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DRAFT FINAL

ADMIN RECORD

PHASE I RFI/RI REPORT
WALNUT CREEK PRIORITY DRAINAGE
OPERABLE UNIT NO. 6

APPENDIX J
BASELINE HEALTH RISK ASSESSMENT

Volume II

Attachments J1, J2, J3, J4, and J5

U.S. Department of Energy
Rocky Flats Environmental Technology Site
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ATTACHMENT J1
ESTIMATING THE CONCENTRATION TERM

In accordance with EPA guidance (USEPA 1989a, 1992a; USEPA Region VIII 1994), the 95% upper confidence limit (95% UCL) on the mean is used as the exposure point concentration for calculating the central tendency and reasonable maximum risk in Superfund risk assessments. The 95% UCL is an estimate of the average contaminant concentration in an exposure area and is used instead of the mean in order to account for the uncertainty in calculating the true mean from a small data set.

This Attachment contains (1) a discussion of the statistical methods that were used to test the distribution of the data (normal or lognormal) and to calculate the concentration term and (2) tables showing all sample results used in the calculations.

GENERAL STATISTICAL METHODS

For normally distributed data, the 95% UCL is calculated according to the following equation:

$$UCL_{1-\alpha} = \bar{x} + \frac{t_{1-\alpha,n-1}}{\sqrt{n}} s \qquad \textbf{(J.1)}$$

For lognormally distributed data, the following equation is used:

$$UCL_{1-\alpha} = \exp\left(\bar{y} + 0.5 s_y^2 + \frac{s_y H_{1-\alpha}}{\sqrt{n-1}}\right) \qquad \textbf{(J.2)}$$

The parameters μ and s are the mean and standard deviation of the original data; y and s_y are the mean and standard deviation of the log-transformed data; n is the sample size; t is the Student's t value at significance level of α (0.05) with (n-1) degrees of freedom; and H is the H statistic at a significance level of α. Values for the H statistic were taken from an expanded $H_{0.95}$ table with small increments of n and s_y (WCC 1993).

It is not always possible to correctly identify the distribution of a small sample (n = 20 to 50), which is the size of many environmental data sets (Hahn and Shapiro 1967; Shumway et al. 1989). Distributions other than normal or lognormal are also possible. However, only

the normal and lognormal distributions were used in this report because (1) risk assessment guidance recommends using the normal and lognormal distributions and (2) methods to test distributions other than normal or lognormal are not readily available.

Distribution testing and calculating summary statistics for the original or the log-transformed data were performed using statistical procedures recommended by EPA (1989b) or generally accepted in engineering practice. The following standard statistical methods were applied, depending on the characteristics of the data set:

- Wilk-Shapiro test for normality (USEPA 1992b).
- Probability plotting test for normality (USEPA 1992b).
- Robust probability plotting for estimating mean and standard deviation. This method has been well documented and proved to be very powerful in statistical analysis, especially in cases where multiple detection limits are reported (Helsel 1990; Helsel and Cohn 1988; Hirsch and Stedinger 1987).

Different procedures were applied depending on frequency of non-detects (NDs), sample size (some were too small to test distribution), and presence of zero or negative concentrations. Each of these cases is discussed below.

CASE 1: FREQUENCY OF NON-DETECTS ≤ 15%

If the total number of NDs within a data set was less than 15% of the total observations, the NDs were replaced by one-half the Sample Quantitation Limit (SQL). The distribution was tested using the entire data set (detected values and one-half of the SQL for NDs). The test of normality was performed using the Wilk-Shapiro test. Following the test for normality, the mean and standard deviation were calculated on either the original data or the log-transformed data, as appropriate.

CASE 2: FREQUENCY OF 15% < NON-DETECTS ≤ 90%

When the frequency of NDs exceeds 15%, the simple substitution method for NDs used in (1) (i.e., one-half the SQL) generally produces biased estimates of the mean and standard deviation and is not recommended (USEPA 1989b; USEPA 1992b; Helsel 1990). Distributional methods such as maximum likelihood estimates and robust probability plotting are recommended instead (USEPA 1992b; Helsel 1990).

Robust Probability Plotting

For metals and radionuclides with a frequency of NDs between 15% and 90%, normality was tested using either censored or detects-only probability plotting (USEPA 1992b). Data censoring is described in Case 5 below. To estimate means and standard deviations, the robust probability plotting method was used with a computer program developed by Helsel and Cohn (1991). As indicated in Table 1, the robust probability plotting method was applied to antimony and silver in surface soil and to silver in pond sediment (AOC No. 4).

Robust probability plotting methods combine results reported above the detection limit with extrapolated values for NDs by assuming a distributional shape in order to estimate summary statistics. A distribution is fitted to the detected results using probability plotting procedures. The fitted distribution is then used to extrapolate values below the reporting limit. These extrapolated values are not considered estimates for specific samples, but are used collectively only to estimate summary statistics. A brief summary of the method used in this report is described below:

- Determine the probability plotting positions of each observation (detected and non-detected), p_i, by using an appropriate plotting position formula, such as the Weibull, Blom, or the Hazen plotting formula. For multiple detection limits, a method by Hirsch and Stedinger (1987) was used to determine the plotting position.

- For the plotting positions obtained above, calculate the corresponding normal score, NS, from the inverse cumulative normal distribution,

$$N.S. = F^{-1}(p_i)$$

- Develop a regression model of the original data or log-transformed data (detected values only) vs. normal score.

- Use the regression model to extrapolate concentrations for the non-detected values according to their normal score.

- Use the detected concentrations and the extrapolated concentrations to calculate the summary statistics.

CASE 3: FREQUENCY OF NON-DETECTS > 90%

If the total number of NDs in a data set was more than 90%, distribution testing is not meaningful and was not performed. Under such a circumstance, the reasonable maximum detected concentration adopted for risk assessment was either (1) the maximum detected concentration or (2) the 95% UCL on the mean, using one-half of the detection limit for non-detects and assuming normally distributed data.

CASE 4: SAMPLE SIZE TOO SMALL

When the sample size was too small (generally 5 or less with no NDs, or 10 or less with more than 5 NDs) to warrant a normality test and to establish meaningful statistical parameters, the data set was assumed to be normally distributed and the statistics were calculated by substituting one-half the SQL for NDs. In some cases with a large percentage of NDs, the maximum detected concentration was adopted as the reasonable maximum exposure concentration for risk assessment.

CASE 5: DATA SETS WITH ZERO OR NEGATIVE CONCENTRATIONS

For radionuclide data sets with zero or negative concentrations, the zeros and negatives were treated as NDs with a detection limit of the minimum positive detected concentration. This adjustment was necessary to yield an all-positive data set prior to log-transformation and had less effect on the distribution than adding a constant to all results. Negative and zero values

were present in the following data sets: Am-241 in AOC No. 1 subsurface soil; Am-241 and Pu-239/240 in AOC No. 2 surface soil; and Pu-239/240 in AOC No. 4 stream/dry sediment. The calculation of means and standard deviations followed the procedures as specified in cases 1, 2, and 4, depending on the frequency of NDs (including zeros and negatives) in the data sets.

Two alternate methods of estimating the mean and standard deviation of data sets with zero or negative values were considered: a three-parameter lognormal method and an "add-on" method in which a small positive constant is added to all results to yield a data set with all positive values. Neither method was adopted, for the reasons presented below.

For data sets with zero or negative concentrations, a three-parameter lognormal distribution could be used to calculate the 95% UCL of the mean. However, the procedures to estimate the three parameters and the 95% UCLs are too complicated to be applied here and are probably not warranted for purposes of risk assessment because simpler methods appear to provide adequate estimates of exposure concentrations.

In the "add-on" method, a two-parameter lognormal distribution was assumed to be applicable to the data if an appropriate positive constant ("add-on") was added to each result; that is $z_i = (x_i + \tau)$, where x_i is the sample value, τ is a positive constant, and z_i is positive. The mean and standard deviation of $\ln(z_i)$ were then calculated, and the 95% UCL of the mean for z was determined by Equation (J.2). The 95% UCL of the mean for x was estimated as the 95% UCL of the mean for z minus τ. The add-on method was compared with the robust probability plotting method. It was found that the add-on method is very sensitive to the positive value (τ) chosen and did not provide good estimates of the statistics. As a result, the add-on method was not used to calculate the 95% UCLs of the mean.

In conclusion, radionuclide data sets with zero or negative values were adjusted by setting the zero or negative values to the smallest positive detected value, and the concentration terms were calculated as specified in Cases 1, 2, or 4 above, depending upon the detection frequency.

RESULTS

The data used to calculate 95% UCL concentrations and summary statistics are shown in tables accompanying this Attachment.

DISCUSSION

This section discusses the selection of the concentration terms for silver, Am-241, and Pu-239/240 in pond sediment; VOCs in pond surface water (AOC No. 4); and Pu-239/240 in stream/dry sediment (AOC No. 3). These were indicated with the footnote "d" in Tables J5-4, J5-5, and J5-6.

In each of these cases, the 95% UCL based on a normal distribution, rather than a lognormal distribution or the maximum concentration, was used as the concentration term. For silver, Am-241, and Pu-239/240 in pond sediment and for Pu-239/240 in AOC No. 3 stream/dry sediment, the "lognormal" 95% UCL exceeded the maximum sample concentration, and the maximum concentration was considered an overly conservative estimate of an average exposure concentration. Data used in calculating the exposure terms are shown in Tables 18, 22, 25, and 26 accompanying this Attachment.

For VOCs in AOC No. 4 pond surface water, the 95% UCLs calculated on the untransformed data assuming a normal distribution were adequately conservative, judging from the frequency of detection and range of detected concentrations, and no further analysis was performed on these data (see Table 27 of this Attachment).

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ATTACHMENT J1
LIST OF TABLES

TABLE 1	LOGNORMAL 95% UCL CONCENTRATIONS FOR CHEMICALS OF CONCERN
TABLE 2	95% UCL CONCENTRATION AOC NO. 1 SURFACE SOIL METALS
TABLE 3	95% UCL CONCENTRATION AOC NO. 1 SURFACE SOIL RADIONUCLIDES
TABLE 4	95% UCL CONCENTRATION AOC NO. 1 SUBSURFACE SOIL METALS
TABLE 5	95% UCL CONCENTRATION AOC NO. 1 SUBSURFACE SOIL RADIONUCLIDES
TABLE 6	95% UCL CONCENTRATION AOC NO. 2, 30-ACRE AREA, SURFACE SOIL METALS
TABLE 7	95% UCL CONCENTRATION AOC NO. 2, 30-ACRE AREA, SURFACE SOIL RADIONUCLIDES
TABLE 8	95% UCL CONCENTRATION AOC NO. 2, TOTAL AREA SURFACE SOIL METALS
TABLE 9	95% UCL CONCENTRATION AOC NO. 2, TOTAL AREA SURFACE SOIL RADIONUCLIDES
TABLE 10	95% UCL CONCENTRATION AOC NO. 2 SUBSURFACE SOIL SEMIVOLATILES
TABLE 11	95% UCL CONCENTRATION AOC NO. 2, TOTAL AREA SUBSURFACE SOIL METALS
TABLE 12	95% UCL CONCENTRATION AOC NO. 2, TOTAL AREA SUBSURFACE SOIL RADIONUCLIDES
TABLE 13	95% UCL CONCENTRATION AOC NO. 3 POND SEDIMENT SEMIVOLATILES
TABLE 14	95% UCL CONCENTRATION AOC NO. 3 POND SEDIMENT PCBs
TABLE 15	95% UCL CONCENTRATION AOC NO. 3 POND SEDIMENT METALS
TABLE 16	95% UCL CONCENTRATION AOC NO. 3 POND SEDIMENT RADIONUCLIDES
TABLE 17	95% UCL CONCENTRATION AOC NO. 3 STREAM AND DRY SEDIMENT SEMIVOLATILES

TABLE 18	95% UCL CONCENTRATION AOC NO. 3 STREAM AND DRY SEDIMENT METALS
TABLE 19	95% UCL CONCENTRATION AOC NO. 3 STREAM AND DRY SEDIMENT RADIONUCLIDES
TABLE 20	95% UCL CONCENTRATION AOC NO. 4 POND SEDIMENT SEMIVOLATILES
TABLE 21	95% UCL CONCENTRATION AOC NO. 4 POND SEDIMENT PCBs
TABLE 22	95% UCL CONCENTRATION AOC NO. 4 POND SEDIMENT METALS
TABLE 23	95% UCL CONCENTRATION AOC NO. 4 POND SEDIMENT RADIONUCLIDES
TABLE 24	95% UCL CONCENTRATION AOC NO. 4 POND SURFACE WATER VOLATILES
TABLE 25	95% UCL CONCENTRATION AOC NO. 4 STREAM AND DRY SEDIMENT SEMIVOLATILES
TABLE 26	95% UCL CONCENTRATION AOC NO. 4 STREAM AND DRY SEDIMENT METALS
TABLE 27	95% UCL CONCENTRATION AOC NO. 4 STREAM AND DRY SEDIMENT RADIONUCLIDES
TABLE 28	95% UCL CONCENTRATION AOC NO. 2, TOTAL AREA METALS OF INTEREST IN GROUNDWATER
TABLE 29	95% UCL CONCENTRATION BACKGROUND GROUNDWATER METALS (ANTIMONY)
TABLE 30	95% UCL CONCENTRATION BACKGROUND GROUNDWATER METALS (ARSENIC)
TABLE 31	95% UCL CONCENTRATION BACKGROUND GROUNDWATER METALS (BERYLLIUM)
TABLE 32	95% UCL CONCENTRATION BACKGROUND GROUNDWATER METALS (MANGANESE)

ATTACHMENT J1
TABLE LEGEND

(1) = Calculated on well averages
AOC = Area of Concern
CRDL = Contract Required Detection Limit
mg/kg = milligram per kilogram
pCi/g = picocuries per gram
pCi/L = picocuries per liter
RME = Reasonable Maximum Exposure
SQL = Sample Quantitation Limit
UCL = Upper Confidence Limit
µg/kg = microgram per kilogram
µg/L = microgram per liter
[ ] = Detected Results

Laboratory Qualifiers

B = Organics (Volatiles, Semivolatiles, Pesticides/PCBs) indicates chemical was in both the sample and associated method blank
B = Inorganics (Metals & Other Inorganics) detected concentration was less than CRDL and above IDL
B = Radionuclides - the activity in the method blank exceeded the minimal detectable activity (MDA)
C = Pesticide/PCB result where identification was confirmed by GC/MS
D = Organics - analysis was performed at a dilution
E = Inorganics - reported value is estimated due to interference
J = Organics - positively identified below SQL - quantity is estimated
J = Inorganics & radionuclides - quantity is estimated
N = Metals - Spike recoveries in the matrix spike sample did not meet advisory limits
U = All analyses - analyzed chemical was not detected
W = Metals - post digestion spike did not meet control limit
* = Organics - outside contract required QC limits
* = Metals - Matrix duplicate analysis did not meet advisory limits

Validation Qualifiers

A = Result accepted with qualifications
JA = Result accepted but was estimated
J = Estimated result due to outside holding time, improperly preserved, quality control parameter outside control limit
R = Rejected result
V = Valid result

Attachment J1
Table 1
Log Normal 95% UCLs for Chemicals of Concern

Analyte	Distribution	Technique for Adjustment	Sample Size	Mean of x or LN(x)	S.D. of x or LN(x)	t(0.05,n-1)	H(0.05,n)	95% UCL	Units	Comments
Surface Soil										
AOC No. 1 (1)										
AOC No. 2, 30-acre maximum exposure area										
Antimony	log normal	RPP	57	2.438	0.444		1.835	14.086	mg/kg	
Silver	log normal	RPP	64	-2.205	2.107		3.606	2.643	mg/kg	
Vanadium	log normal		64	3.384	0.370		1.788	34.310	mg/kg	
Zinc	log normal		64	4.239	0.459		1.838	85.655	mg/kg	
Americium-241	log normal		42	-0.949	1.193		2.575	1.275	pCi/g	
Plutonium-239/240	log normal		55	-0.585	1.503		2.871	3.099	pCi/g	
AOC No. 2, total area (2)										
Antimony	log normal	RPP	69	2.589	0.469		1.840	16.495	mg/kg	
Silver	log normal	RPP	77	-2.643	2.247		3.712	2.310	mg/kg	
Vanadium	log normal		77	3.442	0.372		1.780	36.130	mg/kg	
Zinc	log normal		77	4.208	0.427		1.809	80.461	mg/kg	
Americium-241	log normal		54	-1.478	1.488		2.857	1.238	pCi/g	
Plutonium-239/240	log normal		67	-0.944	1.646		3.006	2.776	pCi/g	

RPP Robust Probability Plot
S.D. Standard Deviation
LN natural log
t Student's t statistic for normal distribution
H H statistic for lognormal distribution
UCL Upper confidence limit

(1) For AOC No. 1, the normal 95% UCL and the log normal 95% UCL values were approximately the same, therefore, the normal 95% UCL (as shown on Attachment J1, Table 2) were used.
(2) AOC No. 2 total area is approximately 50 acres.

Attachment J1
Table 1
Log Normal 95% UCLs for Chemicals of Concern

Analyte	Distribution	Technique for Adjustment	Sample Size	Mean of x or LN(x)	S.D. of x or LN(x)	t(0.05,n-1)	H(0.05,n)	95% UCL	Units	Comments
Subsurface Soil										
AOC No. 1										
Barium	log normal		44	4.556	0.541		1.923	129.232	mg/kg	
Americium-241	log normal		42	-5.140	0.949		2.290	0.013	pCi/g	
Plutonium-239/240	log normal		42	-5.078	1.197		2.580	0.021	pCi/g	
Uranium-233/234	log normal		43	-0.460	0.459		1.868	0.800	pCi/g	
Uranium-238	log normal		43	-0.331	0.933		2.273	1.540	pCi/g	
AOC No. 2, total area (1)										
Barium	log normal		99	4.577	0.810		2.046	159.705	mg/kg	
Am-241	log normal		93	-5.100	1.425		2.657	0.025	pCi/g	
Pu-239/240	log normal		86	-5.153	2.161		3.559	0.138	pCi/g	
Uranium-233/234	normal		99	0.733	0.263	1.984		0.785	pCi/g	
Uranium-238	log normal		98	-0.338	0.316		1.742	0.793	pCi/g	

RPP Robust Probability Plot
S.D. Standard Deviation
LN natural log
t Student's t statistic for normal distribution
H H statistic for lognormal distribution
UCL Upper confidence limit

(1) AOC No. 2 total area is approximately 50 acres.

Attachment J1
Table 1
Log Normal 95% UCLs for Chemicals of Concern

Analyte	Distribution	Technique for Adjustment	Sample Size	Mean of x or LN(x)	S.D.	t(0.05,n-1)	H(0.05,n)	95% UCL	Units	Comments
Pond Sediment										
AOC No. 3										
Bis(2-ethylhexyl)phthalate	log normal		15	6.208	1.186		3.046	2637.0	µg/kg	
Vanadium	log normal		15	3.535	0.312		1.892	42.2	mg/kg	
Am-241	log normal		14	0.339	1.544		3.791	23.4	pCi/g	Exceeds max
Pu-239/240	log normal		14	1.326	1.475		3.658	50.0	pCi/g	Exceeds max
AOC No. 4										
Aroclor-1254	log normal		20	4.517	3.532		7.002	1.4E+7	µg/kg	Exceeds max
Bis(2-ethylhexyl)phthalate	log normal		19	7.880	1.537		3.469	30257.9	µg/kg	
Silver	log normal	RPP	20	3.048	1.701		3.695	379.1	mg/kg	Exceeds max
Pu-239/240	log normal		15	2.672	1.667		3.923	333.1	pCi/g	Exceeds max

RPP Robust Probability Plot
S.D. Standard Deviation
LN natural log
t Student's t statistic for normal distribution
H H statistic for lognormal distribution
UCL Upper confidence limit

Attachment J1
Table 1
Log Normal 95% UCLs for Chemicals of Concern

Analyte	Distribution	Technique for Adjustment	Sample Size	Mean of x or LN(x)	S.D. of x or LN(x)	t(0.05,n-1)	H(0.05,n)	95% UCL	Units	Comments
Stream Sediment										
AOC No. 3										
Strontium	log normal		9	-0.070	1.152		3.580	7.78	mg/kg	
Plutonium-239/240	log normal		9	4.074	0.217		2.463	72.68	pCi/g	Exceeds max
AOC No. 4										
Zinc	log normal		12	4.454	0.589		2.256	152.6	mg/kg	

RPP Robust Probability Plot
S.D. Standard Deviation
LN natural log
t Student's t statistic for normal distribution
H H statistic for lognormal distribution
UCL Upper confidence limit

ATTACHMENT J1
TABLE 2
95% UCL CONCENTRATION
AOC NO. 1
SURFACE SOIL METALS

			ANTIMONY(mg/kg)					VANADIUM (mg/kg)					ZINC (mg/kg)				
Location	Field ID	Date Sampled	Result	SQL	CRDL	Qual	Valid. Qual.	Result	SQL	CRDL	Qual	Valid. Qual.	Result	SQL	CRDL	Qual	Valid. Qual.
SS600492	SS60004WC	10/09/92	18.8	18.8	12		JA	31.7	31.7	10		V	59	59	4		V
SS600592	SS60005WC	10/09/92	18.2	18.2	12		JA	33.1	33.1	10		V	31.6	31.6	4		V
SS600692	SS60006WC	10/09/92	19.4	19.4	12		JA	28.7	28.7	10		V	54.1	54.1	4		V
SS600792	SS60007WC	10/09/92	26	26	12		JA	27.9	27.9	10		V	43.8	43.8	4		V
SS600892	SS60008WC	10/23/92	23.5	23.5	12		JA	40.1	40.1	10		V	36.5	36.5	4		JA
SS600992	SS60009WC	10/23/92	5.75	11.5	12	U	V	30.9	30.9	10		V	36.2	36.2	4		JA
SS601092	SS60010WC	10/23/92	5.85	11.7	12	U	V	33.5	33.5	10		V	27.8	27.8	4		JA
SS601192	SS60011WC	10/23/92	6.12	12.25	12	U	V	37.2	37.2	10		V	52.6	52.6	4		JA
SS601292	SS60012WC	10/23/92	14.4	14.4	12		JA	31.8	31.8	10		V	42	42	4		JA
SS601392	SS60013WC	10/23/92	6	12	12	U	V	26.2	26.2	10		V	52.4	52.4	4		JA
SS601492	SS60014WC	10/26/92					R	33.8	33.8	10		V	51.7	51.7	4		JA
SS601592	SS60015WC	10/12/92	5.2	10.4	12	U	JA	38.6	38.6	10		V	44.9	44.9	4		V
SS601692	SS60016WC	10/12/92	5.2	10.4	12	U	JA	28.7	28.7	10		V	40.7	40.7	4		V
SS601792	SS60017WC	10/12/92	24.15	24.15	12		JA	32.35	32.35	10		V	51.25	51.25	4		V
SS601892	SS60018WC	10/26/92					R	27.2	27.2	10		V	36.3	36.3	4		JA
SS601992	SS60019WC	10/26/92					R	39.8	39.8	10		V	41.1	41.1	4		JA
SS602092	SS60020WC	10/26/92					R	24.8	24.8	10		V	41.6	41.6	4		JA
SS602192	SS60021WC	10/26/92					R	26.3	26.3	10		V	40.2	40.2	4		JA
SS602292	SS60022WC	10/27/92					R	29.5	29.5	10		V	48.2	48.2	4		JA
SS602392	SS60023WC	10/12/92	19.1	19.1	12		JA	35.5	35.5	10		V	60.2	60.2	4		V
SS602492	SS60024WC	10/12/92	5.2	10.4	12	U	JA	31.3	31.3	10		V	54.8	54.8	4		V
SS602592	SS60025WC	10/27/92					R	23.8	23.8	10		V	42.4	42.4	4		JA
SS602692	SS60026WC	10/27/92					R	32.7	32.7	10		V	38.2	38.2	4		JA
77192	SS60191WC	11/19/92	6.55	13.1	12	U	JA	37.6	37.6	10		V	59.7	59.7	4		JA
Number of samples			16					24					24				
Number of detects			8					24					24				
Minimum detected			14.4					23.8					27.8				
Maximum detected			24.15					40.1					60.2				
Average			13.09					31.79					45.30				
Standard Deviation			7.78					4.57					8.80				
t-value			1.753					1.714					1.714				
95% UCL			16.50					33.39					48.38				

ATTACHMENT J1
TABLE 2
95% UCL CONCENTRATION
AOC NO. 1
SURFACE SOIL METALS

Statistics based on log normal distribution		
Mean of ln-t	3.449	3.794
Std of ln-t	0.148	0.204
H-0.95 value	1.737	1.762
95% UCL	33.558	48.904

ATTACHMENT J1
TABLE 2
95% UCL CONCENTRATION
AOC NO. 1
SURFACE SOIL METALS

			ANTIMONY(mg/kg)					VANADIUM (mg/kg)					ZINC (mg/kg)				
Location	Field ID	Date Sampled	Result	SQL	CRDL	Qual	Valid. Qual.	Result	SQL	CRDL	Qual	Valid. Qual.	Result	SQL	CRDL	Qual	Valid. Qual.
SS600492	SS60004WC	10/09/92	18.8	18.8	12		JA	31.7	31.7	10		V	59	59	4		V
SS600592	SS60005WC	10/09/92	18.2	18.2	12		JA	33.1	33.1	10		V	31.6	31.6	4		V
SS600692	SS60006WC	10/09/92	19.4	19.4	12		JA	28.7	28.7	10		V	54.1	54.1	4		V
SS600792	SS60007WC	10/09/92	26	26	12		JA	27.9	27.9	10		V	43.8	43.8	4		V
SS600892	SS60008WC	10/23/92	23.5	23.5	12		JA	40.1	40.1	10		V	36.5	36.5	4		JA
SS600992	SS60009WC	10/23/92	5.75	11.5	12	U	V	30.9	30.9	10		V	36.2	36.2	4		JA
SS601092	SS60010WC	10/23/92	5.85	11.7	12	U	V	33.5	33.5	10		V	27.8	27.8	4		JA
SS601192	SS60011WC	10/23/92	6.12	12.25	12	U	V	37.2	37.2	10		V	52.6	52.6	4		JA
SS601292	SS60012WC	10/23/92	14.4	14.4	12		JA	31.8	31.8	10		V	42	42	4		JA
SS601392	SS60013WC	10/23/92	6	12	12	U	V	26.2	26.2	10		V	52.4	52.4	4		JA
SS601492	SS60014WC	10/26/92					R	33.8	33.8	10		V	51.7	51.7	4		JA
SS601592	SS60015WC	10/12/92	5.2	10.4	12	U	JA	38.6	38.6	10		V	44.9	44.9	4		V
SS601692	SS60016WC	10/12/92	5.2	10.4	12	U	JA	28.7	28.7	10		V	40.7	40.7	4		V
SS601792	SS60017WC	10/12/92	24.15	24.15	12		JA	32.35	32.35	10		V	51.25	51.25	4		V
SS601892	SS60018WC	10/26/92					R	27.2	27.2	10		V	36.3	36.3	4		JA
SS601992	SS60019WC	10/26/92					R	39.8	39.8	10		V	41.1	41.1	4		JA
SS602092	SS60020WC	10/26/92					R	24.8	24.8	10		V	41.6	41.6	4		JA
SS602192	SS60021WC	10/26/92					R	26.3	26.3	10		V	40.2	40.2	4		JA
SS602292	SS60022WC	10/27/92					R	29.5	29.5	10		V	48.2	48.2	4		JA
SS602392	SS60023WC	10/12/92	19.1	19.1	12		JA	35.5	35.5	10		V	60.2	60.2	4		V
SS602492	SS60024WC	10/12/92	5.2	10.4	12	U	JA	31.3	31.3	10		V	54.8	54.8	4		V
SS602592	SS60025WC	10/27/92					R	23.8	23.8	10		V	42.4	42.4	4		JA
SS602692	SS60026WC	10/27/92					R	32.7	32.7	10		V	38.2	38.2	4		JA
77192	SS60191WC	11/19/92	6.55	13.1	12	U	JA	37.6	37.6	10		V	59.7	59.7	4		JA
Number of samples			16					24					24				
Number of detects			8					24					24				
Minimum detected			14.4					23.8					27.8				
Maximum detected			24.15					40.1					60.2				
Average			13.09					31.79					45.30				
Standard Deviation			7.78					4.57					8.80				
t-value			1.753					1.714					1.714				
95% UCL			16.50					33.39					48.38				
Statistics based on log normal distribution																	
Mean of ln-t								3.449					3.794				
Std of ln-t								0.148					0.204				
H-0.95 value								1.737					1.762				
95% UCL								33.558					48.904				

ATTACHMENT J1
TABLE 3
95% UCL CONCENTRATION
AOC NO. 1
SURFACE SOIL RADIONUCLIDES

				AMERICIUM-241 (pCi/g)					PLUTONIUM-239/240 (pCi/g)				
IHSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
167.1	SS600492	SS60004WC	10/09/92	0.02	0.02			A	0.09	0.09			A
167.1	SS600592	SS60005WC	10/09/92	0.01	0.01		J	A					
167.1	SS600692	SS60006WC	10/09/92	0.03	0.03			A	0.05	0.05			A
167.1	SS600792	SS60007WC	10/09/92	0.01	0.01		J	A	0.09	0.09	0.02		A
167.1	SS600892	SS60008WC	10/23/92	0.00	0.00			A	0.01	0.01			A
167.1	SS600992	SS60009WC	10/23/92	0.02	0.02	0.00		A	0.10	0.10			A
167.1	SS601092	SS60010WC	10/23/92	0.00	0.00	0.00		A	0.02	0.02			A
167.1	SS601192	SS60011WC	10/23/92	0.02	0.02			A	0.04	0.04			A
167.1	SS601292	SS60012WC	10/23/92	0.01	0.01			A					R
167.1	SS601392	SS60013WC	10/23/92	0.02	0.02			A	0.06	0.06			A
167.1	SS601492	SS60014WC	10/26/92	0.03	0.03			A	0.13	0.13			A
167.1	SS601592	SS60015WC	10/12/92	0.02	0.02		J	A	0.06	0.06			A
167.1	SS601692	SS60016WC	10/12/92	0.03	0.03			A	0.09	0.09	0.01		A
167.1	SS601792	SS60017WC	10/12/92	0.039295	0.039295			A	0.11805	0.11805	0.016		A
167.1	SS601892	SS60018WC	10/26/92	0.02316	0.02316			A	0.06319	0.06319			A
167.1	SS601992	SS60019WC	10/26/92	0.0168	0.0168		J	A	0.03766	0.03766	0.013		A
167.1	SS602092	SS60020WC	10/26/92	0.02203	0.02203			A	0.0434	0.0434	0.027		A
167.1	SS602192	SS60021WC	10/26/92	1.147	1.147	0.004		A	1.849	1.849	0.019		A
167.1	SS602292	SS60022WC	10/27/92	0.0305	0.0305			A	0.0936	0.0936			A
167.1	SS602392	SS60023WC	10/12/92	0.02146	0.02146			A	0.1118	0.1118			A
167.1	SS602492	SS60024WC	10/12/92	0.01888	0.01888		J	A	0.05718	0.05718	0.019		A
167.1	SS602592	SS60025WC	10/27/92	0.0157	0.0157	0.004		A	0.0511	0.0511			A
167.1	SS602692	SS60026WC	10/27/92	0.0112	0.0112	0.004		A	0.0378	0.0378	0.005		A
167.1	77192	SS60191WC	11/19/92						0.05	0.05	0.01		A
Number of samples				23					22				
Number of detects				23					22				
Minimum detected				0.0041					0.0093				
Maximum detected				1.1470					1.8490				
Average				0.0686					0.1469				
Standard Deviation				0.2301					0.3727				
t-value				1.717					1.721				
95% UCL				0.1510					0.2837				
Statistics based on lon normal distribution													
Mean of ln-t				-3.872					-2.720				
Std of ln-t				1.031					0.977				
H-0.95 value				2.571					2.530				
95% UCL				0.062					0.182				

ATTACHMENT J1
TABLE 4
95% UCL CONCENTRATION
AOC NO. 1
SUBSURFACE SOIL METALS

				BARIUM (mg/kg)				
IHSS	Location	Field ID	Depth	Result	SQL	CRDL	Qual	Valid Qual
167.1	61192	BH60001WC	0-2	90.5	90.5	40		V
167.1	61192	BH60002WC	2-4	99.8	99.8	40		V
167.1	61292	BH60003WC	0-2	101	101	40		V
167.1	61292	BH60004WC	2-4	50.7	50.7	40		V
167.1	61392	BH60006WC	0-2	154	154	40		V
167.1	61392	BH60007WC	2-4	97.3	97.3	40		V
167.1	61492	BH60008WC	0-2	65.8	65.8	40		V
167.1	61492	BH60009WC	2-4	77.2	77.2	40		V
167.1	61692	BH60012WC	0-2	84.9	84.9	40		V
167.1	61692	BH60013WC	2-4	91.3	91.3	40		V
167.1	61792	BH60014WC	0-2	46.6	46.6	40		V
167.1	61792	BH60015WC	2-4	56.7	56.7	40		V
167.1	61892	BH60016WC	0-2	109	109	40		V
167.1	61892	BH60017WC	2-4	224	224	40		V
167.1	61992	BH60018WC	0-2	150.5	150.5	40		V
167.1	61992	BH60019WC	2-4.2	866	866	40		V
167.1	62092	BH60020WC	0-2	176	176	40		V
167.1	62092	BH60021WC	2-4	104	104	40		V
167.1	62192	BH60022WC	0-2	59.9	59.9	40		V
167.1	62192	BH60023WC	2-4	79.1	79.1	40		V
167.1	62292	BH60024WC	0-2	98.2	98.2	40		V
167.1	62292	BH60025WC	2-4	65.9	65.9	40		V
167.1	62392	BH60026WC	0-2	60.7	60.7	40		V
167.1	62392	BH60027WC	2-4	72.6	72.6	40		V
167.1	62492	BH60028WC	0-2	64	64	40		V
167.1	62492	BH60029WC	2-4	67.9	67.9	40		V
167.1	62592	BH60030WC	0-2	99	99	40		V
167.1	62592	BH60031WC	2-4	64.4	64.4	40		V
167.1	62692	BH60032WC	0-2	53.8	53.8	40		V
167.1	62692	BH60033WC	2-4	62.4	62.4	40		V
167.1	62792	BH60034WC	0-2	96.2	96.2	40		V
167.1	62792	BH60035WC	2-4	152	152	40		V
167.1	62892	BH60036WC	0-2	269	269	40		V
167.1	62892	BH60037WC	2-3.8	207	207	40		V
167.1	62992	BH60038WC	0-2	54.4	54.4	40		V
167.1	62992	BH60039WC	2-4	60.7	60.7	40		V
167.1	63092	BH60040WC	0-2	74	74	40		V
167.1	63092	BH60041WC	2-4	104	104	40		V
167.1	63192	BH60042WC	0-2	93.9	93.9	40		V
167.1	63192	BH60043WC	2-4	85.7	85.7	40		V
167.1	63292	BH60044WC	0-2	149	149	40		V
167.1	63292	BH60045WC	2-4	163	163	40		V
167.1	63392	BH60046WC	0-2	88.2	88.2	40		V
167.1	63392	BH60047WC	2-4.5	61.6	61.6	40		V
Number of samples				44				
Number of detects				44				
Minimum detected				46.6				
Maximum detected				866				
Average				117.09				
Standard Deviation				124.11				
t-value				1.684				
95% UCL				148.60				
Statistics based on log normal distribution								
95% UCL (see Table 1)				129.23				

ATTACHMENT J1
TABLE 5
ROCKY FLATS OU6
95% UCL CONCENTRATION
AOC NO. 1
SUBSURFACE SOIL RADIONUCLIDES

					AMERICIUM-241 (pCi/g)				
IHSS	Location	Field ID	Sample Date	Depth	Result	SQL	CRDL	Qual	Valid Qual
167.1	61192	BH60001WC	10/27/92	0-2	0.01467	0.01467		J	A
167.1	61192	BH60002WC	10/27/92	2-4	0.02471	0.02471			A
167.1	61292	BH60003WC	10/28/92	0-2	0.003687	0.003687		J	A
167.1	61292	BH60004WC	10/28/92	2-4	0.01089	0.01089		J	A
167.1	61392	BH60006WC	10/29/92	0-2	0.0131	0.0131			A
167.1	61392	BH60007WC	10/29/92	2-4	0.00275	0.00275			A
167.1	61492	BH60008WC	10/29/92	0-2	0.006235	0.006235	0.011		A
167.1	61492	BH60009WC	10/29/92	2-4	0.0127	0.0127			A
167.1	61692	BH60012WC	11/02/92	0-2	0.00311	0.00311			A
167.1	61692	BH60013WC	11/02/92	2-4	0.00229	0.00229			A
167.1	61792	BH60014WC	11/02/92	0-2	0.00115	0.00115			A
167.1	61792	BH60015WC	11/02/92	2-4	0.00785	0.00785			A
167.1	61892	BH60016WC	11/03/92	0-2	0.01995	0.01995		J	A
167.1	61892	BH60017WC	11/03/92	2-4	0.0222	0.0222			A
167.1	61992	BH60018WC	11/12/92	0-2	0.0224	0.0224			A
167.1	61992	BH60019WC	11/12/92	2-4.2	0.0061	0.0061			A
167.1	62092	BH60020WC	11/12/92	0-2					R
167.1	62092	BH60021WC	11/12/92	2-4	0.00642	0.00642			A
167.1	62192	BH60022WC	11/09/92	0-2	0.00189	0.00189			A
167.1	62192	BH60023WC	11/09/92	2-4	0.00584	0.00584			A
167.1	62292	BH60024WC	10/30/92	0-2	0.014	0.014			A
167.1	62292	BH60025WC	10/30/92	2-4	0.00103	0.00103	0.005		A
167.1	62392	BH60026WC	10/30/92	0-2	0.0116	0.0116			A
167.1	62392	BH60027WC	10/30/92	2-4	0.00786	0.00786	0.005		A
167.1	62492	BH60028WC	11/02/92	0-2	0.00513	0.00513	0.006		A
167.1	62492	BH60029WC	11/02/92	2-4	0.00478	0.00478			A
167.1	62592	BH60030WC	11/09/92	0-2	0.00205	0.00205	0.01		A
167.1	62592	BH60031WC	11/09/92	2-4	0.002	0.002			A
167.1	62692	BH60032WC	11/04/92	0-2	0.015932	0.015932			A
167.1	62692	BH60033WC	11/04/92	2-4	0.0131	0.0131	0.004	J	A
167.1	62792	BH60034WC	11/11/92	0-2	0.00107	0.00107			A
167.1	62792	BH60035WC	11/11/92	2-4	0.0023	0.0023			A
167.1	62892	BH60036WC	11/11/92	0-2	0.00619	0.00619	0.006		A
167.1	62892	BH60037WC	11/11/92	2-3.8	0	0	0.009		A
167.1	62992	BH60038WC	11/10/92	0-2	0.0143	0.0143			A
167.1	62992	BH60039WC	11/10/92	2-4	0.0043	0.0043			A
167.1	63092	BH60041WC	11/04/92	2-4	0.01297	0.01297		J	A
167.1	63192	BH60042WC	11/09/92	0-2	0.0121	0.0121	0.009		A
167.1	63192	BH60043WC	11/09/92	2-4	0.00621	0.00621			A
167.1	63292	BH60044WC	11/10/92	0-2	0.00396	0.00396			A
167.1	63292	BH60045WC	11/10/92	2-4	0.01295	0.01295	0.011		A
167.1	63392	BH60046WC	11/11/92	0-2	0.00703	0.00703			A
167.1	63392	BH60047WC	11/11/92	2-4.5	0.0033	0.0033			A
Number of samples					42				
Number of detects					42				
Minimum detected					0				
Maximum detected					0.0247				
Average					0.0084				
Standard Deviation					0.0064				
t-value					1.684				
95% UCL					0.0100				
Statistics based on log normal distribution									
95% UCL (see Table 1)					0.013				

