestion of Groundwater	Arsenic	5.2E-04	7.7E-04
Residential	Dermal Contact with Groundwater While Showering	Arsenic	1.5E-06	2.2E-06

Table C.5-27
Estimated Daily Intakes and Incremental Lifetime Cancer Risks
for Groundwater at All Source Areas, Salmon Site
 (Page 2 of 2)

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	ILCR
Radionuclides of Potential Concern (intake units pCi)				
Residential	Ingestion of Groundwater	Tritium	9.0E+05	6.5E-08
Residential	Dermal Contact with Groundwater While Showering	Tritium	3.9E+03	2.8E-10
Residential	Ingestion of Home-Grown Produce	Tritium	1.4E+03	9.8E-11

Table C.5-28
Estimated Daily Intakes and Hazard Quotients
for Groundwater at All Source Areas, Salmon Site

Potentially Exposed Population	Exposure Pathway	Constituent	Estimated Intake (mg/kg-d)	HQ
Future Exposure Pathways				
Alluvial Aquifer				
Residential	Ingestion of Groundwater	Arsenic	2.1E-04	7.0E-01
Residential	Dermal Contact with Groundwater While Showering	Arsenic	6.1E-07	2.0E-03
Local Aquifer				
Residential	Ingestion of Groundwater	Arsenic	1.2E-03	4.0E+00
Residential	Dermal Contact with Groundwater While Showering	Arsenic	3.5E-06	1.2E-02

exposure to radionuclides is 6.6×10^{-4} , with protactinium-234 (4.5×10^{-4}) contributing most of the risk. The ILCR for the park ranger scenario to external exposure to radionuclides is 1.4×10^{-5} , with protactinium-234 (9.3×10^{-6}) contributing most of the risk. Note that protactinium-234 is a daughter and natural decay product of uranium-238. Uranium-238 is a naturally occurring isotope and was detected at Source Area 1. Uranium-238 does not significantly contribute to the total risk because it decays primarily as a low energy alpha emitter; therefore, does not significantly contribute to the ILCR. Protactinium-228 decays primarily as a beta emitter, and has a higher associated ILCR.

For the recreational scenario the incidental soil ingestion pathway total ILCR is 2.9×10^{-7} for chemicals, with arsenic contributing most of the risk and 1.9×10^{-8} for radionuclides, with protactinium-231 and radium-228+D contributing most of the risk. For the inhalation of dust pathway the total ILCR is 6.2×10^{-10} for chemicals, with arsenic contributing most of the risk and 3.2×10^{-9} for radionuclides, with protactinium-231 contributing most of the risk. For the dermal contact with soil pathway the ILCR is 1.9×10^{-7} with arsenic contributing most of the risk. For the external exposure pathway the ILCR is 2.7×10^{-5} with protactinium-234 contributing most of the risk.

For residential scenario the incidental soil ingestion pathway total ILCR is 7.3×10^{-6} for chemicals, with arsenic contributing most of the risk and 4.8×10^{-7} for radionuclides, with protactinium-231 and radium-228+D contributing most of the risk. For the inhalation of dust pathway the total ILCR is 1.5×10^{-8} for chemicals, with arsenic contributing most of the risk and 8.1×10^{-8} for radionuclides, with protactinium-131 contributing most of the risk. For the dermal contact with soil pathway the future ILCR is 2.5×10^{-6} for chemicals, with arsenic contributing most of the risk. For the ingestion of home-grown produce pathway the total ILCR is 2.3×10^{-7} for chemicals, with bis (2-ethylhexyl) phthalate the contributor to the risk and 3.7×10^{-5} for radionuclides, with radium-228+D and radium-224 contributing most of the risk. For the external exposure pathway the total ILCR is 6.6×10^{-4} with protactinium-234 contributing most of the risk.

For the park ranger the incidental soil ingestion pathway total ILCR is 8.5×10^{-8} for chemicals, with arsenic contributing most of the risk and 1.2×10^{-8} for radionuclides, with protactinium-231 and radium-228+D contributing most of the risk. For the inhalation of dust pathway, the total ILCR is 3.2×10^{-10} for chemicals, with arsenic contributing most of the risk and 1.7×10^{-9} for radionuclides, with protactinium-231 contributing most of the risk. For the dermal contact with

soil pathway the ILCR is 2.6×10^{-7} , with arsenic contributing most of the risk. For the external exposure pathway, the ICLR is 1.4×10^{-5} with protactinium-234 and contributing most of the risk.

The recreational, residential, and park ranger exposure scenarios to surface soil at Source Area 1 do not pose a significant potential carcinogenic risk. None of the surface soil PCOCs exceeded a HQ of 1.0 for any of the potential exposure pathways. The surface soil cumulative site ILCR to a current or future individual based on the RME is less than 10^{-4} except for thallium-208 (1.7×10^{-4}) and protactinium-234 (4.5×10^{-4}) previously mentioned residential scenario, external exposure (Table C.5-1). These radionuclides are naturally occurring, with thallium-208 a daughter of thorium-232 and protactinium-234 a daughters of uranium-238. With the exclusion of the naturally occurring radionuclide daughters, under current and future conditions, exposure to surface soil at Source Area 1, does not pose a potential significant carcinogenic risk (EPA, 1991b).