ATTACHMENT J1
TABLE 5
ROCKY FLATS OU6
95% UCL CONCENTRATION
AOC NO. 1
SUBSURFACE SOIL RADIONUCLIDES

					PLUTONIUM-239/240 (pCi/g)				
IHSS	Location	Field ID	Sample Date	Depth	Result	SQL	CRDL	Qual	Valid Qual
167.1	61192	BH60001WC	10/27/92	0-2	0.009362	0.009362		J	A
167.1	61192	BH60002WC	10/27/92	2-4	0.00741	0.00741		J	A
167.1	61292	BH60003WC	10/28/92	0-2	0.01169	0.01169	0.019	J	A
167.1	61292	BH60004WC	10/28/92	2-4					R
167.1	61392	BH60006WC	10/29/92	0-2	0.0106	0.0106	0.008		A
167.1	61392	BH60007WC	10/29/92	2-4	0.00523	0.00523	0.008		A
167.1	61492	BH60008WC	10/29/92	0-2	0.010035	0.010035	0.011		A
167.1	61492	BH60009WC	10/29/92	2-4	0.00872	0.00872	0.007		A
167.1	61692	BH60012WC	11/02/92	0-2	0.00291	0.00291	0.007		A
167.1	61692	BH60013WC	11/02/92	2-4	0.00961	0.00961			A
167.1	61792	BH60014WC	11/02/92	0-2	0.017	0.017	0.009		A
167.1	61792	BH60015WC	11/02/92	2-4	0.00484	0.00484			A
167.1	61892	BH60016WC	11/03/92	0-2	0.06245	0.06245			A
167.1	61892	BH60017WC	11/03/92	2-4	0.01137	0.01137		J	A
167.1	61992	BH60018WC	11/12/92	0-2	0.05795	0.05795	0.007		A
167.1	61992	BH60019WC	11/12/92	2-4.2	0.00153	0.00153	0.007		A
167.1	62092	BH60020WC	11/12/92	0-2	0.0183	0.0183	0.005		A
167.1	62092	BH60021WC	11/12/92	2-4	0.00474	0.00474			A
167.1	62192	BH60022WC	11/09/92	0-2	0.00422	0.00422	0.005		A
167.1	62192	BH60023WC	11/09/92	2-4	0.00112	0.00112			A
167.1	62292	BH60024WC	10/30/92	0-2	0.0546	0.0546			A
167.1	62292	BH60025WC	10/30/92	2-4	0.00097	0.00097	0.006		A
167.1	62392	BH60026WC	10/30/92	0-2	0.0047	0.0047			A
167.1	62392	BH60027WC	10/30/92	2-4	0.00575	0.00575			A
167.1	62492	BH60028WC	11/02/92	0-2	-0.00173	-0.00173	0.011		A
167.1	62492	BH60029WC	11/02/92	2-4	0.00707	0.00707			A
167.1	62592	BH60030WC	11/09/92	0-2	0.00781	0.00781	0.009		A
167.1	62592	BH60031WC	11/09/92	2-4	0.00346	0.00346			A
167.1	62692	BH60032WC	11/04/92	0-2	0.07159	0.07159	0.024		A
167.1	62692	BH60033WC	11/04/92	2-4	0.01442	0.01442		J	A
167.1	62792	BH60034WC	11/11/92	0-2	0.0013	0.0013			A
167.1	62792	BH60035WC	11/11/92	2-4	0.00159	0.00159	0.011		A
167.1	62892	BH60036WC	11/11/92	0-2	0.00512	0.00512	0.008		A
167.1	62892	BH60037WC	11/11/92	2-3.8	0.00185	0.00185			A
167.1	62992	BH60038WC	11/10/92	0-2	0.00877	0.00877	0.006		A
167.1	62992	BH60039WC	11/10/92	2-4	-0.00117	-0.00117	0.005		A
167.1	63092	BH60041WC	11/04/92	2-4	0.01749	0.01749		J	A
167.1	63192	BH60042WC	11/09/92	0-2	0.0061	0.0061			A
167.1	63192	BH60043WC	11/09/92	2-4	0.00322	0.00322			A
167.1	63292	BH60044WC	11/10/92	0-2	0.0148	0.0148			A
167.1	63292	BH60045WC	11/10/92	2-4	0.014295	0.014295	0.009		A
167.1	63392	BH60046WC	11/11/92	0-2	0.0065	0.0065	0.006		A
167.1	63392	BH60047WC	11/11/92	2-4.5	0.0019	0.0019			A
Number of samples					42				
Number of detects					42				
Minimum detected					-0.0017				
Maximum detected					0.0716				
Average					0.0121				
Standard Deviation					0.0169				
t-value					1.684				
95% UCL					0.0165				

Statistics based on log normal distribution

95% UCL (see Table 1) 0.021

ATTACHMENT J1
TABLE 5
ROCKY FLATS OU6
95% UCL CONCENTRATION
AOC NO. 1
SUBSURFACE SOIL RADIONUCLIDES

					URANIUM-233,-234 (pCi/g)				
IHSS	Location	Field ID	Sample Date	Depth	Result	SQL	CRDL	Qual	Valid Qual
167.1	61192	BH60001WC	10/27/92	0-2	0.9392	0.9392	0.023		A
167.1	61192	BH60002WC	10/27/92	2-4	0.7499	0.7499	0.045		A
167.1	61292	BH60003WC	10/28/92	0-2	1.122	1.122	0.038		A
167.1	61292	BH60004WC	10/28/92	2-4	0.7551	0.7551	0.051		A
167.1	61392	BH60006WC	10/29/92	0-2	0.78	0.78	0.017		A
167.1	61392	BH60007WC	10/29/92	2-4	0.517	0.517	0.018		A
167.1	61492	BH60008WC	10/29/92	0-2	0.414	0.414	0.017		A
167.1	61492	BH60009WC	10/29/92	2-4	0.419	0.419	0.017		A
167.1	61692	BH60012WC	11/02/92	0-2	0.526	0.526	0.015		A
167.1	61692	BH60013WC	11/02/92	2-4	0.295	0.295	0.015		A
167.1	61792	BH60014WC	11/02/92	0-2	0.394	0.394	0.011		A
167.1	61792	BH60015WC	11/02/92	2-4	0.417	0.417	0.031		A
167.1	61892	BH60016WC	11/03/92	0-2	1.074	1.074			A
167.1	61892	BH60017WC	11/03/92	2-4	1.042	1.042	0.039		A
167.1	61992	BH60018WC	11/12/92	0-2	0.9065	0.9065	0.031		A
167.1	61992	BH60019WC	11/12/92	2-4.2	0.706	0.706	0.044		A
167.1	62092	BH60020WC	11/12/92	0-2	0.809	0.809	0.014		A
167.1	62092	BH60021WC	11/12/92	2-4	3.05	3.05	0.017		A
167.1	62192	BH60022WC	11/09/92	0-2	0.43	0.43			A
167.1	62192	BH60023WC	11/09/92	2-4	0.365	0.365	0.015		A
167.1	62292	BH60024WC	10/30/92	0-2	0.618	0.618	0.018		A
167.1	62292	BH60025WC	10/30/92	2-4	0.387	0.387	0.018		A
167.1	62392	BH60026WC	10/30/92	0-2	0.721	0.721	0.016		A
167.1	62392	BH60027WC	10/30/92	2-4	0.563	0.563			A
167.1	62492	BH60028WC	11/02/92	0-2	0.638	0.638	0.014		A
167.1	62492	BH60029WC	11/02/92	2-4	0.6	0.6	0.016		A
167.1	62592	BH60030WC	11/09/92	0-2	0.691	0.691	0.017		A
167.1	62592	BH60031WC	11/09/92	2-4	0.516	0.516	0.019		A
167.1	62692	BH60032WC	11/04/92	0-2	0.77335	0.77335	0.063		A
167.1	62692	BH60033WC	11/04/92	2-4	0.8311	0.8311	0.045		A
167.1	62792	BH60034WC	11/11/92	0-2	0.589	0.589	0.026		A
167.1	62792	BH60035WC	11/11/92	2-4	0.322	0.322			A
167.1	62892	BH60036WC	11/11/92	0-2	0.591	0.591	0.016		A
167.1	62892	BH60037WC	11/11/92	2-3.8	1.49	1.49	0.013		A
167.1	62992	BH60038WC	11/10/92	0-2	0.534	0.534	0.016		A
167.1	62992	BH60039WC	11/10/92	2-4	0.386	0.386			A
167.1	63092	BH60041WC	11/04/92	2-4	1.115	1.115	0.043		A
167.1	63192	BH60042WC	11/09/92	0-2	0.307	0.307	0.016		A
167.1	63192	BH60043WC	11/09/92	2-4	0.402	0.402	0.025		A
167.1	63292	BH60044WC	11/10/92	0-2	0.944	0.944	0.014		A
167.1	63292	BH60045WC	11/10/92	2-4	0.7005	0.7005	0.02		A
167.1	63392	BH60046WC	11/11/92	0-2	0.662	0.662	0.017		A
167.1	63392	BH60047WC	11/11/92	2-4.5	0.484	0.484	0.016		A
Number of samples					43				
Number of detects					43				
Minimum detected					0.295				
Maximum detected					3.05				
Average					0.7111				
Standard Deviation					0.4435				
t-value					1.684				
95% UCL					0.8250				
Statistics based on log normal distribution									
95% UCL (see Table 1)					0.800				

ATTACHMENT J1
TABLE 5
ROCKY FLATS OU6
95% UCL CONCENTRATION
AOC NO. 1
SUBSURFACE SOIL RADIONUCLIDES

					URANIUM-238				
IHSS	Location	Field ID	Sample Date	Depth	Result	SQL	CRDL	Qual	Valid Qual
167.1	61192	BH60001WC	10/27/92	0-2	0.7952	0.7952			A
167.1	61192	BH60002WC	10/27/92	2-4	0.9831	0.9831			A
167.1	61292	BH60003WC	10/28/92	0-2	1.06	1.06	0.027		A
167.1	61292	BH60004WC	10/28/92	2-4	0.9021	0.9021	0.029		A
167.1	61392	BH60006WC	10/29/92	0-2	0.839	0.839	0.017		A
167.1	61392	BH60007WC	10/29/92	2-4	0.455	0.455	0.018		A
167.1	61492	BH60008WC	10/29/92	0-2	0.337	0.337			A
167.1	61492	BH60009WC	10/29/92	2-4	0.412	0.412	0.017		A
167.1	61692	BH60012WC	11/02/92	0-2	0.591	0.591	0.015		A
167.1	61692	BH60013WC	11/02/92	2-4	0.309	0.309	0.015		A
167.1	61792	BH60014WC	11/02/92	0-2	0.521	0.521			A
167.1	61792	BH60015WC	11/02/92	2-4	0.402	0.402	0.031		A
167.1	61892	BH60016WC	11/03/92	0-2	1.261	1.261			A
167.1	61892	BH60017WC	11/03/92	2-4	0.7794	0.7794	0.039		A
167.1	61992	BH60018WC	11/12/92	0-2	0.9485	0.9485	0.022		A
167.1	61992	BH60019WC	11/12/92	2-4.2	0.888	0.888	0.036		A
167.1	62092	BH60020WC	11/12/92	0-2	0.865	0.865	0.014		A
167.1	62092	BH60021WC	11/12/92	2-4	2.77	2.77	0.017		A
167.1	62192	BH60022WC	11/09/92	0-2	0.401	0.401			A
167.1	62192	BH60023WC	11/09/92	2-4	0.38	0.38	0.015		A
167.1	62292	BH60024WC	10/30/92	0-2	0.76	0.76	0.018		A
167.1	62292	BH60025WC	10/30/92	2-4	0.551	0.551			A
167.1	62392	BH60026WC	10/30/92	0-2	0.627	0.627			A
167.1	62392	BH60027WC	10/30/92	2-4	0.594	0.594			A
167.1	62492	BH60028WC	11/02/92	0-2	0.513	0.513	0.014		A
167.1	62492	BH60029WC	11/02/92	2-4	0.481	0.481	0.016		A
167.1	62592	BH60030WC	11/09/92	0-2	0.566	0.566			A
167.1	62592	BH60031WC	11/09/92	2-4	0.635	0.635	0.019		A
167.1	62692	BH60032WC	11/04/92	0-2	1.06535	1.06535	0.063		A
167.1	62692	BH60033WC	11/04/92	2-4	0.775	0.775	0.032		A
167.1	62792	BH60034WC	11/11/92	0-2	0.624	0.624	0.018		A
167.1	62792	BH60035WC	11/11/92	2-4	0.706	0.706			A
167.1	62892	BH60036WC	11/11/92	0-2	0.864	0.864	0.016		A
167.1	62892	BH60037WC	11/11/92	2-3.8	141	141			A
167.1	62992	BH60038WC	11/10/92	0-2	0.496	0.496	0.016		A
167.1	62992	BH60039WC	11/10/92	2-4	0.358	0.358	0.015		A
167.1	63092	BH60041WC	11/04/92	2-4	0.901	0.901	0.075		A
167.1	63192	BH60042WC	11/09/92	0-2	0.299	0.299	0.016		A
167.1	63192	BH60043WC	11/09/92	2-4	0.308	0.308	0.018		A
167.1	63292	BH60044WC	11/10/92	0-2	0.699	0.699	0.014		A
167.1	63292	BH60045WC	11/10/92	2-4	0.8025	0.8025	0.02		A
167.1	63392	BH60046WC	11/11/92	0-2	0.587	0.587	0.017		A
167.1	63392	BH60047WC	11/11/92	2-4.5	0.484	0.484	0.016		A
Number of samples					43				
Number of detects					43				
Minimum detected					0.299				
Maximum detected					141				
Average					3.9673				
Standard Deviation					21.1483				
t-value					1.684				
95% UCL					9.3984				
Statistics based on log normal distribution									
95% UCL (see Table 1)					1.54				

ATTACHMENT J1
TABLE 6
95% UCL CONCENTRATION
AOC NO. 2, 30-ACRE AREA
SURFACE SOIL METALS

				ANTIMONY(mg/kg)					SILVER (mg/kg)				
IHSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid. Qual.	Result	SQL	CRDL	Qual	Valid. Qual.
141	SS609792	SS60097WC	10/07/92	10.6	10.6	12	B	JA	1.3	1.3	2	B	V
141	SS609892	SS60098WC	10/07/92	5.25	10.5	12	U	V	0.425	0.85	2	U	V
141	SS609992	SS60099WC	10/07/92	14.3	14.3	12		JA	0.44	0.88	2	U	V
141	SS610492	SS60104WC	10/08/92	15.1	15.1	12		JA	0.425	0.85	2	U	V
141	SS610592	SS60105WC	10/08/92	18.7	18.7	12		JA	0.43	0.86	2	U	V
141	SS610692	SS60106WC	10/08/92	5.5	11	12	U	V	0.445	0.89	2	U	V
141	SS611192	SS60111WC	10/08/92	5.1	10.2	12	U	V	0.415	0.83	2	U	V
141	SS611292	SS60112WC	10/08/92	13.7	13.7	12		JA	0.425	0.85	2	U	V
141	SS611392	SS60113WC	10/08/92	5.4	10.8	12	U	V	0.44	0.88	2	U	V
141	SS612092	SS60120WC	09/28/92	5.8	11.6	12	U	JA	7.8	7.8	2		V
141	SS612192	SS60121WC	09/29/92	6.7	13.4	12	U	JA	52.7	52.7	2		V
141	SS612892	SS60128WC	09/29/92	11.2	22.4	12	U	JA	0.41	0.82	2	U	JA
141	SS612992	SS60129WC	09/29/92	13.25	26.5	12	U	JA	0.41	0.82	2	U	JA
141	SS613092	SS60130WC	09/29/92	9.55	19.1	12	U	JA	0.41	0.82	2	U	JA
141	SS613192	SS60131WC	10/01/92	5.1	10.2	12	U	V	0.415	0.83	2	U	JA
141	SS613292	SS60132WC	10/01/92	5.15	10.3	12	U	V	0.42	0.84	2	U	V
141	SS613392	SS60133WC	09/29/92	6.125	12.25	12	U	V	0.41	0.82	2	U	V
141	SS613492	SS60134WC	09/29/92	5.1	10.2	12	U	V	0.415	0.83	2	U	V
141	SS613592	SS60135WC	09/29/92	6.5	13	12	U	JA	0.415	0.83	2	U	V
141	SS613692	SS60136WC	10/01/92	10.8	10.8	12	B	JA	0.405	0.81	2	U	V
141	SS613792	SS60137WC	10/01/92	5.2	10.4	12	U	V	4.9	4.9	2		V
141	SS613892	SS60138WC	10/01/92	17.5	17.5	12		JA	0.425	0.85	2	U	V
141	SS613992	SS60139WC	10/01/92	15.9	15.9	12		JA	0.415	0.83	2	U	V
141	SS614092	SS60140WC	10/01/92	5.05	10.1	12	U	V	0.41	0.82	2	U	V
141	SS614192	SS60141WC	10/01/92	5.15	10.3	12	U	V	0.415	0.83	2	U	V
141	SS614292	SS60142WC	10/01/92	17.2	17.2	12		JA	0.415	0.83	2	U	V
141	SS614392	SS60143WC	10/01/92	18.65	18.65	12		JA	0.42	0.84	2	U	V
141	SS614492	SS60144WC	10/05/92	14.6	14.6	12		V	0.425	0.85	2	U	V
141	SS614592	SS60145WC	10/05/92	5.2	10.4	12	U	V	2.5	2.5	2		V
141	SS614692	SS60146WC	10/05/92	17.9	17.9	12		V	8.9	8.9	2		V
141	SS614792	SS60147WC	10/06/92	15.9	15.9	12		JA	4.9	4.9	2		V
141	SS614892	SS60148WC	10/06/92	5.25	10.5	12	U	V	1.8	1.8	2	B	V
141	SS614992	SS60149WC	10/06/92	14.3	14.3	12		JA	2.2	2.2	2		V
141	SS615092	SS60150WC	10/06/92	14.9	14.9	12		JA	3.1	3.1	2		V
141	SS615192	SS60151WC	10/06/92	5.35	10.7	12	U	V	3.1	3.1	2		V
141	SS615292	SS60152WC	10/07/92	11.9	11.9	12	B	JA	0.44	0.88	2	U	V
141	SS620792	SS60207WC	02/12/93	7.1	14.2	12	U	JA	0.45	0.9	2	U	V
141	SS620892	SS60208WC	02/12/93	7.05	14.1	12	U	JA	0.445	0.89	2	U	V
141	SS620992	SS60209WC	02/12/93	7.05	14.1	12	U	JA	0.445	0.89	2	U	V

ATTACHMENT J1
TABLE 6
95% UCL CONCENTRATION
AOC NO. 2, 30-ACRE AREA
SURFACE SOIL METALS

				ANTIMONY(mg/kg)					SILVER (mg/kg)				
IHSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid. Qual.	Result	SQL	CRDL	Qual	Valid. Qual.
141	SS621092	SS60210WC	02/12/93	6.45	12.9	12	U	JA	0.405	0.81	2	U	V
156.2	SS602892	SS60028WC	01/06/93	6.85	13.7	12	U	JA	0.75	1.5	2	U	V
156.2	SS606792	SS60067WC	10/15/92	12.2	12.2	12	B	JA	0.65	1.3	2	U	V
156.2	SS606892	SS60068WC	10/15/92	23.8	23.8	12		JA	0.65	1.3	2	U	V
156.2	SS606992	SS60069WC	10/16/92	38.9	38.9	12		JA	0.6	1.2	2	U	V
156.2	SS607192	SS60071WC	10/15/92	30.4	30.4	12		JA	0.6	1.2	2	U	V
156.2	SS607292	SS60072WC	10/16/92	16.5	16.5	12		JA	0.65	1.3	2	U	V
156.2	SS607592	SS60075WC	10/16/92	18.2	18.2	12		JA	0.6	1.2	2	U	V
156.2	SS607692	SS60076WC	10/16/92	14.1	14.1	12		JA	0.65	1.3	2	U	V
156.2	SS607892	SS60078WC	10/16/92	30.8	30.8	12		JA	0.65	1.3	2	U	V
165	SS603092	SS60030WC	01/27/93					R	0.45	0.9	2	U	V
165	SS603192	SS60031WC	01/27/93					R	0.43	0.86	2	U	V
165	SS603292	SS60032WC	01/27/93					R	0.435	0.87	2	U	V
165	SS606192	SS60061WC	10/28/92					R	0.7	1.4	2	U	V
165	SS606292	SS60062WC	10/28/92	13.4	13.4	12	B	JA	0.7	1.4	2	U	V
165	SS606392	SS60063WC	10/29/92					R	0.65	1.3	2	U	V
165	SS606492	SS60064WC	10/29/92					R	0.65	1.3	2	U	V
165	SS606592	SS60065WC	10/29/92	27.4	27.4	12		JA	0.65	1.3	2	U	V
165	SS606692	SS60066WC	10/29/92	13.1	13.1	12	B	JA	0.7	1.4	2	U	V
165	SS620092	SS60200WC	01/27/93					R	0.43	0.86	2	U	V
165	SS620192	SS60201WC	01/29/93	6.4	12.8	12	U	JA	0.4	0.8	2	U	V
165	SS620292	SS60202WC	01/29/93	7.25	14.5	12	U	JA	0.455	0.91	2	U	V
165	SS620392	SS60203WC	01/28/93	6	12	12	U	JA	0.38	0.76	2	U	V
165	SS620492	SS60204WC	01/28/93	6.7	13.4	12	U	JA	0.425	0.85	2	U	V
165	SS620592	SS60205WC	01/28/93	6.2	12.4	12	U	JA	0.39	0.78	2	U	V
Number of samples				57					64				
Number of detects				27					11				
Minimum detected				10.6					1.3				
Maximum detected				38.9					52.7				
Average				11.84					1.86				
Standard Deviation				7.41					6.61				
t-value				1.684					1.671				
95% UCL				13.49					3.24				
Statistics based on log normal distribution													
95% UCL (see Table 1)				14.09					2.64				

ATTACHMENT J1
TABLE 6
95% UCL CONCENTRATION
AOC NO. 2, 30-ACRE AREA
SURFACE SOIL METALS

				VANADIUM (mg/kg)					ZINC (mg/kg)				
IHSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid. Qual.	Result	SQL	CRDL	Qual	Valid. Qual.
141	SS609792	SS60097WC	10/07/92	26.5	26.5	10		V	60.1	60.1	4		JA
141	SS609892	SS60098WC	10/07/92	28.4	28.4	10		V	64.2	64.2	4		JA
141	SS609992	SS60099WC	10/07/92	28.4	28.4	10		V	153	153	4		JA
141	SS610492	SS60104WC	10/08/92	32.1	32.1	10		V	70.2	70.2	4		JA
141	SS610592	SS60105WC	10/08/92	29.2	29.2	10		V	89.6	89.6	4		JA
141	SS610692	SS60106WC	10/08/92	32.5	32.5	10		V	207	207	4		JA
141	SS611192	SS60111WC	10/08/92	32.05	32.05	10		V	59.55	59.55	4		JA
141	SS611292	SS60112WC	10/08/92	37.6	37.6	10		V	49.1	49.1	4		JA
141	SS611392	SS60113WC	10/08/92	28.2	28.2	10		V	61.9	61.9	4		JA
141	SS612092	SS60120WC	09/28/92	25.3	25.3	10		V	244	244	4		JA
141	SS612192	SS60121WC	09/29/92	22.2	22.2	10		V	650	650	4		JA
141	SS612892	SS60128WC	09/29/92	67.2	67.2	10		V	81.2	81.2	4		JA
141	SS612992	SS60129WC	09/29/92	75.9	75.9	10		V	67.1	67.1	4		JA
141	SS613092	SS60130WC	09/29/92	75.5	75.5	10		V	84.3	84.3	4		JA
141	SS613192	SS60131WC	10/01/92	38.5	38.5	10		V	70.8	70.8	4		JA
141	SS613292	SS60132WC	10/01/92	25.2	25.2	10		V	75.2	75.2	4		JA
141	SS613392	SS60133WC	09/29/92	34.55	34.55	10		V	89.35	89.35	4		JA
141	SS613492	SS60134WC	09/29/92	34.4	34.4	10		V	80.5	80.5	4		JA
141	SS613592	SS60135WC	09/29/92	36.3	36.3	10		V	87	87	4		JA
141	SS613692	SS60136WC	10/01/92	33.3	33.3	10		V	82.3	82.3	4		JA
141	SS613792	SS60137WC	10/01/92	32.7	32.7	10		V	77.1	77.1	4		JA
141	SS613892	SS60138WC	10/01/92	33.5	33.5	10		V	61	61	4		JA
141	SS613992	SS60139WC	10/01/92	31.6	31.6	10		V	52.3	52.3	4		JA
141	SS614092	SS60140WC	10/01/92	35.2	35.2	10		V	66	66	4		JA
141	SS614192	SS60141WC	10/01/92	31.7	31.7	10		V	67.1	67.1	4		JA
141	SS614292	SS60142WC	10/01/92	43.6	43.6	10		V	77.7	77.7	4		JA
141	SS614392	SS60143WC	10/01/92	34.4	34.4	10		V	64.95	64.95	4		JA
141	SS614492	SS60144WC	10/05/92	37.6	37.6	10		V	67.4	67.4	4		V
141	SS614592	SS60145WC	10/05/92	35.5	35.5	10		V	65.1	65.1	4		V
141	SS614692	SS60146WC	10/05/92	30.5	30.5	10		V	72.6	72.6	4		V
141	SS614792	SS60147WC	10/06/92	32.1	32.1	10		V	73.5	73.5	4		JA
141	SS614892	SS60148WC	10/06/92	33.8	33.8	10		V	85.1	85.1	4		JA
141	SS614992	SS60149WC	10/06/92	34.2	34.2	10		V	89.5	89.5	4		JA
141	SS615092	SS60150WC	10/06/92	35.45	35.45	10		V	80.4	80.4	4		JA
141	SS615192	SS60151WC	10/06/92	32.8	32.8	10		V	67.6	67.6	4		JA
141	SS615292	SS60152WC	10/07/92	35.5	35.5	10		V	65.7	65.7	4		JA
141	SS620792	SS60207WC	02/12/93	20.9	20.9	10		V	58.6	58.6	4		V
141	SS620892	SS60208WC	02/12/93	27.1	27.1	10		V	54.7	54.7	4		V
141	SS620992	SS60209WC	02/12/93	28.5	28.5	10		V	56.2	56.2	4		V

ATTACHMENT J1
TABLE 6
95% UCL CONCENTRATION
AOC NO. 2, 30-ACRE AREA
SURFACE SOIL METALS

				VANADIUM (mg/kg)					ZINC (mg/kg)				
IHSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid. Qual.	Result	SQL	CRDL	Qual	Valid. Qual.
141	SS621092	SS60210WC	02/12/93	19.7	19.7	10		V	89.2	89.2	4		V
156.2	SS602892	SS60028WC	01/06/93	20.4	20.4	10		V	57.3	57.3	4		JA
156.2	SS606792	SS60067WC	10/15/92	24	24	10		JA	46.5	46.5	4		JA
156.2	SS606892	SS60068WC	10/15/92	37.5	37.5	10		JA	48.1	48.1	4		JA
156.2	SS606992	SS60069WC	10/16/92	40.1	40.1	10		JA	72.3	72.3	4		JA
156.2	SS607192	SS60071WC	10/15/92	44.2	44.2	10		JA	53.6	53.6	4		JA
156.2	SS607292	SS60072WC	10/16/92	42.7	42.7	10		JA	50.6	50.6	4		JA
156.2	SS607592	SS60075WC	10/16/92	38.6	38.6	10		JA	45.7	45.7	4		JA
156.2	SS607692	SS60076WC	10/16/92	37.8	37.8	10		JA	58.5	58.5	4		JA
156.2	SS607892	SS60078WC	10/16/92	49.9	49.9	10		JA	61.6	61.6	4		JA
165	SS603092	SS60030WC	01/27/93	20.2	20.2	10		V	74.7	74.7	4		V
165	SS603192	SS60031WC	01/27/93	15.3	15.3	10		V	34.4	34.4	4		V
165	SS603292	SS60032WC	01/27/93	20.9	20.9	10		V	37.5	37.5	4		V
165	SS606192	SS60061WC	10/28/92	24.7	24.7	10		V	68.4	68.4	4		V
165	SS606292	SS60062WC	10/28/92	20.8	20.8	10		V	86.3	86.3	4		V
165	SS606392	SS60063WC	10/29/92	19.9	19.9	10		V	85.6	85.6	4		V
165	SS606492	SS60064WC	10/29/92	17	17	10		V	48.6	48.6	4		V
165	SS606592	SS60065WC	10/29/92	18.65	18.65	10		V	77.2	77.2	4		V
165	SS606692	SS60066WC	10/29/92	34.8	34.8	10		V	117	117	4		V
165	SS620092	SS60200WC	01/27/93	13.7	13.7	10		V	42.9	42.9	4		V
165	SS620192	SS60201WC	01/29/93	26.4	26.4	10		V	52.3	52.3	4		V
165	SS620292	SS60202WC	01/29/93	13.9	13.9	10		V	38.9	38.9	4		V
165	SS620392	SS60203WC	01/28/93	12.7	12.7	10		V	46.8	46.8	4		V
165	SS620492	SS60204WC	01/28/93	16.4	16.4	10		V	33.9	33.9	4		V
165	SS620592	SS60205WC	01/28/93	19.1	19.1	10		V	34.3	34.3	4		V
Number of samples				64					64				
Number of detects				64					64				
Minimum detected				12.7					33.9				
Maximum detected				75.9					650				
Average				31.55					81.11				
Standard Deviation				12.29					79.30				
t-value				1.671					1.671				
95% UCL				34.12					97.68				

Statistics based on log normal distribution

95% UCL (see Table 1) 34.31 85.66

ATTACHMENT J1
TABLE 7
95% UCL CONCENTRATION
AOC NO. 2, 30-ACRE AREA
SURFACE SOIL RADIONUCLIDES

				AMERICIUM-241 (pCi/g)					PLUTONIUM-239/240 (pCi/g)				
IHSS	Location	Field Id	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
141	SS609792	SS60097WC	10/07/92	0.5903	0.5903			A	1.513	1.513	0.025		A
141	SS609892	SS60098WC	10/07/92	0.3039	0.3039			A	0.3292	0.3292			A
141	SS609992	SS60099WC	10/07/92	0.291	0.291			A	0.1873	0.1873			A
141	SS610492	SS60104WC	10/08/92	0.4133	0.4133			A	1.049	1.049			A
141	SS610592	SS60105WC	10/08/92	1.842	1.842			A	10.38	10.38			A
141	SS610692	SS60106WC	10/08/92	0.5622	0.5622			A	0.3806	0.3806			A
141	SS611192	SS60111WC	10/08/92	0.52515	0.52515			A	1.9235	1.9235			A
141	SS611292	SS60112WC	10/08/92	0.3364	0.3364			A	2.612	2.612	0.015		A
141	SS611392	SS60113WC	10/08/92	0.5655	0.5655	0.005		A	1.787	1.787			A
141	SS612092	SS60120WC	09/28/92					R	0.709	0.709			A
141	SS612192	SS60121WC	09/29/92					R					R
141	SS612892	SS60128WC	09/29/92					R					R
141	SS612992	SS60129WC	09/29/92					R					R
141	SS613092	SS60130WC	09/29/92					R					R
141	SS613192	SS60131WC	10/01/92					R	0.142	0.142			A
141	SS613292	SS60132WC	10/01/92					R	0.433	0.433			A
141	SS613392	SS60133WC	09/29/92					R					R
141	SS613492	SS60134WC	09/29/92					R					R
141	SS613592	SS60135WC	09/29/92					R					R
141	SS613692	SS60136WC	10/01/92					R	0.0566	0.0566			A
141	SS613792	SS60137WC	10/01/92					R	2.61	2.61			A
141	SS613892	SS60138WC	10/01/92					R	0.639	0.639			A
141	SS613992	SS60139WC	10/01/92					R	0.303	0.303			A
141	SS614092	SS60140WC	10/01/92					R	0.238	0.238			A
141	SS614192	SS60141WC	10/01/92					R	0.369	0.369			A
141	SS614292	SS60142WC	10/01/92					R	0.444	0.444			A
141	SS614392	SS60143WC	10/01/92					R	0.845	0.845			A
141	SS614492	SS60144WC	10/05/92	0.5655	0.5655			A	2.568	2.568			A
141	SS614592	SS60145WC	10/05/92	0.7374	0.7374			A	1.618	1.618	0.006		A
141	SS614692	SS60146WC	10/05/92	1.156	1.156			A	3.062	3.062			A
141	SS614892	SS60148WC	10/06/92	0.2982	0.2982			A	0.639	0.639			A
141	SS614992	SS60149WC	10/06/92	0.8111	0.8111			A	3.487	3.487	0.024		A
141	SS615092	SS60150WC	10/06/92	1.22815	1.22815			A	3.8675	3.8675	0.037		A
141	SS615192	SS60151WC	10/06/92	1.551	1.551	0.006		A	3.844	3.844			A
141	SS615292	SS60152WC	10/07/92	0.2669	0.2669			A	0.7332	0.7332			A
141	SS620792	SS60207WC	02/12/93	0.4044	0.4044	0.003		A	0.3646	0.3646	0.009		A
141	SS620892	SS60208WC	02/12/93	0.2531	0.2531	0.003		A	0.3671	0.3671	0.007		A

ATTACHMENT J1
TABLE 7
95% UCL CONCENTRATION
AOC NO. 2, 30-ACRE AREA
SURFACE SOIL RADIONUCLIDES

				AMERICIUM-241 (pCi/g)					PLUTONIUM-239/240 (pCi/g)				
IHSS	Location	Field Id	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
141	SS620992	SS60209WC	02/12/93	0.3786	0.3786	0.003		A	0.3522	0.3522	0.004		A
141	SS621092	SS60210WC	02/12/93	0.5925	0.5925	0.006		A	0.9841	0.9841	0.004		A
156.2	SS602892	SS60028WC	01/06/93	0.1009	0.1009			A	0.1216	0.1216			A
156.2	SS606792	SS60067WC	10/15/92	0.0476	0.0476			A	0.06847	0.06847	0.02		A
156.2	SS606892	SS60068WC	10/15/92	0.162	0.162			A	0.09816	0.09816	0.018		A
156.2	SS606992	SS60069WC	10/16/92	0.07033	0.07033			A	0.06659	0.06659	0.008		A
156.2	SS607192	SS60071WC	10/15/92	0.1068	0.1068			A	0.06906	0.06906			A
156.2	SS607292	SS60072WC	10/16/92	0.09206	0.09206			A	0.09897	0.09897			A
156.2	SS607592	SS60075WC	10/16/92	0.06872	0.06872			A	0.03398	0.03398			A
156.2	SS607692	SS60076WC	10/16/92	0.3012	0.3012			A	0.6637	0.6637			A
156.2	SS607892	SS60078WC	10/16/92	0.06419	0.06419			A	0.06426	0.06426			A
165	SS603092	SS60030WC	01/27/93	1.64	1.64	0.013			1.76	1.76	0.0094		
165	SS603192	SS60031WC	01/27/93	0.0671	0.0671	0.0095			0.0324	0.0324	0.0095		
165	SS603292	SS60032WC	01/27/93	0.499	0.499	0.0032			0.384	0.384	0.0036		
165	SS606192	SS60061WC	10/28/92	0.9943	0.9943			A	0.06033	0.06033			A
165	SS606292	SS60062WC	10/28/92	0.02481	0.02481			A	0.5102	0.5102			A
165	SS606392	SS60063WC	10/29/92	1.083	1.083	0.018		A	0.7775	0.7775	0.027		A
165	SS606492	SS60064WC	10/29/92	1.328	1.328			A	0.8529	0.8529	0.018		A
165	SS606592	SS60065WC	10/29/92	3.2425	3.2425			A	2.5625	2.5625	0.047		A
165	SS606692	SS60066WC	10/29/92	3.027	3.027			A	3.148	3.148	0.045		A
165	SS620092	SS60200WC	01/27/93	0.302	0.302	0.0091			0.225	0.225	0.004		
165	SS620192	SS60201WC	01/29/93	2.44	2.44			A	6.241	6.241			A
165	SS620292	SS60202WC	01/29/93	0.1591	0.1591			A	0.0945	0.0945			A
165	SS620392	SS60203WC	01/28/93					R	1.346	1.346	0.009		A
165	SS620492	SS60204WC	01/28/93					R	15.22	15.22	0.005		A
Number of samples				42					55				
Number of detects				42					55				
Minimum detected				0.0248					0.0324				
Maximum detected				3.2425					15.22				
Average				0.7022					1.5152				
Standard Deviation				0.7690					2.5763				
t-value				1.684					1.684				
95% UCL				0.9020					2.1002				
Statistics based on loG normal distribution													
95% UCL (see Table 1)				1.2700					3.1000				

ATTACHMENT J1
TABLE 8
95% UCL CONCENTRATION
AOC NO. 2 , TOTAL AREA
SURFACE SOIL METALS

				ANTIMONY(mg/kg)					SILVER (mg/kg)				
IHSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid. Qual.	Result	SQL	CRDL	Qual	Valid. Qual.
141	SS609792	SS60097WC	10/07/92	10.6	10.6	12	B	JA	1.3	1.3	2	B	V
141	SS609892	SS60098WC	10/07/92	5.25	10.5	12	U	V	0.425	0.85	2	U	V
141	SS609992	SS60099WC	10/07/92	14.3	14.3	12		JA	0.44	0.88	2	U	V
141	SS610492	SS60104WC	10/08/92	15.1	15.1	12		JA	0.425	0.85	2	U	V
141	SS610592	SS60105WC	10/08/92	18.7	18.7	12		JA	0.43	0.86	2	U	V
141	SS610692	SS60106WC	10/08/92	5.5	11	12	U	V	0.445	0.89	2	U	V
141	SS611192	SS60111WC	10/08/92	5.1	10.2	12	U	V	0.415	0.83	2	U	V
141	SS611292	SS60112WC	10/08/92	13.7	13.7	12		JA	0.425	0.85	2	U	V
141	SS611392	SS60113WC	10/08/92	5.4	10.8	12	U	V	0.44	0.88	2	U	V
141	SS612092	SS60120WC	09/28/92	5.8	11.6	12	U	JA	7.8	7.8	2		V
141	SS612192	SS60121WC	09/29/92	6.7	13.4	12	U	JA	52.7	52.7	2		V
141	SS612892	SS60128WC	09/29/92	11.2	22.4	12	U	JA	0.41	0.82	2	U	JA
141	SS612992	SS60129WC	09/29/92	13.25	26.5	12	U	JA	0.41	0.82	2	U	JA
141	SS613092	SS60130WC	09/29/92	9.55	19.1	12	U	JA	0.41	0.82	2	U	JA
141	SS613192	SS60131WC	10/01/92	5.1	10.2	12	U	V	0.415	0.83	2	U	JA
141	SS613292	SS60132WC	10/01/92	5.15	10.3	12	U	V	0.42	0.84	2	U	V
141	SS613392	SS60133WC	09/29/92	6.125	12.25	12	U	V	0.41	0.82	2	U	V
141	SS613492	SS60134WC	09/29/92	5.1	10.2	12	U	V	0.415	0.83	2	U	V
141	SS613592	SS60135WC	09/29/92	6.5	13	12	U	JA	0.415	0.83	2	U	V
141	SS613692	SS60136WC	10/01/92	10.8	10.8	12	B	JA	0.405	0.81	2	U	V
141	SS613792	SS60137WC	10/01/92	5.2	10.4	12	U	V	4.9	4.9	2		V
141	SS613892	SS60138WC	10/01/92	17.5	17.5	12		JA	0.425	0.85	2	U	V
141	SS613992	SS60139WC	10/01/92	15.9	15.9	12		JA	0.415	0.83	2	U	V
141	SS614092	SS60140WC	10/01/92	5.05	10.1	12	U	V	0.41	0.82	2	U	V
141	SS614192	SS60141WC	10/01/92	5.15	10.3	12	U	V	0.415	0.83	2	U	V
141	SS614292	SS60142WC	10/01/92	17.2	17.2	12		JA	0.415	0.83	2	U	V
141	SS614392	SS60143WC	10/01/92	18.65	18.65	12		JA	0.42	0.84	2	U	V
141	SS614492	SS60144WC	10/05/92	14.6	14.6	12		V	0.425	0.85	2	U	V
141	SS614592	SS60145WC	10/05/92	5.2	10.4	12	U	V	2.5	2.5	2		V
141	SS614692	SS60146WC	10/05/92	17.9	17.9	12		V	8.9	8.9	2		V
141	SS614792	SS60147WC	10/06/92	15.9	15.9	12		JA	4.9	4.9	2		V
141	SS614892	SS60148WC	10/06/92	5.25	10.5	12	U	V	1.8	1.8	2	B	V
141	SS614992	SS60149WC	10/06/92	14.3	14.3	12		JA	2.2	2.2	2		V
141	SS615092	SS60150WC	10/06/92	14.9	14.9	12		JA	3.1	3.1	2		V
141	SS615192	SS60151WC	10/06/92	5.35	10.7	12	U	V	3.1	3.1	2		V
141	SS615292	SS60152WC	10/07/92	11.9	11.9	12	B	JA	0.44	0.88	2	U	V
141	SS620792	SS60207WC	02/12/93	7.1	14.2	12	U	JA	0.45	0.9	2	U	V
141	SS620892	SS60208WC	02/12/93	7.05	14.1	12	U	JA	0.445	0.89	2	U	V
141	SS620992	SS60209WC	02/12/93	7.05	14.1	12	U	JA	0.445	0.89	2	U	V
141	SS621092	SS60210WC	02/12/93	6.45	12.9	12	U	JA	0.405	0.81	2	U	V
156.2	SS602892	SS60028WC	01/06/93	6.85	13.7	12	U	JA	0.75	1.5	2	U	V
156.2	SS602992	SS60029WC	01/06/93	7.6	15.2	12	U	JA	0.8	1.6	2	U	V
156.2	SS606792	SS60067WC	10/15/92	12.2	12.2	12	B	JA	0.65	1.3	2	U	V
156.2	SS606892	SS60068WC	10/15/92	23.8	23.8	12		JA	0.65	1.3	2	U	V
156.2	SS606992	SS60069WC	10/16/92	38.9	38.9	12		JA	0.6	1.2	2	U	V
156.2	SS607092	SS60070WC	10/15/92	22.9	22.9	12		JA	0.65	1.3	2	U	V
156.2	SS607192	SS60071WC	10/15/92	30.4	30.4	12		JA	0.6	1.2	2	U	V
156.2	SS607292	SS60072WC	10/16/92	16.5	16.5	12		JA	0.65	1.3	2	U	V
156.2	SS607392	SS60073WC	10/16/92					R	0.65	1.3	2	U	V
156.2	SS607492	SS60074WC	10/16/92	23.1	23.1	12		JA	0.65	1.3	2	U	V
156.2	SS607592	SS60075WC	10/16/92	18.2	18.2	12		JA	0.6	1.2	2	U	V
156.2	SS607692	SS60076WC	10/16/92	14.1	14.1	12		JA	0.65	1.3	2	U	V