Potential risks due to contact with subsurface soil at Source Area 1 are summarized in Tables C.5-13 (lifetime cancer risks) and C.5-14 (hazard quotients). The residential scenario is the only scenario where the subsurface soil pathway is applicable. For the incidental soil ingestion pathway, the total ILCR is 1.6×10^{-8} for chemicals, with benzene contributing most of the risk and 2.3×10^{-6} for radionuclides, with lead-210+D contributing most of the risk. For the inhalation of dust pathway the total ILCR is 2.6×10^{-11} for chemicals, with benzene contributing most of the risk and 4.1×10^{-10} for radionuclides, with lead-210+D contributing most of the risk. For the dermal contact with soil pathway, the ILCR is 2.6×10^{-8} for chemicals, with benzene contributing most of the risk. For the ingestion of home-grown produce pathway, the total ILCR is 6.5×10^{-6} for chemicals, with benzene contributing most to the risk and 2.4×10^{-4} for radionuclides, with lead-210+D contributing most of the risk. For the external exposure pathway, the total ILCR is 2.0×10^{-4} with radium-226+D and radium-228+D contributing most of the risk.

The residential scenario exposure to subsurface soil at Source Area 1 does not pose a significant potential carcinogenic risk. None of the subsurface soil PCOCs exceeded a HQ of 1.0 for any of the potential exposure pathways. The surface soil cumulative site ILCR to a future individual based on the RME is less than 10^{-4} excluding daughters of naturally occurring radionuclides. Therefore, under current and future conditions, exposure to subsurface soil at Source Area 1, does not pose a potential significant carcinogenic risk (EPA, 1991b).

C.5.3.2 Source Area 2

Potential risks due to contact with surface soil at Source Area 2 are summarized in [Tables C.5-3](#) (lifetime cancer risks) and [C.5-4](#) (hazard quotients). The surface soil pathways identified at Source Area 2 include incidental soil ingestion (chemicals and radionuclides), dermal contact (chemicals), inhalation of dust (chemicals and radionuclides), external exposure (radionuclides), and ingestion of home-grown produce (chemicals and radionuclides). The ingestion of home-grown produce pathway is only applicable to the residential scenario.

The surface soil pathway with highest risk is external exposure to radionuclides. The ILCR for the recreational scenario external exposure to radionuclides is 2.2×10^{-5} , with thorium-228+D (2.0×10^{-5}) contributing most of the risk. The ILCR for the residential scenario external exposure to radionuclides is 5.5×10^{-4} , with thorium-228+D (4.9×10^{-4}) contributing most of the risk. The ILCR for the park ranger scenario to external exposure to radionuclides is 1.2×10^{-5} , with thorium-228+D (1.0×10^{-5}) contributing most of the risk. Note that protactinium-234 is a daughter and natural decay product of thorium 232. Thorium-232 is a naturally occurring isotope. Thorium-232 and thorium 228 decay primarily as a low energy alpha emitter.

For the recreational scenario the incidental soil ingestion pathway the total ILCR is 1.5×10^{-10} for chemicals, with bis (2-ethylhexyl) phthalate contributing most of the risk and 5.7×10^{-8} for radionuclides, with thorium-228+D contributing most of the risk. For the inhalation of dust pathway the total ILCR is 1.0×10^{-15} for chemicals, with methylene chloride the contributor to the risk and 4.1×10^{-8} for radionuclides, with thorium-228+D contributing most of the risk. For the dermal contact with soil pathway the ILCR is 3.3×10^{-10} , with bis (2-ethylhexyl) phthalate contributing most of the risk. For the external exposure pathway the ICLR is 2.2×10^{-5} , with thorium-228+D contributing most of the risk.

For residential scenario the incidental soil ingestion pathway the total ILCR is 3.7×10^{-9} for chemicals, with bis (2-ethylhexyl) phthalate contributing most of the risk and 1.4×10^{-6} for radionuclides, with thorium-228+D contributing most of the risk. For the inhalation of dust pathway the total ILCR is 2.6×10^{-14} for chemicals, with methylene chloride the contributor to the risk and 1.0×10^{-6} for radionuclides, with thorium 228+D contributing most of the risk. For the dermal contact with soil pathway the ILCR is 4.2×10^{-9} for chemicals, with bis (2-ethylhexyl) phthalate contributing most of the risk. For the ingestion of home-grown produce pathway the total ILCR is 1.6×10^{-7} for chemicals, with methylene chloride contributing most to the risk and 2.9×10^{-5} for radionuclides, with thorium-228+D and radium-228+D contributing

most of the risk. For the external exposure pathway, the total ILCR is 5.5×10^{-4} with thorium-228+D contributing most of the risk.

For the park ranger the incidental soil ingestion pathway the total ILCR is 4.4×10^{-11} for chemicals, with bis (2-ethylhexyl) phthalate contributing most of the risk and 3.7×10^{-8} for radionuclides, with thorium-228+D contributing most of the risk. For the inhalation of dust pathway the total ILCR is 5.3×10^{-16} for chemicals, with methylene chloride the contributor to the risk and 2.1×10^{-8} for radionuclides, with thorium-228+D contributing most of the risk. For the dermal contact with soil pathway the ILCR is 4.4×10^{-10} , with bis (2-ethylhexyl) phthalate contributing most of the risk. For the external exposure pathway the ICLR is 1.2×10^{-5} , with thorium-228+D contributing most of the risk.

The recreational, residential, and park ranger exposure scenarios to surface soil at Source Area 2 do not pose a potential carcinogenic risk. None of the surface soil PCOCs exceeded a HQ of 1.0 for any of the potential exposure pathways. The surface soil cumulative site ILCR to a current or future individual based on the RME is less than 10^{-4} except for thorium-228 (4.9×10^{-4}) previously mentioned residential scenario, external exposure ([Table C.5-3](#)). This radionuclide is naturally occurring and a daughter of thorium-232. With the exclusion of the naturally occurring radionuclide daughter, under current and future conditions, exposure to surface soil at Source Area 2 does not pose a potential significant carcinogenic risk (EPA, 1991b).