ATTACHMENT J1
TABLE 8
95% UCL CONCENTRATION
AOC NO. 2 , TOTAL AREA
SURFACE SOIL METALS

				ANTIMONY(mg/kg)					SILVER (mg/kg)				
IHSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid. Qual.	Result	SQL	CRDL	Qual	Valid. Qual.
156.2	SS607792	SS60077WC	10/16/92	43.6	43.6	12		JA	0.65	1.3	2	U	V
156.2	SS607892	SS60078WC	10/16/92	30.8	30.8	12		JA	0.65	1.3	2	U	V
156.2	SS607992	SS60079WC	10/19/92	20.5	20.5	12		JA	0.65	1.3	2	U	V
156.2	SS608092	SS60080WC	10/19/92	29	29	12		JA	0.65	1.3	2	U	V
156.2	SS608192	SS60081WC	10/19/92	24.2	24.2	12		JA	0.65	1.3	2	U	V
156.2	SS608292	SS60082WC	10/19/92	20.1	20.1	12		JA	0.65	1.3	2	U	V
156.2	SS608392	SS60083WC	10/19/92	20.2	20.2	12		JA	0.65	1.3	2	U	V
156.2	SS608492	SS60084WC	10/20/92	30.2	30.2	12		JA	0.65	1.3	2	U	V
156.2	SS608592	SS60085WC	10/20/92	18.3	18.3	12		JA	0.65	1.3	2	U	V
156.2	SS608692	SS60086WC	10/20/92	23.6	23.6	12		JA	0.65	1.3	2	U	V
165	SS603092	SS60030WC	01/27/93					R	0.45	0.9	2	U	V
165	SS603192	SS60031WC	01/27/93					R	0.43	0.86	2	U	V
165	SS603292	SS60032WC	01/27/93					R	0.435	0.87	2	U	V
165	SS606192	SS60061WC	10/28/92					R	0.7	1.4	2	U	V
165	SS606292	SS60062WC	10/28/92	13.4	13.4	12	B	JA	0.7	1.4	2	U	V
165	SS606392	SS60063WC	10/29/92					R	0.65	1.3	2	U	V
165	SS606492	SS60064WC	10/29/92					R	0.65	1.3	2	U	V
165	SS606592	SS60065WC	10/29/92	27.4	27.4	12		JA	0.65	1.3	2	U	V
165	SS606692	SS60066WC	10/29/92	13.1	13.1	12	B	JA	0.7	1.4	2	U	V
165	SS620092	SS60200WC	01/27/93					R	0.43	0.86	2	U	V
165	SS620192	SS60201WC	01/29/93	6.4	12.8	12	U	JA	0.4	0.8	2	U	V
165	SS620292	SS60202WC	01/29/93	7.25	14.5	12	U	JA	0.455	0.91	2	U	V
165	SS620392	SS60203WC	01/28/93	6	12	12	U	JA	0.38	0.76	2	U	V
165	SS620492	SS60204WC	01/28/93	6.7	13.4	12	U	JA	0.425	0.85	2	U	V
165	SS620592	SS60205WC	01/28/93	6.2	12.4	12	U	JA	0.39	0.78	2	U	V
Number of samples				69					77				
Number of detects				38					11				
Minimum detected				10.6					1.3				
Maximum detected				43.6					52.7				
Average				13.88					1.66				
Standard Deviation				8.76					6.04				
t-value				1.671					1.671				
95% UCL				15.65					2.81				
Statistics based on log normal distribution													
95% UCL (see Table 1)				16.49					2.31				

ATTACHMENT J1
TABLE 8
95% UCL CONCENTRATION
AOC NO. 2 , TOTAL AREA
SURFACE SOIL METALS

				VANADIUM (mg/kg)					ZINC (mg/kg)				
IHSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid. Qual.	Result	SQL	CRDL	Qual	Valid. Qual.
141	SS609792	SS60097WC	10/07/92	26.5	26.5	10		V	60.1	60.1	4		JA
141	SS609892	SS60098WC	10/07/92	28.4	28.4	10		V	64.2	64.2	4		JA
141	SS609992	SS60099WC	10/07/92	28.4	28.4	10		V	153	153	4		JA
141	SS610492	SS60104WC	10/08/92	32.1	32.1	10		V	70.2	70.2	4		JA
141	SS610592	SS60105WC	10/08/92	29.2	29.2	10		V	89.6	89.6	4		JA
141	SS610692	SS60106WC	10/08/92	32.5	32.5	10		V	207	207	4		JA
141	SS611192	SS60111WC	10/08/92	32.05	32.05	10		V	59.55	59.55	4		JA
141	SS611292	SS60112WC	10/08/92	37.6	37.6	10		V	49.1	49.1	4		JA
141	SS611392	SS60113WC	10/08/92	28.2	28.2	10		V	61.9	61.9	4		JA
141	SS612092	SS60120WC	09/28/92	25.3	25.3	10		V	244	244	4		JA
141	SS612192	SS60121WC	09/29/92	22.2	22.2	10		V	650	650	4		JA
141	SS612892	SS60128WC	09/29/92	67.2	67.2	10		V	81.2	81.2	4		JA
141	SS612992	SS60129WC	09/29/92	75.9	75.9	10		V	67.1	67.1	4		JA
141	SS613092	SS60130WC	09/29/92	75.5	75.5	10		V	84.3	84.3	4		JA
141	SS613192	SS60131WC	10/01/92	38.5	38.5	10		V	70.8	70.8	4		JA
141	SS613292	SS60132WC	10/01/92	25.2	25.2	10		V	75.2	75.2	4		JA
141	SS613392	SS60133WC	09/29/92	34.55	34.55	10		V	89.35	89.35	4		JA
141	SS613492	SS60134WC	09/29/92	34.4	34.4	10		V	80.5	80.5	4		JA
141	SS613592	SS60135WC	09/29/92	36.3	36.3	10		V	87	87	4		JA
141	SS613692	SS60136WC	10/01/92	33.3	33.3	10		V	82.3	82.3	4		JA
141	SS613792	SS60137WC	10/01/92	32.7	32.7	10		V	77.1	77.1	4		JA
141	SS613892	SS60138WC	10/01/92	33.5	33.5	10		V	61	61	4		JA
141	SS613992	SS60139WC	10/01/92	31.6	31.6	10		V	52.3	52.3	4		JA
141	SS614092	SS60140WC	10/01/92	35.2	35.2	10		V	66	66	4		JA
141	SS614192	SS60141WC	10/01/92	31.7	31.7	10		V	67.1	67.1	4		JA
141	SS614292	SS60142WC	10/01/92	43.6	43.6	10		V	77.7	77.7	4		JA
141	SS614392	SS60143WC	10/01/92	34.4	34.4	10		V	64.95	64.95	4		JA
141	SS614492	SS60144WC	10/05/92	37.6	37.6	10		V	67.4	67.4	4		V
141	SS614592	SS60145WC	10/05/92	35.5	35.5	10		V	65.1	65.1	4		V
141	SS614692	SS60146WC	10/05/92	30.5	30.5	10		V	72.6	72.6	4		V
141	SS614792	SS60147WC	10/06/92	32.1	32.1	10		V	73.5	73.5	4		JA
141	SS614892	SS60148WC	10/06/92	33.8	33.8	10		V	85.1	85.1	4		JA
141	SS614992	SS60149WC	10/06/92	34.2	34.2	10		V	89.5	89.5	4		JA
141	SS615092	SS60150WC	10/06/92	35.45	35.45	10		V	80.4	80.4	4		JA
141	SS615192	SS60151WC	10/06/92	32.8	32.8	10		V	67.6	67.6	4		JA
141	SS615292	SS60152WC	10/07/92	35.5	35.5	10		V	65.7	65.7	4		JA
141	SS620792	SS60207WC	02/12/93	20.9	20.9	10		V	58.6	58.6	4		V
141	SS620892	SS60208WC	02/12/93	27.1	27.1	10		V	54.7	54.7	4		V
141	SS620992	SS60209WC	02/12/93	28.5	28.5	10		V	56.2	56.2	4		V
141	SS621092	SS60210WC	02/12/93	19.7	19.7	10		V	89.2	89.2	4		V
156.2	SS602892	SS60028WC	01/06/93	20.4	20.4	10		V	57.3	57.3	4		JA
156.2	SS602992	SS60029WC	01/06/93	25.2	25.2	10		V	48	48	4		JA
156.2	SS606792	SS60067WC	10/15/92	24	24	10		JA	46.5	46.5	4		JA
156.2	SS606892	SS60068WC	10/15/92	37.5	37.5	10		JA	48.1	48.1	4		JA
156.2	SS606992	SS60069WC	10/16/92	40.1	40.1	10		JA	72.3	72.3	4		JA
156.2	SS607092	SS60070WC	10/15/92	44	44	10		JA	49.3	49.3	4		JA
156.2	SS607192	SS60071WC	10/15/92	44.2	44.2	10		JA	53.6	53.6	4		JA
156.2	SS607292	SS60072WC	10/16/92	42.7	42.7	10		JA	50.6	50.6	4		JA
156.2	SS607392	SS60073WC	10/16/92	31.8	31.8	10		JA	56.2	56.2	4		JA
156.2	SS607492	SS60074WC	10/16/92	35	35	10		JA	62.1	62.1	4		JA
156.2	SS607592	SS60075WC	10/16/92	38.6	38.6	10		JA	45.7	45.7	4		JA
156.2	SS607692	SS60076WC	10/16/92	37.8	37.8	10		JA	58.5	58.5	4		JA

ATTACHMENT J1
TABLE 8
95% UCL CONCENTRATION
AOC NO. 2 , TOTAL AREA
SURFACE SOIL METALS

				VANADIUM (mg/kg)					ZINC (mg/kg)				
IHSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid. Qual.	Result	SQL	CRDL	Qual	Valid. Qual.
156.2	SS607792	SS60077WC	10/16/92	48	48	10		JA	45.9	45.9	4		JA
156.2	SS607892	SS60078WC	10/16/92	49.9	49.9	10		JA	61.6	61.6	4		JA
156.2	SS607992	SS60079WC	10/19/92	47.7	47.7	10		V	67.4	67.4	4		JA
156.2	SS608092	SS60080WC	10/19/92	65.1	65.1	10		V	67.5	67.5	4		JA
156.2	SS608192	SS60081WC	10/19/92	41.75	41.75	10		V	66.95	66.95	4		JA
156.2	SS608292	SS60082WC	10/19/92	46.7	46.7	10		V	65.7	65.7	4		JA
156.2	SS608392	SS60083WC	10/19/92	50.9	50.9	10		V	56.7	56.7	4		JA
156.2	SS608492	SS60084WC	10/20/92	38.2	38.2	10		V	64.8	64.8	4		JA
156.2	SS608592	SS60085WC	10/20/92	39.9	39.9	10		V	54.4	54.4	4		JA
156.2	SS608692	SS60086WC	10/20/92	39.4	39.4	10		V	52.1	52.1	4		JA
165	SS603092	SS60030WC	01/27/93	20.2	20.2	10		V	74.7	74.7	4		V
165	SS603192	SS60031WC	01/27/93	15.3	15.3	10		V	34.4	34.4	4		V
165	SS603292	SS60032WC	01/27/93	20.9	20.9	10		V	37.5	37.5	4		V
165	SS606192	SS60061WC	10/28/92	24.7	24.7	10		V	68.4	68.4	4		V
165	SS606292	SS60062WC	10/28/92	20.8	20.8	10		V	86.3	86.3	4		V
165	SS606392	SS60063WC	10/29/92	19.9	19.9	10		V	85.6	85.6	4		V
165	SS606492	SS60064WC	10/29/92	17	17	10		V	48.6	48.6	4		V
165	SS606592	SS60065WC	10/29/92	18.65	18.65	10		V	77.2	77.2	4		V
165	SS606692	SS60066WC	10/29/92	34.8	34.8	10		V	117	117	4		V
165	SS620092	SS60200WC	01/27/93	13.7	13.7	10		V	42.9	42.9	4		V
165	SS620192	SS60201WC	01/29/93	26.4	26.4	10		V	52.3	52.3	4		V
165	SS620292	SS60202WC	01/29/93	13.9	13.9	10		V	38.9	38.9	4		V
165	SS620392	SS60203WC	01/28/93	12.7	12.7	10		V	46.8	46.8	4		V
165	SS620492	SS60204WC	01/28/93	16.4	16.4	10		V	33.9	33.9	4		V
165	SS620592	SS60205WC	01/28/93	19.1	19.1	10		V	34.3	34.3	4		V
Number of samples				77					77				
Number of detects				77					77				
Minimum detected				12.7					33.9				
Maximum detected				75.9					650				
Average				33.41					77.25				
Standard Deviation				12.56					72.87				
t-value				1.671					1.671				
95% UCL				35.81					91.13				
Statistics based on log normal distribution													
95% UCL (see Table 1)				36.13					80.46				

ATTACHMENT J1
TABLE 9
95% UCL CONCENTRATION
AOC NO. 2, TOTAL AREA
SURFACE SOIL RADIONUCLIDES

				AMERICIUM-241 (pCi/g)					PLUTONIUM-239/240 (pCi/g)				
IHSS	Location	Field Id	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
141	SS609792	SS60097WC	10/07/92	0.5903	0.5903			A	1.513	1.513	0.025		A
141	SS609892	SS60098WC	10/07/92	0.3039	0.3039			A	0.3292	0.3292			A
141	SS609992	SS60099WC	10/07/92	0.291	0.291			A	0.1873	0.1873			A
141	SS610492	SS60104WC	10/08/92	0.4133	0.4133			A	1.049	1.049			A
141	SS610592	SS60105WC	10/08/92	1.842	1.842			A	10.38	10.38			A
141	SS610692	SS60106WC	10/08/92	0.5622	0.5622			A	0.3806	0.3806			A
141	SS611192	SS60111WC	10/08/92	0.52515	0.52515			A	1.9235	1.9235			A
141	SS611292	SS60112WC	10/08/92	0.3364	0.3364			A	2.612	2.612	0.015		A
141	SS611392	SS60113WC	10/08/92	0.5655	0.5655	0.005		A	1.787	1.787			A
141	SS612092	SS60120WC	09/28/92					R	0.709	0.709			A
141	SS612192	SS60121WC	09/29/92					R					R
141	SS612892	SS60128WC	09/29/92					R					R
141	SS612992	SS60129WC	09/29/92					R					R
141	SS613092	SS60130WC	09/29/92					R					R
141	SS613192	SS60131WC	10/01/92					R	0.142	0.142			A
141	SS613292	SS60132WC	10/01/92					R	0.433	0.433			A
141	SS613392	SS60133WC	09/29/92					R					R
141	SS613492	SS60134WC	09/29/92					R					R
141	SS613592	SS60135WC	09/29/92					R					R
141	SS613692	SS60136WC	10/01/92					R	0.0566	0.0566			A
141	SS613792	SS60137WC	10/01/92					R	2.61	2.61			A
141	SS613892	SS60138WC	10/01/92					R	0.639	0.639			A
141	SS613992	SS60139WC	10/01/92					R	0.303	0.303			A
141	SS614092	SS60140WC	10/01/92					R	0.238	0.238			A
141	SS614192	SS60141WC	10/01/92					R	0.369	0.369			A
141	SS614292	SS60142WC	10/01/92					R	0.444	0.444			A
141	SS614392	SS60143WC	10/01/92					R	0.845	0.845			A
141	SS614492	SS60144WC	10/05/92	0.5655	0.5655			A	2.568	2.568			A
141	SS614592	SS60145WC	10/05/92	0.7374	0.7374			A	1.618	1.618	0.006		A
141	SS614692	SS60146WC	10/05/92	1.156	1.156			A	3.062	3.062			A
141	SS614892	SS60148WC	10/06/92	0.2982	0.2982			A	0.639	0.639			A
141	SS614992	SS60149WC	10/06/92	0.8111	0.8111			A	3.487	3.487	0.024		A
141	SS615092	SS60150WC	10/06/92	1.22815	1.22815			A	3.8675	3.8675	0.037		A
141	SS615192	SS60151WC	10/06/92	1.551	1.551	0.006		A	3.844	3.844			A
141	SS615292	SS60152WC	10/07/92	0.2669	0.2669			A	0.7332	0.7332			A
141	SS620792	SS60207WC	02/12/93	0.4044	0.4044	0.003		A	0.3646	0.3646	0.009		A
141	SS620892	SS60208WC	02/12/93	0.2531	0.2531	0.003		A	0.3671	0.3671	0.007		A
141	SS620992	SS60209WC	02/12/93	0.3786	0.3786	0.003		A	0.3522	0.3522	0.004		A
141	SS621092	SS60210WC	02/12/93	0.5925	0.5925	0.006		A	0.9841	0.9841	0.004		A
156.2	SS602892	SS60028WC	01/06/93	0.1009	0.1009			A	0.1216	0.1216			A
156.2	SS606792	SS60067WC	10/15/92	0.0476	0.0476			A	0.06847	0.06847	0.02		A
156.2	SS606892	SS60068WC	10/15/92	0.162	0.162			A	0.09816	0.09816	0.018		A
156.2	SS606992	SS60069WC	10/16/92	0.07033	0.07033			A	0.06659	0.06659	0.008		A
156.2	SS607092	SS60070WC	10/15/92	0.04867	0.04867			A	0.1003	0.1003			A
156.2	SS607192	SS60071WC	10/15/92	0.1068	0.1068			A	0.06906	0.06906			A
156.2	SS607292	SS60072WC	10/16/92	0.09206	0.09206			A	0.09897	0.09897			A
156.2	SS607392	SS60073WC	10/16/92	0.04182	0.04182			A	0.00773	0.007733		J	A
156.2	SS607492	SS60074WC	10/16/92	0.08041	0.08041			A	0.1594	0.1594	0.021		A
156.2	SS607592	SS60075WC	10/16/92	0.06872	0.06872			A	0.03398	0.03398			A
156.2	SS607692	SS60076WC	10/16/92	0.3012	0.3012			A	0.6637	0.6637			A
156.2	SS607792	SS60077WC	10/16/92	0.03487	0.03487			A	0.05733	0.05733			A
156.2	SS607892	SS60078WC	10/16/92	0.06419	0.06419			A	0.06426	0.06426			A
156.2	SS607992	SS60079WC	10/19/92	0.0186	0.0186	0.006		A	0.037	0.037	0.007		A

ATTACHMENT J1
TABLE 9
95% UCL CONCENTRATION
AOC NO. 2, TOTAL AREA
SURFACE SOIL RADIONUCLIDES

				AMERICIUM-241 (pCi/g)					PLUTONIUM-239/240 (pCi/g)				
IHSS	Location	Field Id	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
156.2	SS608092	SS60080WC	10/19/92	0.0315	0.0315			A	0.0971	0.0971	0.005		A
156.2	SS608192	SS60081WC	10/19/92	0.02175	0.02175	0.004		A	0.0432	0.0432			A
156.2	SS608292	SS60082WC	10/19/92	0.236	0.236			A	1.85	1.85	0.005		A
156.2	SS608392	SS60083WC	10/19/92	0.0182	0.0182			A	0.0439	0.0439	0.005		A
156.2	SS608492	SS60084WC	10/20/92	0.027	0.027			A	0.0871	0.0871	0.008		A
156.2	SS608592	SS60085WC	10/20/92	0.0327	0.0327			A	0.0778	0.0778	0.005		A
156.2	SS608692	SS60086WC	10/20/92	0.0162	0.0162	0.006		A	0.0537	0.0537			A
165	SS603092	SS60030WC	01/27/93	1.64	1.64	0.013			1.76	1.76	0.0094		
165	SS603192	SS60031WC	01/27/93	0.0671	0.0671	0.0095			0.0324	0.0324	0.0095		
165	SS603292	SS60032WC	01/27/93	0.499	0.499	0.0032			0.384	0.384	0.0036		
165	SS606192	SS60061WC	10/28/92	0.9943	0.9943			A	0.06033	0.06033			A
165	SS606292	SS60062WC	10/28/92	0.02481	0.02481			A	0.5102	0.5102			A
165	SS606392	SS60063WC	10/29/92	1.083	1.083	0.018		A	0.7775	0.7775	0.027		A
165	SS606492	SS60064WC	10/29/92	1.328	1.328			A	0.8529	0.8529	0.018		A
165	SS606592	SS60065WC	10/29/92	3.2425	3.2425			A	2.5625	2.5625	0.047		A
165	SS606692	SS60066WC	10/29/92	3.027	3.027			A	3.148	3.148	0.045		A
165	SS620092	SS60200WC	01/27/93	0.302	0.302	0.0091			0.225	0.225	0.004		
165	SS620192	SS60201WC	01/29/93	2.44	2.44			A	6.241	6.241			A
165	SS620292	SS60202WC	01/29/93	0.1591	0.1591			A	0.0945	0.0945			A
165	SS620392	SS60203WC	01/28/93					R	1.346	1.346	0.009		A
165	SS620492	SS60204WC	01/28/93					R	15.22	15.22	0.005		A
Number of samples				54					67				
Number of detects				54					67				
Minimum detected				0.02					0.01				
Maximum detected				3.24					15.22				
Average				0.56					1.28				
Standard Deviation				0.73					2.40				
t-value				1.684					1.671				
95% UCL				0.72					1.77				
Statistics based on log normal distribution													
95% UCL (see Table 1)				1.24					2.78				

ATTACHMENT J1
TABLE10
95% UCL CONCENTRATION
AOC NO.2, TOTAL AREA
SUBSURFACE SOIL SEMIVOLATILES

				BENZO(a)PYRENE (µg/kg)					BENZO(b)FLUORANTHENE (µg/kg)				
IHSS	Location	Field ID	Depth	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
165	73492	BH60622WC	0-5.6		410	330	U	V		410	330	U	V
165	73492	BH60623WC	5.6-13		370	330	U	V	185	370	330	U	V
165	72992	BH60624WC	0-6		390	330	U	V	195	390	330	U	V
165	72992	BH60625WC	6-11.9		400	330	U	V		400	330	U	V
165	72992	BH60626WC	11.9-15		400	330	U	V		400	330	U	V
165	73092	BH60644WC	0-6		410	330	U	V		410	330	U	V
165	73092	BH60645WC	6-12		400	330	U	V		400	330	U	V
165	72292	BH60647WC	0-6		410	330	U	V		410	330	U	V
165	72292	BH60654WC	6-11.6		360	330	U	V	180	360	330	U	V
165	72292	BH60655WC	11.6-16.4		380	330	U	V	190	380	330	U	V
165	72692	BH60660WC	0-4					R	57	57	330	J	A
165	72392	BH60667WC	0-5.8		380	330	U	V	190	380	330	U	V
165	72392	BH60668WC	5.8-12		380	330	U	V	190	380	330	U	V
165	72392	BH60669WC	12-16		400	330	U	V		400	330	U	V
165	72592	BH60682WC	0-5		390	330	U	V	195	390	330	U	V
165	72792	BH60684WC	0-5.6	130	130	330	J	A	170	170	330	J	A
165	72792	BH60685WC	5.6-12		360	330	U	V	180	360	330	U	V
165	72792	BH60686WC	12-17.8		400	330	U	V		400	330	U	V
165	72892	BH60698WC	0-6		380	330	U	V	190	380	330	U	V
165	72892	BH60699WC	6-12.4		350	330	U	V	175	350	330	U	V
165	72792	BH60710WC	17.8-23.8		390	330	U	V		390	330	U	V
165	72492	BH60716WC	0-5	38	38	330	J	A	60	60	330	J	A
165	73392	BH60718WC	0-6.2	175	350	330	U	V	175	350	330	U	V
165	73392	BH60719WC	6.2-12		360	330	U	V	180	360	330	U	V
165	73192	BH60739WC	0-6.2	175	350	330	U	V	175	350	330	U	V
165	73192	BH60740WC	6.2-12		360	330	U	V	180	360	330	U	V
Number of samples				4					17				
Number of detects				2					3				
Minimum detected				38					57				
Maximum detected				130					170				
Average				129.5					168.65				
Standard Deviation				55.93					40.86				
t-value				2.353					1.746				
95% UCL				195.30					185.95				

ATTACHMENT J1
TABLE 11
95% UCL CONCENTRATION
AOC NO. 2, TOTAL AREA
SUBSURFACE SOIL METALS

					BARIUM (mg/kg)				
IHSS	Location	Field ID	Sample Date	Depth	Result	SQL	CRDL	Qual	Valid Qual
156.2	73692	BH60145WC	12/02/92	0-6	102	102	40		V
156.2	73692	BH60149WC	12/02/92	6-12	39.1	39.1	40	B	V
156.2	77992	BH60171WC	12/02/92	0-6	299	299	40		V
156.2	77992	BH60173WC	12/02/92	6-8	296	296	40		V
156.2	77992	BH60175WC	12/02/92	8-11	160.5	160.5	40		V
156.2	73692	BH60185WC	12/02/92	12-18	53.5	53.5	40		V
156.2	73692	BH60186WC	12/03/92	18-24	564	564	40		V
156.2	77792	BH60193WC	12/03/92	0-6	206	206	40		V
156.2	77792	BH60194WC	12/03/92	12-18	47.9	47.9	40		V
156.2	77792	BH60195WC	12/03/92	6-12	158	158	40		V
156.2	73592	BH60200WC	12/03/92	0-6	133	133	40		V
156.2	77692	BH60207WC	12/04/92	0-5.9	149	149	40		V
156.2	77692	BH60208WC	12/04/92	5.9-12	189	189	40		V
156.2	77692	BH60209WC	12/04/92	12-16.3	138	138	40		V
156.2	73592	BH60222WC	12/04/92	6-12	236	236	40		V
156.2	73592	BH60223WC	12/04/92	12-16	81.9	81.9	40		V
156.2	77692	BH60234WC	12/04/92	16.3-19.5	180	180	40		V
156.2	74692	BH60235WC	12/07/92	0-6	191	191	40		JA
156.2	74692	BH60236WC	12/07/92	6-7.6	103	103	40		JA
156.2	74692	BH60237WC	12/07/92	8.3-12.2	636	636	40		JA
156.2	77892	BH60244WC	12/04/92	0-6	234	234	40		JA
156.2	77892	BH60245WC	12/04/92	6-12.2	90.7	90.7	40		JA
156.2	77892	BH60246WC	12/04/92	12.2-16.5	150	150	40		JA
156.2	77592	BH60252WC	12/07/92	0-6.4	117	117	40		JA
156.2	77592	BH60253WC	12/07/92	6.4-10.2	94.8	94.8	40		JA
156.2	77592	BH60254WC	12/07/92	10.2-13.3	430	430	40		JA
156.2	73892	BH60267WC	12/07/92	0-6	110	110	40		JA
156.2	73892	BH60268WC	12/07/92	6-12	103	103	40		JA
156.2	73892	BH60269WC	12/07/92	12-18	86.6	86.6	40		JA
156.2	74492	BH60284WC	12/08/92	0-5.9	125	125	40		JA
156.2	74492	BH60285WC	12/08/92	5.9-10.1	154	154	40		JA
156.2	74492	BH60286WC	12/08/92	10.1-14.2	119	119	40		JA
156.2	74192	BH60293WC	12/08/92	0-6	185	185	40		V
156.2	74192	BH60294WC	12/08/92	6-12	180	180	40		V
156.2	74192	BH60295WC	12/08/92	12-18	76.3	76.3	40		V
156.2	73992	BH60301WC	12/11/92	0-6	115	115	40		V
156.2	73992	BH60302WC	12/11/92	6-10	99.2	99.2	40		V
156.2	74092	BH60313WC	12/10/92	0-5.5	110	110	40		V
156.2	74092	BH60314WC	12/10/92	5.5-12	74.8	74.8	40		V
156.2	74092	BH60315WC	12/10/92	12-18	64.5	64.5	40		V
156.2	73992	BH60321WC	12/11/92	10-14	31	31	40	B	V
156.2	73792	BH60322WC	12/10/92	0-5.9	103	103	40		V
156.2	73792	BH60323WC	12/10/92	5.9-10	22.9	22.9	40	B	V
156.2	74392	BH60342WC	12/11/92	0-5.9	104	104	40		V
156.2	74392	BH60358WC	12/11/92	5.9-9.8	137	137	40		V
156.2	74392	BH60359WC	12/11/92	9.8-12.9	46.2	46.2	40	B	V
156.2	74892	BH60374WC	12/14/92	0-6	277	277	40		V
156.2	74892	BH60375WC	12/14/92	6-10	117	117	40		V
156.2	74892	BH60376WC	12/14/92	10-14	45.9	45.9	40	B	V
156.2	74992	BH60393WC	12/14/92	0-6	446	446	40		V
156.2	74992	BH60394WC	12/14/92	6-12	109	109	40		V
156.2	74992	BH60395WC	12/14/92	12-15.8	90.5	90.5	40		V
156.2	74992	BH60403WC	12/14/92	15.8-22	49	49	40		V
156.2	73592	BH60404WC	12/15/92	16-22	32.4	32.4	40	B	V
156.2	74792	BH60405WC	12/16/92	0-6.1	169.5	169.5	40		V

ATTACHMENT J1
TABLE 11
95% UCL CONCENTRATION
AOC NO. 2, TOTAL AREA
SUBSURFACE SOIL METALS

					BARIUM (mg/kg)				
IHSS	Location	Field ID	Sample Date	Depth	Result	SQL	CRDL	Qual	Valid Qual
156.2	74792	BH60408WC	12/16/92	6.1-12.3	159	159	40		V
156.2	74792	BH60409WC	12/16/92	12.3-18.4	199	199	40		V
156.2	74592	BH60410WC	12/15/92	0-6	110	110	40		V
156.2	74592	BH60411WC	12/15/92	6-11.8	90.6	90.6	40		V
156.2	74592	BH60412WC	12/15/92	11.8-18	248	248	40		V
156.2	74592	BH60429WC	12/15/92	18-21.3	81.8	81.8	40		V
156.2	74592	BH60430WC	12/15/92	21.3-24	36.6	36.6	40	B	V
156.2	74792	BH60453WC	12/16/92	18.4-20.5	27.9	27.9	40	B	V
156.2	74792	BH60454WC	12/16/92	20.5-24.2	59.1	59.1	40		V
156.2	74292	BH60468WC	12/17/92	0-6	81.9	81.9	40		V
156.2	74292	BH60469WC	12/17/92	6-12.3	96.3	96.3	40		V
156.2	74292	BH60476WC	12/17/92	12.3-17.8	148	148	40		V
156.2	74292	BH60486WC	12/17/92	17.8-19.8	33.2	33.2	40	B	V
156.2	74292	BH60487WC	12/17/92	19.8-24.3	67.5	67.5	40		V
156.2	63592	BH60532WC	01/07/93	0-6	87.7	87.7	40		V
156.2	63592	BH60533WC	01/07/93	6-12.1	114	114	40		V
156.2	63592	BH60534WC	01/07/93	12.1-16.2	51.8	51.8	40		V
156.2	63592	BH60540WC	01/07/93	16.2-20.1	864	864	40		V
156.2	63692	BH60542WC	01/08/93	0-6	69.8	69.8	40		V
156.2	63692	BH60543WC	01/08/93	6-8.9	40.2	40.2	40	B	V
156.2	63692	BH60544WC	01/08/93	8.9-14	216	216	40		V
165	73492	BH60622WC	01/19/93	0-5.6	60.2	60.2	40		V
165	73492	BH60623WC	01/19/93	5.6-13	30.1	30.1	40	B	V
165	72992	BH60624WC	01/20/93	0-6	81	81	40		V
165	72992	BH60625WC	01/20/93	6-11.9	87	87	40		V
165	72992	BH60626WC	01/20/93	11.9-15	1050	1050	40		V
165	73092	BH60644WC	01/25/93	0-6	76.7	76.7	40		V
165	73092	BH60645WC	01/25/93	6-12	373	373	40		V
165	72292	BH60647WC	01/26/93	0-6	93.6	93.6	40		V
165	72292	BH60654WC	01/26/93	6-11.6	32.6	32.6	40	B	V
165	72292	BH60655WC	01/26/93	11.6-16.4	41.6	41.6	40	B	V
165	72392	BH60667WC	01/26/93	0-5.8	64.1	64.1	40		V
165	72392	BH60668WC	01/26/93	5.8-12	48.3	48.3	40		V
165	72392	BH60669WC	01/26/93	12-16	49.6	49.6	40		V
165	72792	BH60684WC	01/27/93	0-5.6	37.1	37.1	40	B	V
165	72792	BH60685WC	01/27/93	5.6-12	28.1	28.1	40	B	V
165	72792	BH60686WC	01/27/93	12-17.8	60.6	60.6	40		V
165	72892	BH60698WC	01/28/93	0-6	119	119	40		V
165	72892	BH60699WC	01/28/93	6-12.4	19.8	19.8	40	B	V
165	72792	BH60710WC	01/27/93	17.8-23.8	35.2	35.2	40	B	V
165	73392	BH60718WC	01/28/93	0-6.2	29.2	29.2	40	B	V
165	73392	BH60719WC	01/28/93	6.2-12	31	31	40	B	V
165	73192	BH60739WC	01/29/93	0-6.2	77.7	77.7	40		V
165	73192	BH60740WC	01/29/93	6.2-12	31.9	31.9	40	B	V
Number of samples					99				
Number of detects					99				
Minimum detected					19.8				
Maximum detected					1050				
Average					140.42				
Standard Deviation					159.50				
t-value					1.671				
95% UCL					167.21				

Statistics based on log normal distribution

95% UCL (see Table 1) 159.7

ATTACHMENT J1
TABLE 12
ROCKY FLATS OU6
95% UCL CONCENTRATION
AOC NO. 2, TOTAL AREA
SUBSURFACE SOIL RADIONUCLIDES

					AMERICIUM-241 (pCi/g)					PLUTONIUM-239/240 (pCi/g)				
IHSS	Location	Field ID	Sample Date	Depth	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
156.2	73692	BH60145WC	12/02/92	0-6	0.005	0.005	0.002	J	A	0.01	0.01	0.005	J	V
156.2	73692	BH60149WC	12/02/92	6-12	0.004	0.004	0.004	J	A	0.0005	0.001	0.002	U	V
156.2	77992	BH60171WC	12/02/92	0-6	0.0035	0.007	0.008	U	A	0.002	0.004	0.007	U	V
156.2	77992	BH60173WC	12/02/92	6-8	0.008	0.008	0.007	J	A	0.002	0.004	0.005	U	V
156.2	77992	BH60175WC	12/02/92	8-11	0.018	0.018	0.018	J	A	0.016	0.016	0.003	J	V
156.2	73692	BH60185WC	12/02/92	12-18	0.004	0.004	0.004	J	A	-0.001	-0.002	0.008	U	V
156.2	73692	BH60186WC	12/03/92	18-24	0	0	0.01	U	A					R
156.2	77792	BH60193WC	12/03/92	0-6	0.0076	0.0076	0.017		A	0.033	0.033	0.004		
156.2	77792	BH60194WC	12/03/92	12-18	-0.0004	-0.0004	0.005		A	0.0014	0.0014	0.003		
156.2	77792	BH60195WC	12/03/92	6-12	0.0023	0.0023	0.01		A	0.023	0.023	0.004		
156.2	73592	BH60200WC	12/03/92	0-6	0.023	0.023	0.004		A					R
156.2	77692	BH60207WC	12/04/92	0-5.9	0.006	0.006	0.005	J	A					R
156.2	77692	BH60208WC	12/04/92	5.9-12	0.0005	0.001	0.004	U	A					R
156.2	77692	BH60209WC	12/04/92	12-16.3	0.0015	0.003	0.004	U	A					R
156.2	73592	BH60222WC	12/04/92	6-12	0.0048	0.0048	0.011		A	0.0042	0.0042	0.004		
156.2	73592	BH60223WC	12/04/92	12-16	-0.0015	-0.0015	0.012		A	0.0019	0.0019	0.004		
156.2	77692	BH60234WC	12/04/92	16.3-19.5	0.0005	0.001	0.005	U	A					R
156.2	74692	BH60235WC	12/07/92	0-6	0.026	0.026	0.005		A	0.12	0.12	0.007		
156.2	74692	BH60236WC	12/07/92	6-7.6	0.0093	0.0093	0.009		A	0.042	0.042	0.004		
156.2	74692	BH60237WC	12/07/92	8.3-12.2	0.014	0.014	0.006		A	0.0061	0.0061	0.003		
156.2	77892	BH60244WC	12/04/92	0-6	0.018	0.018	0.008		A	0.022	0.022	0.003		
156.2	77892	BH60245WC	12/04/92	6-12.2	0.012	0.012	0.006		A	0.0036	0.0036	0.004		
156.2	77892	BH60246WC	12/04/92	12.2-16.5	0.0013	0.0013	0.005		A	0.004	0.004	0.004		A
156.2	77592	BH60252WC	12/07/92	0-6.4	0.0082	0.0082	0.005		A	0.045	0.045	0.004		
156.2	77592	BH60253WC	12/07/92	6.4-10.2	0.0069	0.0069	0.011		A	0.19	0.19	0.006		
156.2	77592	BH60254WC	12/07/92	10.2-13.3	0.006	0.006	0.004		A	-0.002	-0.002	0.006		A
156.2	73892	BH60267WC	12/07/92	0-6	0.029	0.029	0.008	B	V	0.016	0.016	0.007	J	V
156.2	73892	BH60268WC	12/07/92	6-12	0.003	0.006	0.019	U	V	0.021	0.021	0.002	J	V
156.2	73892	BH60269WC	12/07/92	12-18	0.012	0.012	0.006	BJ	V	0.01	0.01	0.004	J	V
156.2	74492	BH60284WC	12/08/92	0-5.9	0.31	0.31	0.012	B	V	0.88	0.88	0.001		V
156.2	74492	BH60285WC	12/08/92	5.9-10.1	0.012	0.012	0.002	BJ	V	0.048	0.048	0.005		V
156.2	74492	BH60286WC	12/08/92	10.1-14.2	0.0005	0.001	0.005	U	V	0	0	0.002	U	V
156.2	74192	BH60293WC	12/08/92	0-6	0.019	0.019	0.016	J	V	-0.0005	-0.001	0.008	U	V
156.2	74192	BH60294WC	12/08/92	6-12	0.003	0.003	0.002	BJ	V	-0.001	-0.002	0.011	U	V
156.2	74192	BH60295WC	12/08/92	12-18	-0.0005	-0.001	0.009	U	V	0.001	0.002	0.004	U	V
156.2	73992	BH60301WC	12/11/92	0-6	0.009	0.009	0.005	BJ	V	0.004	0.004	0.004	J	V
156.2	73992	BH60302WC	12/11/92	6-10	0.001	0.002	0.003	U	V	0.006	0.006	0.006	J	V
156.2	74092	BH60313WC	12/10/92	0-5.5	0.023	0.023	0.004		A					R
156.2	74092	BH60314WC	12/10/92	5.5-12	0.004	0.004	0.004	J	A					R