Potential risks due to contact with subsurface soil at Source Area 2 are summarized in [Tables C.5-15](#) (lifetime cancer risks) and [C.5-16](#) (hazard quotients). The residential scenario is the only scenario where the subsurface soil pathway is applicable. For the incidental soil ingestion pathway the total ILCR is 7.7×10^{-6} for chemicals, with arsenic contributing most of the risk and 4.6×10^{-6} for radionuclides, with lead-210+D contributing most of the risk. For the inhalation of dust pathway the total ILCR is 1.2×10^{-6} for chemicals, with arsenic contributing most of the risk and 6.8×10^{-8} for radionuclides, with lead-210+D and uranium-235+D contributing most of the risk. For the dermal contact with soil pathway the ILCR is 2.2×10^{-6} for chemicals, with arsenic contributing most of the risk. For the ingestion of home-grown produce pathway the total ILCR is 3.3×10^{-7} for chemicals, with bis (2-ethylhexyl) phthalate the contributor to the risk and 4.7×10^{-4} for radionuclides, with lead-210+D contributing most of the risk. For the external exposure pathway, the total ILCR is 3.7×10^{-4} with thallium-208 and radium-226+D contributing most of the risk.

The residential scenario exposure to subsurface soil at Source Area 2 does not pose a significant potential carcinogenic risk. None of the surface soil PCOCs exceeded a HQ of 1.0 for any of the potential exposure pathways except for manganese (1.7) residential scenario, inhalation of dust pathway (Table C.5-16). The subsurface soil cumulative site ILCR to a future individual based on the RME is less than 10^{-4} except for radium-226+D (1.2×10^{-4}), radium-228+D (1.0×10^{-4}), and thallium-208 (1.2×10^{-4}) previously mentioned residential scenario, external exposure (Table C.5-15). These radionuclides are naturally occurring with radium-228 and thallium-208 daughters of thorium-232, and radium-226 a daughter of uranium-238. With the exclusion of the naturally occurring radionuclide daughters, under future conditions, exposure to subsurface soil at Source Area 2, does not pose a potential significant carcinogenic risk (EPA, 1991b).

C.5.3.3 Source Area 3

Potential risks due to contact with surface soil at Source Area 3 are summarized in Tables C.5-5 (lifetime cancer risks) and Table C.5-6 (hazard quotients). The surface soil pathways identified at Source Area 3 include incidental soil ingestion (chemicals and radionuclides), dermal contact (chemicals), inhalation of dust (chemicals and radionuclides), external exposure (radionuclides), and ingestion of home-grown produce (chemicals and radionuclides). The ingestion of home-grown produce pathway is only applicable to the residential scenario.

The surface soil pathway with highest risk is external exposure to radionuclides. The ILCR for the recreational scenario external exposure to radionuclides is 7.1×10^{-6} , with thallium-208 (3.8×10^{-6}) contributing most of the risk. The ILCR for the residential scenario external exposure to radionuclides is 1.8×10^{-4} , with thallium-208 (9.4×10^{-5}) contributing most of the risk. The ILCR for the park ranger scenario to external exposure to radionuclides is 3.6×10^{-6} , with thallium-208 (1.6×10^{-6}) contributing most of the risk.

For the recreational scenario incidental soil ingestion pathway the total ILCR is 1.6×10^{-7} for chemicals, with benzo(a)pyrene contributing most of the risk and 1.0×10^{-7} for radionuclides, with lead-210+D contributing most of the risk. For the inhalation of dust pathway the total ILCR is 1.1×10^{-9} for chemicals, with dieldrin the contributor to the risk and 2.3×10^{-9} for radionuclides, with uranium 238+D contributing most of the risk. For the dermal contact with soil pathway the ILCR is 3.0×10^{-7} , with benzo(a)pyrene contributing most of the risk. For the external exposure pathway the ICLR is 7.1×10^{-6} , with radium-228+D contributing most of the risk.

For the residential scenario incidental soil ingestion pathway the total ILCR is 4.0×10^{-6} for chemicals, with benzo(a)pyrene contributing most of the risk and 2.6×10^{-6} for radionuclides, with lead-210+D contributing most of the risk. For the inhalation of dust pathway the total ILCR is 2.7×10^{-8} for chemicals, with dieldrin contributing to the risk and 5.6×10^{-8} for radionuclides, with uranium-238+D contributing most of the risk. For the dermal contact with soil pathway the ILCR is 3.8×10^{-6} for chemicals, with benzo(a)pyrene contributing most of the risk. For the ingestion of home-grown produce pathway the total ILCR is 2.6×10^{-4} for chemicals, with benzo(a)pyrene contributing the most to the risk and 2.7×10^{-4} for radionuclides, with lead-210+D contributing most of the risk. For the external exposure pathway the total ILCR is 1.8×10^{-4} , with thallium-208 contributing most of the risk.

For the park ranger incidental soil ingestion pathway the total ILCR is 4.6×10^{-8} for chemicals, with benzo(a)pyrene contributing most of the risk and 6.7×10^{-8} for radionuclides, with lead-210+D contributing most of the risk. For the inhalation of dust pathway the total ILCR is 5.5×10^{-10} for chemicals, with dieldrin the contributor to the risk and 1.2×10^{-9} for radionuclides, with uranium-238+D contributing most of the risk. For the dermal contact with soil pathway the ILCR is 4.1×10^{-7} with benzo(a)pyrene contributing most of the risk. For the external exposure pathway the ICLR is 3.6×10^{-6} , with thallium-208 and radium-228+D contributing most of the risk.

The recreational, residential, and park ranger exposure scenarios to surface soil at Source Area 3 do not pose a significant potential carcinogenic risk. None of the surface soil PCOCs exceeded a HQ of 1.0 for any of the potential exposure pathways. The surface soil cumulative site ILCR to a current or future individual based on the RME is less than 10^{-4} except for lead-210+D (2.4×10^{-4}) previously mentioned residential scenario, ingestion of home-grown produce and benzo(a)pyrene (2.3×10^{-4}) residential scenario, ingestion of home-grown produce ([Table C.5-5](#)). This radionuclide is naturally occurring, with lead-210 a daughter of uranium-238. With the exclusion of the naturally occurring radionuclide daughter and the single chemical, benzo(a)pyrene, under current and future conditions, exposure to surface soil at Source Area 3, does not pose a potential significant carcinogenic risk (EPA, 1991b).

Potential risks due to contact with subsurface soil at Source Area 3 are summarized in [Tables C.5-17](#) (lifetime cancer risks) and [C.5-18](#) (hazard quotients). The residential scenario is the only scenario where the subsurface soil pathway is applicable. There were no chemical PCOCs contributing to the risk from subsurface soil at Source Area 3. For the incidental soil

ingestion pathway the total ILCR is 3.0×10^{-6} for radionuclides, with lead-210+D contributing most of the risk. For the inhalation of dust pathway the total ILCR is 2.6×10^{-8} for radionuclides, with lead-210+D contributing most of the risk. For the ingestion of home-grown produce pathway, the total ILCR is 3.2×10^{-4} for radionuclides, with lead-210+D contributing most of the risk. For the external exposure pathway, the total ILCR is 2.9×10^{-4} with thallium-208 contributing most of the risk.

The residential scenario exposure to subsurface soil at Source Area 3 does not pose a significant potential carcinogenic risk. None of the surface soil PCOCs exceeded a HQ of 1.0 for any of the potential exposure pathways. The subsurface soil cumulative site ILCR to a future individual based on the RME is less than 10^{-4} except of radium-228+D (1.0×10^{-4}) and thallium-208 (1.8×10^{-4}) previously mentioned residential scenario, external exposure (Table C.5-17). These radionuclides are naturally occurring, with radium-228 and thallium-208 daughters of thorium-232. With the exclusion of the naturally occurring radionuclide daughters, under future conditions, exposure to subsurface soil at Source Area 3, does not pose a potential significant carcinogenic risk (EPA, 1991b).

C.5.3.4 Source Area 4

Potential risks due to contact with surface soil at Source Area 4 are summarized in Tables C.5-7 (lifetime cancer risks) and C.5-8 (hazard quotients). The surface soil pathways identified at Source Area 4 include incidental soil ingestion (chemicals and radionuclides), dermal contact (chemicals), inhalation of dust (radionuclides), external exposure (radionuclides), and ingestion of home-grown produce (chemicals and radionuclides). The ingestion of home-grown produce pathway is only applicable to the residential scenario.

The surface soil pathway with highest risk is external exposure to radionuclides. The ILCR for the recreational scenario external exposure to radionuclides is 2.2×10^{-5} , with thorium-228+D (1.9×10^{-5}) contributing most of the risk. The ILCR for the residential scenario external exposure to radionuclides is 5.5×10^{-4} , with thorium-228+D (4.8×10^{-4}) contributing most of the risk. The ILCR for the park ranger scenario to external exposure to radionuclides is 1.1×10^{-5} with thorium-228+D (1.0×10^{-5}) contributing most of the risk.

For the recreational scenario incidental soil ingestion pathway the total ILCR is 1.2×10^{-10} for chemicals, with bis (2-ethylhexyl) phthalate the contributor to the risk and 7.1×10^{-8} for radionuclides, with thorium-228+D contributing most of the risk. For the inhalation of dust

pathway the total ILCR is 4.8×10^{-8} for radionuclides, with thorium-228+D contributing most of the risk. There are not any PCOCs that contribute to the inhalation of dust chemical risk. For the dermal contact with soil pathway the ILCR is 2.6×10^{-10} with bis (2-ethylhexyl) phthalate the contributor to the risk. For the external exposure pathway the ICLR is 2.2×10^{-5} with thorium-228+D contributing most of the risk.

For the residential scenario incidental soil ingestion pathway the total ILCR is 2.9×10^{-9} for chemicals, with bis (2-ethylhexyl) phthalate the contributor to the risk and 1.7×10^{-6} for radionuclides, with thorium-228+D contributing most of the risk. For the inhalation of dust pathway the total ILCR is 1.2×10^{-6} for radionuclides, with thorium 228+D contributing most of the risk. There are not any PCOCs that contribute to the inhalation of dust chemical risk. For the dermal contact with soil pathway, the ILCR is 3.3×10^{-9} for chemicals, with bis (2-ethylhexyl) phthalate the contributor to the risk. For the ingestion of home-grown produce pathway the total ILCR is 4.7×10^{-7} for chemicals, with bis (2-ethylhexyl) phthalate the contributor to the risk and 3.8×10^{-5} for radionuclides, with thorium-228+D and radium-228+D contributing most of the risk. For the external exposure pathway the total ILCR is 5.5×10^{-4} with thorium-228+D contributing most of the risk.

For the park ranger incidental soil ingestion pathway the total ILCR is 3.4×10^{-11} for chemicals, with bis (2-ethylhexyl) phthalate the contributor to the risk and 4.5×10^{-8} for radionuclides, with thorium-228+D contributing most of the risk. For the inhalation of dust pathway the total ILCR is 2.5×10^{-8} for radionuclides, with thorium-228+D contributing most of the risk. There are not any PCOCs that contribute to the inhalation of dust chemical risk. For the dermal contact with soil pathway the ILCR is 3.4×10^{-10} with bis (2-ethylhexyl) phthalate the contributor to the risk. For the external exposure pathway, the ICLR is 1.1×10^{-5} with thorium-228+D contributing most of the risk.