ATTACHMENT J1
TABLE 12
ROCKY FLATS OU6
95% UCL CONCENTRATION
AOC NO. 2, TOTAL AREA
SUBSURFACE SOIL RADIONUCLIDES

					AMERICIUM-241 (pCi/g)					PLUTONIUM-239/240 (pCi/g)				
IHSS	Location	Field ID	Sample Date	Depth	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
156.2	74092	BH60315WC	12/10/92	12-18	0.001	0.002	0.004	U	A					R
156.2	73992	BH60321WC	12/11/92	10-14	0.0005	0.001	0.006	U	V	0.001	0.002	0.006	U	V
156.2	73792	BH60322WC	12/10/92	0-5.9	0.018	0.018	0.003	J	A					R
156.2	73792	BH60323WC	12/10/92	5.9-10	0	0	0.004	U	A					R
156.2	74392	BH60342WC	12/11/92	0-5.9	0.0229	0.0229				0.0855	0.0855			
156.2	74392	BH60358WC	12/11/92	5.9-9.8	0.00959	0.00959	0.005		A	0.0181	0.0181	0.004		A
156.2	74392	BH60359WC	12/11/92	9.8-12.9	0.00462	0.00462			A	0.00123	0.00123			A
156.2	74892	BH60374WC	12/14/92	0-6	0.00813	0.00813	0.005		A	0.0184	0.0184	0.007		A
156.2	74892	BH60375WC	12/14/92	6-10	0.00934	0.00934			A	0.0129	0.0129	0.008		A
156.2	74892	BH60376WC	12/14/92	10-14	0.00138	0.00138	0.007		A	0	0	0.01		A
156.2	74992	BH60393WC	12/14/92	0-6	0.014	0.014	0.007	J	V	0.0375	0.0375	0.009		V
156.2	74992	BH60394WC	12/14/92	6-12	0.001	0.002	0.004	U	V	0.015	0.015	0.004	J	V
156.2	74992	BH60395WC	12/14/92	12-15.8	0.0015	0.003	0.004	U	V	-0.0005	-0.001	0.008	U	V
156.2	74992	BH60403WC	12/14/92	15.8-22	0.004	0.004	0.002	BJ	V	0	0	0.002	U	V
156.2	73592	BH60404WC	12/15/92	16-22	0.001	0.002	0.006	U	V	-0.0005	-0.001	0.007	U	A
156.2	74792	BH60405WC	12/16/92	0-6.1	0.0245	0.0245	0.005		V	0.079	0.079	0.002		A
156.2	74792	BH60408WC	12/16/92	6.1-12.3	0.005	0.005	0.004	J	V	0.015	0.015	0.002	J	A
156.2	74792	BH60409WC	12/16/92	12.3-18.4	0.002	0.004	0.014	U	V	0.006	0.006	0.005	J	A
156.2	74592	BH60410WC	12/15/92	0-6	0.018	0.018	0.002	J	V	0.044	0.044	0.002		A
156.2	74592	BH60411WC	12/15/92	6-11.8	0.007	0.007	0.002	J	V	0.018	0.018	0.002	J	A
156.2	74592	BH60412WC	12/15/92	11.8-18	0.0005	0.001	0.004	U	V	0.0035	0.007	0.009	U	A
156.2	74592	BH60429WC	12/15/92	18-21.3	0.008	0.008	0.002	J	V	-0.001	-0.002	0.007	U	A
156.2	74592	BH60430WC	12/15/92	21.3-24	0.002	0.002	0.002	J	V	-0.001	-0.002	0.006	U	A
156.2	74792	BH60453WC	12/16/92	18.4-20.5	0.017	0.017	0.001	J	V	0.001	0.002	0.004	U	A
156.2	74792	BH60454WC	12/16/92	20.5-24.2	0.009	0.009	0.002	J	V	-0.0005	-0.001	0.006	U	A
156.2	74292	BH60468WC	12/17/92	0-6	0.0373	0.0373	0.01		V	0.452	0.452	0.005		A
156.2	74292	BH60469WC	12/17/92	6-12.3	0.0196	0.0196	0.01		V	0.113	0.113			A
156.2	74292	BH60476WC	12/17/92	12.3-17.8	0.00529	0.00529			V	0.0122	0.0122	0.015		A
156.2	74292	BH60486WC	12/17/92	17.8-19.8	0.00443	0.00443			V	0.0014	0.0014	0.007		A
156.2	74292	BH60487WC	12/17/92	19.8-24.3	0.00677	0.00677			V	0.00134	0.00134			A
156.2	63592	BH60532WC	01/07/93	0-6					R	0.0292	0.0292			A
156.2	63592	BH60533WC	01/07/93	6-12.1					R	0.0122	0.0122			A
156.2	63592	BH60534WC	01/07/93	12.1-16.2					R	0	0	0.008		A
156.2	63592	BH60540WC	01/07/93	16.2-20.1					R	0	0	0.009		A
156.2	63692	BH60542WC	01/08/93	0-6	0.017	0.017	0.005	B	A	0.0505	0.0505	0.005		V
156.2	63692	BH60543WC	01/08/93	6-8.9	0.0005	0.001	0.002	U	A	0.0005	0.001	0.005	U	V
156.2	63692	BH60544WC	01/08/93	8.9-14	0.0015	0.003	0.006	U	A	0.0015	0.003	0.004	U	V
165	73492	BH60622WC	01/19/93	0-5.6	0.44	0.44	0.005		A	0.53	0.53	0.005		V
165	73492	BH60623WC	01/19/93	5.6-13	0.007	0.007	0.004	J	A	0.004	0.004	0.004	J	V

ATTACHMENT J1
TABLE 12
ROCKY FLATS OU6
95% UCL CONCENTRATION
AOC NO. 2, TOTAL AREA
SUBSURFACE SOIL RADIONUCLIDES

					AMERICIUM-241 (pCi/g)					PLUTONIUM-239/240 (pCi/g)				
IHSS	Location	Field ID	Sample Date	Depth	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
165	72992	BH60624WC	01/20/93	0-6	0.0025	0.005	0.01	U	A	0.001	0.002	0.003	U	V
165	72992	BH60625WC	01/20/93	6-11.9	0	0	0.004	U	A	0.004	0.004	0.003	J	V
165	72992	BH60626WC	01/20/93	11.9-15	0.003	0.003	0.002	J	A	-0.001	-0.002	0.009	U	V
165	73092	BH60644WC	01/25/93	0-6	0.18	0.18	0.002		A	0.088	0.088	0.01		V
165	73092	BH60645WC	01/25/93	6-12	0.014	0.014	0.002	J	A	0.008	0.008	0.005	J	V
165	72292	BH60647WC	01/26/93	0-6	0.034	0.034			A					R
165	72292	BH60654WC	01/26/93	6-11.6	0.01155	0.01155		J	A	0.01725	0.01725		J	A
165	72292	BH60655WC	01/26/93	11.6-16.4	0.002186	0.002186		J	A					R
165	72392	BH60667WC	01/26/93	0-5.8	0.104	0.104	0.0036			0.166	0.166	0.0082		
165	72392	BH60668WC	01/26/93	5.8-12	0.0148	0.0148	0.0095			0.0054	0.0054	0.01		
165	72392	BH60669WC	01/26/93	12-16	0.00768	0.00768	0.0046			0.00731	0.00731	0.0073		
165	72792	BH60684WC	01/27/93	0-5.6	0.0305	0.0305	0.0042			0.0617	0.0617	0.016		
165	72792	BH60685WC	01/27/93	5.6-12	0.007035	0.007035	0.01			0.00325	0.00325	0.013		
165	72792	BH60686WC	01/27/93	12-17.8	0.00566	0.00566	0.0043			-0.00125	-0.00125	0.012		
165	72892	BH60698WC	01/28/93	0-6	0.0699	0.0699	0.0091			0.166	0.166	0.01		
165	72892	BH60699WC	01/28/93	6-12.4	0.012	0.012	0.0036			0.00553	0.00553	0.0033		
165	72792	BH60710WC	01/27/93	17.8-23.8	0.00633	0.00633	0.0032			0.00421	0.00421	0.011		
165	73392	BH60718WC	01/28/93	0-6.2	0.0222	0.0222	0.0035			0.0184	0.0184	0.0034		
165	73392	BH60719WC	01/28/93	6.2-12	0.00752	0.00752	0.0032			-0.00108	-0.00108	0.01		
165	73192	BH60739WC	01/29/93	0-6.2					R	0.09743	0.09743	0.008		A
165	73192	BH60740WC	01/29/93	6.2-12					R	0.004663	0.004663	0.005	J	A
Number of samples					93					86				
Number of detects					72					65				
Minimum detected					-0.0015					-0.002				
Maximum detected					0.44					0.88				
Average					0.0202					0.0433				
Standard Deviation					0.0580					0.1215				
t-value					1.671					1.671				
95% UCL					0.0302					0.0652				
RME					0.0302					0.0652				

SQL = Sample Quantitation Limit

CRDL = Contract Required Detection Limit

RME = Reasonable Maximum Exposure

UCL = Upper Confidence Limit

[ ] = Detected Results

ATTACHMENT J1
TABLE 12
ROCKY FLATS OU6
95% UCL CONCENTRATION
AOC NO. 2, TOTAL AREA
SUBSURFACE SOIL RADIONUCLIDES

					URANIUM-233,-234 (pCi/g)					URANIUM-238 (pCi/g)				
IHSS	Location	Field ID	Sample Date	Depth	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
156.2	73692	BH60145WC	12/02/92	0-6	0.98	0.98	0.018	B	A	0.76	0.76	0.018	B	A
156.2	73692	BH60149WC	12/02/92	6-12	0 65	0.65	0.014	B	A	0.75	0.75	0.005	B	A
156.2	77992	BH60171WC	12/02/92	0-6	1	1	0.006	B	A	1.1	1.1	0.022	B	A
156.2	77992	BH60173WC	12/02/92	6-8	1.3	1.3	0.02	B	A	1.2	1.2	0.006	B	A
156.2	77992	BH60175WC	12/02/92	8-11	0.965	0.965	0.018	B	A	0.905	0.905	0.013	B	A
156.2	73692	BH60185WC	12/02/92	12-18	0.93	0.93	0.005	B	A	1.1	1.1	0.012	B	A
156.2	73692	BH60186WC	12/03/92	18-24	0.94	0.94	0.2		A	1.1	1.1	0.2		A
156.2	77792	BH60193WC	12/03/92	0-6	0.62	0.62	0.014		A	0.62	0.62	0.005		A
156.2	77792	BH60194WC	12/03/92	12-18	0.37	0.37	0.015		A	0.46	0.46	0.019		A
156.2	77792	BH60195WC	12/03/92	6-12	0.7	0.7	0.011		A	0.75	0.75	0.005		A
156.2	73592	BH60200WC	12/03/92	0-6	1	1	0.1		A	0.84	0.84	0.1		A
156.2	77692	BH60207WC	12/04/92	0-5.9	0.675	0.675	0.2		A	0.625	0.625	0.1		A
156.2	77692	BH60208WC	12/04/92	5.9-12	0.75	0.75	0.1		A	0.67	0.67	0.1		A
156.2	77692	BH60209WC	12/04/92	12-16.3	0.55	0.55	0.1		A	0.47	0.47	0.1		A
156.2	73592	BH60222WC	12/04/92	6-12	0.42	0.42	0.016		A	0.4	0.4	0.008		A
156.2	73592	BH60223WC	12/04/92	12-16	0.92	0.92	0.051		A	0.75	0.75	0.055		A
156.2	77692	BH60234WC	12/04/92	16.3-19.5	0.71	0.71	0.1		A	0.57	0.57	0.1		A
156.2	74692	BH60235WC	12/07/92	0-6	0.98	0.98	0.017		A	0.87	0.87	0.014		A
156.2	74692	BH60236WC	12/07/92	6-7.6	0.55	0.55	0.014		A	0.58	0.58	0.006		A
156.2	74692	BH60237WC	12/07/92	8.3-12.2	0.54	0.54	0.019		A	0.58	0.58	0.011		A
156.2	77892	BH60244WC	12/04/92	0-6	0.59	0.59	0.009		A	0.72	0.72	0.006		A
156.2	77892	BH60245WC	12/04/92	6-12.2	0.71	0.71	0.009		A	0.69	0.69	0.013		A
156.2	77892	BH60246WC	12/04/92	12.2-16.5	0.4	0.4	0.018		A	0.54	0.54	0.009		A
156.2	77592	BH60252WC	12/07/92	0-6.4	0.64	0.64	0.011		A	0.63	0.63	0.005		A
156.2	77592	BH60253WC	12/07/92	6.4-10.2	0.71	0.71	0.016		A	0.69	0.69	0.005		A
156.2	77592	BH60254WC	12/07/92	10.2-13.3	0.44	0.44	0.034		A	0.55	0.55	0.01		A
156.2	73892	BH60267WC	12/07/92	0-6	0.83	0.83	0.021	B	A	0.78	0.78	0.021	B	A
156.2	73892	BH60268WC	12/07/92	6-12	0.76	0.76	0.005	B	A	0.74	0.74	0.005	B	A
156.2	73892	BH60269WC	12/07/92	12-18	0.68	0.68	0.023	B	A	0.89	0.89	0.032		A
156.2	74492	BH60284WC	12/08/92	0-5.9	0.74	0.74	0.022	B	A	0.92	0.92	0.018	B	A
156.2	74492	BH60285WC	12/08/92	5.9-10.1	0.6	0.6	0.017	B	A	0.64	0.64	0.005	B	A
156.2	74492	BH60286WC	12/08/92	10.1-14.2	0.5	0.5	0.006	B	A	0.61	0.61	0.019	B	A
156.2	74192	BH60293WC	12/08/92	0-6	0.92	0.92	0.018	B	A	0.84	0.84	0.018	B	A
156.2	74192	BH60294WC	12/08/92	6-12	0.021	0.021	0.017	BJ	A	0	0	0.005	U	A
156.2	74192	BH60295WC	12/08/92	12-18	0.54	0.54	0.005	B	A	0.62	0.62	0.005	B	A
156.2	73992	BH60301WC	12/11/92	0-6	0.77	0.77	0.1		V	0.54	0.54	0.1		V
156.2	73992	BH60302WC	12/11/92	6-10	0.53	0.53	0.1		V	0.53	0.53	0.1		V
156.2	74092	BH60313WC	12/10/92	0-5.5	1.1	1.1	0.3		A	1	1	0.2		A
156.2	74092	BH60314WC	12/10/92	5.5-12	0.51	0.51	0.2		A	0.53	0.53	0.2		A

ATTACHMENT J1
TABLE 12
ROCKY FLATS OU6
95% UCL CONCENTRATION
AOC NO. 2, TOTAL AREA
SUBSURFACE SOIL RADIONUCLIDES

					URANIUM-233,-234 (pCi/g)					URANIUM-238 (pCi/g)				
IHSS	Location	Field ID	Sample Date	Depth	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
156.2	74092	BH60315WC	12/10/92	12-18	0.58	0.58	0.2		A	0.66	0.66	0.2		A
156.2	73992	BH60321WC	12/11/92	10-14	0.43	0.43	0.1		V	0.73	0.73	0.1		V
156.2	73792	BH60322WC	12/10/92	0-5.9	0.68	0.68	0.1		A	0.57	0.57	0.1		A
156.2	73792	BH60323WC	12/10/92	5.9-10	0.45	0.45	0.2		A	0.43	0.43	0.2		A
156.2	74392	BH60342WC	12/11/92	0-5.9	0.835	0.835				0.978	0.978			
156.2	74392	BH60358WC	12/11/92	5.9-9.8	0.344	0.344	0.017		A	0.393	0.393	0.017		A
156.2	74392	BH60359WC	12/11/92	9.8-12.9	0.405	0.405	0.023		A	0.517	0.517			A
156.2	74892	BH60374WC	12/14/92	0-6	0.861	0.861			A	0.874	0.874	0.028		A
156.2	74892	BH60375WC	12/14/92	6-10	0.675	0.675	0.058		A	0.512	0.512	0.026		A
156.2	74892	BH60376WC	12/14/92	10-14	0.583	0.583	0.025		A	0.702	0.702	0.025		A
156.2	74992	BH60393WC	12/14/92	0-6	1.1	1.1	0.029		A	1.005	1.005	0.019		A
156.2	74992	BH60394WC	12/14/92	6-12	0.86	0.86	0.016		A	0.79	0.79	0.01		A
156.2	74992	BH60395WC	12/14/92	12-15.8	0.81	0.81	0.011		A	1	1	0.011		A
156.2	74992	BH60403WC	12/14/92	15.8-22	0.57	0.57	0.021	B	A	0.72	0.72	0.035	B	A
156.2	73592	BH60404WC	12/15/92	16-22	1.1	1.1	0.022		A	1.4	1.4	0.013	B	A
156.2	74792	BH60405WC	12/16/92	0-6.1	1.15	1.15	0.014		A	1.1	1.1	0.024	B	A
156.2	74792	BH60408WC	12/16/92	6.1-12.3	0.99	0.99	0.012		A	1	1	0.012	B	A
156.2	74792	BH60409WC	12/16/92	12.3-18.4	0.79	0.79	0.021	B	A	0.82	0.82	0.021	B	A
156.2	74592	BH60410WC	12/15/92	0-6	0.96	0.96	0.025		A	1.2	1.2	0.025	B	A
156.2	74592	BH60411WC	12/15/92	6-11.8	1	1	0.022		A	0.89	0.89	0.035	B	A
156.2	74592	BH60412WC	12/15/92	11.8-18	0.79	0.79	0.012		A	0.85	0.85	0.012	B	A
156.2	74592	BH60429WC	12/15/92	18-21.3	0.4	0.4	0.069		A	0.55	0.55	0.051		A
156.2	74592	BH60430WC	12/15/92	21.3-24	0.76	0.76	0.044		A	0.73	0.73	0.037	B	A
156.2	74792	BH60453WC	12/16/92	18.4-20.5	0.86	0.86	0.048		A	0.64	0.64	0.048	B	A
156.2	74792	BH60454WC	12/16/92	20.5-24.2	0.74	0.74	0.062		A	0.83	0.83	0.062		A
156.2	74292	BH60468WC	12/17/92	0-6	0.933	0.933	0.03		A	0.976	0.976	0.03		A
156.2	74292	BH60469WC	12/17/92	6-12.3	0.711	0.711	0.034		A	0.792	0.792	0.034		A
156.2	74292	BH60476WC	12/17/92	12.3-17.8	0.883	0.883	0.026		A	0.936	0.936	0.019		A
156.2	74292	BH60486WC	12/17/92	17.8-19.8	0.636	0.636	0.031		A	0.409	0.409	0.031		A
156.2	74292	BH60487WC	12/17/92	19.8-24.3	1.06	1.06	0.066		A	1.29	1.29			A
156.2	63592	BH60532WC	01/07/93	0-6	0.752	0.752	0.02		A	0.602	0.602	0.02		A
156.2	63592	BH60533WC	01/07/93	6-12.1	0.528	0.528	0.013		A	0.677	0.677	0.013		A
156.2	63592	BH60534WC	01/07/93	12.1-16.2	0.784	0.784	0.029		A	0.687	0.687	0.029		A
156.2	63592	BH60540WC	01/07/93	16.2-20.1	0.993	0.993	0.031		A	0.812	0.812			A
156.2	63692	BH60542WC	01/08/93	0-6	0.64	0.64	0.06	B	A	0.61	0.61	0.025	B	A
156.2	63692	BH60543WC	01/08/93	6-8.9	0.34	0.34	0.019	B	A	0.52	0.52	0.011	B	A
156.2	63692	BH60544WC	01/08/93	8.9-14	0.69	0.69	0.046	B	A	0.82	0.82	0.022	B	A
165	73492	BH60622WC	01/19/93	0-5.6	0.87	0.87	0.024	B	A	0.49	0.49	0.041		A
165	73492	BH60623WC	01/19/93	5.6-13	0.33	0.33	0.048	B	A	0.64	0.64	0.048		A

ATTACHMENT J1
TABLE 12
ROCKY FLATS OU6
95% UCL CONCENTRATION
AOC NO. 2, TOTAL AREA
SUBSURFACE SOIL RADIONUCLIDES

					URANIUM-233,-234 (pCi/g)					URANIUM-238 (pCi/g)				
IHSS	Location	Field ID	Sample Date	Depth	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
165	72992	BH60624WC	01/20/93	0-6	0.98	0.98	0.023	B	A	1	1	0.014	B	A
165	72992	BH60625WC	01/20/93	6-11.9	1.2	1.2	0.015	B	A	0.8	0.8	0.025	B	A
165	72992	BH60626WC	01/20/93	11.9-15	1.2	1.2	0.044	B	A	1.2	1.2	0.044	B	A
165	73092	BH60644WC	01/25/93	0-6	1.3	1.3	0.018	B	A	1.1	1.1	0.01	B	A
165	73092	BH60645WC	01/25/93	6-12	1.3	1.3	0.036	B	A	1.6	1.6	0.02	B	A
165	72292	BH60647WC	01/26/93	0-6	1.255	1.255	0.039		A	1.124	1.124	0.039		A
165	72292	BH60654WC	01/26/93	6-11.6	0.7417	0.7417	0.036		A	0.8	0.8	0.026		A
165	72292	BH60655WC	01/26/93	11.6-16.4	0.8751	0.8751	0.023		A	0.7751	0.7751	0.023		A
165	72392	BH60667WC	01/26/93	0-5.8	0.577	0.577	0.057			0.577	0.577	0.057		
165	72392	BH60668WC	01/26/93	5.8-12	0.58	0.58	0.063			0.738	0.738	0.063		
165	72392	BH60669WC	01/26/93	12-16	0.769	0.769	0.063			0.736	0.736	0.063		
165	72792	BH60684WC	01/27/93	0-5.6	0.352	0.352	0.066			0.472	0.472	0.066		
165	72792	BH60685WC	01/27/93	5.6-12	0.3495	0.3495	0.086			0.458	0.458	0.086		
165	72792	BH60686WC	01/27/93	12-17.8	0.345	0.345	0.091			0.571	0.571	0.091		
165	72892	BH60698WC	01/28/93	0-6	1.24	1.24	0.063			0.414	0.414	0.025		
165	72892	BH60699WC	01/28/93	6-12.4	0.255	0.255	0.065			0.297	0.297	0.026		
165	72792	BH60710WC	01/27/93	17.8-23.8	0.532	0.532	0.083			0.586	0.586	0.083		
165	73392	BH60718WC	01/28/93	0-6.2	0.423	0.423	0.069			0.396	0.396	0.069		
165	73392	BH60719WC	01/28/93	6.2-12	0.547	0.547	0.069			0.583	0.583	0.027		
165	73192	BH60739WC	01/29/93	0-6.2	0.7041	0.7041	0.042		A	0.7973	0.7973	0.037		A
165	73192	BH60740WC	01/29/93	6.2-12	0.5986	0.5986	0.036		A	0.6921	0.6921	0.044		A
Number of samples					99					99				
Number of detects					99					98				
Minimum detected					0.021					0.297				
Maximum detected					1.3					1.6				
Average					0.7327					0.7417				
Standard Deviation					0.2620					0.2494				
t-value					1.671					1.671				
95% UCL					0.7767					0.7836				
RME														
Statistics based on log normal distribution										0.7930				
95% UCL (see Table 1)														

ATTACHMENT J1
TABLE 13
95% UCL CONCENTRATION
AOC NO. 3
POND SEDIMENT SEMIVOLATILES

				BENZO(a)PYRENE (µg/kg)					BENZO(b)FLUORANTHENE (µg/kg)					BIS(2-ETHYLHEXYL)PHTHALATE (µg/kg)				
IHSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
142.1	SED60092	SD60000WC	10/29/92	310	310	330	J	A	420	420	330	J	A	230	230	330	J	A
142.1	SED60192	SD60001WC	11/02/92	190	190	330	J	A	305	610	330	U	V	305	610	330	U	V
142.1	SED60292	SD60002WC	10/29/92	240	240	330	J	A	300	300	330	J	A	320	320	330	J	A
142.1	SED60392	SD60003WC	10/29/92	205	205	330	J	A	270	270	330	J	A	485	485	330	J	A
142.1	SED60492	SD60004WC	11/02/92	295	590	330	U	V	295	590	330	U	V	90	90	330	J	A
142.2	SED60592	SD60005WC	11/12/92	75	75	330	J	A	280	560	330	U	V	530	530	330	J	A
142.2	SED60692	SD60006WC	11/12/92	240	480	330	U	V	240	480	330	U	V	110	110	330	J	A
142.2	SED60792	SD60007WC	11/12/92	320	640	330	U	V	320	640	330	U	V	4200	4200	330		V
142.2	SED60892	SD60008WC	11/12/92	385	770	330	U	V	385	770	330	U	V	7800	7800	330		V
142.2	SED60992	SD60009WC	11/12/92	235	470	330	U	V	235	470	330	U	V	350	350	330	J	A
142.3	SED61092	SD60010WC	10/21/92	150	150	330	J	A	260	260	330	J	A	580	580	330	BJ	JA
142.3	SED61192	SD60011WC	10/21/92	240	240	330	J	A	370	370	330	J	A	990	990	330	B	JA
142.3	SED61292	SD60012WC	10/22/92	170	170	330	J	A	240	240	330	J	A	570	570	330		V
142.3	SED61392	SD60013WC	10/21/92	295	590	330	U	V	240	240	330	J	A	590	590	330	BJ	JA
142.3	SED61492	SD60014WC	10/22/92	250	500	330	U	V	250	500	330	U	V	220	220	330	J	A
Number of samples				15					15					15				
Number of detects				8					7					14				
Minimum detected				75					240					90				
Maximum detected				310					420					7800				
Average				240					294					1158				
Standard Deviation				74.14					55.89					2021.73				
t-value				1.761					1.761					1.761				
95% UCL				273.7					319.4					2077				

Statistics based on log normal distribution

95% UCL (see Table 1) 2637

ATTACHMENT J1
TABLE 14
95% UCL CONCENTRATION
AOC NO.3
POND SEDIMENT PCBs

				AROCLOR-1254 (µg/kg)				
IHSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual
142.1	SED60092	SD60000WC	10/29/92	590	590	160		V
142.1	SED60192	SD60001WC	11/02/92	330	330	160		V
142.1	SED60292	SD60002WC	10/29/92	460	460	160		V
142.1	SED60392	SD60003WC	10/29/92	330	330	160		V
142.1	SED60492	SD60004WC	11/02/92	320	320	160		V
142.2	SED60592	SD60005WC	11/12/92	590	590	160		V
142.2	SED60692	SD60006WC	11/12/92	115	230	160	U	V
142.2	SED60792	SD60007WC	11/12/92	155	310	160	U	V
142.2	SED60892	SD60008WC	11/12/92	185	370	160	U	V
142.2	SED60992	SD60009WC	11/12/92	115	230	160	U	V
142.3	SED61092	SD60010WC	10/21/92	140	280	160	U	V
142.3	SED61192	SD60011WC	10/21/92	140	280	160	U	V
142.3	SED61292	SD60012WC	10/22/92	130	260	160	U	V
142.3	SED61392	SD60013WC	10/21/92	140	280	160	U	V
142.3	SED61492	SD60014WC	10/22/92	120	240	160	U	V
Number of samples				15				
Number of detects				6				
Minimum detect				320				
Maximum detect				590				
Average				257.33				
Standard Deviation				165.23				
t-value				1.761				
95% UCL				332.46				

ATTACHMENT J1
TABLE 15
ROCKY FLATS OU6
95% UCL CONCENTRATION
AOC NO. 3
POND SEDIMENT METALS

				ANTIMONY (mg/kg)					SILVER (mg/kg)				
IJSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
142.1	SED60092	SD60000WC	10/29/92	29.6	29.6	12		JA	1.15	2.3	2	U	V
142.1	SED60192	SD60001WC	11/02/92	11	22	12	U	JA	1.2	2.4	2	U	V
142.1	SED60292	SD60002WC	10/29/92	30.4	30.4	12		JA	1.25	2.5	2	U	V
142.1	SED60392	SD60003WC	10/29/92	21.6	21.6	12	B	JA	3.9	3.9	2		JA
142.1	SED60492	SD60004WC	11/02/92	10.15	20.3	12	U	JA	1.1	2.2	2	U	V
142.2	SED60592	SD60005WC	11/12/92					R	1.25	2.5	2	U	V
142.2	SED60692	SD60006WC	11/12/92					R	0.9	1.8	2	U	V
142.2	SED60792	SD60007WC	11/12/92					R	1.5	3	2	U	V
142.2	SED60892	SD60008WC	11/12/92					R	1.5	3	2	U	V
142.2	SED60992	SD60009WC	11/12/92					R	0.85	1.7	2	U	V
142.3	SED61092	SD60010WC	10/21/92	9.8	19.6	12	U	JA	1.05	2.1	2	U	V
142.3	SED61192	SD60011WC	10/21/92	10.45	20.9	12	U	JA	1.15	2.3	2	U	V
142.3	SED61292	SD60012WC	10/22/92	26	26	12		JA	1.05	2.1	2	U	JA
142.3	SED61392	SD60013WC	10/21/92					R	1.1	2.2	2	U	V
142.3	SED61492	SD60014WC	10/22/92	8.45	16.9	12	U	V	0.9	1.8	2	U	JA
Number of samples				9					15				
Number of detects				4					1				
Minimum detected				21.6					3.9				
Maximum detected				30.4					3.9				
Average				17.49					1.32				
Standard Deviation				8.75					0.71				
t-value				1.86					1.761				
95% UCL				22.92					1.65				

Statistics based on log normal distribution
95% UCL (see Table 1)

ATTACHMENT J1
TABLE 15
ROCKY FLATS OU6
95% UCL CONCENTRATION
AOC NO. 3
POND SEDIMENT METALS

				VANADIUM (mg/kg)				
IJSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual
142.1	SED60092	SD60000WC	10/29/92	36.6	36.6	10		V
142.1	SED60192	SD60001WC	11/02/92	27.1	27.1	10		V
142.1	SED60292	SD60002WC	10/29/92	36.8	36.8	10		V
142.1	SED60392	SD60003WC	10/29/92	33.35	33.35	10		V
142.1	SED60492	SD60004WC	11/02/92	32.8	32.8	10		V
142.2	SED60592	SD60005WC	11/12/92	23.5	23.5	10		V
142.2	SED60692	SD60006WC	11/12/92	21.2	21.2	10		V
142.2	SED60792	SD60007WC	11/12/92	32	32	10		V
142.2	SED60892	SD60008WC	11/12/92	27.3	27.3	10		V
142.2	SED60992	SD60009WC	11/12/92	27.1	27.1	10		V
142.3	SED61092	SD60010WC	10/21/92	62.7	62.7	10		V
142.3	SED61192	SD60011WC	10/21/92	60.1	60.1	10		V
142.3	SED61292	SD60012WC	10/22/92	39.6	39.6	10		V
142.3	SED61392	SD60013WC	10/21/92	47.6	47.6	10		V
142.3	SED61492	SD60014WC	10/22/92	32.1	32.1	10		V
Number of samples				15				
Number of detects				15				
Minimum detected				21.2				
Maximum detected				62.7				
Average				35.99				
Standard Deviation				11.83				
t-value				1.761				
95% UCL				41.37				
Statistics based on log normal distribution								
95% UCL (see Table 1)				42.2				

ATTACHMENT J1
TABLE 16
95% UCL CONCENTRATION
AOC NO. 3
POND SEDIMENT RADIONUCLIDES

				AMERICIUM-241 (pCi/g)					PLUTONIUM-239/240 (pCi/g)				
IHSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
142.1	SED60092	SD60000WC	29-Oct-92	12.25	12.25	0		A	35.47	35.47	0.056		A
142.1	SED60192	SD60001WC	2-Nov-92	7.5	7.5	0		A	17.67	17.67	0		A
142.1	SED60292	SD60002WC	29-Oct-92	13.23	13.23	0		A	36.2	36.2	0		A
142.1	SED60392	SD60003WC	29-Oct-92	10.325	10.325	0		A	26.8	26.8	0.049		A
142.1	SED60492	SD60004WC	2-Nov-92	3.25	3.25	0		A					R
142.2	SED60592	SD60005WC	12-Nov-92	1.07	1.07	0		A	3.99	3.99	0		A
142.2	SED60692	SD60006WC	12-Nov-92	0.154	0.154	0.007		A	0.587	0.587	0		A
142.2	SED60792	SD60007WC	12-Nov-92	1.74	1.74	0.004		A	5.65	5.65	0		A
142.2	SED60892	SD60008WC	12-Nov-92					R	2.58	2.58	0.005		A
142.2	SED60992	SD60009WC	12-Nov-92	1.08	1.08	0		A	3.13	3.13	0		A
142.3	SED61092	SD60010WC	21-Oct-92	0.6663	0.6663	0		A	2.053	2.053	0		A
142.3	SED61192	SD60011WC	21-Oct-92	0.3328	0.3328	0		A	0.9137	0.9137	0.02		A
142.3	SED61292	SD60012WC	22-Oct-92	0.4222	0.4222	0		A	1.304	1.304	0.026		A
142.3	SED61392	SD60013WC	21-Oct-92	0.2457	0.2457	0		A	0.6185	0.6185	0		A
142.3	SED61492	SD60014WC	22-Oct-92	0.3974	0.3974	0.005		A	1.182	1.182	0.018		A
Number of samples				14					14				
Number of detects				14					14				
Minimum detected				0.154					0.587				
Maximum detected				13.23					36.2				
Average				3.76					9.87				
Standard Deviation				4.68					12.84				
t-value				1.771					1.771				
95% UCL				5.98					15.95				
RME				5.98					15.95				
Statistics based on log normal distribution													
95% UCL (see Table 1)				23.4					50				

ATTACHMENT J1
TABLE 17
95% UCL CONCENTRATION
AOC NO. 3
STREAM AND DRY SEDIMENT SEMIVOLATILES

			BENZO(a)ANTHRACENE (µg/kg)					BENZO(a)PYRENE (µg/kg)					BENZO(b)FLUORANTHENE (µg/kg)				
Location	Field Id	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
SED65092	SD60050WC			550	330	U	V	275	550	330	U	V	275	550	330	U	V
SED65192	SD60051WC			560	330	U	V	280	560	330	U	V	280	560	330	U	V
SED65292	SD60052WC			570	330	U	V	285	570	330	U	V	285	570	330	U	V
SED65392	SD60053WC			520	330	U	V	260	520	330	U	V	260	520	330	U	V
SED65492	SD60054WC		51	51	330	J	A	220	440	330	U	V	110	110	330	J	A
SED65592	SD60055WC		190	190	330	J	A	260	260	330	J	A	400	400	330	J	A
SED68192	SD60081WC	02/19/93	230	460	330	U	V	230	460	330	U	V	230	460	330	U	V
SED68492	SD60084WC	05/06/93	230	460	330	U	V	110	110	330	J	A	140	140	330	J	A
SED68692	SD60086WC	05/06/93	240	480	330	U	V	240	480	330	U	V	240	480	330	U	V
Number of samples			5					9					9				
Number of detects			2					2					3				
Minimum detection			51					110					110				
Maximum detection			190					260					400				
Average			188.20					240.00					246.67				
Standard Deviation			70.72					50.61					79.90				
t-value			2.132					1.86					1.86				
95% UCL			255.63					271.38					296.20				
RME			190					260					296				

ATTACHMENT J1
TABLE 17
95% UCL CONCENTRATION
AOC NO. 3
STREAM AND DRY SEDIMENT SEMIVOLATILES

			INDENO(1,2,3-cd)PYRENE (µg/kg)				
Location	Field Id	Sample Date	Result	SQL	CRDL	Qual	Valid Qual
SED65092	SD60050WC			550	330	U	V
SED65192	SD60051WC			560	330	U	V
SED65292	SD60052WC			570	330	U	V
SED65392	SD60053WC			520	330	U	V
SED65492	SD60054WC			440	330	U	V
SED65592	SD60055WC		110	110	330	J	A
SED68192	SD60081WC	02/19/93		460	330	U	V
SED68492	SD60084WC	05/06/93		460	330	U	V
SED68692	SD60086WC	05/06/93		480	330	U	V
Number of samples			1				
Number of detects			1				
Minimum detection			110				
Maximum detection			110				
Average			-				
Standard Deviation			-				
t-value			-				
95% UCL			-				
RME			110				

ATTACHMENT J1
TABLE 18
95% UCL CONCENTRATION
AOC NO. 3
STREAM AND DRY SEDIMENT METALS

			COBALT (mg/kg)					STRONTIUM (mg/kg)				
Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
SED65092	SD60050WC		10.7	10.7	10	B	V	59.5	59.5	40	B	JA
SED65192	SD60051WC		6.3	6.3	10	B	V	52.3	52.3	40	B	JA
SED65292	SD60052WC		9.8	9.8	10	B	V	55.8	55.8	40	B	JA
SED65392	SD60053WC		12.6	12.6	10	B	V	69.7	69.7	40		JA
SED65492	SD60054WC		11.3	11.3	10	B	V	51.6	51.6	40	B	JA
SED65592	SD60055WC		10.8	10.8	10	B	V	57	57	40	B	JA
SED68192	SD60081WC	02/19/93	11.10	11.10	10.00	B	V	55.00	55.00	40.00	B	JA
SED68492	SD60084WC	05/06/93	6.90	6.90	10.00	B		44.80	44.80	40.00	B	
SED68692	SD60086WC	05/06/93	7.80	7.80	10.00	B		95.40	95.40	40.00		
Number of samples			9					9				
Number of detects			9					9				
Minimum detected			6.30					44.80				
Maximum detected			12.60					95.40				
Average			9.70					60.12				
Standard Deviation			2.06					13.98				
t-value			1.86					1.86				
95% UCL			10.98					68.79				

ATTACHMENT J1
TABLE 18
95% UCL CONCENTRATION
AOC NO. 3
STREAM AND DRY SEDIMENT METALS

			VANADIUM (mg/kg)					ZINC (mg/kg)				
Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
SED65092	SD60050WC		26.1	26.1	10		V	293	293	4		V
SED65192	SD60051WC		18.8	18.8	10		V	80.3	80.3	4		V
SED65292	SD60052WC		28.8	28.8	10		V	189	189	4		V
SED65392	SD60053WC		31.8	31.8	10		V	67.1	67.1	4		V
SED65492	SD60054WC		34.4	34.4	10		V	121	121	4		V
SED65592	SD60055WC		32	32	10		V	164	164	4		V
SED68192	SD60081WC	02/19/93	33.90	33.90	10.00		V	61.70	61.70	4.00		V
SED68492	SD60084WC	05/06/93	18.40	18.40	10.00			178.00	178.00	4.00		
SED68692	SD60086WC	05/06/93	25.00	25.00	10.00			54.00	54.00	4.00		
Number of samples			9					9				
Number of detects			9					9				
Minimum detected			18.40					54.00				
Maximum detected			34.40					293.00				
Average			27.69					134.23				
Standard Deviation			5.73					74.76				
t-value			1.86					1.86				
95% UCL			31.24					180.58				

ATTACHMENT J1
TABLE 19
95% UCL CONCENTRATION
AOC NO. 3
STREAM AND DRY SEDIMENT RADIONUCLIDES

			AMERICIUM-241 (pCi/g)					PLUTONIUM-239/240 (pCi/g)				
Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
SED65092	SD60050WC	02/11/93						0.5977	0.5977			A
SED65192	SD60051WC	02/11/93						3.64	3.64			A
SED65292	SD60052WC	02/11/93						2.846	2.846	0.014		A
SED65392	SD60053WC	02/11/93						4.444	4.444			A
SED65492	SD60054WC	02/11/93	0.2497	0 2497	0.004		A	0.5277	0.5277			A
SED65592	SD60055WC	02/11/93	0.3269	0.3269	0.003		A	0.7255	0.7255			A
SED68192	SD60081WC	02/19/93	0.2695	0.2695			A	0.6766	0.6766			A
SED68492	SD60084WC	05/06/93	0.2190	0.2190	0.004			0.6290	0.6290	0.018		
SED68692	SD60086WC	05/06/93	0.0593	0.0593	0.0039			0.1190	0.1190	0.013		
Number of detects			5					9				
Number of samples			5					9				
Minimum detected			0.0593					0.1190				
Maximum detected			0.3269					4.4440				
Average			0.2249					1.5784				
Standard Deviation			0.0900					1.5168				
t-value			2.132					1.860				
95% UCL			0.3107					2.5188				

ATTACHMENT J1
TABLE 20
95% UCL CONCENTRATION
AOC NO. 4
POND SEDIMENT SEMIVOLATILES

				BENZO(a)PYRENE (µg/kg)					BENZO(b)FLUORANTHENE (µg/kg)					BIS(2-ETHYLHEXYL)PHTHALATE (µg/kg)				
IHSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
142.5	SED62092	SD60020WC	11/16/92	150	150	330	J	A	720	720	330	J	A	11000	11000	330		V
142.5	SED62192	SD60021WC	11/16/92	375	750	330	U	V	375	750	330	U	V	590	590	330	J	A
142.5	SED62292	SD60022WC	11/16/92	470	940	330	U	V	1500	1500	330		V	46000	46000	330	D	V
142.5	SED62392	SD60023WC	11/16/92	450	450	330	J	A	2000	2000	330		V	37000	37000	330	D	V
142.5	SED62492	SD60024WC	11/16/92	435	435	330		A	1450	1450	330		A	5150	5150	330		V
142.6	SED62592	SD60025WC	11/18/92	130	130	330	J	A	285	570	330	U	V	8800	8800	330		V
142.6	SED62692	SD60026WC	11/18/92	400	800	330	U	V	400	800	330	U	V	330	330	330	J	A
142.6	SED62892	SD60028WC	11/15/92	410	820	330	U	V	410	820	330	U	V	9000	9000	330		V
142.6	SED62992	SD60029WC	11/18/92	355	710	330	U	V	355	710	330	U	V	2000	2000	330		V
142.7	SED63092	SD60030WC	10/27/92	265	530	330	U	V	265	530	330	U	V	570	570	330		V
142.7	SED63192	SD60031WC	10/27/92	250	500	330	U	V	250	500	330	U	V	370	370	330	J	A
142.7	SED63292	SD60032WC	10/28/92	260	260	330	J	A	560	560	330	J	A	9100	9100	330		V
142.7	SED63392	SD60033WC	10/27/92	480	960	330	U	V	770	770	330	J	A	9000	9000	330		V
142.7	SED63492	SD60034WC	10/28/92	250	500	330	U	V	54	54	330	J	A	790	790	330		V
142.8	SED63592	SD60035WC	10/22/92	420	420	330	J	A	660	660	330		V	980	980	330		V
142.8	SED63692	SD60036WC	10/26/92	290	290	330	J	A	440	440	330	J	A	650	650	330		V
142.8	SED63792	SD60037WC	10/26/92	420	420	330	J	A	1000	1000	330		V	2600	2600	330		V
142.8	SED63892	SD60038WC	10/22/92	370	370	330	J	A	660	660	330		V	2100	2100	330		V
142.8	SED63992	SD60039WC	10/26/92	340	340	330	J	A	550	550	330		V	750	750	330		V
Number of samples				19					19					19				
Number of detects				10					12					19				
Minimum detected				130					54					330				
Maximum detected				450					2000					46000				
Average				343.16					668.63					7725.26				
Standard Deviation				100.53					484.61					12224.90				
t-value				1.734					1.734					1.734				
95% UCL				383.15					861.41					12588.41				