The recreational, residential, and park ranger exposure scenarios to surface soil at Source Area 4 do not pose a significant potential carcinogenic risk. None of the surface soil PCOCs exceeded a HQ of 1.0 for any of the potential exposure pathways. The surface soil cumulative site ILCR to a current or future individual based on the RME is less than 10^{-4} except for thorium-228 (4.8×10^{-4}) previously mentioned residential scenario, external exposure ([Table C.5-7](#)). This radionuclide is naturally occurring, with thorium-228 a daughter of thorium-232. With the exclusion of the naturally occurring radionuclide daughter, under current and future conditions,

exposure to surface soil at Source Area 4, does not pose a potential significant carcinogenic risk (EPA, 1991b).

Potential risks due to contact with subsurface soil at Source Area 4 are summarized in [Tables C.5-19](#) (lifetime cancer risks) and [C.5-20](#) (hazard quotients). The residential scenario is the only scenario where the subsurface soil pathway is applicable. For the incidental soil ingestion pathway the total ILCR is 7.3×10^{-9} for chemicals, with bis (2-ethylhexyl) phthalate and Di-n-octyl Phthalate contributing most of the risk and 9.0×10^{-6} for radionuclides, with lead-210+D contributing most of the risk. For the inhalation of dust pathway the total ILCR is 1.0×10^{-13} for chemicals, with chloromethane the contributor to the risk and 9.7×10^{-8} for radionuclides, with lead-210+D contributing most of the risk. For the dermal contact with soil pathway the ILCR is 6.3×10^{-9} for chemicals, with bis (2-ethylhexyl) phthalate contributing most of the risk. For the ingestion of home-grown produce pathway the total ILCR is 4.2×10^{-7} for chemicals, with chloromethane contributing most to the risk and 9.5×10^{-4} for radionuclides, with lead-210+D contributing most of the risk. For the external exposure pathway the total ILCR is 9.0×10^{-4} with radium-226+D contributing most of the risk.

The residential scenario exposure to subsurface soil at Source Area 4 does not pose a significant potential carcinogenic risk. None of the surface soil PCOCs exceeded a HQ of 1.0 for any of the potential exposure pathways. The subsurface soil cumulative site ILCR to a future individual based on the RME is less than 10^{-4} except for lead-210+D (8.5×10^{-4}) previously mentioned residential scenario, ingestion of home-grown produce and radium-226+D (5.5×10^{-4}), radium-228+D (1.3×10^{-4}), and thallium-208 (1.8×10^{-4}) previously mentioned residential scenario, external exposure ([Table C.5-19](#)). These radionuclides are naturally occurring, with radium-228 and thallium-208 daughters of thorium-232, and radium-226 and lead-210 daughters of uranium-238. With the exclusion of the naturally occurring radionuclide daughters, under future conditions, exposure to subsurface soil at Source Area 4, does not pose a potential significant carcinogenic risk (EPA, 1991b).

C.5.3.5 Source Area 5

Potential risks due to contact with surface soil at Source Area 5 are summarized in [Tables C.5-9](#) (lifetime cancer risks) and [C.5-10](#) (hazard quotients). The surface soil pathways identified at Source Area 5 include incidental soil ingestion (chemicals and radionuclides), dermal contact (chemicals), inhalation of dust (chemicals and radionuclides), external exposure (radionuclides),

and ingestion of home-grown produce (chemicals and radionuclides). The ingestion of home-grown produce pathway is only applicable to the residential scenario.

The surface soil pathway with highest risk is external exposure to radionuclides. The ILCR for the recreational scenario external exposure to radionuclides is 7.7×10^{-6} , with thorium-228+D (4.7×10^{-6}) contributing most of the risk. The ILCR for the residential scenario external exposure to radionuclides is 1.9×10^{-4} , with thorium-228+D (1.2×10^{-4}) contributing most of the risk. The ILCR for the park ranger scenario to external exposure to radionuclides is 4.0×10^{-6} , with thorium-228+D (2.4×10^{-6}) contributing most of the risk.

For the recreational scenario incidental soil ingestion pathway the total ILCR is 3.9×10^{-9} for chemicals, with 4,4'-DDE and 4,4'-DDT contributing most of the risk and 5.0×10^{-8} for radionuclides, with uranium-234 and thorium-228+D contributing most of the risk. For the inhalation of dust pathway the total ILCR is 4.0×10^{-12} for chemicals, with 4,4'-DDT contributing most of the risk and 2.9×10^{-8} for radionuclides, with and uranium-234 contributing most of the risk. For the dermal contact with soil pathway, the ILCR is 4.4×10^{-9} with 4,4'-DDE and 4,4'-DDT contributing most of the risk. For the external exposure pathway the ICLR is 7.7×10^{-6} with thorium-228+D contributing most of the risk.

For the residential scenario incidental soil ingestion pathway, the total ILCR is 9.1×10^{-8} for chemicals, with 4,4'-DDE and 4,4'-DDT contributing most of the risk and 1.3×10^{-6} for radionuclides, with uranium-234, and thorium-228+D contributing most of the risk. For the inhalation of dust pathway, the total ILCR is 8.4×10^{-8} for chemicals, with 4,4'-DDT contributing most of the risk and 7.2×10^{-7} for radionuclides, with uranium-234 contributing most of the risk. For the dermal contact with soil pathway the ILCR is 5.5×10^{-8} for chemicals, with 4,4'-DDE and 4,4'-DDT contributing most of the risk. For the ingestion of home-grown produce pathway the total ILCR is 5.8×10^{-7} for chemicals, with 4,4'-DDE and 4,4'-DDT contributing most to the and risk and 3.9×10^{-5} for radionuclides, with uranium-234 and radium-228+D contributing most of the risk. For the external exposure pathway the total ILCR is 1.9×10^{-4} with thorium-228+D contributing most of the risk.