Statistics based on log normal distribution

95% UCL (see Table 1) 30258

ATTACHMENT J1
TABLE 21
95% UCL CONCENTRATION
AOC NO. 4
POND SEDIMENT PCBs

				AROCLOR-1254 (µg/kg)				
IHSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual
142.5	SED62092	SD60020WC	11/16/92	1100	1100	160		V
142.5	SED62192	SD60021WC	11/16/92	180	360	160	U	V
142.5	SED62292	SD60022WC	11/16/92	6000	12000	160	U	V
142.5	SED62392	SD60023WC	11/16/92	5600	5600	160	C	V
142.5	SED62492	SD60024WC	11/16/92	955	955	160		V
142.6	SED62592	SD60025WC	11/18/92	3300	3300	160	C	V
142.6	SED62692	SD60026WC	11/18/92	400	400	160		V
142.6	SED62792	SD60027WC	11/18/92	520	520	160		V
142.6	SED62892	SD60028WC	11/15/92	6600	6600	160	C	V
142.6	SED62992	SD60029WC	11/18/92	175	350	160	U	V
142.7	SED63092	SD60030WC	10/27/92	125	250	160	U	V
142.7	SED63192	SD60031WC	10/27/92	270	270	160		V
142.7	SED63292	SD60032WC	10/28/92	2700	2700	160	C	V
142.7	SED63392	SD60033WC	10/27/92	2900	2900	160		V
142.7	SED63492	SD60034WC	10/28/92	130	260	160	U	V
142.8	SED63592	SD60035WC	10/22/92	230	230	160		V
142.8	SED63692	SD60036WC	10/26/92	110	220	160	U	V
142.8	SED63792	SD60037WC	10/26/92	440	440	160		V
142.8	SED63892	SD60038WC	10/22/92	150	300	160	U	V
142.8	SED63992	SD60039WC	10/26/92	300	300	160		V
Number of samples				20				
Number of detects				13				
Minimum detected				230				
Maximum detected				6600				
Average				1609.25				
Standard Deviation				2107.23				
t-value				1.729				
95% UCL				2423.94				

ATTACHMENT J1
TABLE 22
95% UCL CONCENTRATION
AOC NO. 4
POND SEDIMENT METALS

				ANTIMONY (mg/kg)					SILVER (mg/kg)				
IHSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
142.5	SED62092	SD60020WC	11/16/92					R	57.3	57.3	2		V
142.5	SED62192	SD60021WC	11/16/92					R	6.5	6.5	2		V
142.5	SED62292	SD60022WC	11/16/92					R	129	129	2		V
142.5	SED62392	SD60023WC	11/16/92					R	124	124	2		V
142.5	SED62492	SD60024WC	11/16/92					R	49.1	49.1	2		V
142.6	SED62592	SD60025WC	11/18/92					R	141	141	2		V
142.6	SED62692	SD60026WC	11/18/92					R	20.9	20.9	2		JA
142.6	SED62792	SD60027WC	11/18/92					R	15.2	15.2	2		V
142.6	SED62892	SD60028WC	11/15/92					R	207	207	2		V
142.6	SED62992	SD60029WC	11/18/92					R	1.3	2.6	2	U	V
142.7	SED63092	SD60030WC	10/27/92					R	12.7	12.7	2		V
142.7	SED63192	SD60031WC	10/27/92					R	15.2	15.2	2		V
142.7	SED63292	SD60032WC	10/28/92	68.5	68.5	12		JA	239	239	2		V
142.7	SED63392	SD60033WC	10/27/92					R	240	240	2		V
142.7	SED63492	SD60034WC	10/28/92					R	20.3	20.3	2		V
142.8	SED63592	SD60035WC	10/22/92	24.7	24.7	12		JA	0.85	1.7	2	U	JA
142.8	SED63692	SD60036WC	10/26/92					R	0.95	1.9	2	U	V
142.8	SED63792	SD60037WC	10/26/92					R	1.25	2.5	2	U	V
142.8	SED63892	SD60038WC	10/22/92	25.6	25.6	12		JA	1.15	2.3	2	U	JA
142.8	SED63992	SD60039WC	10/26/92					R	0.975	1.95	2	U	V
Number of samples				3					20				
Number of detects				3					14				
Minimum detected				24.7					6.5				
Maximum detected				68.5					240				
Average				39.60					64.18				
Standard Deviation				20.44					81.94				
t-value				2.92					1.729				
95% UCL				74.06					95.86				

ATTACHMENT J1
TABLE 22
95% UCL CONCENTRATION
AOC NO. 4
POND SEDIMENT METALS

				VANADIUM (mg/kg)				
IHSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual
142.5	SED62092	SD60020WC	11/16/92	28.7	28.7	10	B	V
142.5	SED62192	SD60021WC	11/16/92	30.5	30.5	10		V
142.5	SED62292	SD60022WC	11/16/92	33.1	33.1	10		V
142.5	SED62392	SD60023WC	11/16/92	27.6	27.6	10	B	V
142.5	SED62492	SD60024WC	11/16/92	23.9	23.9	10		V
142.6	SED62592	SD60025WC	11/18/92	20.8	20.8	10		JA
142.6	SED62692	SD60026WC	11/18/92	21.5	21.5	10	B	JA
142.6	SED62792	SD60027WC	11/18/92	24.2	24.2	10	B	JA
142.6	SED62892	SD60028WC	11/15/92	25.3	25.3	10		JA
142.6	SED62992	SD60029WC	11/18/92	23.3	23.3	10		JA
142.7	SED63092	SD60030WC	10/27/92	20.5	20.5	10		V
142.7	SED63192	SD60031WC	10/27/92	27.4	27.4	10		V
142.7	SED63292	SD60032WC	10/28/92	30.1	30.1	10		V
142.7	SED63392	SD60033WC	10/27/92	32.7	32.7	10		V
142.7	SED63492	SD60034WC	10/28/92	28.4	28.4	10		V
142.8	SED63592	SD60035WC	10/22/92	28.5	28.5	10		V
142.8	SED63692	SD60036WC	10/26/92	20.9	20.9	10		V
142.8	SED63792	SD60037WC	10/26/92	35.4	35.4	10		V
142.8	SED63892	SD60038WC	10/22/92	46.2	46.2	10		V
142.8	SED63992	SD60039WC	10/26/92	35.25	35.25	10		V
Number of samples				20				
Number of detects				20				
Minimum detected				20.5				
Maximum detected				46.2				
Average				28.21				
Standard Deviation				6.16				
t-value				1.729				
95% UCL				30.59				

ATTACHMENT J1
TABLE 23
95% UCL CONCENTRATION
AOC NO. 4
POND SEDIMENT RADIONUCLIDES

				AMERICIUM-241 (pCi/g)					PLUTONIUM-239/240 (pCi/g)				
IHSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
142.5	SED62092	SD60020WC	11/16/92	96.11	96.11	0		A					R
142.5	SED62192	SD60021WC	11/16/92	7.861	7.861	0		A	20.65	20.65	0.028		A
142.5	SED62292	SD60022WC	11/16/92	156.5	156.5	0		A					R
142.5	SED62392	SD60023WC	11/16/92	194.5	194.5	0		A					R
142.5	SED62492	SD60024WC	11/16/92	47.87	47.87	0		A	92	92	0.22		A
142.6	SED62592	SD60025WC	11/18/92	15.1	15.1	0		A	41.2	41.2	0		A
142.6	SED62692	SD60026WC	11/18/92	9.2	9.2	0		A	26.9	26.9	0.008		A
142.6	SED62792	SD60027WC	11/18/92	4.91	4.91	0		A	13.1	13.1	0		A
142.6	SED62892	SD60028WC	11/15/92	23.1	23.1	0		A	36.9	36.9	0.009		A
142.6	SED62992	SD60029WC	11/18/92	4.58	4.58	0		A	15.7	15.7	0.006		A
142.7	SED63092	SD60030WC	10/27/92	3.426	3.426	0		A	11.99	11.99	0.021		A
142.7	SED63192	SD60031WC	10/27/92	2.746	2.746	0.006		A	7.568	7.568	0		A
142.7	SED63292	SD60032WC	10/28/92	42.23	42.23	0		A	115.8	115.8	0.155		A
142.7	SED63392	SD60033WC	10/27/92	63.07	63.07	0		A	180.2	180.2	0		A
142.7	SED63492	SD60034WC	10/28/92	6.995	6.995	0		A					R
142.8	SED63592	SD60035WC	10/22/92	2.177	2.177	0		A	8.37	8.37	0.007		A
142.8	SED63692	SD60036WC	10/26/92	0.4584	0.4584	0		A	0.8329	0.8329	0		A
142.8	SED63792	SD60037WC	10/26/92	0.5881	0.5881	0.004		A	1.338	1.338	0		A
142.8	SED63892	SD60038WC	10/22/92	0.4847	0.4847	0		A	0.9002	0.9002	0.006		A
142.8	SED63992	SD60039WC	10/26/92	0.5321	0.5321	0		A					R
Number of samples				20					15				
Number of detects				27					15				
Minimum detected				0.458					0.833				
Maximum detected				194.5					180.2				
Average				34.12					38.23				
Standard Deviation				53.55					49.88				
t-value				1.706					1.761				
95% UCL				54.55					60.91				

ATTACHMENT J1
TABLE 24
95% UCL CONCENTRATION
AOC NO. 4
POND SURFACE WATER VOLATILES

				1,2-DICHLOROETHENE (µg/l)					CHLOROFORM (µg/l)				
IHSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
142.5	SW62092	SWU6020WC	09/21/92	2.5	5	5	U	V	2.5	5	5	U	V
142.5	SW62192	SWU6021WC	09/21/92	2.5	5	5	U	V	2.5	5	5	U	V
142.5	SW62292	SWU6022WC	09/21/92	2.5	5	5	U	V	2.5	5	5	U	V
142.5	SW62392	SWU6023WC	09/23/92	2.5	5	5	U	V	2.5	5	5	U	V
142.5	SW62492	SWU6024WC	09/21/92	2.5	5	5	U	V	2.5	5	5	U	V
142.6	SW62592	SWU6025WC	09/23/92	2	2	5	J	A	2.5	5	5	U	V
142.6	SW62692	SWU6026WC	09/24/92	3	3	5	J	A	2.5	5	5	U	V
142.6	SW62792	SWU6027WC	09/23/92	2.5	5	5	U	V	2.5	5	5	U	V
142.6	SW62892	SWU6028WC	09/23/92	2	2	5	J	A	2.5	5	5	U	V
142.6	SW62992	SWU6029WC	09/24/92	2.5	5	5	U	V	2.5	5	5	U	V
142.6	SW62892	SWU6061WC	09/23/92	2	2	5	J	A	2.5	5	5	U	V
142.7	SW63092	SWU6030WC	10/05/92	2.5	5	5	U	V	1	1	5	J	A
142.7	SW63192	SWU6031WC	10/05/92	2.5	5	5	U	V	1	1	5	J	A
142.7	SW63292	SWU6032WC	10/05/92	2.5	5	5	U	V	1	1	5	J	A
142.7	SW63392	SWU6033WC	10/05/92	2.5	5	5	U	V	1	1	5	J	A
142.7	SW63492	SWU6034WC	10/05/92	2.5	5	5	U	V	1	1	5	J	A
142.8	SW63592	SWU6035WC	10/01/92	2.5	5	5	U	V	1.5	1.5	5	J	A
142.8	SW63692	SWU6036WC	10/01/92	2.5	5	5	U	V	2	2	5	J	A
142.8	SW63792	SWU6037WC	10/01/92	2.5	5	5	U	V	0.8	0.8	5	J	A
142.8	SW63892	SWU6038WC	10/01/92	2.5	5	5	U	V	2	2	5	J	A
142.8	SW63992	SWU6039WC	10/01/92	2.5	5	5	U	V	0.8	0.8	5	J	A
Number of samples				21					21				
Number of detects				4					10				
Minimum detected				2					0.8				
Maximum detected				3					2				
Average				2.45					1.89				
Standard Deviation				0.21					0.71				
t-value				1.725					1.725				
95% UCL				2.53					2.15				

ATTACHMENT J1
TABLE 24
95% UCL CONCENTRATION
AOC NO. 4
POND SURFACE WATER VOLATILES

				TRICHLOROETHENE (µg/l)				
IHSS	Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual
142.5	SW62092	SWU6020WC	09/21/92	2.5	5	5	U	V
142.5	SW62192	SWU6021WC	09/21/92	2.5	5	5	U	V
142.5	SW62292	SWU6022WC	09/21/92	2.5	5	5	U	V
142.5	SW62392	SWU6023WC	09/23/92	2.5	5	5	U	V
142.5	SW62492	SWU6024WC	09/21/92	2.5	5	5	U	V
142.6	SW62592	SWU6025WC	09/23/92	2	2	5	J	A
142.6	SW62692	SWU6026WC	09/24/92	4	4	5	J	A
142.6	SW62792	SWU6027WC	09/23/92	2	2	5	J	A
142.6	SW62892	SWU6028WC	09/23/92	2	2	5	J	A
142.6	SW62992	SWU6029WC	09/24/92	2.5	5	5	U	V
142.6	SW62892	SWU6061WC	09/23/92	2	2	5	J	A
142.7	SW63092	SWU6030WC	10/05/92	2.5	5	5	U	V
142.7	SW63192	SWU6031WC	10/05/92	2.5	5	5	U	V
142.7	SW63292	SWU6032WC	10/05/92	2.5	5	5	U	V
142.7	SW63392	SWU6033WC	10/05/92	2.5	5	5	U	V
142.7	SW63492	SWU6034WC	10/05/92	2.5	5	5	U	V
142.8	SW63592	SWU6035WC	10/01/92	2.5	5	5	U	V
142.8	SW63692	SWU6036WC	10/01/92	2.5	5	5	U	V
142.8	SW63792	SWU6037WC	10/01/92	2.5	5	5	U	V
142.8	SW63892	SWU6038WC	10/01/92	2.5	5	5	U	V
142.8	SW63992	SWU6039WC	10/01/92	6	6	5		V
Number of samples				21				
Number of detects				6				
Minimum detected				2				
Maximum detected				6				
Average				2.64				
Standard Deviation				0.85				
t-value				1.725				
95% UCL				2.96				

ATTACHMENT J1
TABLE 25
95% UCL CONCENTRATION
AOC NO. 4
STREAM AND DRY SEDIMENT SEMIVOLATILES

			BENZO(a)ANTHRACENE (µg/kg)					BENZO(a)PYRENE (µg/kg)				
Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
SED65892	SD60058WC		200	200	330	J	A	230	230	330	J	A
SED65992	SD60059WC		225	225	330	J	A	455	455	330	U	V
SED66092	SD60060WC		290	580	330	U	V	580	580	330	U	V
SED66192	SD60061WC		240	480	330	U	V	480	480	330	U	V
SED66292	SD60062WC		300	600	330	U	V	600	600	330	U	V
SED66392	SD60063WC		235	470	330	U	V	470	470	330	U	V
SED66492	SD60064WC		245	490	330	U	V	490	490	330	U	V
SED66592	SD60065WC		280	280	330	J	A	380	380	330	J	A
SED69792	SD60097WC	05/10/93	215	430	330	U	V	215	430	330	U	V
SED69892	SD60098WC	05/10/93	360	360	330	J	A	410	410	330	J	A
SED69992	SD60099WC	05/10/93	190	380	330	U	V	190	380	330	U	V
SED70092	SD60100WC	05/10/93	430	430	330		V	480	480	330		V
Number of samples			12					12				
Number of detects			5					4				
Minimum detected			200					230				
Maximum detected			430					480				
Average			267.5					415				
Standard Deviation			67.16					131.10				
t-value			1.796					1.796				
95% UCL			302.32					482.97				

ATTACHMENT J1
TABLE 25
95% UCL CONCENTRATION
AOC NO. 4
STREAM AND DRY SEDIMENT SEMIVOLATILES

			BENZO(b)FLUORANTHENE (µg/kg)					INDENO(1,2,3-cd)PYRENE (µg/kg)				
Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
SED65892	SD60058WC		280	280	330	J	A		560	330	U	V
SED65992	SD60059WC		340	340	330	J	A	130	130	330	J	A
SED66092	SD60060WC		290	580	330	U	V		580	330	U	V
SED66192	SD60061WC		240	480	330	U	V		480	330	U	V
SED66292	SD60062WC		300	600	330	U	V		600	330	U	V
SED66392	SD60063WC		235	470	330	U	V	235	470	330	U	V
SED66492	SD60064WC		245	490	330	U	V		490	330	U	V
SED66592	SD60065WC		500	500	330		V	190	190	330	J	A
SED69792	SD60097WC	05/10/93	215	430	330	U	V	215	430	330	U	V
SED69892	SD60098WC	05/10/93	550	550	330		V	150	150	330	J	A
SED69992	SD60099WC	05/10/93	190	380	330	U	V	190	380	330	U	V
SED70092	SD60100WC	05/10/93	650	650	330		V	180	180	330	J	A
Number of samples			12					7				
Number of detects			5					4				
Minimum detected			280					130				
Maximum detected			650					190				
Average			336.25					184.29				
Standard Deviation			141.86					33.21				
t-value			1.796					1.943				
95% UCL			409.80					208.68				

ATTACHMENT J1
TABLE 26
95% UCL CONCENTRATION
AOC NO. 4
STREAM AND DRY SEDIMENT METALS

			COBALT (mg/kg)					STRONTIUM (mg/kg)				
Location	Field Id	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
SED65892	SD60058WC		11.5	11.5	10	B	JA	73.7	73.7	40		JA
SED65992	SD60059WC		7.4	7.4	10	B	V	55.65	55.65	40	B	JA
SED66092	SD60060WC		8.8	8.8	10	B	V	92.4	92.4	40		JA
SED66192	SD60061WC		7.5	7.5	10	B	V	44.1	44.1	40	B	JA
SED66292	SD60062WC		7.1	7.1	10	B	V	60	60	40	B	JA
SED66392	SD60063WC		9.6	9.6	10	B	V	58.5	58.5	40		JA
SED66492	SD60064WC		8.1	8.1	10	B	V	82.8	82.8	40		JA
SED66592	SD60065WC		7.6	7.6	10	B	V	52.7	52.7	40	B	JA
SED69792	SD60097WC	05/10/93	8.50	8.50	10.00	B	V	70.40	70.40	40.00		JA
SED69892	SD60098WC	05/10/93	8.40	8.40	10.00	B	V	62.30	62.30	40.00		JA
SED69992	SD60099WC	05/10/93	5.30	5.30	10.00	B	V	20.10	20.10	40.00	B	JA
SED70092	SD60100WC	05/10/93	5.40	5.40	10.00	B	JA	95.80	95.80	40.00		JA
Number of samples			12					12				
Number of detects			12					12				
Minimum detected			5.3					20.1				
Maximum detected			11.5					95.8				
Average			7.93					64.04				
Standard Deviation			1.62					20.16				
t-value			1.796					1.796				
95% UCL			8.77					74.49				

Statistics based on log normal distribution
95% UCL (see Table 1)

ATTACHMENT J1
TABLE 26
95% UCL CONCENTRATION
AOC NO. 4
STREAM AND DRY SEDIMENT METALS

			VANADIUM (mg/kg)					ZINC (mg/kg)				
Location	Field Id	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
SED65892	SD60058WC		26.9	26.9	10		JA	286	286	4		V
SED65992	SD60059WC		27.95	27.95	10		V	191	191	4		V
SED66092	SD60060WC		25.5	25.5	10		V	89	89	4		V
SED66192	SD60061WC		20.2	20.2	10		V	55.3	55.3	4		V
SED66292	SD60062WC		16.4	16.4	10	B	V	56.7	56.7	4		V
SED66392	SD60063WC		23.8	23.8	10		V	89.1	89.1	4		V
SED66492	SD60064WC		29.9	29.9	10		V	56.6	56.6	4		V
SED66592	SD60065WC		25	25	10		V	103	103	4		V
SED69792	SD60097WC	05/10/93	16.30	16.30	10.00		V	73.70	73.70	4.00		JA
SED69892	SD60098WC	05/10/93	25.10	25.10	10.00		V	117.00	117.00	4.00		JA
SED69992	SD60099WC	05/10/93	23.30	23.30	10.00		V	31.30	31.30	4.00		JA
SED70092	SD60100WC	05/10/93	31.30	31.30	10.00		V	76.30	76.30	4.00		JA
Number of samples			12					12				
Number of detects			12					12				
Minimum detected			16.3					31.3				
Maximum detected			31.3					286				
Average			24.30					102.08				
Standard Deviation			4.54					67.76				
t-value			1.796					1.796				
95% UCL			26.66					137.21				
Statistics based on log normal distribution												
95% UCL (see Table 1)								152.6				

ATTACHMENT J1
TABLE 27
95% UCL CONCENTRATION
AOC NO. 4
STREAM AND DRY SEDIMENT RADIONUCLIDES

			AMERICIUM-241 (pCi/g)					PLUTONIUM-239/240 (pCi/g)				
Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
SED65892	SD60058WC	02/17/93	0.7932	0.7932			A	0.7277	0.7277	0.008		A
SED65992	SD60059WC	02/17/93	1.293	1.293	0.003		A	0.97535	0.97535			A
SED66092	SD60060WC	02/17/93						1.248	1.248	0.004		A
SED66192	SD60061WC	02/17/93	0.368	0.368	0.002		A	0.851	0.851	0.013		A
SED66292	SD60062WC	02/18/93	0.3953	0.3953	0.005		A	0.7276	0.7276	0.01		A
SED66392	SD60063WC	02/18/93	0.6731	0.6731	0.006		A	1.304	1.304	0.004		A
SED66492	SD60064WC	02/18/93	0.07457	0.07457	0.003		A	0.1484	0.1484			A
SED66592	SD60065WC	02/18/93	0.3273	0.3273			A	3.095	3.095	0.003		A
SED69792	SD60097WC	05/10/93	0.0332	0.0332	0.0225			-0.0083	-0.0083	0.0611		
SED69892	SD60098WC	05/10/93	0.3120	0.3120	0.00395			0.3400	0.3400	0.0142		
SED69992	SD60099WC	05/10/93	0.0186	0.0186	0.00419			0.0675	0.0675	0.0157		
SED70092	SD60100WC	05/10/93	0.7460	0.7460	0.00452			1.9500	1.9500	0.0120		
Number of samples			11					12				
Number of detects			11					12				
Minimum detected			0.0186					-0.0083				
Maximum detected			1.293					3.0950				
Average			0.4577					0.9522				
Standard Deviation			0.3705					0.8483				
t-value			1.812					1.796				
95% UCL			0.6601					1.3920				

ATTACHMENT J1
TABLE 28
95% UCL CONCENTRATION
AOC NO.2, TOTAL AREA
CHEMICALS OF INTEREST IN GROUNDWATER

			ANTIMONY (µg/l)					ARSENIC (µg/l)				
Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
02691	GW02172IT	12/19/91	28.65	57.30	60.00	U	JA	1.00	2.00	10.00	U	V
02691	GW02513IT	02/27/92	4.00	8.00	60.00	U	V	1.00	2.00	10.00	U	JA
02691	GW02856IT	05/14/92	9.00	18.00	60.00	U	JA	1.10	1.10	10.00	BN	JA
02691	GW03215IT	08/03/92	9.40	18.80	18.80	U	V	1.50	1.50	1.00		JA
02691	GW03826IT	11/09/92	15.00	30.00	60.00	U	V	1.40	1.40	10.00	B	V
3586	GW01818IT	10/08/91	16.00	32.00	60.00	U	JA	1.00	2.00	10.00	UW	V
3586	GW02195IT	01/10/92	4.00	8.00	60.00	U	JA	3.80	3.80	10.00	B	V
3586	GW02631IT	04/07/92	9.00	18.00	60.00	U	V	2.80	2.80	10.00	B	V
3586	GW03217IT	08/05/92	8.50	17.00	60.00	U	V	1.70	3.40	10.00	UBN	JA
3586	GW03828IT	12/10/92	7.00	14.00	60.00	U	V	6.20	6.20	10.00	B	V
B208089	GW01820IT	10/08/91	26.55	53.10	60.00	U	JA	3.00	3.00	10.00	B	V
B208089	GW02635IT	04/10/92	9.00	18.00	60.00	U	V	1.00	2.00	10.00	U	V
P209789	GW00021WC	02/09/93	15.50	31.00	17.00	U	V	2.10	2.10	2.00		JA
P209789	GW01610IT	08/01/91	28.40	28.40	60.00	B		1.00	2.00	10.00	U	
P209789	GW01837IT	10/11/91	28.90	57.80	60.00	U	JA	1.00	2.00	10.00	UN	JA
P209789	GW02239IT	01/20/92	4.00	8.00	60.00	U	V	1.60	1.60	10.00	B	V
P209789	GW02789IT	04/24/92	9.00	18.00	60.00	U	V	0.50	1.00	10.00	U	V
P209789	GW03186IT	07/20/92	10.00	20.00	60.00	U	V	0.50	1.00	10.00	U	V
P209789	GW03551IT	10/16/92	12.20	24.40	24.40	U	V	0.40	0.80	0.80	U	JA
76292	GW00533WC	04/21/93	13.50	27.00	17.00	U	V	5.10	5.10	2.00		JA
Number of samples			20					20				
Number of detects			1					10				
Minimum detected			28.40					1.10				
Maximum detected			28.40					6.20				
Average			13.38					1.89				
Standard Deviation			8.13					1.53				
t-value			1.729					1.729				
95% UCL			16.52					2.48				

ATTACHMENT J1
TABLE 28
95% UCL CONCENTRATION
AOC NO.2, TOTAL AREA
CHEMICALS OF INTEREST IN GROUNDWATER

			BERYLLIUM (µg/l)					MANGANESE (µg/l)				
Location	Field ID	Sample Date	Result	SQL	CRDL	Qual	Valid Qual	Result	SQL	CRDL	Qual	Valid Qual
02691	GW02172IT	12/19/91	1.2	2.40	5.00	U	JA	481.00	481.00	15.00		V
02691	GW02513IT	02/27/92	0.5	1.00	5.00	U	V	202.00	202.00	15.00		V
02691	GW02856IT	05/14/92	1.3	1.30	5.00	B	V	135.00	135.00	15.00		V
02691	GW03215IT	08/03/92	1.1	1.10	0.60		JA	209.00	209.00	1.40		V
02691	GW03826IT	11/09/92	1.2	2.40	5.00	U	JA	252.00	252.00	15.00		V
3586	GW01818IT	10/08/91	0.5	1.00	5.00	U	V	913.00	913.00	15.00		V
3586	GW02195IT	01/10/92	0.5	1.00	5.00	U	V	3540.00	3540.00	15.00		V
3586	GW02631IT	04/07/92	0.5	1.00	5.00	U	V	3280.00	3280.00	15.00		V
3586	GW03217IT	08/05/92	0.5	1.00	5.00	U	V	4170.00	4170.00	15.00		V
3586	GW03828IT	12/10/92	0.5	1.00	5.00	U	V	3740.00	3740.00	15.00		V
B208089	GW01820IT	10/08/91	0.5	1.00	5.00	U	V	123.00	123.00	15.00		V
B208089	GW02635IT	04/10/92	0.5	1.00	5.00	U	V	285.00	285.00	15.00		V
P209789	GW00021WC	02/09/93	0.5	1.00	1.00	U	V	2.10	2.10	1.00		V
P209789	GW01610IT	08/01/91	0.5	1.00	5.00	U		10.00	10.00	15.00	B	
P209789	GW01837IT	10/11/91	0.5	1.00	5.00	U	V	14.40	14.40	15.00	BN*	JA
P209789	GW02239IT	01/20/92	0.5	1.00	5.00	U	V	109.00	109.00	15.00	E	V
P209789	GW02789IT	04/24/92	0.5	1.00	5.00	U	JA	11.00	11.00	15.00	B	V
P209789	GW03186IT	07/20/92	1.5	3.00	5.00	U	V	1.00	2.00	15.00	U	JA
P209789	GW03551IT	10/16/92	0.4	0.80	0.80	U	V	15.20	15.20	2.10		V
76292	GW00533WC	04/21/93	2.6	2.60	1.00		V	529.00	529.00	1.00		V
Number of samples			20					20				
Number of detects			3					19				
Minimum detected			1.10					2.10				
Maximum detected			2.60					4170.00				
Average			0.79					901.09				
Standard Deviation			0.53					1415.05				
t-value			1.729					1.729				
95% UCL			1.00					1448.17				

ATTACHMENT J1
TABLE 29
95% UCL CONCENTRATION
BACKGROUND GROUNDWATER ANTIMONY

			ANTIMONY (ug/l)					
Location	Field ID	Sample Date	Result	Well Ave	SQL	CDRL	Qual	Valid. Qua
B102289	GW01785IT	9/17/91	3.50		7.00	60.0	U	JA
B102289	GW02126IT	12/12/91	18.05		36.10	60.0	U	JA
B102289	GW02482IT	2/28/92	4.00		8.00	60.0	U	V
B102289	GW02944IT	5/26/92	9.00		18.00	60.0	U	V
B102289	GW03218IT	7/28/92	10.00		20.00	60.0	U	V
B102289	GW03795IT	10/27/92	30.00	12.43	60.00	60.0	U	
B102389	GW02129IT	12/13/91	13.30		13.30	60.0	B	V
B102389	GW02485IT	2/13/92	14.40		14.40	60.0	BN	JA
B102389	GW02947IT	5/26/92	9.00		18.00	60.0	U	V
B102389	GW03224IT	8/11/92	30.00		60.00	60.0	U	
B102389	GW03798IT	10/16/92	12.20	15.78	24.40	24.4	U	
B200589	GW01774IT	9/19/91	14.05		28.10	60.0	U	JA
B200589	GW02043IT	12/7/91	86.60		86.60	60.0		JA
B200589	GW02322IT	1/28/92	3.60		7.20	60.0	U	
B200589	GW02322IT	1/28/92	4.00		8.00	60.0	U	JA
B200589	GW03030IT	6/26/92	9.00		18.00	60.0	U	V
B200589	GW03471IT	9/23/92	30.00		60.00	60.0	U	
B200589	GW03790IT	11/5/92	15.00	23.18	30.00	60.0	U	
B200689	GW02042IT	11/18/91	24.60		24.60	60.0	B	
B200689	GW02497IT	2/20/92	4.00		8.00	60.0	U	
B200689	GW02980IT	5/29/92	9.00		18.00	60.0	U	V
B200689	GW03274IT	8/10/92	30.00		60.00	60.0	U	
B200689	GW03783IT	11/10/92	30.00	19.52	60.00	60.0	U	
B200789	GW01773IT	9/13/91	7.10		7.10	60.0	B	V
B200789	GW02554IT	3/3/92	4.00		8.00	60.0	U	JA
B200789	GW02981IT	6/2/92	9.00		18.00	60.0	U	V
B200789	GW03269IT	8/18/92	30.00		60.00	60.0	U	
B200789	GW03785IT	10/26/92	30.00	16.02	60.00	60.0	U	
B200889	GW02096IT	12/7/91	10.80		10.80	60.0	B	JA
B200889	GW02351IT	2/3/92	4.00		8.00	60.0	U	V
B200889	GW03027IT	6/4/92	9.00		18.00	60.0	U	V
B200889	GW03273IT	8/17/92	30.00		60.00	60.0	U	
B200889	GW03933IT	11/12/92	15.00	13.76	30.00	60.0	U	
B201189	GW02103IT	12/11/91	17.30		17.30	60.0	B	V
B201189	GW02522IT	2/27/92	4.00		8.00	60.0	U	V
B201189	GW02972IT	6/5/92	9.00		18.00	60.0	U	V
B201189	GW03275IT	7/30/92	10.00		20.00	60.0	U	V
B201189	GW03774IT	10/20/92	30.00	14.06	60.00	60.0	U	
B201289	GW03271IT	7/27/92	10.00	10.00	20.00	60.0	U	V
B201589	GW02104IT	12/10/91	17.30		17.30	60.0	B	JA
B201589	GW02973IT	6/5/92	9.00	13.15	18.00	60.0	UN	JA
B202489	GW01757IT	9/11/91	25.00		50.00	60.0	U	V
B202489	GW02119IT	12/11/91	17.00		17.00	60.0	B	V
B202489	GW02535IT	2/27/92	4.00		8.00	60.0	U	V
B202489	GW02970IT	6/3/92	9.00		18.00	60.0	U	V
B202489	GW03272IT	7/27/92	10.00		20.00	60.0	U	V
B202489	GW03773IT	10/19/92	30.00	15.83	60.00	60.0	U	
B202589	GW01753IT	9/10/91	25.00		50.00	60.0	U	V
B202589	GW02099IT	12/9/91	8.70		8.70	60.0	B	JA
B202589	GW02544IT	3/26/92	9.00		18.00	60.0	UN	V
B202589	GW02967IT	5/29/92	9.00		18.00	60.0	U	V
B202589	GW03325IT	8/13/92	30.00		60.00	60.0	U	
B202589	GW03766IT	10/21/92	30.00	18.62	60.00	60.0	U	
B203189	GW01781IT	9/18/91	15.95	15.95	31.90	60.0	U	JA
B203289	GW01782IT	9/17/91	3.50		7.00	60.0	U	JA
B203289	GW02040IT	12/11/91	11.50		23.00	60.0	U	JA

ATTACHMENT J1
TABLE 29
95% UCL CONCENTRATION
BACKGROUND GROUNDWATER ANTIMONY

			ANTIMONY (ug/l)					
Location	Field ID	Sample Date	Result	Well Ave	SQL	CDRL	Qual	Valid. Qua
B203289	GW02498IT	2/21/92	8.40		8.40	60.0	B	
B203289	GW03270IT	8/11/92	30.00		60.00	60.0	U	
B203289	GW03784IT	11/4/92	30.00	16.68	60.00	60.0	U	
B203489	GW01772IT	9/13/91	3.50	3.50	7.00	60.0	U	JA
B205589	GW01746IT	9/10/91	25.00		50.00	60.0	U	V
B205589	GW02107IT	12/11/91	32.80		32.80	60.0	B	V
B205589	GW02523IT	2/27/92	4.00		8.00	60.0	U	V
B205589	GW02974IT	6/5/92	9.00		18.00	60.0	UN	JA
B205589	GW03280IT	7/30/92	10.00		20.00	60.0	U	V
B205589	GW03776IT	10/20/92	30.00	18.47	60.00	60.0	U	
B302789	GW02144IT	12/15/91	13.45		26.90	60.0	U	JA
B302789	GW03052IT	6/9/92	9.00		18.00	60.0	U	V
B302789	GW03759IT	10/22/92	12.20	11.55	24.40	24.4	U	
B302889	GW02068IT	12/16/91	20.40		20.40	60.0	B	V
B302889	GW02503IT	2/22/92	4.00		8.00	60.0	U	
B302889	GW03040IT	6/4/92	9.00		18.00	60.0	UN	JA
B302889	GW03400IT	8/13/92	30.00		60.00	60.0	U	
B302889	GW03749IT	11/6/92	15.00	15.68	30.00	60.0	U	
B302989	GW01672IT	8/29/91	4.00		8.00	60.0	U	
B302989	GW02069IT	12/7/91	21.90		21.90	60.0	B	JA
B302989	GW02492IT	2/21/92	4.00		8.00	60.0	U	V
B302989	GW03051IT	6/4/92	9.00		18.00	60.0	UN	JA
B302989	GW03401IT	8/13/92	30.00		60.00	60.0	U	
B302989	GW03752IT	11/6/92	15.00	13.98	30.00	60.0	U	
B305389	GW02153IT	12/18/91	12.85		25.70	60.0	U	JA
B305389	GW03054IT	6/10/92	9.00		18.00	60.0	U	V
B305389	GW03405IT	8/18/92	30.00		60.00	60.0	U	
B305389	GW03761IT	10/23/92	12.20	16.01	24.40	24.4	U	
B400189	GW02052IT	11/25/91	22.95		45.90	60.0	U	JA
B400189	GW02456IT	2/13/92	14.80		14.80	60.0	BN	JA
B400189	GW03033IT	6/2/92	9.00		18.00	60.0	U	V
B400189	GW03034IT	6/5/92	9.00		18.00	60.0	U	V
B400189	GW03397IT	8/20/92	20.18		40.35	28.2	U	V
B400189	GW03753IT	11/19/92	7.00	13.82	14.00	60.0	U	
B400289	GW00397IT	9/14/90	15.00		30.00		U	
B400289	GW01790IT	9/19/91	14.85		29.70	60.0	U	JA
B400289	GW02139IT	12/17/91	12.10		24.20	60.0	U	JA
B400289	GW02458IT	2/13/92	9.90		9.90	60.0	BN	JA
B400289	GW02959IT	6/9/92	9.00		18.00	60.0	U	V
B400289	GW03468IT	9/8/92	30.00	15.14	60.00	60.0	U	
B400389	GW01789IT	9/18/91	14.50		29.00	60.0	U	JA
B400389	GW02053IT	11/25/91	35.00		70.00	60.0	U	JA
B400389	GW02444IT	2/7/92	4.00		8.00	60.0	U	V
B400389	GW02960IT	6/8/92	9.00		18.00	60.0	U	V
B400389	GW03479IT	9/23/92	30.00		60.00	60.0	U	
B400389	GW03762IT	11/12/92	15.00	17.92	30.00	60.0	U	
B400489	GW01778IT	9/16/91	3.50		7.00	60.0	U	JA
B400489	GW02054IT	11/26/91	19.40		38.80	60.0	U	JA
B400489	GW02443IT	2/10/92	4.00		8.00	60.0	U	V
B400489	GW02961IT	6/9/92	9.00		18.00	60.0	U	V
B400489	GW03482IT	9/15/92	30.00		60.00	60.0	U	
B400489	GW03763IT	11/11/92	30.00	15.98	60.00	60.0	U	
B401989	GW01745IT	9/6/91	25.00		50.00	60.0	U	V
B401989	GW02070IT	12/14/91	16.50		16.50	60.0	B	V
B401989	GW02583IT	3/13/92	9.00		18.00	60.0	U	V
B401989	GW03066IT	6/24/92	9.00		18.00	60.0	U	V

ATTACHMENT J1
TABLE 29
95% UCL CONCENTRATION
BACKGROUND GROUNDWATER ANTIMONY

			ANTIMONY (ug/l)					
Location	Field ID	Sample Date	Result	Well Ave	SQL	CDRL	Qual	Valid. Qua
B401989	GW03339IT	8/6/92	30.00		60.00	60.0	U	
B401989	GW03748IT	10/21/92	30.00	19.92	60.00	60.0	U	
B402189	GW02141IT	12/19/91	19.03		38.05	60.0	U	JA
B402189	GW02340IT	3/23/92	9.00		18.00	60.0	UN	V
B402189	GW03067IT	6/24/92	9.00		18.00	60.0	U	V
B402189	GW03406IT	8/18/92	30.00		60.00	60.0	U	
B402189	GW03734IT	11/12/92	15.00	16.41	30.00	60.0	U	
B402689	GW01716IT	8/27/91	4.00		8.00	60.0	U	
B402689	GW02123IT	12/14/91	22.00		22.00	60.0	B	V
B402689	GW02948IT	5/28/92	9.00		18.00	60.0	U	V
B402689	GW03733IT	12/3/92	16.50	12.88	33.00	17.0	U	
B405489	GW01719IT	8/28/91	4.00		8.00	60.0	U	
B405489	GW02154IT	12/18/91	12.25		24.50	60.0	U	JA
B405489	GW02451IT	2/10/92	12.80		12.80	60.0	BN	JA
B405489	GW02996IT	6/26/92	9.00		18.00	60.0	U	V
B405489	GW03346IT	8/19/92	30.00		60.00	60.0	U	
B405489	GW03742IT	11/11/92	30.00	16.34	60.00	60.0	U	
B405586	GW01775IT	9/13/91	16.80		16.80	60.0	B	V
B405586	GW02168IT	12/18/91	19.03		38.05	60.0	U	JA
B405586	GW02452IT	3/13/92	20.70		20.70	60.0	B	V
B405586	GW02993IT	6/11/92	9.90		19.80	19.8	U	V
B405586	GW03343IT	8/18/92	30.00		60.00	60.0	U	
B405586	GW03745IT	12/8/92	16.50	18.82	33.00	17.0	U	
B405689	GW02056IT	12/18/91	12.95		25.90	60.0	U	JA
B405689	GW02457IT	2/13/92	13.00		13.00	60.0	BN	JA
B405689	GW03036IT	6/29/92	18.70		18.70	60.0	B	JA
B405689	GW03418IT	8/18/92	30.00		60.00	60.0	U	
B405689	GW03764IT	11/9/92	30.00	20.93	60.00	60.0	U	
B405789	GW01784IT	9/17/91	3.50		7.00	60.0	U	JA
B405789	GW02055IT	11/26/91	18.35		36.70	60.0	U	JA
B405789	GW02442IT	2/10/92	4.00		8.00	60.0	U	V
B405789	GW02963IT	6/8/92	9.00		18.00	60.0	U	V
B405789	GW03419IT	9/22/92	30.00		60.00	60.0	U	
B405789	GW03765IT	11/10/92	30.00	15.81	60.00	60.0	U	
B405889	GW01720IT	8/27/91	4.00		8.00	60.0	U	
B405889	GW02071IT	12/14/91	13.10		13.10	60.0	B	V
B405889	GW02584IT	3/13/92	9.00		18.00	60.0	U	V
B405889	GW03001IT	6/5/92	9.00		18.00	60.0	UN	JA
B405889	GW03309IT	8/17/92	30.00		60.00	60.0	U	
B405889	GW03737IT	11/12/92	15.00	13.35	30.00	60.0	U	
Number of Samples			152					
Number of Detects			26					
Minimum Detected			7.10					
Maximum Detected			86.60					
Average			16.26					
Number of wells sampled				31				
Number of wells with detects				23				
Minimum well average				3.50				
Maximum well average				23.18				
Average				15.53				
Standard Deviation				3.55				
t-value				1.697				
95% UCL (1)				16.61				

ATTACHMENT J1
TABLE 30
95% UCL CONCENTRATION
BACKGROUND GROUNDWATER ARSENIC

			ARSENIC (ug/l)					
Location	Field ID	Sample Date	Result	Well Ave	SQL	CDRL	Qual	Valid. Qu
B102289	GW01785IT	9/17/91	1.0		2.0	10.0	U	V
B102289	GW02126IT	12/12/91	2.0		2.0	10.0	B	V
B102289	GW02482IT	2/28/92	1.0		2.0	10.0	U	V
B102289	GW02944IT	5/26/92	2.3		2.3	10.0	B	V
B102289	GW03218IT	7/28/92	0.6		1.3	10.0	U	V
B102289	GW03795IT	10/27/92	5.0	2.0	10.0	10.0	U	
B102389	GW02129IT	12/13/91	2.0		2.0	10.0	B	V
B102389	GW02485IT	2/13/92	1.0		1.0	10.0	BN	JA
B102389	GW02947IT	5/26/92	1.1		1.1	10.0	B	V
B102389	GW03224IT	8/11/92	5.0		10.0	10.0	UN	
B102389	GW03798IT	10/16/92	0.8	2.0	0.8	0.7		
B200589	GW01774IT	9/19/91	1.0		2.0	10.0	U	V
B200589	GW02043IT	12/7/91	3.0		3.0	10.0	B	V
B200589	GW02322IT	1/28/92	0.5		1.0	10.0	U	V
B200589	GW03030IT	6/26/92	0.5		1.0	10.0	U	V
B200589	GW03471IT	9/23/92	5.0		10.0	10.0	UWN	
B200589	GW03790IT	11/5/92	0.5	1.8	1.0	10.0	U	
B200689	GW01780IT	9/17/91	1.0		2.0	10.0	U	V
B200689	GW02497IT	2/20/92	0.5		1.0	10.0	UN	
B200689	GW02980IT	5/29/92	0.5		1.0	10.0	U	V
B200689	GW03274IT	8/10/92	5.0		10.0	10.0	UN	
B200689	GW03783IT	11/10/92	5.0	2.4	10.0	10.0	UN	
B200789	GW01773IT	9/13/91	1.0		2.0	10.0	U	V
B200789	GW02095IT	12/7/91	1.0		2.0	10.0	U	V
B200789	GW02554IT	3/3/92	1.0		2.0	10.0	U	V
B200789	GW02981IT	6/2/92	1.0		2.0	10.0	UN	JA
B200789	GW03269IT	8/18/92	5.0		10.0	10.0	U	
B200789	GW03785IT	10/26/92	10.0	3.2	10.0	10.0	UW	
B200889	GW01766IT	9/13/91	1.0		2.0	10.0	U	V
B200889	GW02096IT	12/7/91	1.0		2.0	10.0	U	V
B200889	GW02351IT	2/3/92	0.5		1.0	10.0	UN	JA
B200889	GW03027IT	6/4/92	0.5		1.0	10.0	U	V
B200889	GW03273IT	8/17/92	5.0		10.0	10.0	U	
B200889	GW03933IT	11/12/92	0.5	1.4	1.0	10.0	U	
B201189	GW02103IT	12/11/91	1.0		2.0	10.0	U	V
B201189	GW02522IT	2/27/92	1.0		2.0	10.0	U	V
B201189	GW02972IT	6/5/92	2.9		2.9	10.0	BN	JA
B201189	GW03275IT	7/30/92	0.5		1.0	10.0	UN	JA
B201189	GW03774IT	10/20/92	5.0	2.1	10.0	10.0	U	
B201289	GW03271IT	7/27/92	0.5	0.5	1.0	10.0	UWN	JA
B201589	GW02104IT	12/10/91	1.0		2.0	10.0	U	V
B201589	GW02973IT	6/5/92	0.5	0.8	1.0	10.0	UN	JA
B202489	GW01757IT	9/11/91	1.0		2.0	10.0	U	V
B202489	GW02119IT	12/11/91	1.0		2.0	10.0	U	V
B202489	GW02535IT	2/27/92	1.0		2.0	10.0	U	V
B202489	GW02970IT	6/3/92	1.0		2.0	10.0	UN	JA
B202489	GW03272IT	7/27/92	0.5		1.0	10.0	UN	JA
B202489	GW03773IT	10/19/92	5.0	1.6	10.0	10.0	UW	
B202589	GW01753IT	9/10/91	1.0		2.1	10.0	U	V
B202589	GW02099IT	12/9/91	1.0		2.0	10.0	U	V
B202589	GW02544IT	3/26/92	1.0		2.0	10.0	UN	V
B202589	GW02967IT	5/29/92	1.1		1.1	10.0	B	V
B202589	GW03325IT	8/13/92	5.0		10.0	10.0	UN	
B202589	GW03766IT	10/21/92	5.0	2.3	10.0	10.0	UW	
B203189	GW01781IT	9/18/91	1.0	1.0	2.0	10.0	U	V

ATTACHMENT J1
TABLE 30
95% UCL CONCENTRATION
BACKGROUND GROUNDWATER ARSENIC

			ARSENIC (ug/l)					
Location	Field ID	Sample Date	Result	Well Ave	SQL	CDRL	Qual	Valid. Qu
B203289	GW01782IT	9/17/91	1.0		2.0	10.0	U	V
B203289	GW02040IT	12/11/91	1.0		2.0	10.0	U	V
B203289	GW02498IT	2/21/92	0.5		1.0	10.0	UN	
B203289	GW03270IT	8/11/92	5.0		10.0	10.0	UWN	
B203289	GW03784IT	11/4/92	5.0	2.5	10.0	10.0	UN	
B203489	GW01772IT	9/13/91	1.0	1.0	2.0	10.0	U	V
B205589	GW01746IT	9/10/91	1.0		2.0	10.0	U	V
B205589	GW02107IT	12/11/91	1.0		2.0	10.0	U	V
B205589	GW02523IT	2/27/92	1.0		2.0	10.0	U	JA
B205589	GW02974IT	6/5/92	1.0		1.0	10.0	BN	JA
B205589	GW03280IT	7/30/92	1.3		1.3	10.0	BN	JA
B205589	GW03776IT	10/20/92	5.0	1.7	10.0	10.0	U	
B302789	GW03052IT	6/9/92	0.5		1.0	10.0	U	V
B302789	GW03759IT	10/22/92	0.4	0.4	0.7	0.7	U	
B302889	GW02068IT	12/16/91	1.0		2.0	10.0	U	V
B302889	GW02503IT	2/22/92	0.5		1.0	10.0	UN	
B302889	GW03040IT	6/4/92	0.5		1.0	10.0	UN	JA
B302889	GW03400IT	8/13/92	5.0		10.0	10.0	UN	
B302889	GW03749IT	11/6/92	0.5	1.5	1.0	10.0	U	
B302989	GW01672IT	8/29/91	1.0		2.0	10.0	U	
B302989	GW02069IT	12/7/91	1.0		2.0	10.0	U	V
B302989	GW02492IT	2/21/92	0.5		1.0	10.0	UN	JA
B302989	GW03051IT	6/4/92	0.5		1.0	10.0	UN	JA
B302989	GW03401IT	8/13/92	5.0		10.0	10.0	UN	
B302989	GW03752IT	11/6/92	0.5	1.4	1.0	10.0	U	
B305389	GW01739IT	9/19/91	1.0		2.0	10.0	U	V
B305389	GW03054IT	6/10/92	0.5		1.0	10.0	U	V
B305389	GW03405IT	8/18/92	5.0		10.0	10.0	U	
B305389	GW03761IT	10/23/92	0.4	1.7	0.7	0.7	U	
B400189	GW01750IT	9/17/91	1.0		2.0	10.0	U	V
B400189	GW02052IT	11/25/91	1.0		2.0	10.0	U	V
B400189	GW02456IT	2/13/92	1.0		2.0	10.0	UN	JA
B400189	GW03033IT	6/2/92	1.0		2.0	10.0	UN	JA
B400189	GW03034IT	6/5/92	1.0		2.0	10.0	UN	JA
B400189	GW03397IT	8/20/92	0.5		1.0	1.0	U	V
B400189	GW03753IT	11/19/92	0.5	0.9	1.0	10.0	U	
B400289	GW00397IT	9/14/90	1.0		2.0		UW	
B400289	GW01790IT	9/19/91	1.0		2.0	10.0	U	V
B400289	GW02458IT	2/13/92	1.0		2.0	10.0	UN	JA
B400289	GW02959IT	6/9/92	1.3		1.3	10.0	B	V
B400289	GW03468IT	9/8/92	5.0	1.9	10.0	10.0	UN	
B400389	GW01789IT	9/18/91	1.0		2.0	10.0	U	V
B400389	GW02053IT	11/25/91	2.0		2.0	10.0	B	V
B400389	GW02444IT	2/7/92	0.5		1.0	10.0	UN	JA
B400389	GW02960IT	6/8/92	1.3		1.3	10.0	B	V
B400389	GW03479IT	9/23/92	5.0		10.0	10.0	UN	
B400389	GW03762IT	11/12/92	0.5	1.7	1.0	10.0	U	
B400489	GW01778IT	9/16/91	1.0		2.0	10.0	U	V
B400489	GW02443IT	2/10/92	0.5		1.0	10.0	UN	JA
B400489	GW02961IT	6/9/92	0.5		1.0	10.0	U	V
B400489	GW03482IT	9/15/92	5.0		10.0	10.0	UW	
B400489	GW03763IT	11/11/92	5.0	2.4	10.0	10.0	UN	
B401989	GW01745IT	9/6/91	1.0		2.0	10.0	U	V
B401989	GW02070IT	12/14/91	1.0		2.0	10.0	U	V
B401989	GW02583IT	3/13/92	0.5		1.0	10.0	UN	JA

ATTACHMENT J1
TABLE 30
95% UCL CONCENTRATION
BACKGROUND GROUNDWATER ARSENIC

			ARSENIC (ug/l)					
Location	Field ID	Sample Date	Result	Well Ave	SQL	CDRL	Qual	Valid. Qu
B401989	GW03066IT	6/24/92	0.5		1.0	10.0	U	V
B401989	GW03339IT	8/6/92	5.0		10.0	10.0	UN	
B401989	GW03748IT	10/21/92	5.0	2.2	10.0	10.0	UW	
B402189	GW02141IT	12/19/91	1.0		2.0	10.0	U	V
B402189	GW02540IT	3/23/92	1.0		2.0	10.0	UN	V
B402189	GW03067IT	6/24/92	0.5		1.0	10.0	U	V
B402189	GW03406IT	8/18/92	5.0		10.0	10.0	U	
B402189	GW03734IT	11/12/92	1.5	1.8	1.5	10.0	B	
B402689	GW01716IT	8/27/91	1.0		2.0	10.0	U	
B402689	GW02123IT	12/14/91	1.0		2.0	10.0	U	V
B402689	GW02475IT	2/13/92	0.5		1.0	10.0	UN	JA
B402689	GW02948IT	5/28/92	0.5		1.0	10.0	U	V
B402689	GW03733IT	12/3/92	1.0	0.8	2.0	2.0	U	
B405489	GW01719IT	8/28/91	1.0		2.0	10.0	U	
B405489	GW02451IT	2/10/92	0.5		1.0	10.0	UN	JA
B405489	GW02996IT	6/26/92	0.5		1.0	10.0	U	V
B405489	GW03346IT	8/19/92	5.0		10.0	10.0	U	
B405489	GW03742IT	11/11/92	5.0	2.4	10.0	10.0	UN	
B405586	GW01775IT	9/13/91	1.0		2.0	10.0	U	V
B405586	GW02452IT	3/13/92	1.6		1.6	10.0	BN	JA
B405586	GW02993IT	6/11/92	1.9		1.9	1.0		JA
B405586	GW03343IT	8/18/92	5.0		10.0	10.0	U	
B405586	GW03745IT	12/8/92	1.0	2.1	2.0	2.0	U	
B405689	GW01783IT	9/17/91	1.0		2.0	10.0	U	V
B405689	GW02457IT	2/13/92	1.0		2.0	10.0	UN	JA
B405689	GW03036IT	6/29/92	0.5		1.0	10.0	U	V
B405689	GW03418IT	8/18/92	5.0		10.0	10.0	UW	
B405689	GW03764IT	11/9/92	5.0	2.5	10.0	10.0	UN	
B405789	GW01784IT	9/17/91	1.0		2.0	10.0	U	V
B405789	GW02442IT	2/10/92	0.5		1.0	10.0	UN	JA
B405789	GW02963IT	6/8/92	0.5		1.0	10.0	U	V
B405789	GW03419IT	9/22/92	5.0		10.0	10.0	UN	
B405789	GW03765IT	11/10/92	5.0		10.0	10.0	UN	
B405889	GW01720IT	8/27/91	1.0		2.0	10.0	U	
B405889	GW02071IT	12/14/91	1.0		2.0	10.0	U	V
B405889	GW02584IT	3/13/92	0.5		1.0	10.0	UN	JA
B405889	GW03001IT	6/5/92	0.5		1.0	10.0	UN	JA
B405889	GW03309IT	8/17/92	5.0		10.0	10.0	UW	
B405889	GW03737IT	11/12/92	0.5	1.9	1.0	10.0	U	

Number of Samples	149
Number of Detects	13
Minimum Detected	0.4
Maximum Detected	10.0
Average	1.8

Number of wells sampled	30
Number of wells with detects	10
Minimum well average	0.43
Maximum well average	3.17
Average	1.72
Standard Deviation	0.65
t-value	1.697
95% UCL (1)	1.92

ATTACHMENT J1
TABLE 31
95% UCL CONCENTRATION
BACKGROUND GROUNDWATER BERYLLIUM

			BERYLLIUM (ug/l)				
Location	Field ID	Sample Date	Result	Well Ave	SQL	CDRL	Qual
B102289	GW01785IT	9/17/91	0.5		1.0	5.0	U
B102289	GW02126IT	12/12/91	0.5		1.0	5.0	U
B102289	GW02482IT	2/28/92	0.5		1.0	5.0	U
B102289	GW02944IT	5/26/92	1.8		1.8	5.0	B
B102289	GW03218IT	7/28/92	1.5		3.0	5.0	U
B102289	GW03795IT	10/27/92	2.5	1.2	5.0	5.0	U
B102389	GW02129IT	12/13/91	0.5		1.0	5.0	U
B102389	GW02485IT	2/13/92	0.5		1.0	5.0	U
B102389	GW02947IT	5/26/92	0.5		1.0	5.0	U
B102389	GW03224IT	8/11/92	2.5		5.0	5.0	U
B102389	GW03798IT	10/16/92	0.4	0.9	0.8	0.8	U
B200589	GW01774IT	9/19/91	0.5		1.0	5.0	U
B200589	GW02043IT	12/7/91	4.8		4.8	5.0	B
B200589	GW02322IT	1/28/92	0.5		1.0	5.0	U
B200589	GW03030IT	6/26/92	0.5		1.0	5.0	U
B200589	GW03471IT	9/23/92	2.5		5.0	5.0	U
B200589	GW03790IT	11/5/92	1.1	1.6	1.1	5.0	B
B200689	GW01780IT	9/17/91	0.5		1.0	5.0	U
B200689	GW02497IT	2/20/92	0.5		1.0	5.0	U
B200689	GW02980IT	5/29/92	1.1		1.1	5.0	B
B200689	GW03274IT	8/10/92	2.5		5.0	5.0	U
B200689	GW03783IT	11/10/92	2.5	1.4	5.0	5.0	U
B200789	GW01773IT	9/13/91	0.5		1.0	5.0	U
B200789	GW02095IT	12/7/91	0.5		1.0	5.0	U
B200789	GW02554IT	3/3/92	0.5		1.0	5.0	U
B200789	GW02981IT	6/2/92	0.5		1.0	5.0	U
B200789	GW03269IT	8/18/92	2.5		5.0	5.0	U
B200789	GW03785IT	10/26/92	2.5	1.2	5.0	5.0	U
B200889	GW01766IT	9/13/91	0.5		1.0	5.0	U
B200889	GW02096IT	12/7/91	0.5		1.0	5.0	U
B200889	GW02351IT	2/3/92	0.5		1.0	5.0	U
B200889	GW03027IT	6/4/92	1.1		1.1	5.0	B
B200889	GW03273IT	8/17/92	2.5		5.0	5.0	U
B200889	GW03933IT	11/12/92	0.5	0.9	1.0	5.0	U
B201189	GW02103IT	12/11/91	0.5		1.0	5.0	U
B201189	GW02522IT	2/27/92	0.5		1.0	5.0	U
B201189	GW02972IT	6/5/92	0.5		1.0	5.0	U
B201189	GW03275IT	7/30/92	1.5		3.0	5.0	U
B201189	GW03774IT	10/20/92	2.5	1.1	5.0	5.0	U
B201289	GW03271IT	7/27/92	1.5	1.5	3.0	5.0	U
B201589	GW02104IT	12/10/91	0.5		1.0	5.0	U
B201589	GW02973IT	6/5/92	0.5	0.5	1.0	5.0	U
B202489	GW01737IT	9/11/91	2.0		2.0	5.0	B
B202489	GW02119IT	12/11/91	0.5		1.0	5.0	U
B202489	GW02535IT	2/27/92	0.5		1.0	5.0	U
B202489	GW02970IT	6/3/92	0.5		1.0	5.0	U
B202489	GW03272IT	7/27/92	1.5		3.0	5.0	U
B202489	GW03773IT	10/19/92	2.5	1.3	5.0	5.0	U
B202589	GW01753IT	9/10/91	1.0		2.0	5.0	U
B202589	GW02099IT	12/9/91	0.5		1.0	5.0	U
B202589	GW02544IT	3/26/92	0.5		1.0	5.0	U
B202589	GW02967IT	5/29/92	0.5		1.0	5.0	U
B202589	GW03325IT	8/13/92	2.5		5.0	5.0	U
B202589	GW03766IT	10/21/92	2.5	1.0	5.0	5.0	U
B203189	GW01781IT	9/18/91	0.5	0.5	1.0	5.0	U
B203289	GW01782IT	9/17/91	0.5		1.0	5.0	U
B203289	GW02040IT	12/11/91	0.5		1.0	5.0	U
B203289	GW02498IT	2/21/92	0.5		1.0	5.0	U

ATTACHMENT J1
TABLE 31
95% UCL CONCENTRATION
BACKGROUND GROUNDWATER BERYLLIUM

			BERYLLIUM (ug/l)				
Location	Field ID	Sample Date	Result	Well Ave	SQL	CDRL	Qual
B203289	GW03270IT	8/11/92	2.5		5.0	5.0	U
B203289	GW03784IT	11/4/92	2.5	1.3	5.0	5.0	U
B203489	GW01772IT	9/13/91	0.5	0.5	1.0	5.0	U
B205589	GW01746IT	9/10/91	1.0		2.0	5.0	U
B205589	GW02107IT	12/11/91	0.5		1.0	5.0	U
B205589	GW02523IT	2/27/92	0.5		1.0	5.0	U
B205589	GW02974IT	6/5/92	0.5		1.0	5.0	U
B205589	GW03280IT	7/30/92	1.5		3.0	5.0	U
B205589	GW03776IT	10/20/92	2.5	1.1	5.0	5.0	U
B302789	GW02144IT	12/15/91	0.5		1.0	5.0	U
B302789	GW02587IT	3/16/92	0.5		1.0	5.0	U
B302789	GW03052IT	6/9/92	0.5		1.0	5.0	U
B302789	GW03759IT	10/22/92	0.4	0.5	0.8	0.8	U
B302889	GW02068IT	12/16/91	0.5		1.0	5.0	U
B302889	GW02503IT	2/22/92	0.5		1.0	5.0	U
B302889	GW03040IT	6/4/92	0.5		1.0	5.0	U
B302889	GW03400IT	8/13/92	2.5		5.0	5.0	U
B302889	GW03749IT	11/6/92	0.5	0.9	1.0	5.0	U
B302989	GW01672IT	8/29/91	0.5		1.0	5.0	U
B302989	GW02069IT	12/7/91	0.5		1.0	5.0	U
B302989	GW02492IT	2/21/92	0.5		1.0	5.0	U
B302989	GW03051IT	6/4/92	0.5		1.0	5.0	U
B302989	GW03401IT	8/13/92	2.5		5.0	5.0	U
B302989	GW03752IT	11/6/92	0.5	0.8	1.0	5.0	U
B305389	GW01739IT	9/19/91	0.5		1.0	5.0	U
B305389	GW02153IT	12/18/91	0.5		1.0	5.0	U
B305389	GW02595IT	3/16/92	0.5		1.0	5.0	U
B305389	GW03054IT	6/10/92	0.5		1.0	5.0	U
B305389	GW03405IT	8/18/92	2.5		5.0	5.0	U
B305389	GW03761IT	10/23/92	0.4	0.8	0.8	0.8	U
B400189	GW01750IT	9/17/91	0.5		1.0	5.0	U
B400189	GW02052IT	11/25/91	0.5		1.0	5.0	U
B400189	GW02456IT	2/13/92	0.5		1.0	5.0	U
B400189	GW03033IT	6/2/92	0.5		1.0	5.0	U
B400189	GW03034IT	6/5/92	0.5		1.0	5.0	U
B400189	GW03397IT	8/20/92	0.5		0.9	0.9	U
B400189	GW03753IT	11/19/92	0.5	0.5	1.0	5.0	U
B400289	GW00397IT	9/14/90	1.0		2.0		U
B400289	GW01790IT	9/19/91	0.5		1.0	5.0	U
B400289	GW02139IT	12/17/91	0.5		1.0	5.0	U
B400289	GW02458IT	2/13/92	0.5		1.0	5.0	U
B400289	GW02959IT	6/9/92	0.5		1.0	5.0	U
B400289	GW03468IT	9/8/92	2.5	0.9	5.0	5.0	U
B400389	GW01789IT	9/18/91	0.5		1.0	5.0	U
B400389	GW02053IT	11/25/91	1.0		1.0	5.0	B
B400389	GW02444IT	2/7/92	0.5		1.0	5.0	U
B400389	GW02960IT	6/8/92	1.7		1.7	5.0	B
B400389	GW03479IT	9/23/92	2.5		5.0	5.0	U
B400389	GW03762IT	11/12/92	0.5	1.1	1.0	5.0	U
B400489	GW01778IT	9/16/91	0.5		1.0	5.0	U
B400489	GW02054IT	11/26/91	0.5		1.0	5.0	U
B400489	GW02443IT	2/10/92	0.5		1.0	5.0	U
B400489	GW02961IT	6/9/92	0.5		1.0	5.0	U
B400489	GW03482IT	9/15/92	2.5		5.0	5.0	U
B400489	GW03763IT	11/11/92	2.5	1.2	5.0	5.0	U
B401989	GW01745IT	9/6/91	1.0		2.0	5.0	U
B401989	GW02070IT	12/14/91	0.5		1.0	5.0	U
B401989	GW02583IT	3/13/92	0.5		1.0	5.0	U

ATTACHMENT J1
TABLE 31
95% UCL CONCENTRATION
BACKGROUND GROUNDWATER BERYLLIUM

			BERYLLIUM (ug/l)				
Location	Field ID	Sample Date	Result	Well Ave	SQL	CDRL	Qual
B401989	GW03066IT	6/24/92	0.5		1.0	5.0	U
B401989	GW03339IT	8/6/92	2.5		5.0	5.0	U
B401989	GW03748IT	10/21/92	2.5	1.3	5.0	5.0	U
B402189	GW02141IT	12/19/91	0.5		1.0	5.0	U
B402189	GW02540IT	3/23/92	0.5		1.0	5.0	U
B402189	GW03067IT	6/24/92	0.5		1.0	5.0	U
B402189	GW03406IT	8/18/92	2.5		5.0	5.0	U
B402189	GW03734IT	11/12/92	0.5	0.9	1.0	5.0	U
B402689	GW01716IT	8/27/91	0.5		1.0	5.0	U
B402689	GW02123IT	12/14/91	0.5		1.0	5.0	U
B402689	GW02475IT	2/13/92	0.5		1.0	5.0	U
B402689	GW02948IT	5/28/92	1.1		1.1	5.0	B
B402689	GW03733IT	12/3/92	0.5	0.6	1.0	1.0	U
B405489	GW01719IT	8/28/91	0.5		1.0	5.0	U
B405489	GW02134IT	12/18/91	0.5		1.0	5.0	U
B405489	GW02451IT	2/10/92	0.5		1.0	5.0	U
B405489	GW02996IT	6/26/92	0.5		1.0	5.0	U
B405489	GW03346IT	8/19/92	2.5		5.0	5.0	U
B405489	GW03742IT	11/11/92	2.5	1.2	5.0	5.0	U
B405586	GW01775IT	9/13/91	0.5		1.0	5.0	U
B405586	GW02168IT	12/18/91	1.0		1.0	5.0	B
B405586	GW02452IT	3/13/92	0.5		1.1	5.0	U
B405586	GW02993IT	6/11/92	0.7		0.7	0.6	
B405586	GW03343IT	8/18/92	2.5		5.0	5.0	U
B405586	GW03745IT	12/8/92	0.8	1.0	1.6	1.0	U
B405689	GW01783IT	9/17/91	0.5		1.0	5.0	U
B405689	GW02036IT	12/18/91	0.5		1.0	5.0	U
B405689	GW02457IT	2/13/92	0.5		1.0	5.0	U
B405689	GW03036IT	6/29/92	0.5		1.0	5.0	U
B405689	GW03418IT	8/18/92	2.5		5.0	5.0	U
B405689	GW03764IT	11/9/92	2.5	1.2	5.0	5.0	U
B405789	GW01784IT	9/17/91	0.5		1.0	5.0	U
B405789	GW02055IT	11/26/91	0.5		1.0	5.0	U
B405789	GW02442IT	2/10/92	0.5		1.0	5.0	U
B405789	GW02963IT	6/8/92	0.5		1.0	5.0	U
B405789	GW03419IT	9/22/92	2.5		5.0	5.0	U
B405789	GW03765IT	11/10/92	2.5	1.2	5.0	5.0	U
B405889	GW01720IT	8/27/91	0.5		1.0	5.0	U
B405889	GW02071IT	12/14/91	0.5		1.0	5.0	U
B405889	GW02584IT	3/13/92	0.5		1.0	5.0	U
B405889	GW03001IT	6/5/92	0.5		1.0	5.0	U
B405889	GW03309IT	8/17/92	2.5		5.0	5.0	U
B405889	GW03737IT	11/12/92	0.5	0.8	1.0	5.0	U
Number of Samples			159				
Number of Detects			12				
Minimum Detected			0.7				
Maximum Detected			4.8				
Average			1.0				

Number of wells sampled	31
Number of wells with detects	8
Minimum well average	0.50
Maximum well average	23.50
Average	0.99
Standard Deviation	0.30
t-value	1.697
95% UCL (1)	1.09

ATTACHMENT J1
TABLE 32
95% UCL CONCENTRATION
BACKGROUND GROUNDWATER MANGANESE

			MANGANESE (ug/l)					
Location	Field ID	Sample Date	Result	Well Ave	SQL	CDRL	Qual	Valid. Q
B102289	GW01785IT	9/17/91	44.9		44.9	15.0		V
B102289	GW02126IT	12/12/91	322.5		322.5	15.0		V
B102289	GW02482IT	2/28/92	112.3		112.3	15.0	•	JA
B102289	GW02944IT	5/26/92	365.0		365.0	15.0		V
B102289	GW03218IT	7/28/92	118.5		118.5	15.0		V
B102289	GW03795IT	10/27/92	298.0	210.2	298.0	15.0		
B102389	GW02129IT	12/13/91	136.0		136.0	15.0		V
B102389	GW02485IT	2/13/92	134.0		134.0	15.0		V
B102389	GW02947IT	5/26/92	166.0		166.0	15.0		V
B102389	GW03224IT	8/11/92	185.0		185.0	15.0	E	
B102389	GW03798IT	10/16/92	218.0	167.8	218.0	2.1		
B200589	GW01774IT	9/19/91	7.0		7.0	15.0	B	V
B200589	GW02043IT	12/7/91	1950.0		1950.0	15.0		V
B200589	GW02322IT	1/28/92	69.2		69.2	15.0		V
B200589	GW03030IT	6/26/92	37.0		37.0	15.0		V
B200589	GW03471IT	9/23/92	547.5		547.5	15.0		
B200589	GW03790IT	11/5/92	59.2	445.0	59.2	15.0		
B200689	GW01780IT	9/17/91	47.5		47.5	15.0		V
B200689	GW02042IT	11/18/91	25.0		25.0	15.0		
B200689	GW02497IT	2/20/92	50.5		50.5	15.0		
B200689	GW02980IT	5/29/92	156.0		156.0	15.0		V
B200689	GW03274IT	8/10/92	193.0		193.0	15.0	E	
B200689	GW03783IT	11/10/92	33.4	84.2	33.4	15.0		
B200789	GW01773IT	9/13/91	29.2		29.2	15.0		V
B200789	GW02095IT	12/7/91	54.8		54.8	15.0		V
B200789	GW02554IT	3/3/92	189.0		189.0	15.0	•	JA
B200789	GW02981IT	6/2/92	106.0		106.0	15.0		V
B200789	GW03269IT	8/18/92	36.5		36.5	15.0		
B200789	GW03785IT	10/26/92	92.0	84.6	92.0	15.0		
B200889	GW01766IT	9/13/91	28.5		28.5	15.0		V
B200889	GW02096IT	12/7/91	25.2		25.2	15.0		V
B200889	GW02351IT	2/3/92	77.6		77.6	15.0		V
B200889	GW03027IT	6/4/92	43.6		43.6	15.0		V
B200889	GW03273IT	8/17/92	22.2		22.2	15.0		
B200889	GW03933IT	11/12/92	31.1	38.0	31.1	15.0		
B201189	GW02103IT	12/11/91	73.5		73.5	15.0		V
B201189	GW02522IT	2/27/92	57.8		57.8	15.0		V
B201189	GW02972IT	6/5/92	58.1		58.1	15.0		V
B201189	GW03275IT	7/30/92	59.7		59.7	15.0		V
B201189	GW03774IT	10/20/92	584.0	166.6	584.0	15.0		
B201289	GW03271IT	7/27/92	7.3	7.3	7.3	15.0	B	V
B201589	GW02104IT	12/10/91	5.6		5.6	15.0	B	V
B201589	GW02973IT	6/5/92	3.9	4.8	3.9	15.0	B	V
B202489	GW01757IT	9/11/91	148.0		148.0	15.0		V
B202489	GW02119IT	12/11/91	11.8		11.8	15.0	B	V
B202489	GW02535IT	2/27/92	10.4		10.4	15.0	B	V
B202489	GW02970IT	6/3/92	6.5		6.5	15.0	B	V
B202489	GW03272IT	7/27/92	10.9		10.9	15.0	B	V
B202489	GW03773IT	10/19/92	30.2	36.3	30.2	15.0		
B202589	GW01753IT	9/10/91	78.5		78.5	15.0		V
B202589	GW02099IT	12/9/91	9.6		9.6	15.0		V
B202589	GW02544IT	3/26/92	3.9		3.9	15.0	B	V
B202589	GW02967IT	5/29/92	3.8		3.8	15.0	B	V
B202589	GW03325IT	8/13/92	72.5		72.5	15.0	E	
B202589	GW03766IT	10/21/92	47.0	35.9	47.0	15.0		
B203189	GW01781IT	9/18/91	74.7	74.7	74.7	15.0		V
B203289	GW01782IT	9/17/91	98.3		98.3	15.0		V
B203289	GW02040IT	12/11/91	100.0		100.0	15.0		V

ATTACHMENT J1
TABLE 32
95% UCL CONCENTRATION
BACKGROUND GROUNDWATER MANGANESE

			MANGANESE (ug/l)					
Location	Field ID	Sample Date	Result	Well Ave	SQL	CDRL	Qual	Valid. Q
B203289	GW02498IT	2/21/92	37.8		37.8	15.0		
B203289	GW03270IT	8/11/92	192.0		192.0	15.0	E	
B203289	GW03784IT	11/4/92	145.0	114.6	145.0	15.0		
B203489	GW01772IT	9/13/91	16.6	16.6	16.6	15.0		V
B205589	GW01746IT	9/10/91	70.7		70.7	15.0		V
B205589	GW02107IT	12/11/91	55.2		55.2	15.0		V
B205589	GW02523IT	2/27/92	42.0		42.0	15.0		V
B205589	GW02974IT	6/5/92	31.4		31.4	15.0		V
B205589	GW03280IT	7/30/92	30.8		30.8	15.0		V
B205589	GW03776IT	10/20/92	18.6	46.0	18.6	15.0		
B302789	GW02144IT	12/15/91	5.6		5.6	15.0	B	V
B302789	GW02587IT	3/16/92	7.1		7.1	15.0	BE	V
B302789	GW03052IT	6/9/92	33.6		33.6	15.0		V
B302789	GW03759IT	10/22/92	3.9	12.6	3.9	2.1		
B302889	GW02068IT	12/16/91	15.9		15.9	15.0		V
B302889	GW02583IT	2/22/92	3.8		3.8	15.0	B	
B302889	GW03040IT	6/4/92	6.2		6.2	15.0	B	V
B302889	GW03400IT	8/13/92	7.5		15.0	15.0	U	
B302889	GW03749IT	11/6/92	4.6	7.6	4.6	15.0	B	
B302989	GW01672IT	8/29/91	33.7		33.7	15.0		
B302989	GW02069IT	12/7/91	34.4		34.4	15.0		V
B302989	GW02492IT	2/21/92	21.3		21.3	15.0		V
B302989	GW03051IT	6/4/92	30.4		30.4	15.0		V
B302989	GW03401IT	8/13/92	31.5		31.5	15.0	E	
B302989	GW03752IT	11/6/92	37.5	31.5	37.5	15.0		
B305389	GW01739IT	9/19/91	0.5		1.0	15.0	U	V
B305389	GW02153IT	12/18/91	2.3		2.3	15.0	B	V
B305389	GW02595IT	3/16/92	3.4		3.4	15.0	BE	V
B305389	GW03054IT	6/10/92	2.7		2.7	15.0	B	JA
B305389	GW03405IT	8/18/92	7.5		15.0	15.0	U	
B305389	GW03761IT	10/23/92	1.1	2.9	2.1	2.1	U	
B400189	GW01750IT	9/17/91	124.0		124.0	15.0		V
B400189	GW02052IT	11/25/91	42.1		42.1	15.0		V
B400189	GW02456IT	2/13/92	7.5		7.5	15.0	BE	JA
B400189	GW03033IT	6/2/92	151.0		151.0	15.0		V
B400189	GW03034IT	6/5/92	141.0		141.0	15.0		V
B400189	GW03397IT	8/20/92	91.1		91.1	2.1		V
B400189	GW03753IT	11/19/92	74.4	90.1	74.4	15.0		
B400289	GW00397IT	9/14/90	3.1		3.1		B	
B400289	GW01790IT	9/19/91	19.2		19.2	15.0		V
B400289	GW02139IT	12/17/91	45.2		45.2	15.0		V
B400289	GW02458IT	2/13/92	5.2		5.2	15.0	BE	JA
B400289	GW02959IT	6/9/92	5.1		5.1	15.0	B	JA
B400289	GW03468IT	9/8/92	211.0	48.1	211.0	15.0		
B400389	GW01789IT	9/18/91	0.5		1.0	15.0	U	V
B400389	GW02053IT	11/25/91	244.0		244.0	15.0		V
B400389	GW02444IT	2/7/92	12.7		12.7	15.0	B	V
B400389	GW02960IT	6/8/92	60.3		60.3	15.0		V
B400389	GW03479IT	9/23/92	7.5		15.0	15.0	U	
B400389	GW03762IT	11/12/92	135.0	76.7	135.0	15.0		
B400489	GW01778IT	9/16/91	1.8		1.8	15.0	B	V
B400489	GW02034IT	11/26/91	52.6		52.6	15.0		V
B400489	GW02443IT	2/10/92	20.9		20.9	15.0		V
B400489	GW02961IT	6/9/92	19.7		19.7	15.0		V
B400489	GW03482IT	9/15/92	7.5		15.0	15.0	U	
B400489	GW03763IT	11/11/92	132.0	39.1	132.0	15.0		
B401989	GW01745IT	9/6/91	5.2		5.2	15.0	B	JA
B401989	GW02070IT	12/14/91	2.0		2.0	15.0	B	V

ATTACHMENT J1
TABLE 32
95% UCL CONCENTRATION
BACKGROUND GROUNDWATER MANGANESE

			MANGANESE (ug/l)					
Location	Field ID	Sample Date	Result	Well Ave	SQL	CDRL	Qual	Valid. Q
B401989	GW02583IT	3/13/92	5.2		5.2	15.0	B	V
B401989	GW03066IT	6/24/92	11.5		11.5	15.0	B	V
B401989	GW03339IT	8/6/92	19.2		19.2	15.0		
B401989	GW03748IT	10/21/92	7.5	8.4	15.0	15.0	U	
B402189	GW02141IT	12/19/91	9.3		9.3	15.0	B	V
B402189	GW02540IT	3/23/92	1.0		2.0	15.0	U	V
B402189	GW03067IT	6/24/92	21.1		21.1	15.0		V
B402189	GW03406IT	8/18/92	45.8		45.8	15.0		
B402189	GW03734IT	11/12/92	40.7	23.6	40.7	15.0		
B402689	GW01716IT	8/27/91	278.0		278.0	15.0		
B402689	GW02123IT	12/14/91	242.0		242.0	15.0		V
B402689	GW02475IT	2/13/92	209.0		209.0	15.0		V
B402689	GW02948IT	5/28/92	185.0		185.0	15.0		V
B402689	GW03733IT	12/3/92	253.0	233.4	253.0	1.0		
B405489	GW01719IT	8/28/91	3.3		3.3	15.0	B	
B405489	GW02154IT	12/18/91	7.1		7.1	15.0	B	V
B405489	GW02451IT	2/10/92	3.2		3.2	15.0	B	V
B405489	GW02996IT	6/26/92	1.0		2.0	15.0	U	V
B405489	GW03346IT	8/19/92	7.5		15.0	15.0	U	
B405489	GW03742IT	11/11/92	7.5	4.9	15.0	15.0	U	
B405586	GW01775IT	9/13/91	125.0		125.0	15.0		V
B405586	GW02168IT	12/18/91	278.0		278.0	15.0		V
B405586	GW02452IT	3/13/92	299.0		299.0	15.0		V
B405586	GW02993IT	6/11/92	407.0		407.0	1.5		V
B405586	GW03343IT	8/18/92	303.0		303.0	15.0		
B405586	GW03745IT	12/8/92	456.0	311.3	456.0	1.0		
B405689	GW01783IT	9/17/91	0.5		1.0	15.0	U	V
B405689	GW02036IT	12/18/91	14.9		14.9	15.0	B	V
B405689	GW02457IT	2/13/92	5.2		5.2	15.0	BE	JA
B405689	GW03036IT	6/29/92	11.5		11.5	15.0	B	V
B405689	GW03418IT	8/18/92	7.5		15.0	15.0	U	
B405689	GW03764IT	11/9/92	21.2	10.1	21.2	15.0		
B405789	GW01784IT	9/17/91	3.7		3.7	15.0	B	V
B405789	GW02055IT	11/26/91	181.0		181.0	15.0		V
B405789	GW02442IT	2/10/92	134.0		134.0	15.0		V
B405789	GW02963IT	6/8/92	28.1		28.1	15.0		V
B405789	GW03419IT	9/22/92	87.4		87.4	15.0		
B405789	GW03765IT	11/10/92	7.5	73.6	15.0	15.0	U	
B405889	GW01720IT	8/27/91	7.6		7.6	15.0	B	
B405889	GW02071IT	12/14/91	1.2		1.2	15.0	B	V
B405889	GW02584IT	3/13/92	3.6		3.6	15.0	B	V
B405889	GW03001IT	6/5/92	1.0		2.0	15.0	U	V
B405889	GW03369IT	8/17/92	7.5		15.0	15.0	U	
B405889	GW03737IT	11/12/92	1.5	3.7	3.0	15.0	U	
Number of Samples			160					
Number of Detects			167					
Minimum Detected			1.2					
Maximum Detected			1950.0					
Average			86.7					
Number of wells sampled				31				
Number of wells with detects				31				
Minimum well average				2.91				
Maximum well average				444.98				
Average				80.98				
Standard Deviation				100.16				
t-value				1.697				
95% UCL (1)				111.50				

ATTACHMENT J2
EXPOSURE FACTOR TABLES

PATHWAY-SPECIFIC INTAKE EQUATIONS

The following equations were used to estimate intake of chemicals and radionuclides for the exposure scenarios evaluated in the risk assessment. Numerical values for the exposure factors for each receptor are shown on the Exposure Factors Tables following the equations.