For the park ranger incidental soil ingestion pathway the total ILCR is 1.1×10^{-9} for chemicals, with 4,4'-DDE and 4,4'-DDT contributing most of the risk and 3.2×10^{-8} for radionuclides, with uranium-234 and thorium-228+D contributing most of the risk. For the inhalation of dust pathway the total ILCR is 2.0×10^{-12} for chemicals, with 4,4'-DDT contributing most of the risk

and 1.5×10^{-8} for radionuclides, with uranium-234 contributing most of the risk. For the dermal contact with soil pathway the ILCR is 5.8×10^{-9} with 4,4'-DDE and 4,4'-DDT contributing most of the risk. For the external exposure pathway the ILCR is 4.0×10^{-6} with thorium-228+D contributing most of the risk.

The recreational, residential, and park ranger exposure scenarios to surface soil at Source Area 5 do not pose a significant potential carcinogenic risk. None of the surface soil PCOCs exceeded a HQ of 1.0 for any of the potential exposure pathways. The surface soil cumulative site ILCR to a current or future individual based on the RME is less than 10^{-4} except for thorium-228 (1.2×10^{-4}) previously mentioned residential scenario, external exposure (Table C.5-9). This radionuclide is naturally occurring, with thorium-228 a daughter of thorium-232. With the exclusion of the naturally occurring radionuclide daughter, under current and future conditions, exposure to surface soil at Source Area 5, does not pose a potential significant carcinogenic risk (EPA, 1991b).

Potential risks due to contact with subsurface soil at Source Area 5 are summarized in Tables C.5-21 (lifetime cancer risks) and C.5-22 (hazard quotients). The residential scenario is the only scenario where the subsurface soil pathway is applicable. There were no chemical PCOCs contributing to the risk from subsurface soil at Source Area 5. For the incidental soil ingestion pathway the total ILCR is 1.9×10^{-6} for radionuclides, with lead-210+D contributing most of the risk. For the inhalation of dust pathway the total ILCR is 2.2×10^{-8} for radionuclides, with lead-210+D contributing most of the risk. For the ingestion of home-grown produce pathway, the total ILCR is 2.0×10^{-4} for radionuclides, with lead-210+D contributing most of the risk. For the external exposure pathway the total ILCR is 1.2×10^{-4} with lead-210+D contributing most of the risk.

The residential scenario exposure to subsurface soil at Source Area 5 does not pose a significant potential carcinogenic risk. None of the surface soil PCOCs exceeded a HQ of 1.0 for any of the potential exposure pathways. The subsurface soil cumulative site ILCR to a future individual based on the RME is less than 10^{-4} except for lead-210+D (1.9×10^{-4}) previously mentioned residential scenario, ingestion of home-grown produce and radium-226+D (1.2×10^{-4}) previously mentioned residential scenario, external exposure (Table C.5-21). These radionuclides are naturally occurring with radium-226 and lead-210 daughters of uranium-238. With the exclusion of the naturally occurring radionuclide daughters, under future conditions, exposure to subsurface soil at Source Area 5, does not pose a potential significant carcinogenic risk (EPA, 1991b).

C.5.3.6 Source Area 6

Potential risks due to contact with surface soil at Source Area 6 are summarized in [Tables C.5-11](#) (lifetime cancer risks) and [C.5-12](#) (hazard quotients). The surface soil pathways identified at Source Area 6 include incidental soil ingestion (chemicals and radionuclides), dermal contact (chemicals), inhalation of dust (chemicals and radionuclides), external exposure (radionuclides), and ingestion of home-grown produce (chemicals and radionuclides). The ingestion of home-grown produce pathway is only applicable to the residential scenario.

The surface soil pathway with highest risk is external exposure to radionuclides. The ILCR for the recreational scenario external exposure to radionuclides is 2.6×10^{-8} , with radium-224 the contributor to the risk. The ILCR for the residential scenario external exposure to radionuclides is 6.5×10^{-7} , with radium-224 the contributor to the risk. The ILCR for the park ranger scenario to external exposure to radionuclides is 1.3×10^{-8} , with radium-224 the contributor to the risk. Note that radium-224 is the only isotope contributing to the radiological risk.

For the recreational scenario incidental soil ingestion pathway, the total ILCR is 2.7×10^{-12} for chemicals, with chloroform the contributor to the risk and 8.5×10^{-9} for radionuclides, with radium-224 the contributor to the risk. For the inhalation of dust pathway, the total ILCR is 7.5×10^{-14} for chemicals, with chloroform the contributor to the risk and 3.0×10^{-10} for radionuclides, with radium-224 the contributor to the risk. For the dermal contact with soil pathway the ILCR is 5.9×10^{-12} with chloroform the contributor to the risk. For the external exposure pathway the ILCR is 2.6×10^{-8} with radium-224 the contributor to the risk.

For the residential scenario incidental soil ingestion pathway the total ILCR is 6.7×10^{-11} for chemicals, with chloroform the contributor to the risk and 2.1×10^{-7} for radionuclides, with radium-224 the contributor to the risk. For the inhalation of dust pathway the total ILCR is 1.9×10^{-12} for chemicals, with chloroform the contributor to the risk and 7.6×10^{-9} for radionuclides, with radium-224 the contributor to the risk. For the dermal contact with soil pathway the ILCR is 7.5×10^{-11} for chemicals, with chloroform the contributor to the risk. For the ingestion of home-grown produce pathway the total ILCR is 4.3×10^{-8} for chemicals, with chloroform the contributor to the risk and 1.0×10^{-5} for radionuclides, with radium-224 the contributor to the risk. For the external exposure pathway, the total ILCR is 6.5×10^{-7} , with radium-224 the contributor to the risk.

For the park ranger incidental soil ingestion pathway the total ILCR is 7.8×10^{-13} for chemicals, with chloroform the contributor to the risk and 5.5×10^{-9} for radionuclides, with radium-224 the contributor to the risk. For the inhalation of dust pathway, the total ILCR is 3.9×10^{-14} for chemicals, with chloroform the contributor to the risk and 1.6×10^{-10} for radionuclides, with radium-224 the contributor to the risk. For the dermal contact with soil pathway the ILCR is 7.8×10^{-12} for chemicals with chloroform the contributor to the risk. For the external exposure pathway the ILCR is 1.3×10^{-8} with radium-224 the contributor to the risk.

The recreational, residential, and park ranger exposure scenarios to surface soil at Source Area 6 do not pose a potential carcinogenic risk. None of the surface soil PCOCs exceeded a HQ of 1.0 for any of the potential exposure pathways. The surface soil cumulative site ILCR to a current or future individual based on the RME is less than 10^{-4} . Therefore, under current and future conditions, exposure to surface soil at Source Area 6, does not pose a potential significant carcinogenic risk (EPA, 1991b).

C.5.3.7 Other Media of Concern (Surface Water, Sediment, and Groundwater)

Potential risks due to contact with surface water at the Salmon Site are summarized in [Tables C.5-23](#) (lifetime cancer risks) and [C.5-24](#) (hazard quotients).

The recreational scenario exposure to surface water, all source areas, does not pose a potential carcinogenic risk. None of the surface water PCOCs exceeded a HQ of 1.0 for the potential exposure pathways. The surface water cumulative site ILCR to the current individual based on the RME is less than 10^{-6} . Therefore, under current conditions, exposure to surface water at the Salmon Site does not pose a potential significant carcinogenic risk (EPA, 1991b).

The residential and park ranger scenario exposure to surface water, all source areas, does not pose a potential carcinogenic risk. None of the surface water PCOCs exceeded a HQ of 1.0 for the potential exposure pathways. The surface water cumulative site ILCR to the future individual based on the RME is less than 10^{-6} . Therefore, under future conditions, exposure to surface water at the Salmon Site does not pose a potential significant carcinogenic risk (EPA, 1991b).

Potential risks due to contact with sediment at the Salmon Site are summarized in [Tables C.5-25](#) (lifetime cancer risks) and [C.5-26](#) (hazards quotients). The sediment pathways identified at the Salmon Site include incidental soil ingestion (chemicals and radionuclides), dermal contact

(chemicals), inhalation of dust (chemicals and radionuclides), external exposure (radionuclides), and ingestion of home-grown produce (chemicals and radionuclides).

For recreational scenario, the incidental sediment ingestion pathway the total ILCR is 2.4×10^{-10} for chemicals, with arsenic the contributor to the risk and 2.2×10^{-7} for radionuclides, with lead-210+D contributing most of the risk. For the inhalation of dust pathway, the total ILCR is 5.5×10^{-12} for chemicals, with arsenic the contributor to the risk and 3.4×10^{-9} for radionuclides, with lead-210+D contributing most of the risk. For the dermal contact with soil pathway, the ILCR is 1.6×10^{-10} for chemicals, with arsenic the contributor to the risk. For the external exposure pathway, the total ILCR is 5.7×10^{-6} with radium-226+D and thorium-232 contributing most of the risk.

The recreational scenario exposure to sediments at the Salmon Site does not pose a significant potential carcinogenic risk. None of the sediment PCOCs exceeded a HQ of 1.0 for any of the potential exposure pathways. The sediment cumulative site ILCR to a current individual based on the RME is less than 10^{-4} . Under current conditions, exposure to sediment at the Salmon Site, does not pose a potential significant carcinogenic risk (EPA, 1991b).

For the residential scenario incidental sediment ingestion pathway the total ILCR is 6.1×10^{-9} for chemicals, with arsenic the contributor to the risk and 5.5×10^{-6} for radionuclides, with lead-210+D contributing most of the risk. For the inhalation of dust pathway the total ILCR is 1.3×10^{-8} for chemicals, with arsenic the contributor to the risk and 7.8×10^{-8} for radionuclides, with lead-210+D contributing most of the risk. For the dermal contact with soil pathway the ILCR is 4.0×10^{-9} for chemicals with arsenic the contributor to the risk. For the ingestion of home-grown produce pathway the total ILCR is 5.6×10^{-4} for radionuclides, with lead-210+D contributing most of the risk. For the ingestion of home-grown produce there were no chemical PCOC. For the external exposure pathway, the total ILCR is 1.4×10^{-4} with radium-226+D and thallium-208 contributing most of the risk.

The residential scenario exposure to sediments at the Salmon Site does not pose a significant potential carcinogenic risk. None of the surface sediment PCOCs exceeded a HQ of 1.0 for any of the potential exposure pathways. The sediment soil cumulative site ILCR to a future individual based on the RME is less than 10^{-4} except for lead-210+D (6.1×10^{-4}) previously mentioned residential scenario, ingestion of home-grown produce ([Table C.5-25](#)). This radionuclide is naturally occurring, with lead-210 a daughter of uranium-238. With the

exclusion of the naturally occurring radionuclide daughter, under future conditions, exposure to sediment at the Salmon Site, does not pose a potential significant carcinogenic risk (EPA, 1991b).