Soil and Sediment Ingestion

Chemical intake from soil ingestion is estimated using the following equation:

$$\text{Intake} = \frac{\text{Conc.} \times \text{IR} \times \text{FC} \times \text{ME} \times \text{EF} \times \text{ED} \times \text{CF}}{\text{BW} \times \text{AT}}$$

where:

Intake	=	Chemical intake, mg/kg-day
Conc.	=	Chemical concentration in soil, mg/kg
IR	=	Soil ingestion rate, mg/day
FC	=	Fraction contaminated, unitless
ME	=	Soil matrix effect, unitless (see Section J6.2.1)
EF	=	Exposure frequency, days/year
ED	=	Exposure duration, years
CF	=	Conversion factor, 10^{-6} kg/mg
BW	=	Body weight, kg
AT	=	Averaging time, days

Inhalation of Airborne Particulate Matter and of Indoor VOCs

Chemical intake through inhalation exposure routes is estimated using the following equation:

$$\text{Intake} = \frac{\text{Conc.} \times \text{IR} \times \text{DF} \times \text{ET} \times \text{EF} \times \text{ED}}{\text{BW} \times \text{AT}}$$

where:

Intake	=	Chemical intake, mg/kg-day
Conc.	=	Chemical concentration in air, mg/m^3
IR	=	Inhalation rate, m^3/hr
DF	=	Respiratory deposition factor in lung, unitless
ET	=	Exposure time, hr/day
EF	=	Exposure frequency, days/year
ED	=	Exposure duration, years
BW	=	Body weight, kg
AT	=	Averaging time, days

Soil and Sediment Dermal Contact

Chemical intake through absorption of organic chemicals through skin is estimated using the following equation:

$$\text{Intake} = \frac{\text{Conc.} \times \text{SA} \times \text{AB} \times \text{AD} \times \text{FC} \times \text{EF} \times \text{ED} \times \text{CF}}{\text{BW} \times \text{AT}}$$

where:

Intake	=	Chemical intake, mg/kg-day
Conc.	=	Chemical concentration in soil, mg/kg
SA	=	Surface area, cm^2/day
AB	=	Absorption factor, unitless (chemical-specific; see Section J6.2.3)
AD	=	Soil adherence factor, mg/cm^2
FC	=	Fraction contacted that is contaminated, unitless
EF	=	Exposure frequency, days/year
ED	=	Exposure duration, years
BW	=	Body weight, kg
AT	=	Averaging time, days
CF	=	Conversion factor, kg soil/mg soil

Groundwater Ingestion

Chemical intake from groundwater ingestion is estimated using the following equation:

$$\text{Intake} = \frac{\text{Conc.} \times \text{IR} \times \text{FC} \times \text{EF} \times \text{ED}}{\text{BW} \times \text{AT}}$$

where:

Intake	=	Chemical intake, mg/kg-day
Conc.	=	Chemical concentration in groundwater, mg/L
IR	=	Ingestion rate, L/day
FC	=	Fraction ingested from contaminated source, unitless
EF	=	Exposure frequency, days/years
ED	=	Exposure duration, years
BW	=	Body weight, kg
AT	=	Averaging time, days

Surface Water Ingestion

Chemical intake via ingestion of surface water in the ponds is estimated using the following equation:

$$\text{Intake} = \frac{\text{Conc.} \times \text{IR} \times \text{ET} \times \text{EF} \times \text{ED}}{\text{BW} \times \text{AT}}$$

where:

Intake	=	Chemical intake, mg/kg-day
Conc.	=	Chemical concentration in water, mg/L
IR	=	Ingestion rate, L/hour
ET	=	Exposure time, hr/day
EF	=	Exposure frequency, days/year
ED	=	Exposure duration, years
BW	=	Body weight, kg
AT	=	Averaging time, days

Surface Water Dermal Contact

Chemical intake through absorption of VOCs in water through skin is estimated using the following equation:

$$\text{Intake} = \frac{\text{Conc.} \times \text{SA} \times \text{PC} \times \text{ET} \times \text{EF} \times \text{ED} \times \text{CF}}{\text{BW} \times \text{AT}}$$

where:

Intake	=	Chemical intake, mg/kg-day
Conc.	=	Chemical concentration in water, mg/L
SA	=	Surface area, cm^2/day
PC	=	Permeability constant, cm/hr (chemical-specific; see Section J6.2.6)
ET	=	Exposure time, hr/day
EF	=	Exposure frequency, days/year
ED	=	Exposure duration, years
CF	=	Conversion factor, L/cm^3
BW	=	Body weight, kg
AT	=	Averaging time, days

Intake of Radionuclides from Ingestion and Inhalation

$$\text{Intake} = \text{C} \times \text{IR} \times \text{FC} \times \text{ME} \times \text{EF} \times \text{ED}$$

where:

Intake	=	Lifetime internal radionuclide intake via inhalation or ingestion, pCi
C	=	Activity concentration of a radionuclide at the exposure point, pCi/m^3, pCi/L, or pCi/kg
IR	=	Intake rate, m^3/day, L/day, or kg/day
FC	=	Fraction contaminated, unitless (soil or sediment ingestion pathway only)
ME	=	Soil matrix effect, unitless (see Section J6.2.1; soil or sediment ingestion pathway only)
EF	=	Exposure frequency, days/year

ED	=	Exposure duration, years

External Irradiation

For estimating lifetime excess cancer risk, external irradiation exposure is estimated using the following equation:

$$ER = C \times (1\text{-}Se) \times Te \times EF \times ED$$

where:

ER	=	External irradiation exposure, pCi/g soil per year (pCi-yr/g)
C	=	Mass activity concentration of a radionuclide at the exposure point, pCi/g soil
Se	=	Gamma shielding factor, unitless
Te	=	Gamma exposure time factor, fraction of day (unitless)
EF	=	Exposure frequency, fraction of year (unitless)
ED	=	Exposure duration, years

TABLE AT2-1. Rocky Flats Site-Specific Exposure Factors for Quantitative Human Health Risk Assessment

POTENTIALLY EXPOSED RECEPTORS

FACTORS FOR POTENTIALLY COMPLETE ROUTES OF EXPOSURE		Current Onsite Worker	Future Onsite Office Worker	Future Onsite Construction Worker	Future Onsite Ecological Worker
SOIL/SEDIMENT INGESTION					
Ingestion Rate (mg/day)	RME*	50[1]	50[1]	480[4]	106[6]
	CT*	10[2]	5[3]	95[5]	33[6]
Fraction Ingested from Contaminated Source		1.0[7]	1.0[7]	1.0[7]	1.0[7]
		0.9[7]	0.9[7]	0.9[7]	0.9[7]
Matrix Effect in GI Tract (Absorption Factor)		CS[8]	CS	CS	CS
		CS[8]	CS	CS	CS
Exposure Frequency (days/yr)		250[1]	250[1]	30[10]	65[10]
		219[9]	219[9]	30[10]	65[10]
Exposure Duration (years)		25[1]	25[1]	1[10]	2.5[10]
		4[11]	4[11]	1[10]	2.5[10]
Body Weight (kg)[5]		70	70	70	70
		70	70	70	70
Averaging Time-Noncarcinogenic (days)[12]		9125	9125	365	915
		1460	1460	365	915
Averaging Time: Carcinogen (days)[13]		25550	25550	25550	25550
		25550	25550	25550	25550

NOTES:

(BOLD) Standard Default Exposure Factor (EPA, 1991a) used to calculate conservative risks based on Reasonable Maximum Exposure (RME) by combining high-end (>90th %ile) and central tendency (X or Md) exposure factors to represent exposure "that is both protective and reasonable, not the worst possible case."

(NA) Not applicable because the exposure pathway is incomplete.

(CS) Chemical-specific exposure parameter determined from quantitative analysis and toxicology literature.

(1) EPA RAGS, HHEM, Standard Default Exposure Factors, 1991a.

(2) Average of CT soil ingestion rates of 15 mg/day (outdoor industrial worker) and 5 mg/day (indoor industrial worker) based on inferences drawn from Finley and Paustenbach, 1994.

(3) One-half of industrial workers based on inferences drawn from Finley and Paustenbach, 1994; soil ingestion rates for workers indoors (e.g., office workers) are one-half the average of workers both indoors and outdoors (e.g., industrial workers).

(4) Hawley, 1985, and EPA Exposure Factors Handbook, 1989a. A more defensible HE default is 205 mg/day based on adjusting Hawley's soil adherence value from 3.5 mg/cm^2 to the correct upper bound of 1.5 mg/cm^2 (EPA, 1992a) (480 x 1.5/3.5).

(5) Estimated using HE ingestion rate ratio of construction worker to industrial worker (480/50 = 9.6; CT = 9.6 x 10 mg/day), but a more defensible CT default is 40 (see Note 8).

(6) Based on RME and CT exposure assessment work at Rocky Mountain Arsenal. (Integrated Endangerment Assessment/Risk Characterization) Rocky Mountain Arsenal, August 1993.

(7) The CT is based on average weekly time spent at work (0.9) using a base of 40 hours per week. EPA RAGS, HHEM Pt. a (1989b), recognizes the need for a soil "fraction ingested" (FI) from a contaminated source to reflect "population activity patterns."

(8) In the absence of a CS value, consult methods to estimate maximum oral bioavailability (absorption in the gastrointestinal tract) such as reported by EPA (1994) for lead in soil and by Finley and Paustenbach (1994) for TCDD in soil. Assuming chemical toxicity values are based on absorption from drinking water, absorption adjustments are indicated because toxic chemicals only partially desorb from soil particles (EPA RAGS, HHEM Pt. A, 1989b - Appendix A).

(9) Preliminary CT default value (EPA, 1993).

(10) Final Rocky Flats Programmatic Risk-Based

(11) American Industrial Health Council, 1994; Gephart, Tell and Triemer, 1994.

(12) Exposure duration (years) X 365 days (EPA RAGS, HHEM Pt. A, 1989b).

(13) Lifetime exposure (70) years X 365 days (EPA RAGS, HHEM Pt. A, 1989b).

TABLE AT2-2. Rocky Flats Site-Specific Exposure Factors for Quantitative Human Health Risk Assessment

POTENTIALLY EXPOSED RECEPTORS

FACTORS FOR POTENTIALLY COMPLETE ROUTES OF EXPOSURE		Current Onsite Worker	Future Onsite Industrial Worker	Future Onsite Construction Worker	Future Onsite Ecological Worker
SOIL/SEDIMENT INHALATION					
Inhalation Rate (m^3/hr)	RME*	**0.83**[1]	**0.83**[1]	**1.4**[3]	**1.4**[3]
	CT*	0.83[1]	0.63[2]	1.25[3]	0.83[1]
Respirable Fraction (PM_{10})[4]		0.36	0.36	0.36	0.36
		0.36	0.36	0.36	0.36
Respiratory Deposition Factor (unitless)[5]		0.85	0.85	0.85	0.85
		0.85	0.85	0.85	0.85
Exposure Time (hr/day)		**8**[1]	**8**[1]	**8**[1]	**8**[1]
		7.2[6]	7.2[6]	7.2[6]	7.2[6]
Exposure Frequency (days/yr)		**250**[1]	**250**[1]	30[3]	65[3]
		219[7]	219[7]	30[3]	65[3]
Exposure Duration (years)		**25**[1]	**25**[1]	1[3]	2.5[3]
		4[8]	4[8]	1[3]	2.5[3]
Body Weight (kg)[1]		**70**	**70**	**70**	**70**
		70	70	70	70

POTENTIALLY EXPOSED RECEPTORS

FACTORS FOR POTENTIALLY COMPLETE ROUTES OF EXPOSURE	Current Onsite Worker	Future Onsite Office Worker	Future Onsite Construction Worker	Future Onsite Ecological Worker
Averaging Time:	9125	9125	365	915
Noncarcinogen (days) (9)	1460	1460	365	915
Averaging Time:	25550	25550	25550	25550
Carcinogen (days)(10)	25550	25550	25550	25550

NOTES:

(BOLD) Standard Default Exposure Factor (EPA, 1991a) used to calculate conservative risks based on Reasonable Maximum Exposure (RME) by combining high-end (>90th %ile) and central tendency (X or Md) exposure factors to represent exposure "that is both protective and reasonable, not the worst possible case."

(NA) Not applicable because the exposure pathway is incomplete.

(1) EPA RAGS, HHEM, Standard Default Exposure Factors 1991a.

(2) CT worker inhalation rate of 0.63 m^3/hr (adult indoors) based on EPA Exposure Factors Handbook (1989a).

(3) Outdoor inhalation rate from EPA Exposure Factors Handbook (1989a) and the CT from Final Rocky Flats Programmatic Risk-Based Preliminary Remediation Goals, 1995.

(4) Five-year (1988-1992) mean annual ratio of PM_{10} soil or dust particles to total suspended particulates (TSP) as reported in 1992 RFP Site Environmental Report; EPA Exposure Factors Handbook (1989a) recognizes the need for a "respirable fraction of particulates" (RF) to indicate the total respirable fraction assumed deposited in the lung (100% of PM_{10}). Air modeling was performed using only the PM10 fraction. Therefore, the respirable fraction factor was not used in the risk calculations.

(5) Based on Exposure Assessment work done at Rocky Mountain Arsenal (Integrated Endangerment Assessment/Risk Characterization, August 1993).

(6) Based on average time spent at work (36 hr/wk) (American Industrial Health Council, 1994; Gephart, Tell and Triemer, 1994).

(7) Preliminary CT default value (EPA, 1993).

(8) American Industrial Health Council, 1994, Gephart, Tell and Triemer, 1994.

(9) Exposure duration (years) x 365 days (EPA RAGS,HHEM Pt. A, 1989b).

(10) Lifetime exposure (70 years) x 365 days (EPA RAGS, HHEM Pt. A, 1989b).

TABLE AT2-3. Rocky Flats Site-Specific Exposure Factors for Quantitative Human Health Risk Assessment

POTENTIALLY EXPOSED RECEPTORS

FACTORS FOR POTENTIALLY COMPLETE ROUTES EXPOSURE		Current Onsite Worker	Future Onsite Office Worker	Future Onsite Construction Worker	Future Onsite Ecological Worker
SOIL/SEDIMENT DERMAL CONTACT					
Exposed Skin Surface (cm^2/day)	RME*	3400[2]	2100[2]	4700[2]	4700[2]
	CT*	3400[2]	2100[2]	4700[2]	4700[2]
Fraction Contacted from Contaminated Source		1[3]	1[3]	1[3]	1[3]
		0.9[4]	0.9[4]	0.9[4]	0.9[4]
Soil Adherence (mg/cm^2)		1[1]	1[1]	1[1]	1[1]
		0.2[1]	0.2[1]	0.2[1]	0.2[1]
Skin Absorption Factor		CS[5]	CS	CS	CS
		CS[5]	CS	CS	CS
Exposure Frequency (days/yr)		250[6]	250[6]	30[8]	65[8]
		219[7]	219[7]	30[8]	65[8]
Exposure Duration (years)		25[6]	25[6]	1[8]	2.5[8]
		4[9]	4[9]	1[8]	2.5[8]
Body Weight (kg)[6]		70	70	70	70
		70	70	70	70

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POTENTIALLY EXPOSED RECEPTORS

FACTORS FOR POTENTIALLY COMPLETE ROUTES OF EXPOSURE	Current Onsite Worker	Future Onsite Office Worker	Future Onsite Construction Worker	Future Onsite Ecological Worker
Averaging Time:	9125	9125	365	915
Noncarcinogen (days) [10]	1460	1460	365	915
Averaging Time:	25550	25550	25550	25550
Carcinogen (days)[11]	25550	25550	25550	25550

NOTES:

(BOLD) Standard Default Exposure Factor (EPA, 1992a; EPA 1991a) used to calculate conservative risks based on Reasonable Maximum Exposure (RME) by combining high-end (>90th %ile) and central tendency (X or Md) exposure factors to represent exposure "that is both protective and reasonable, not the worst possible case."

(NA) Not applicable because the exposure pathway is incomplete.

(CS) Chemical-specific exposure parameter determined from quantitative analysis and toxicology literature.

(1) EPA Dermal Exposure Assessment: Principles and Applications, 1992a.

(2) Industrial worker HE value is an average between exposed skin surfaces of 4,700 cm^2 (outdoor construction or ecological worker) and 2,100 cm^2 (indoor office worker) based on EPA Exposure Factors Handbook, 1989a; indoor worker exposure assumes median surface area of adult head and hands (1,200 cm^2 + 900 cm^2), whereas outdoor worker assumes median surface area of adult head, hands, and arms (1,200 cm^2 + 900 cm^2 + 2,600 cm^2).

(3) RME based on EPA guidance. The CT is based on average weekly time spent at work (American Industrial Health Council, 1994; Gephart, Tell and Triemer, 1994).

(4) As in Note 3, based on average weekly time spent at work (0.9) using a base of 40 hours per week.

(5) In the absence of a CS value, consult EPA Region IV Interim Guidance dated 11 February 1992 (default values: 0.01 organics; 0.001 inorganics) (EPA, 1992c). However, alternative values of 0.06 (organic compounds) and 0.01 (metals) are based on maximum dermal bioavailability as reported in "Dermal Absorption Factors for Multiple Chemicals" (15 December 1992; EPA, 1992d).

(6) EPA RAGS, HHEM, Standard Default Exposure Factors, 1991a (for consistency with soil/dust ingestion and inhalation).

(7) Preliminary CT default value (EPA, 1993).

(8) Final Rocky Flats Programmatic Risk-Based Preliminary Remediation Goals, 1995.

(9) American Industrial Health Council, 1994; Gephart, Tell and Triemer, 1994.

(10) Exposure duration (years) x 365 days (EPA RAGS, HHEM Pt. A, 1989b).

(11) Lifetime exposure (70 years) x 365 days (EPA RAGS, HHEM Pt. A, 1989b).

TABLE AT2-4. Rocky Flats Site-Specific Exposure Factors for Quantitative Human Health Risk Assessment

POTENTIALLY EXPOSED RECEPTORS

FACTORS FOR POTENTIALLY COMPLETE ROUTES OF EXPOSURE		Current Onsite Worker	Future Onsite Office Worker	Future Onsite Construction Worker	Future Onsite Ecological Worker
SURFACE WATER/SUSPENDED SEDIMENT INGESTION*					
Ingestion Rate	RME*	NA	NA	NA	0.05[1, 3]
(L/hr)	CT*	NA	NA	NA	0.01[2, 4]
Exposure Time		NA	NA	NA	1[5]
(hr/day)		NA	NA	NA	1[5]
Exposure Frequency		NA	NA	NA	12[3]
(days/yr)		NA	NA	NA	7[3]
Exposure Duration		NA	NA	NA	2.5[3]
(years)		NA	NA	NA	2.5[3]
Body Weight		NA	NA	NA	70[3]
(kg)		NA	NA	NA	70[3]
Averaging Time:		NA	NA	NA	915
Noncarcinogen (days) [6]		NA	NA	NA	915
Averaging Time:		NA	NA	NA	25550
Carcinogen (days) [7]		NA	NA	NA	25550

* Direct ingestion of exposed *in situ* shoreline sediments will utilize *OU-specific* exposure factors.

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NOTES:

(NA) Not applicable because the exposure pathway is incomplete.

(1) Top entry is based on High-End (HE) exposure used to characterize the RME risks in a baseline or remediation risk assessment. RME risks are derived using professional judgment to set one or more sensitive exposure parameters at HE (90-98th %ile) values in combination with others set at central tendency (CT) values in order to characterize the high-end risks to a very small proportion of an exposed population.

(2) Bottom entry is based on CT used to characterize the typical case in a baseline or remediation risk assessment (or a "reasonable worst case", when used in combination with selected high-end values). Average risks are derived using professional judgment to set *all* exposure parameters at 50th %ile (median) or mean values in order to characterize the mid-range risk to the largest proportion of an exposed population.

(3) The RME is based on EPA guidance. The CT is from the Final Rocky Flats Programmatic Risk-Based Preliminary Remediation Goals, 1995.

(4) On the premise that actual swimming rather that wading is unlikely, the CT ingestion rate while wading is assumed to be one-fifth as much as while swimming.

(5) An exposure "event" for the ecological worker (see Final Rocky Flats Programmatic Risk-Based Preliminary Remediation Goals, 1995) is assumed to last 1 hour per day.

(6) Exposure duration (years) x 365 days (EPA RAGS, HHEM Pt. A, 1989b).

(7) Lifetime exposure (70 years) x 365 days (EPA RAGS, HHEM Pt. A, 1989b).

TABLE AT2-5. Rocky Flats Site-Specific Exposure Factors for Quantitative Human Health Risk Assessment

POTENTIALLY EXPOSED RECEPTORS

FACTORS FOR POTENTIALLY COMPLETE ROUTES OF EXPOSURE		Current Onsite Worker	Future Onsite Office Worker	Future Onsite Construction Worker	Future Onsite Ecological Worker
SURFACE WATER DERMAL CONTACT*					
Exposed Skin Surface (cm^2)	RME*	NA	NA	NA	9275[1, 3]
	CT*	NA	NA	NA	9275[2, 3]
Dermal Permeability (cm/hr)		NA	NA	NA	CS[4]
		NA	NA	NA	CS[4]
Exposure Time (hr/day)		NA	NA	NA	1[5]
		NA	NA	NA	1[5]
Exposure Frequency (days/yr)		NA	NA	NA	12[6]
		NA	NA	NA	7[6]
Exposure Duration (years)		NA	NA	NA	2.5[6]
		NA	NA	NA	2.5[6]
Body Weight (kg)		NA	NA	NA	70[6]
		NA	NA	NA	70[6]

- Direct dermal contact with exposed *in situ* shoreline sediment will utilize *OU-specific* exposure factors.

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POTENTIALLY EXPOSED RECEPTORS

FACTORS FOR POTENTIALLY COMPLETE ROUTES OF EXPOSURE	Current Onsite Worker	Future Onsite Office Worker	Future Onsite Construction Worker	Future Onsite Ecological Worker
Averaging Time:	NA	NA	NA	915
Non-Carcinogen (days) (7)	NA	NA	NA	915
Averaging Time:	NA	NA	NA	25550
Carcinogen (days)(8)	NA	NA	NA	25550

NOTES:

(NA) Not applicable because the exposure pathway is incomplete.

(CS) Chemical-specific exposure parameter determined from quantitative analysis and toxicology literature.

(1) Top entry is based on High-End (HE) exposure used to characterize the Reasonable Maximum Exposure (RME) risks in a baseline or remediation risk assessment. RME risks are derived using professional judgment to set one or more sensitive exposure parameters at HE (90-98th %ile) values in combination with others set a Central Tendency (CT) values in order to characterize the high-end risks to a very small proportion of an exposed population.

(2) Bottom entry is based on Central Tendency (CT) used to characterize the typical case in a baseline or remediation risk assessment (or a "reasonable maximum exposure", when used in combination with selected high-end values). Average risks are derived using professional judgment to set *all* exposure parameters at 50th %ile (median) or mean values in order to characterize the mid-range risk to the largest proportion of an exposed population.

(3) On the premise that actual swimming by the ecologist, rather than wading, is highly unlikely, the exposed adult skin surface while wading and reaching underwater is assumed to include the legs (5,950 cm^2), feet (1,250 cm^2), forearms (1,175 cm^2), and hands (900 cm^2) (EPA Exposure Factors Handbook, 1989a).

(4) In the absence of a CS value, consult methods to estimate maximum dermal bioavailability. Possible maxima are: HE value of 1.0 cm/hr determined experimentally for ethylbenzene and toluene among *organic* compounds; HE value of 0.001 cm/hr determined experimentally for cadmium chloride and mercuric chloride among *inorganic* compounds (EPA Dermal Exposure Assessment: Principles and Applications, 1992a).

(5) An exposure "event" for the ecological worker (see Final Rocky Flats Programmatic Risk-Based Preliminary Remediation Goals, 1994) is assumed to last 1 hour per day.

(6) RME is from EPA guidance. The CT is from the Final Rocky Flats Programmatic Risk-Based Preliminary Remediation Goals, 1995 (for consistency with surface water ingestion).

(7) Exposure duration (years) x 365 days (EPA RAGS, HHEM Pt. A, 1989b).

(8) Lifetime exposure (70 years) x 365 days (EPA RAGS, HHEM Pt. A, 1989b).

TABLE AT2-6. Rocky Flats Site-Specific Exposure Factors for Quantitative Human Health Risk Assessment

POTENTIALLY EXPOSED RECEPTORS

FACTORS FOR POTENTIALLY COMPLETE ROUTES OF EXPOSURE		Current Onsite Worker	Future Onsite Office Worker	Future Onsite Construction Worker	Future Onsite Ecological Worker	Future Onsite Resident[1]
GROUND WATER INGESTION						
Ingestion Rate (L/day)	RME*	NA	1	NA	NA	2.0[2,4]
	CT*	NA	1	NA	NA	1.4[3,4]
Fraction Ingested from Contaminated Source		NA	1	NA	NA	1.0
		NA	0.3	NA	NA	0.3[5]
Exposure Frequency (days/yr)		NA	250	NA	NA	350[6]
		NA	219	NA	NA	234[7]
Exposure Duration (years)		NA	25	NA	NA	30[6]
		NA	4	NA	NA	9[8]
Body Weight (kg)		NA	70	NA	NA	70[6]
		NA	70	NA	NA	70[6]
Averaging Time: Noncarcinogen (days) [9]		NA	9125	NA	NA	10950
		NA	1460	NA	NA	3285
Averaging Time: Carcinogen (days)[10]		NA	25550	NA	NA	25550
		NA	25550	NA	NA	25550

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NOTES:

(NA) Not applicable because the exposure pathway is incomplete.

(1) Risk due to chemicals of concern and chemicals of interest in groundwater were calculated using a future onsite residential scenario.

(2) Top entry is based on High-End (HE) exposure used to characterize the Reasonable Maximum Exposure (RME) risks in a baseline or remediation risk assessment. RME risks are derived using professional judgment to set one or more sensitive exposure parameters at HE (90-98th %ile) values in combination with other Central Tendency (CT) values in order to characterize the high-end risk to a very small proportion of an exposed population.

(3) Bottom entry is based on Central Tendency (CT) use to characterize the typical case in a baseline or remediation risk assessment (or a "reasonable maximum exposure", when used in combination with selected high-end values). Average risks are derived using professional judgment to set all exposure parameters at 50th %ile (median) or mean values in order to characterize the mid-range risk to the largest proportion of an exposed population.

(4) HE and CT adult total water-based beverage intakes, including tap water (EPA Exposure Factors Handbook, 1989a).

(5) The CT fraction ingested (FI) is based on 64% of adult time spent at home (American Industrial Health Council, 1994; Gephart, Tell and Triemer, 1994) and on 46% tap water ingestion out of adult total water-based beverage intake (EPA Exposure Factors Handbook, 1989a) (0.64 x 0.46 = 0.3).

(6) EPA RAGS, HHEM, Standard Default Exposure Factors, 1991a.

(7) Preliminary CT default value (EPA, 1993).

(8) Preliminary CT default value (EPA, 1993). A current alternative value is EPA's CT Residential Occupancy Period (ROP) of 8.1 years for total population (EPA, 1992b; American Industrial Health Council, 1994).

(9) Exposure duration (years) x 365 days (EPA RAGS, HHEM Pt. A, 1989b).

(10) Lifetime exposure (70 years) x 365 days (EPA RAGS, HHEM Pt. A, 1989b).

TABLE AT2-7. Rocky Flats Site-Specific Exposure Factors for Quantitative Human Health Risk Assessment

POTENTIALLY EXPOSED RECEPTORS

FACTORS FOR POTENTIALLY COMPLETE ROUTES OF EXPOSURE		Current Onsite Worker	Future Onsite Office Worker	Future Onsite Construction Worker	Future Onsite Ecological Worker
GROUNDWATER/SUBSOIL VOC INHALATION*					
Inhalation Rate (m^3/hr)	RME*	NA	**0.83**[1, 3]	1.4[5]	NA
	CT*	NA	0.63[2, 4]	1.25[5]	NA
Exposure Time (hr/day)		NA	**8**[3]	**8**[3]	NA
		NA	7.2[6]	7.2[6]	NA
Exposure Frequency (days/yr)		NA	**250**[3]	30[5]	NA
		NA	219[7]	30[5]	NA
Exposure Duration (years)		NA	**25**[3]	1[5]	NA
		NA	4[8]	1[5]	NA
Body Weight (kg)[3]		NA	**70**	**70**	NA
		NA	70	70	NA
Averaging Time: Noncarcinogen (days)[9]		NA	9125	365	NA
		NA	1460	365	NA
Averaging Time: Carcinogen (days)[10]		NA	25550	25550	NA
		NA	25550	25550	NA

* Includes *indoor* VOC vapor from household use of groundwater supply and VOC vapor infiltration from subsoil into offices.

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NOTES:

(BOLD) Standard Default Exposure Factor (EPA, 1991a; EPA 1989a) used to calculate conservative risks based on Reasonable Maximum Exposure (RME) by combining high-end (>90th %ile) and central tendency (X or Md) exposure factors to represent exposure "that is both protective and reasonable, not the worst possible case."

(NA) Not applicable because the exposure pathway is incomplete.

(1) Top entry is based on High-End (HE) exposure used to characterize the Reasonable Maximum Exposure (RME) risks in a baseline or remediation risk assessment. RME risks are derived using professional judgment to set one or more sensitive exposure parameters at HE (90-98th %ile) values in combination with others set a Central Tendency (CT) values in order to characterize the high-end risks to a very small proportion of an exposed population.

(2) Bottom entry is based on Central Tendency (CT) used to characterize the typical case in a baseline or remediation risk assessment (or a "reasonable maximum exposure", when used in combination with selected high-end values). Average risks are derived using professional judgment to set *all* exposure parameters at 50th %ile (median) or mean values in order to characterize the mid-range risk to the largest proportion of an exposed population.

(3) EPA RAGS, HHEM, Standard Default Exposure Factors, 1991a.

(4) CT worker inhalation rate of 0.63 m^3/hr (adult indoors) based on EPA Exposure Factors Handbook, 1989a.

(5) RME is based on EPA guidance. The CT is from the Final Rocky Flats Programmatic Risk-Based preliminary Remediation Goals, 1995.

(6) Based on average time spent at work (36 hr/wk) (American Industrial Health Council, 1994; Gephart, Tell and Triemer, 1994).

(7) Preliminary CT default value (EPA 1993).

(8) American Industrial Health Council, 1994; Gephart, Tell and Triemer, 1994.

(9) Exposure duration (years) x 365 days (EPA RAGS, HHEM Pt. A, 1989b).

(10) Lifetime exposure (70 years) x 365 days (EPA RAGS, HHEM Pt. A, 1989b).

TABLE AT2-8. Rocky Flats Site-Specific Exposure Factors for Quantitative Human Health Risk Assessment

POTENTIALLY EXPOSED RECEPTORS

FACTORS FOR POTENTIALLY COMPLETE ROUTES OF EXPOSURE		Current Onsite Worker	Future Onsite Office Worker	Future Onsite Construction Worker	Future Onsite Ecological Worker
EXTERNAL IRRADIATION					
Gamma Exposure Time Factor (T_e)	RME*	**0.3**[1, 3]	**0.3**[3]	**0.3**[3]	**0.3**[3]
	CT*	0.3[2, 3]	0.3[3]	0.3[3]	0.3[3]
Gamma Shielding Factor ($1-S_e$)		**0.8**[5]	**0.8**[5]	**1**[7]	**1**[7]
		0.5[6]	0.5[6]	0.8[8]	0.8[8]
Exposure Frequency[9] (unitless)		**0.7**[4]	**0.7**[4]	0.1[11]	0.2[11]
		0.6[10]	0.6[10]	0.1[11]	0.2[11]
Exposure Duration (years)		**25**[4]	**25**[4]	**1**[11]	**2.5**[11]
		4[12]	4[12]	1[11]	2.5[11]

NOTES:

(BOLD) Standard Default Exposure Factor (EPA, 1991a; EPA 1989a) used to calculate conservative risks based on Reasonable Maximum Exposure (RME) by combining high-end (>90th %ile) and central tendency (X or Md) exposure factors to represent exposure "that is both protective and reasonable, not the worst possible case."

(NA) Not applicable because the exposure pathway is incomplete.

(1) Top entry is based on High-End (HE) exposure used to characterize the Reasonable Maximum Exposure (RME) risks in a baseline or remediation risk assessment. RME risks are derived using professional judgment to set one or more sensitive exposure parameters at HE (90-98th %ile) values in combination with others set a Central Tendency (CT) values in order to characterize the high-end risks to a very small proportion of an exposed population.

(2) Bottom entry is based on Central Tendency (CT) used to characterize the typical case in a baseline or remediation risk assessment (or a "reasonable maximum exposure", when used in combination with selected high-end values). Average risks are derived using professional judgment to set *all* exposure parameters at 50th %ile (median) or mean values in order to characterize the mid-range risk to the largest proportion of an exposed population.

(3) Assuming the HE fraction of time exposed (8 out of 24 hours or 0.33) according to EPA RAGS, HHEM Pt. B- Revised (Dinan, 1992).

(4) EPA RAGS, HHEM, Standard Default Exposure Factors, 1991b. Based on 250 days/year.

(5) Standard default screening value specified in EPA RAGS, HHEM Pt. B, 1991b (1 - 0.2 = 0.8), assuming substantial time shielded by structures.

(6) Estimated typical value for residents and indoor workers shielded by buildings (DOE documents for RFP, such as "Mining Exposure Scenario for Baseline Risk Assessments at the Rocky Flats Environmental Technology Site" (9 August 1994).

(7) Standard default screening value specified in EPA RAGS, HHEM Pt. B, 1991b, assuming limited time shielded by structures.

(8) Assumed typical value for outdoor workers with only limited shielding indoors.

(9) Calculated by dividing exposure frequency for each scenario for soil/dust exposure by 365 days/year; ratio used to allow equation units to balance.

(10) Preliminary CT default value (219 days/yr) (EPA, 1993).

(11) Final Rocky Flats Programmatic Risk-Based Preliminary Remediation Goals, 1995. Based on 30 and 65 days/yr, respectively.

(12) American Industrial Health Council, 1994; Gephart, Tell and Triemer, 1994.

TABLE 9-A
OPEN SPACE EXPOSURE PARAMETERS
INCIDENTAL INGESTION

DUST, SURFACE SOIL, OR SEDIMENT

	Typical Exposure (CT)	High-End Exposure (RME)
Ingestion Rate - Child (mg/visit)	50 (1)	100 (1)
Ingestion Rate - Adult (mg/visit)	25 (1)	50 (1)
Matrix Effect in GI Tract (Absorption Factor)	CS	CS
Exposure Frequency (visits/yr)	10 (2)	25 (2)
Exposure Duration - Child (yr)	2	6
Exposure Duration - Adult (yr)	7	24
Body Weight - Child (kg)	15	15
Body Weight - Adult (kg)	70	70
Averaging Time - Child, Non-carcinogen (days)	730	2,190
Averaging Time - Adult, Non-carcinogen (days)	2,555	8,760
Averaging Time - Carcinogen (days)	25,550	25,550

(1) Assumes standard default *residential* rates as specified for open-space recreational users at DOE's Fernald Site and Hanford Site (RME=200 mg/day for children and 100 mg/day for adults) and at Denver's Lowry Landfill Superfund Site (CT=100 mg/day for children and 50 mg/day for adults). Assumes that Exposure Time is 2.5 hours per day (CT); 5.0 hours per day (RME) (see Note 2, Table B). Using the default daily ingestion rates, soil ingestion per visit for children is calculated as RME=0.5 x 200=100 mg/visit; CT = 50 mg/visit. For adults the ingestion rates are RME=50 and CT=25. Actual open-space recreational intakes would vary, depending on the activity, possibly with dirt biking at one extreme and photographing wildlife at the other.

(2) Exposure Frequency based upon Boulder County's Park and Open Space Visitor Interviews of 1985 (est. 7 days/yr, CT; 25 days/yr, RME), DOE's Hanford Site recreational user (7 days/yr, CT), and Department of Interior's (DOI) National Survey of Fishing, Hunting, and Nonconsumptive Wildlife Recreation of 1985 for Colorado (9.4 days/yr for nonconsumptive use, CT; 15.4 days/yr for fishing and hunting, CT).

TABLE 9-B
OPEN SPACE EXPOSURE PARAMETERS
PARTICULATE INHALATION

DUST, SURFACE SOIL, OR DRY SEDIMENT

	Typical Exposure (CT)	High-End Exposure (RME)
Inhalation Rate (m^3/hr)	0.83 (1)	1.4 (1)
Respirable Fraction (PM_{10})	0.36	0.36
Respiratory Deposition Factor	0.85	0.85
Exposure Time (hr/visit)	1.5 (2)	5.0 (2)
Exposure Frequency (visits/yr)	10 (3)	25 (3)
Exposure Duration (yr)	9	30
Body Weight (kg)	70	70
Averaging Time - Noncarcinogen (days)	3,285	10,950
Averaging Time - Carcinogen (days)	25,550	25,550

(1) Inhalation Rate based upon DOE's Fernald Site and Hanford Site recreational users (0.83 m^3/hr, CT) and on EPA's *Exposure Factors Handbook* (1.4 m^3/hr, RME), which assumes 7% heavy activity, 37% moderate activity, 28% light activity, and 28% resting for an adult.

(2) Exposure Time based upon Boulder County's Park and Open Space Visitor Interviews of 1992 (est. 1.6 hr/day, CT; 5.0 hr/day, RME), DOD's Rocky Mountain Arsenal Site recreational user (1.6 hr/day, CT; 5.0 hr/day, RME), and City of Boulder's Open Space Visitation Study of 1993 (1.0 hr/day, CT; 2.0 hr/day, RME).

(3) Exposure frequency based on Boulder County's Park and Open Space Visitor Interviews of 1985 (estimated 7 days/year, CT; 25 days/year, RME), DOE's Hanford Site recreational user (7 days/year, CT), and DOI's National Survey of Fishing, Hunting, and Nonconsumptive Wildlife Recreation of 1985 for Colorado (9.4 days/year for nonconsumptive use, CT; 15.4 days/year for fishing and hunting, CT).

TABLE 9-C
OPEN SPACE RECREATIONAL EXPOSURE PARAMETERS
DERMAL CONTACT

DUST, SURFACE SOIL, OR SEDIMENT

	Typical Exposure (CT)	High-End Exposure (RME)
Exposed Skin Surface (cm^2)	2,000 (1)	5,300 (1)
Fraction Contacted from Contaminated Source	0.5	1
Soil Adherence to Skin (mg/cm^2)	0.2	1
Skin Absorption Factor	CS	CS
Exposure Frequency (days/yr)	10 (2)	25 (2)
Exposure Duration (yr)	9	30
Body Weight (kg)	70	70
Averaging Time - Noncarcinogen (days)	3,285	10,950
Averaging Time - Carcinogen (days)	25,550	25,550

(1) Exposed Skin Surface based upon EPA's *Dermal Exposure Assessment: Principles and Applications*, which specifies typical and high-end default values for the adult outdoors (2,000 cm^2 and 5,300 cm^2). The CT exposed skin surface is limited to head and hands, while the RME value assumes head, hands, forearms, and lower legs are exposed. DOE's Fernald Site recreational user adopts a comparable RME value (5,000 cm^2). It is conservatively assumed that a persons head will contact sediments.

(2) See Table 9-B, Note 3.

TABLE 9-D
OPEN SPACE EXPOSURE PARAMETERS
INGESTION WHILE WADING

SHALLOW SURFACE WATER	Typical Exposure (CT)	High-End Exposure (RME)
Ingestion Rate (mL/hr)	25 (1)	50 (1)
Exposure Time (hr/visit)	0.5 (2)	1 (2)
Exposure Frequency (visits/yr)	5 (3)	15 (3)
Exposure Duration (yr)	9	30
Body Weight (kg)	70	70
Averaging Time - Noncarcinogen (days)	3,285	10,950
Averaging Time - Carcinogen (days)	25,550	25,550

(1) Ingestion Rate based upon open-space recreational user wading at Denver's Lowry Landfill Superfund Site (50 mL/day, RME; 25 mL/day, CT). For comparison, a single value of 35 mL/day is specified for DOE's Fernald Site (wading in shallow Paddy's Run).

(2) Exposure Time based upon DOE's Fernald Site recreational user (0.5 hr/day, CT) and on the Clear Creek/ Central City Superfund Site recreational user (1.0 hr/day, RME, assuming that wading time would be the same as swimming time).

(3) Assumes that CT Exposure Frequency for *wading* is one-half the EF of 10 days/yr for all visitors (0.5 x 10 = 5 days/yr) and RME is 60% of the EF of 25 (0.6 x 25 = 15 days/yr). See Table A, Note 3. On the average, users are very unlikely to wade on a year-round basis during each visit to the site.

TABLE 9-E
OPEN SPACE EXPOSURE PARAMETERS
DERMAL CONTACT WHILE WADING

SHALLOW SURFACE WATER

	Typical Exposure (CT)	High-End Exposure (RME)
Exposed Skin Surface (cm^2)	4,550 (1)	9,275 (1)
Dermal Permeability (cm/hr)	CS	CS
Exposure Time (hr/visit)	0.5 (2)	1 (2)
Exposure Frequency (visits/yr)	5 (3)	15 (3)
Exposure Duration (yr)	9	30
Body Weight (kg)	70	70
Averaging Time - Noncarcinogen (days)	3,285	10,950
Averaging Time - Carcinogen (days)	25,550	25,550

(1) Typical exposed adult skin surface while wading and reaching underwater (4,550 cm^2) assumes the lower legs, feet, and hands are exposed; high-end exposed surface (9,275 cm^2) assumes the thighs, lower legs, feet, forearms, and hands are exposed (*EPA's Exposure Factors Handbook*).

(2) See Table D, Note 2.

(3) See Table D, Note 3.

TABLE 9-F
OPEN SPACE EXPOSURE PARAMETERS

EXTERNAL IRRADIATION	Typical Exposure (CT)	High-End Exposure (RME)
Gamma Exposure Time Factor (T_e)	0.1 (1)	0.2 (1)
Gamma Shielding Factor ($1-S_e$)	0.8	1
Exposure Frequency (unitless)	0.03(2)	0.07 (2)
Exposure Duration (yr)	9	30

(1) Assumes the high-end fraction of time exposed (1.5 out of 24 hours, CT; 5.0 out of 24 hours, RME) (1.5/24 = 0.1; 5.0/24 = 0.2) (see Table B, Note 2)

(2) Calculate by dividing exposure frequency for soil/dust exposure by 365 days/year; ratio used to allow equation units to balance.