For the park ranger scenario, the incidental sediment ingestion pathway the total ILCR is 7.0×10^{-11} for chemicals, with arsenic the contributor to the risk and 1.4×10^{-7} for radionuclides, with lead-210+D contributing most of the risk. For the inhalation of dust pathway the total ILCR is 2.8×10^{-12} for chemicals, with arsenic the contributor to the risk and 1.8×10^{-9} for radionuclides, with lead-210+D contributing most of the risk. For the dermal contact with soil pathway the ILCR is 2.1×10^{-10} for chemicals, with arsenic the contributor to the risk. For the external exposure pathway, the total ILCR is 2.9×10^{-6} with radium-226+D and thorium-230 contributing most of the risk.

The park ranger scenario exposure to sediments at the Salmon Site does not pose a significant potential carcinogenic risk. None of the sediment PCOCs exceeded a HQ of 1.0 for any of the potential exposure pathways. The sediment cumulative site ILCR to a future individual based on the RME is less than 10^{-4} . Under future conditions, exposure to sediment at the Salmon Site, does not pose a potential significant carcinogenic risk (EPA, 1991b).

Potential risks due to contact with groundwater at the Salmon Site are summarized in [Tables C.5-27](#) (lifetime cancer risks) and [C.5-28](#) (hazards quotients). Currently, there are no on-site wells, and fate and transport modeling showed that extremely small PCOC concentrations reached the site boundary. The only complete groundwater scenario is the potential for a future resident to drill a domestic well for household use in either the Alluvial Aquifer or the Local Aquifer on the Salmon Site. There are no current potential groundwater pathways.

The residential scenario is the only scenario where the groundwater pathway is applicable. The groundwater pathways identified at the Salmon Site include incidental groundwater ingestion (chemicals and radionuclides), dermal contact (chemicals and radionuclides), inhalation of VOCs (chemicals), and ingestion of home-grown produce (chemicals and radionuclides).

For the Alluvial Aquifer, residential scenario incidental groundwater ingestion pathway the total ILCR is 2.1×10^{-4} for chemicals, with arsenic contributing most of the risk and 1.3×10^{-4} for

radionuclides, with tritium the contributor to the risk. For the inhalation of VOCs the total ILCR is 3.1×10^{-7} for chemicals, with trichloroethene the contributor to the risk. There is no radionuclide PCOC for the inhalation pathway. For the dermal contact with groundwater pathway the ILCR is 7.9×10^{-7} for chemicals, with arsenic contributing most of the risk and 5.6×10^{-7} for radionuclides, with tritium the contributor to the risk. For the ingestion of home-grown produce pathway the total ILCR is 1.7×10^{-6} for chemicals, with vinyl chloride contributing most of the risk and 2.0×10^{-7} for radionuclides, with tritium the contributor to the risk.

For the Local Aquifer, residential scenario incidental groundwater ingestion pathway, the total ILCR is 7.7×10^{-4} for chemicals, with arsenic the contributor to the risk and 6.5×10^{-8} for radionuclides, with tritium the contributor to the risk. There are no chemicals or radionuclides PCOC for the inhalation pathway. For the dermal contact with groundwater pathway, the ILCR is 2.2×10^{-6} for chemicals, with arsenic the contributor to the risk and 2.8×10^{-10} for radionuclides, with tritium the contributor to the risk. For the ingestion of home-grown produce pathway, the total ILCR is 9.8×10^{-11} for radionuclides, with tritium the contributor to the risk. There are no chemical PCOCs for the ingestion of home-grown produce pathway.

The residential scenario exposure to groundwater at the Salmon Site does not pose a significant potential carcinogenic risk for either the Alluvial Aquifer or the Local Aquifer. None of the groundwater PCOCs exceeded a HQ of 1.0 for any of the potential exposure pathways except arsenic which had a value of 4.0 in the Alluvial Aquifer, for ingestion of groundwater (Table C.5-28). The groundwater cumulative site ILCR to a future individual based on the RME is less than 10^{-4} except for arsenic (1.4×10^{-4}) and tritium (1.3×10^{-4}) Alluvial Aquifer, ingestion of groundwater pathway and arsenic (7.7×10^{-4}) Local Aquifer, ingestion of groundwater pathway (Table C.5-25).

C.5.4 General Uncertainties

The overriding uncertainties and conservative assumptions associated with the risk characterization are as follows:

- A. Short half-life daughters were carried through the risk analysis when no analytical information was available for the parents (i.e., the parents were either below background or not detected). Many of these remaining daughters may have been below background.

- B. The extrapolation of toxic effects observed at the high doses necessary to conduct animal studies to effects that might occur at much lower, more realistic doses is uncertain.
- C. The extrapolation from toxic effects in laboratory animals to toxic effects in humans (i.e., responses of animals may be different from responses of humans) is uncertain.
- D. The conservative estimation of receptor concentrations for PCOCs are above the true average and include maximum values and upper 95 percent confidence limits.
- E. The pathways selected are the most conservative (i.e., residential).
- F. Currently there is a limited receptor point of contact at any area of concern or media.
- G. Pathway analyses have been conservative and generally do not include fate and transport considerations (e.g., dispersion, adsorption) in the estimates.
- H. Radiological decay was not considered in the risk models. Many of the radionuclides detected at the Salmon Site have half-lives less than the assumed residential scenario exposure duration of 30 years.
- I. The groundwater risk for each aquifer was calculated with the maximum detected concentration for each PCOC. This assumes that these concentrations all occur at the same location and that the potential receptor installs a water-supply well at this location. The probability of both these events occurring is very low.

C.6.0 References

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