ATTACHMENT J3
HEALTH RISK CALCULATIONS

SUMMARY OF RISKS
CURRENT WORKER
AREA OF CONCERN NO. 1

	Central Tendency		Reasonable Maximum	
Pathway	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Ingestion of surface soil	1.78E-03	1.10E-09	1.13E-02	4.35E-08
Inhalation of particulates from surface soil	-	6.59E-10	-	5.22E-09
Dermal contact with surface soil*	-	-	-	-
External Irradiation	-	2.51E-10	-	2.84E-09
Total	1.78E-03	2.01E-09	1.13E-02	5.16E-08

* Dermal absorption of metals and radionuclides is considered insignificant.

CURRENT WORKER
AREA OF CONCERN NO. 1

CT - Soil ingestion

Noncarcinogens

IF =(IR x ED x FC x EF x ME x CF)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Soil Concentration (mg/kg)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	16.5	10	4	0.9	219	0.5	0.000001	70	1460	3.86E-08	4.00E-04	1.59E-03
Vanadium	33.39	10	4	0.9	219	0.5	0.000001	70	1460	3.86E-08	7.00E-03	1.84E-04
Zinc	48.38	10	4	0.9	219	0.5	0.000001	70	1460	3.86E-08	3.00E-01	6.22E-06
											Total Hazard Index	1.78E-03

Radionuclides

IF =IR x ED x FC x EF x ME x CF
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	IF Intake Factor (g)	SF Slope Factor (Risk/pCi)	CR Cancer Risk
Americium-241	0.151	10	4	0.9	219	1	0.001	7.88E+00	3.28E-10	3.90E-10
Plutonium-239/240	0.284	10	4	0.9	219	1	0.001	7.88E+00	3.16E-10	7.08E-10
									Total Radionuclide Cancer Risk	1.10E-09

Total Cancer Risk 1.10E-09

CURRENT WORKER
AREA OF CONCERN NO. 1

RME - soil ingestion

Noncarcinogens

IF =(IR x ED x FC x EF x ME x CF)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Soil Concentration (mg/kg)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	16.5	50	25	1	250	0.5	0.000001	70	9125	2.45E-07	4.00E-04	1.01E-02
Vanadium	33.39	50	25	1	250	0.5	0.000001	70	9125	2.45E-07	7.00E-03	1.17E-03
Zinc	48.38	50	25	1	250	0.5	0.000001	70	9125	2.45E-07	3.00E-01	3.94E-05
											Total Hazard Index	1.13E-02

Radionuclides

IF =IR x ED x FC x EF x ME x CF
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	IF Intake Factor (g)	SF Slope Factor (Risk/pCi)	CR Cancer Risk
Americium-241	0.151	50	25	1	250	1	0.001	3.13E+02	3.28E-10	1.55E-08
Plutonium-239/240	0.284	50	25	1	250	1	0.001	3.13E+02	3.16E-10	2.80E-08
									Total Radionuclide Cancer Risk	4.35E-08
									Total Cancer Risk	4.35E-08

CURRENT WORKER
AREA OF CONCERN NO. 1

CT - Inhalation of particulates

Radionuclides

IF = IR x ET x EF x ED x DF
CR = IF x C x SF

	C	IR	ET	EF	ED	DF	IF	SF	CR
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Deposition Factor	Intake Factor (m^3)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.63E-06	0.83	7.2	219	4	0.85	4.45E+03	3.85E-08	2.79E-10
Plutonium-239/240	3.07E-06	0.83	7.2	219	4	0.85	4.45E+03	2.78E-08	3.80E-10
								Total Radionuclide Cancer Risk	6.59E-10

Total Cancer Risk 6.59E-10

CURRENT WORKER
AREA OF CONCERN NO. 1

RME - Inhalation of particulates

Radionuclides

$$IF = IR \times ET \times EF \times ED \times DF$$
$$CR = IF \times C \times SF$$

	C	IR	ET	EF	ED	DF	IF	SF	CR
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Deposition Factor	Intake Factor (m^3)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.63E-06	0.83	8	250	25	0.85	3.53E+04	3.85E-08	2.21E-09
Plutonium-239/240	3.07E-06	0.83	8	250	25	0.85	3.53E+04	2.78E-08	3.01E-09
								Total Radionuclide Cancer Risk	5.22E-09
								Total Cancer Risk	5.22E-09

CURRENT WORKER
AREA OF CONCERN NO. 1

CT - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (T_e)	GSF Gamma Shielding Factor ($1-S_e$)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	0.151	0.3	0.5	0.6	4	3.60E-01	4.59E-09	2.50E-10
Plutonium-239/240	0.284	0.3	0.5	0.6	4	3.60E-01	1.37E-11	1.40E-12
							Total Cancer Risk	2.51E-10

RME - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (T_e)	GSF Gamma Shielding Factor ($1-S_e$)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	0.151	0.3	0.8	0.68	25	4.08E+00	4.59E-09	2.83E-09
Plutonium-239/240	0.284	0.3	0.8	0.68	25	4.08E+00	1.37E-11	1.59E-11
							Total Cancer Risk	2.84E-09

SUMMARY OF RISK
FUTURE OFFICE WORKER
AREA OF CONCERN NO. 1

	Central Tendency		Reasonable Maximum	
Pathway	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Ingestion of surface soil	8.91E-04	5.49E-10	1.13E-02	4.35E-08
Inhalation of particulates from surface soil	-	5.00E-10	-	5.22E-09
Dermal contact with surface soil *	-	-	-	-
External Irradiation	-	2.51E-10	-	2.93E-09
Total	8.91E-04	1.30E-09	1.13E-02	5.17E-08

* Dermal contact with metals and radionuclides is considered insignificant.

FUTURE OFFICE WORKER
AREA OF CONCERN NO. 1

CT - Soil ingestion

Noncarcinogens

IF =(IR x ED x FC x EF x ME x CF)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Soil Concentration (mg/kg)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	16.5	5	4	0.9	219	0.5	0.000001	70	1460	1.93E-08	4.00E-04	7.96E-04
Vanadium	33.39	5	4	0.9	219	0.5	0.000001	70	1460	1.93E-08	7.00E-03	9.20E-05
Zinc	48.38	5	4	0.9	219	0.5	0.000001	70	1460	1.93E-08	3.00E-01	3.11E-06
											Total Hazard Index	8.91E-04

Radionuclides

IF =IR x ED x FC x EF x ME x CF
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	IF Intake Factor (g)	SF Slope Factor (Risk/pCi)	CR Cancer Risk
Americium-241	0.151	5	4	0.9	219	1	0.001	3.94E+00	3.28E-10	1.95E-10
Plutonium-239/240	0.284	5	4	0.9	219	1	0.001	3.94E+00	3.16E-10	3.54E-10
									Total Radionuclide Cancer Risk	5.49E-10
									Total Cancer Risk	5.49E-10

FUTURE OFFICE WORKER
AREA OF CONCERN NO. 1

RME - soil ingestion

Noncarcinogens

IF =(IR x ED x FC x EF x ME x CF)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Soil Concentration (mg/kg)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	16.5	50	25	1	250	0.5	0.000001	70	9125	2.45E-07	4.00E-04	1.01E-02
Vanadium	33.39	50	25	1	250	0.5	0.000001	70	9125	2.45E-07	7.00E-03	1.17E-03
Zinc	48.38	50	25	1	250	0.5	0.000001	70	9125	2.45E-07	3.00E-01	3.94E-05
											Total Hazard Index	1.13E-02

Radionuclides

IF =IR x ED x FC x EF x ME x CF
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	IF Intake Factor (g)	SF Slope Factor (Risk/pCi)	CR Cancer Risk
Americium-241	0.151	50	25	1	250	1	0.001	3.13E+02	3.28E-10	1.55E-08
Plutonium-239/240	0.284	50	25	1	250	1	0.001	3.13E+02	3.16E-10	2.80E-08
									Total Radionuclide Cancer Risk	4.35E-08
									Total Cancer Risk	4.35E-08

FUTURE OFFICE WORKER
AREA OF CONCERN NO. 1

CT - Inhalation of particulates

Radionuclides

IF = IR x ET x EF x ED x DF
CR = IF x C x SF

	C	IR	ET	EF	ED	DF	IF	SF	CR
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Intake Factor (m^3)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.63E-06	0.63	7.2	219	4	0.85	3.38E+03	3.85E-08	2.12E-10
Plutonium-239/240	3.07E-06	0.63	7.2	219	4	0.85	3.38E+03	2.78E-08	2.88E-10
								Total Radionuclide Cancer Risk	5.00E-10
								Total Cancer Risk	5.00E-10

FUTURE OFFICE WORKER
AREA OF CONCERN NO. 1

RME - Inhalation of particulates

Radionuclides

IF = IR x ET x EF x ED x DF
CR = IF x C x SF

	C	IR	ET	EF	ED	DF	IF	SF	CR
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Intake Factor (m^3)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.63E-06	0.83	8	250	25	0.85	3.53E+04	3.85E-08	2.21E-09
Plutonium-239/240	3.07E-06	0.83	8	250	25	0.85	3.53E+04	2.78E-08	3.01E-09
								Total Radionuclide Cancer Risk	5.22E-09
								Total Cancer Risk	5.22E-09

FUTURE OFFICE WORKER
AREA OF CONCERN NO. 1

CT - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (Te)	GSF Gamma Shielding Factor (1-Se)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	0.151	0.3	0.5	0.6	4	3.60E-01	4.59E-09	2.50E-10
Plutonium-239/240	0.284	0.3	0.5	0.6	4	3.60E-01	1.37E-11	1.40E-12
							Total Cancer Risk	2.51E-10

RME - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (Te)	GSF Gamma Shielding Factor (1-Se)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	0.151	0.3	0.8	0.7	25	4.20E+00	4.59E-09	2.91E-09
Plutonium-239/240	0.284	0.3	0.8	0.7	25	4.20E+00	1.37E-11	1.63E-11
							Total Cancer Risk	2.93E-09

SUMMARY OF RISK
FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 1

	Central Tendency		Reasonable Maximum	
Pathway	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Ingestion of surface soil	1.74E-03	6.72E-10	6.21E-03	2.40E-09
Inhalation of particulates from surface soil	-	1.22E-10	-	2.29E-10
Dermal contact with surface soil *	-	-	-	-
External Irradiation	-	8.36E-11	-	1.05E-10
Total	1.74E-03	8.78E-10	6.21E-03	2.73E-09

* Dermal absorption of metals and radionuclides is considered insignificant.

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 1

CT - Soil ingestion

Noncarcinogens

IF =(IR x ED x FC x EF x ME x CF)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Soil Concentration (mg/kg)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	16.5	33	2.5	0.9	65	0.5	0.000001	70	915	3.77E-08	4.00E-04	1.55E-03
Vanadium	33.39	33	2.5	0.9	65	0.5	0.000001	70	915	3.77E-08	7.00E-03	1.80E-04
Zinc	48.38	33	2.5	0.9	65	0.5	0.000001	70	915	3.77E-08	3.00E-01	6.08E-06
											Total Hazard Index	1.74E-03

Radionuclides

IF =IR x ED x FC x EF x ME x CF
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	IF Intake Factor (g)	SF Slope Factor (Risk/pCi)	CR Cancer Risk
Americium-241	0.151	33	2.5	0.9	65	1	0.001	4.83E+00	3.28E-10	2.39E-10
Plutonium-239/240	0.284	33	2.5	0.9	65	1	0.001	4.83E+00	3.16E-10	4.33E-10
									Total Radionuclide Cancer Risk	6.72E-10
									Total Cancer Risk	6.72E-10

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 1

RME - soil ingestion

Noncarcinogens

IF =(IR x ED x FC x EF x ME x CF)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Soil Concentration (mg/kg)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	16.5	106	2.5	1	65	0.5	0.000001	70	915	1.34E-07	4.00E-04	5.55E-03
Vanadium	33.39	106	2.5	1	65	0.5	0.000001	70	915	1.34E-07	7.00E-03	6.41E-04
Zinc	48.38	106	2.5	1	65	0.5	0.000001	70	915	1.34E-07	3.00E-01	2.17E-05
											Total Hazard Index	6.21E-03

Radionuclides

IF =IR x ED x FC x EF x ME x CF
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminted	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	IF Intake Factor (g)	SF Slope Factor (Risk/pCi)	CR Cancer Risk
Americium-241	0.151	106	2.5	1	65	1	0.001	1.72E+01	3.28E-10	8.53E-10
Plutonium-239/240	0.284	106	2.5	1	65	1	0.001	1.72E+01	3.16E-10	1.55E-09
									Total Radionuclide Cancer Risk	2.40E-09

Total Cancer Risk 2.40E-09

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 1

CT - Inhalation of particulates

Radionuclides

$$IF = IR \times ET \times EF \times ED \times DF$$
$$CR = IF \times C \times SF$$

	C	IR	ET	EF	ED	DF	IF	SF	CR
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Intake Factor (m^3)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.63E-06	0.83	7.2	65	2.5	0.85	8.25E+02	3.85E-08	5.18E-11
Plutonium-239/240	3.07E-06	0.83	7.2	65	2.5	0.85	8.25E+02	2.78E-08	7.04E-11
								Total Radionuclide Cancer Risk	1.22E-10
								Total Cancer Risk	1.22E-10

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 1

RME - Inhalation of particulates

Radionuclides

IF = IR x ET x EF x ED x DF
CR = IF x C x SF

	C	IR	ET	EF	ED	DF	IF	SF	CR
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Intake Factor (m^3)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.63E-06	1.4	8	65	2.5	0.85	1.55E+03	3.85E-08	9.71E-11
Plutonium-239/240	3.07E-06	1.4	8	65	2.5	0.85	1.55E+03	2.78E-08	1.32E-10
								Total Radionuclide Cancer Risk	2.29E-10
								Total Cancer Risk	2.29E-10

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 1

CT - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (T_e)	GSF Gamma Shielding Factor ($1-S_e$)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	0.151	0.3	0.8	0.2	2.5	1.20E-01	4.59E-09	8.32E-11
Plutonium-239/240	0.2837	0.3	0.8	0.2	2.5	1.20E-01	1.37E-11	4.66E-13
							Total Cancer Risk	8.36E-11

RME - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (T_e)	GSF Gamma Shielding Factor ($1-S_e$)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	0.151	0.3	1	0.2	2.5	1.50E-01	4.59E-09	1.04E-10
Plutonium-239/240	0.2837	0.3	1	0.2	2.5	1.50E-01	1.37E-11	5.83E-13
							Total Cancer Risk	1.05E-10

SUMMARY OF RISK
OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 1

	Central Tendency		Reasonable Maximum	
Pathway	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Ingestion of surface soil by a child	2.11E-03	-	1.05E-02	-
Ingestion of surface soil by an adult	2.26E-04	-	1.13E-03	-
Carcinogenic effects of ingestion of surface soil	-	3.83E-10	-	6.27E-09
Inhalation of particulates from surface soil	-	1.41E-11	-	6.61E-10
Dermal contact with surface soil*	-	-	-	-
External Irradiation	-	1.51E-11	-	2.93E-10
Total	2.33E-03	4.12E-10	1.17E-02	7.22E-09

* Dermal absorption of metals and radionuclides is considered insignificant

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 1

CT - Soil ingestion

Noncarcinogens - Child

IF =(IR-C x ED-C x EF x ME x CF)/(BW-C x AT-C)
HQ = (C x IF)/RfD

Chemical	C Soil Concentration (mg/kg)	IR-C Ingestion Rate (mg/visit)	ED-C Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-C Body Weight (kg)	AT-C Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	16.5	50	2	10	0.5	0.000001	15	730	4.57E-08	4.00E-04	1.88E-03
Vanadium	33.39	50	2	10	0.5	0.000001	15	730	4.57E-08	7.00E-03	2.18E-04
Zinc	48.38	50	2	10	0.5	0.000001	15	730	4.57E-08	3.00E-01	7.36E-06
									Total Hazard Index - Child		2.11E-03

Noncarcinogens - Adult

IF =(IR-A x ED-A x EF x ME x CF)/(BW-A x AT-A)
HQ = (C x IF)/RfD

Chemical	C Soil Concentration (mg/kg)	IR-A Ingestion Rate (mg/visit)	ED-A Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-A Body Weight (kg)	AT-A Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	16.5	25	7	10	0.5	0.000001	70	2555	4.89E-09	4.00E-04	2.02E-04
Vanadium	33.39	25	7	10	0.5	0.000001	70	2555	4.89E-09	7.00E-03	2.33E-05
Zinc	48.38	25	7	10	0.5	0.000001	70	2555	4.89E-09	3.00E-01	7.89E-07
									Total Hazard Index - Adult		2.26E-04

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 1

CT - Time-weighted average soil ingestion

Radionuclides

$$IF = [(IR\text{-}C \times ED\text{-}C) + (IR\text{-}A \times ED\text{-}A)] \times EF \times ME \times CF$$
$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	IR-A	ED-A	ME	CF	EF	IF	SF	CR
		Child		Adult							
Chemical	Soil Concentration (pCi/g)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Matrix Effect	Conversion Factor (g/mg)	Exposure Frequency (visits/yr)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.151	50	2	25	7	1	0.001	10	2.75E+00	3.28E-10	1.36E-10
Plutonium-239/240	0.284	50	2	25	7	1	0.001	10	2.75E+00	3.16E-10	2.47E-10
										Total Radionuclide Cancer Risk	3.83E-10

Total Cancer Risk 3.83E-10

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 1

RME - Soil ingestion

Noncarcinogens - Child

IF =(IR-C x ED-C x EF x ME x CF)/(BW-C x AT-C)
HQ = (C x IF)/RfD

Chemical	C Soil Concentration (mg/kg)	IR-C Ingestion Rate (mg/visit)	ED-C Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-C Body Weight (kg)	AT-C Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	16.5	100	6	25	0.5	0.000001	15	2190	2.28E-07	4.00E-04	9.42E-03
Vanadium	33.39	100	6	25	0.5	0.000001	15	2190	2.28E-07	7.00E-03	1.09E-03
Zinc	48.38	100	6	25	0.5	0.000001	15	2190	2.28E-07	3.00E-01	3.68E-05
										Total Hazard Index - Child	1.05E-02

Noncarcinogens - Adult

IF =(IR-A x ED-A x EF x ME x CF)/(BW-A x AT-A)
HQ = (C x IF)/RfD

Chemical	C Soil Concentration (mg/kg)	IR-A Ingestion Rate (mg/visit)	ED-A Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-A Body Weight (kg)	AT-A Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	16.5	50	24	25	0.5	0.000001	70	8760	2.45E-08	4.00E-04	1.01E-03
Vanadium	33.39	50	24	25	0.5	0.000001	70	8760	2.45E-08	7.00E-03	1.17E-04
Zinc	48.38	50	24	25	0.5	0.000001	70	8760	2.45E-08	3.00E-01	3.94E-06
										Total Hazard Index - Adult	1.13E-03

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 1

RME - Time-weighted average soil ingestion

Radionuclides

$$IF = [(IR\text{-}C \times ED\text{-}C) + (IR\text{-}A \times ED\text{-}A)] \times EF \times ME \times CF$$
$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	IR-A	ED-A	ME	CF	EF	IF	SF	CR
		Child		Adult							
Chemical	Soil Concentration (pCi/g)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Matrix Effect	Conversion Factor (g/mg)	Exposure Frequency (visits/yr)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.151	100	6	50	24	1	0.001	25	4.50E+01	3.28E-10	2.23E-09
Plutonium-239/240	0.284	100	6	50	24	1	0.001	25	4.50E+01	3.16E-10	4.04E-09
										Total Radionuclide Cancer Risk	6.27E-09

Total Cancer Risk 6.27E-09

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 1

CT Inhalation of particulates

Radionuclides

$$IF = IR \times ET \times EF \times ED \times DF$$
$$CR = IF \times C \times SF$$

	C	IR	ET	EF	ED	DF	IF	SF	CR
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/visit)	Exposure Frequency (visits/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Intake Factor (m^3)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.63E-06	0.83	1.5	10	9	0.85	9.52E+01	3.85E-08	5.98E-12
Plutonium-239/240	3.07E-06	0.83	1.5	10	9	0.85	9.52E+01	2.78E-08	8.13E-12
								Total Radionuclide Cancer Risk	1.41E-11
								Total Cancer Risk	1.41E-11

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 1

RME Inhalation of particulates

Radionuclides

IF = IR x ET x EF x ED x DF
CR = IF x C x SF

	C	IR	ET	EF	ED	DF	IF	SF	CR
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/visit)	Exposure Frequency (visits/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Intake Factor (m^3)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.63E-06	1.4	5	25	30	0.85	4.46E+03	3.85E-08	2.80E-10
Plutonium-239/240	3.07E-06	1.4	5	25	30	0.85	4.46E+03	2.78E-08	3.81E-10
								Total Radionuclide Cancer Risk	6.61E-10
								Total Cancer Risk	6.61E-10

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 1

CT - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (Te)	GSF Gamma Shielding Factor (1-Se)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	0.151	0.1	0.8	0.03	9	2.16E-02	4.59E-09	1.50E-11
Plutonium-239/240	0.284	0.1	0.8	0.03	9	2.16E-02	1.37E-11	8.40E-14
							Total Cancer Risk	1.51E-11

RME - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (Te)	GSF Gamma Shielding Factor (1-Se)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	0.151	0.2	1	0.07	30	4.20E-01	4.59E-09	2.91E-10
Plutonium-239/240	0.284	0.2	1	0.07	30	4.20E-01	1.37E-11	1.63E-12
							Total Cancer Risk	2.93E-10

SUMMARY OF RISK
FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 1

	Central Tendency		Reasonable Maximum	
Pathway	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Ingestion of subsurface soil	9.27E-05	3.64E-10	5.21E-04	2.04E-09
Inhalation of particulates from surface and subsurface soil	9.37E-08	3.41E-11	1.17E-07	4.24E-11
Dermal contact with subsurface soil*	-	-	-	-
External Irradiation	-	1.55E-09	-	1.94E-09
Total	9.28E-05	1.95E-09	5.21E-04	4.03E-09

*Dermal absorption of metals and radionuclides is considered insignificant.

FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 1

CT - Subsurface soil ingestion

Noncarcinogens

IF =(IR x ED x FC x EF x ME x CF)/(BW x AT)
HQ = (C x IF)/RfD

	C	IR	ED	FC	EF	ME	CF	BW	AT	IF	RfD	HQ
Chemical	Soil Concentration (mg/kg)	Ingestion Rate (mg/day)	Exposure Duration (years)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Barium	129.33	95	1	0.9	30	0.5	0.000001	70	365	5.02E-08	7.00E-02	9.27E-05
											Total Hazard Index	9.27E-05

Radionuclides

IF =IR x ED x FC x EF x ME x CF
CR = C x IF x SF

	C	IR	ED	FC	EF	ME	CF	IF	SF	CR
Radionuclide	Soil Concentration (pCi/g))	Ingestion Rate (mg/day)	Exposure Duration (years)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Conversion Factor (g/mg)	Intake Factor (kg/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Americium-241	0.013	95	1	0.9	30	1	0.001	2.57E+00	3.28E-10	1.09E-11
Plutonium-239/240	0.021	95	1	0.9	30	1	0.001	2.57E+00	3.16E-10	1.70E-11
Uranium-233/234	0.8	95	1	0.9	30	1	0.001	2.57E+00	4.44E-11	9.11E-11
Uranium-238	1.54	95	1	0.9	30	1	0.001	2.57E+00	6.20E-11	2.45E-10
									Total Radionuclide Cancer Risk	3.64E-10
									Total Cancer Risk	3.64E-10

FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 1

RME - Subsurface soil ingestion

Noncarcinogens

IF =(IR x ED x FC x EF x ME x CF)/(BW x AT)
HQ = (C x IF)/RfD

	C	IR	ED	FC	EF	ME	CF	BW	AT	IF	RfD	HQ
Chemical	Soil Concentration (mg/kg)	Ingestion Rate (mg/day)	Exposure Duration (years)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Barium	129.33	480	1	1	30	0.5	0.000001	70	365	2.82E-07	7.00E-02	5.21E-04
											Total Hazard Index	5.21E-04

Radionuclides

IF =IR x ED x FC x EF x ME x CF
CR = C x IF x SF

	C	IR	ED	FC	EF	ME	CF	IF	SF	CR
Radionuclide	Soil Concentration (mg/kg)	Ingestion Rate (mg/day)	Exposure Duration (years)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Conversion Factor (g/mg)	Intake Factor (kg/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Americium-241	0.013	480	1	1	30	1	0.001	1.44E+01	3.28E-10	6.14E-11
Plutonium-239/240	0.021	480	1	1	30	1	0.001	1.44E+01	3.16E-10	9.56E-11
Uranium-233/234	0.8	480	1	1	30	1	0.001	1.44E+01	4.44E-11	5.11E-10
Uranium-238	1.54	480	1	1	30	1	0.001	1.44E+01	6.20E-11	1.37E-09
									Total Radionuclide Cancer Risk	2.04E-09
									Total Cancer Risk	2.04E-09

FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 1

CT - Inhalation of particulates from surface and subsurface soil

Noncarcinogens

$$IF = (IR \times ET \times EF \times ED \times DF)/(BW \times AT)$$
$$HQ = (IF \times C)/RfD$$

	C	IR	ET	EF	ED	DF	BW	AT	IF	RfD	HQ
Chemical	Air Concentration (mg/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Body Weight (kg)	Averaging Time (days)	Intake Factor ($m^3/kg\text{-}day$)	Reference Dose (mg/kg-day)	Hazard Quotient
Barium	1.46E-09	1.25	7.2	30	1	0.85	70	365	8.98E-03	1.40E-04	9.37E-08
										Total Hazard Index	9.37E-08

Radionuclides

$$IF = IR \times ET \times EF \times ED \times DF$$
$$CR = IF \times C \times SF$$

	C	IR	ET	EF	ED	DF	IF	SF	CR
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Intake Factor (m^3)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.63E-06	1.25	7.2	30	1	0.85	2.30E+02	3.85E-08	1.44E-11
Plutonium-239/240	3.07E-06	1.25	7.2	30	1	0.85	2.30E+02	2.78E-08	1.96E-11
Uranium-233/234	9.10E-09	1.25	7.2	30	1	0.85	2.30E+02	1.40E-08	2.92E-14
Uranium-238	1.74E-08	1.25	7.2	30	1	0.85	2.30E+02	1.24E-08	4.95E-14
								Total Radionuclide Cancer Risk	3.41E-11
								Total Cancer Risk	3.41E-11

FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 1

RME - Inhalation of particulates from surface and subsurface soil

Noncarcinogens

IF = (IR x ET x EF x ED x DF)/(BW x AT)
HQ = (IF x C)/RfD

	C	IR	ET	EF	ED	DF	BW	AT	IF	RfD	HQ
Chemical	Air Concentration (mg/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Body Weight (kg)	Averaging Time (days)	Intake Factor ($m^3/kg\text{-}day$)	Reference Dose (mg/kg-day)	Hazard Quotient
Barium	1.46E-09	1.4	8	30	1	0.85	70	365	1.12E-02	1.40E-04	1.17E-07
										Total Hazard Index	1.17E-07

Radionuclides

IF = IR x ET x EF x ED x DF
CR = IF x C x SF

	C	IR	ET	EF	ED	DF	IF	SF	CR
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Intake Factor (m^3)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.63E-06	1.4	8	30	1	0.85	2.86E+02	3.85E-08	1.79E-11
Plutonium-239/240	3.07E-06	1.4	8	30	1	0.85	2.86E+02	2.78E-08	2.44E-11
Uranium-233/234	9.10E-09	1.4	8	30	1	0.85	2.86E+02	1.40E-08	3.64E-14
Uranium-238	1.74E-08	1.4	8	30	1	0.85	2.86E+02	1.24E-08	6.16E-14
								Total Radionuclide Cancer Risk	4.24E-11
								Total Cancer Risk	4.24E-11

FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 1

CT - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (Te)	GSF Gamma Shielding Factor (1-Se)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	0.0129	0.3	0.8	0.08	1	1.92E-02	4.59E-09	1.14E-12
Plutonium-239/240	0.0207	0.3	0.8	0.08	1	1.92E-02	1.37E-11	5.44E-15
Uranium-233/234	0.8	0.3	0.8	0.08	1	1.92E-02	2.14E-11	3.29E-13
Uranium-238	1.54	0.3	0.8	0.08	1	1.92E-02	5.25E-08	1.55E-09
							Total Cancer Risk	1.55E-09

RME - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (Te)	GSF Gamma Shielding Factor (1-Se)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	0.0129	0.3	1	0.08	1	2.40E-02	4.59E-09	1.42E-12
Plutonium-239/240	0.0207	0.3	1	0.08	1	2.40E-02	1.37E-11	6.81E-15
Uranium-233/234	0.8	0.3	1	0.08	1	2.40E-02	2.14E-11	4.11E-13
Uranium-238	1.54	0.3	1	0.08	1	2.40E-02	5.25E-08	1.94E-09
							Total Cancer Risk	1.94E-09

SUMMARY OF RISK
FUTURE OFFICE WORKER
AREA OF CONCERN NO. 2
30-ACRE AREA

	Central Tendency		Reasonable Maximum	
Pathway	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Ingestion of surface soil	7.90E-04	5.50E-09	1.00E-02	4.36E-07
Inhalation of particulates from surface soil	-	5.47E-09	-	5.71E-08
Dermal contact with surface soil *	-	-	-	-
External Irradiation	-	2.11E-09	-	2.47E-08
Inhalation of VOCs from infiltration	2.34E-12	3.09E-15	2.45E-11	3.23E-14
Total	7.90E-04	1.31E-08	1.00E-02	5.18E-07

* Dermal contact with metals and radionuclides is considered insignificant.

FUTURE OFFICE WORKER
AREA OF CONCERN NO. 2
30-ACRE AREA

CT - Soil ingestion.

Noncarcinogens

IF =(IR x ED x FC x EF x ME x CF)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Soil Concentration (mg/kg)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	14.09	5	4	0.9	219	0.5	0.000001	70	1460	1.93E-08	4.00E-04	6.79E-04
Silver	2.64	5	4	0.9	219	0.5	0.000001	70	1460	1.93E-08	5.00E-03	1.02E-05
Vanadium	34.31	5	4	0.9	219	0.5	0.000001	70	1460	1.93E-08	7.00E-03	9.45E-05
Zinc	85.66	5	4	0.9	219	0.5	0.000001	70	1460	1.93E-08	3.00E-01	5.51E-06
											Total Hazard Index	7.90E-04

Radionuclides

IF =IR x ED x FC x EF x ME x CF
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	IF Intake Factor (g)	SF Slope Factor (Risk/pCi)	CR Cancer Risk
Americium-241	1.27	5	4	0.9	219	1	0.001	3.94E+00	3.28E-10	1.64E-09
Plutonium-239/240	3.1	5	4	0.9	219	1	0.001	3.94E+00	3.16E-10	3.86E-09
									Total Radionuclide Cancer Risk	5.50E-09
									Total Cancer Risk	5.50E-09

FUTURE OFFICE WORKER
AREA OF CONCERN NO. 2
30-ACRE AREA

RME - soil ingestion

Noncarcinogens

IF =(IR x ED x FC x EF x ME x CF)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Soil Concentration (mg/kg)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	14.09	50	25	1	250	0.5	0.000001	70	9125	2.45E-07	4.00E-04	8.62E-03
Silver	2.64	50	25	1	250	0.5	0.000001	70	9125	2.45E-07	5.00E-03	1.29E-04
Vanadium	34.31	50	25	1	250	0.5	0.000001	70	9125	2.45E-07	7.00E-03	1.20E-03
Zinc	85.66	50	25	1	250	0.5	0.000001	70	9125	2.45E-07	3.00E-01	6.98E-05
											Total Hazard Index	1.00E-02

Radionuclides

IF =IR x ED x FC x EF x ME x CF
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	IF Intake Factor (g)	SF Slope Factor (Risk/pCi)	CR Cancer Risk
Americium-241	1.27	50	25	1	250	1	0.001	3.13E+02	3.28E-10	1.30E-07
Plutonium-239/240	3.1	50	25	1	250	1	0.001	3.13E+02	3.16E-10	3.06E-07
									Total Radionuclide Cancer Risk	4.36E-07

Total Cancer Risk 4.36E-07

FUTURE OFFICE WORKER
AREA OF CONCERN NO. 2
30-ACRE AREA

CT - Inhalation of particulates

Radionuclides

$$IF = IR \times ET \times EF \times ED \times DF$$
$$CR = IF \times C \times SF$$

Radionuclides	C Air Concentration (pCi/m^3)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	DF Respiratory Deposition Factor	IF Intake Factor (m^3)	SF Slope Factor (Risk/pCi)	CR Cancer Risk
Americium-241	1.52E-05	0.63	7.2	219	4	0.85	3.38E+03	3.85E-08	1.98E-09
Plutonium-239/240	3.72E-05	0.63	7.2	219	4	0.85	3.38E+03	2.78E-08	3.49E-09
								Total Radionuclide Cancer Risk	5.47E-09
								Total Cancer Risk	5.47E-09

FUTURE OFFICE WORKER
AREA OF CONCERN NO. 2
30-ACRE AREA

RME - Inhalation of particulates

Radionuclides

IF = IR x ET x EF x ED x DF
CR = IF x C x SF

	C	IR	ET	EF	ED	DF	IF	SF	CR
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Intake Factor (m^3)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.52E-05	0.83	8	250	25	0.85	3.53E+04	3.85E-08	2.06E-08
Plutonium-239/240	3.72E-05	0.83	8	250	25	0.85	3.53E+04	2.78E-08	3.65E-08
								Total Radionuclide Cancer Risk	5.71E-08
								Total Cancer Risk	5.71E-08

FUTURE OFFICE WORKER
AREA OF CONCERN NO. 2
30-ACRE AREA

CT - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

	C	TF	GSF	EF	ED	IF	SF	CR
Radionuclide	Soil Concentration (pCi/g)	Gamma Time Factor (Te)	Gamma Shielding Factor (1-Se)	Percent of year Exposed	Exposure Duration (years)	Intake Factor (years)	Slope Factor (1/pCi-yr/g)	Cancer Risk
Americium-241	1.27	0.3	0.5	0.6	4	3.60E-01	4.59E-09	2.10E-09
Plutonium-239/240	3.1	0.3	0.5	0.6	4	3.60E-01	1.37E-11	1.53E-11
							Total Cancer Risk	2.11E-09

RME - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

	C	TF	GSF	EF	ED	IF	SF	CR
Radionuclide	Soil Concentration (pCi/g)	Gamma Time Factor (Te)	Gamma Shielding Factor (1-Se)	Percent of year Exposed	Exposure Duration (years)	Intake Factor (years)	Slope Factor (1/pCi-yr/g)	Cancer Risk
Americium-241	1.27	0.3	0.8	0.7	25	4.20E+00	4.59E-09	2.45E-08
Plutonium-239/240	3.1	0.3	0.8	0.7	25	4.20E+00	1.37E-11	1.78E-10
							Total Cancer Risk	2.47E-08

FUTURE OFFICE WORKER
AREA OF CONCERN NO. 2
30-ACRE AREA

CT - Inhalation of VOCs from infiltration

Noncarcinogens

IF = (IR x ET x EF x ED)/(BW x AT)
HQ = (C x IF)/RfD

	C	IR	ET	EF	ED	BW	AT	IF	RfD	HQ
Chemical	VOC Concentration in air (mg/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (years)	Intake Factor (m^3/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Methylene chloride	5.42E-11	0.63	7.2	219	4	70	1460	3.89E-02	9.00E-01	2.34E-12
									Total Hazard Index	2.34E-12

Carcinogens

IF = (IR x ET x EF x ED)/(BW x AT)
CR = C x IF x SF

	C	IR	ET	EF	ED	BW	AT	IF	SF	CR
Chemical	VOC Concentration in air (mg/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (years)	Intake Factor (m^3/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Chloroform	6.22E-12	0.63	7.2	219	4	70	25550	2.22E-03	8.00E-02	1.11E-15
Methylene chloride	5.42E-11	0.63	7.2	219	4	70	25550	2.22E-03	1.60E-03	1.93E-16
Tetrachloroethene	8.22E-11	0.63	7.2	219	4	70	25550	2.22E-03	2.00E-03	3.65E-16
Trichloroethene	1.07E-10	0.63	7.2	219	4	70	25550	2.22E-03	6.00E-03	1.43E-15
									Total Cancer Risk	3.09E-15

FUTURE OFFICE WORKER
AREA OF CONCERN NO. 2
30-ACRE AREA

RME - Inhalation of VOCs from infiltration

Noncarcinogens

IF = (IR x ET x EF x ED)/(BW x AT)
HQ = (C x IF)/RfD

	C	IR	ET	EF	ED	BW	AT	IF	RfD	HQ
Chemical	VOC Concentration in air (mg/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (years)	Intake Factor (m^3/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Methylene chloride	5.42E-11	0.83	8	250	25	70	1460	4.06E-01	9.00E-01	2.45E-11
									Total Hazard Index	2.45E-11

Carcinogens

IF = (IR x ET x EF x ED)/(BW x AT)
CR = C x IF x SF

	C	IR	ET	EF	ED	BW	AT	IF	SF	CR
Chemical	VOC Concentration in air (mg/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (years)	Intake Factor (m^3/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Chloroform	6.22E-12	0.83	8	250	25	70	25550	2.32E-02	8.00E-02	1.15E-14
Methylene chloride	5.42E-11	0.83	8	250	25	70	25550	2.32E-02	1.60E-03	2.01E-15
Tetrachloroethene	8.22E-11	0.83	8	250	25	70	25550	2.32E-02	2.00E-03	3.81E-15
Trichloroethene	1.07E-10	0.83	8	250	25	70	25550	2.32E-02	6.00E-03	1.49E-14
									Total Cancer Risk	3.23E-14

SUMMARY OF RISKS
CURRENT WORKER
AREA OF CONCERN NO. 2

	Central Tendency		Reasonable Maximum	
Pathway	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Ingestion of surface soil	1.82E-03	1.01E-08	1.15E-02	4.02E-07
Inhalation of particulates from surface soil	-	6.89E-11	-	5.46E-10
Dermal contact with surface soil*	-	-	-	-
External Irradiation	-	2.06E-09	-	2.41E-08
Total	1.82E-03	1.23E-08	1.15E-02	4.26E-07

* Dermal absorption of metals and radionuclides is considered insignificant.

CURRENT WORKER
AREA OF CONCERN NO. 2

CT - Soil ingestion

Noncarcinogens

IF =(IR x ED x FC x EF x ME x CF)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Soil Concentration (mg/kg)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	16.49	10	4	0.9	219	0.5	0.000001	70	1460	3.86E-08	4.00E-04	1.59E-03
Silver	2.31	10	4	0.9	219	0.5	0.000001	70	1460	3.86E-08	5.00E-03	1.78E-05
Vanadium	36.13	10	4	0.9	219	0.5	0.000001	70	1460	3.86E-08	7.00E-03	1.99E-04
Zinc	80.46	10	4	0.9	219	0.5	0.000001	70	1460	3.86E-08	3.00E-01	1.03E-05
											Total Hazard Index	1.82E-03

Radionuclides

IF =IR x ED x FC x EF x ME x CF
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	IF Intake Factor (g)	SF Slope Factor (Risk/pCi)	CR Cancer Risk
Americium-241	1.24	10	4	0.9	219	1	0.001	7.88E+00	3.28E-10	3.21E-09
Plutonium-239/240	2.78	10	4	0.9	219	1	0.001	7.88E+00	3.16E-10	6.93E-09
									Total Radionuclide Cancer Risk	1.01E-08
									Total Cancer Risk	1.01E-08

CURRENT WORKER
AREA OF CONCERN NO. 2

RME - soil ingestion

Noncarcinogens

IF =(IR x ED x FC x EF x ME x CF)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Soil Concentration (mg/kg)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	16.49	50	25	1	250	0.5	0.000001	70	9125	2.45E-07	4.00E-04	1.01E-02
Silver	2.31	50	25	1	250	0.5	0.000001	70	9125	2.45E-07	5.00E-03	1.13E-04
Vanadium	36.13	50	25	1	250	0.5	0.000001	70	9125	2.45E-07	7.00E-03	1.26E-03
Zinc	80.46	50	25	1	250	0.5	0.000001	70	9125	2.45E-07	3.00E-01	6.56E-05
											Total Hazard Index	1.15E-02

Radionuclides

IF =IR x ED x FC x EF x ME x CF
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	IF Intake Factor (g)	SF Slope Factor (Risk/pCi)	CR Cancer Risk
Americium-241	1.24	50	25	1	250	1	0.001	3.13E+02	3.28E-10	1.27E-07
Plutonium-239/240	2.78	50	25	1	250	1	0.001	3.13E+02	3.16E-10	2.75E-07
									Total Radionuclide Cancer Risk	4.02E-07

Total Cancer Risk 4.02E-07

CURRENT WORKER
AREA OF CONCERN NO. 2

CT - Inhalation of particulates

Radionuclides

$$IF = IR \times ET \times EF \times ED \times DF$$
$$CR = IF \times C \times SF$$

	C	IR	ET	EF	ED	DF	IF	SF	CR
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Deposition Factor	Intake Factor (m^3)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.53E-07	0.83	7.2	219	4	0.85	4.45E+03	3.85E-08	2.62E-11
Plutonium-239/240	3.45E-07	0.83	7.2	219	4	0.85	4.45E+03	2.78E-08	4.27E-11
								Total Radionuclide Cancer Risk	6.89E-11
								Total Cancer Risk	6.89E-11

CURRENT WORKER
AREA OF CONCERN NO. 2

RME - Inhalation of particulates

Radionuclides

IF = IR x ET x EF x ED x DF
CR = IF x C x SF

	C	IR	ET	EF	ED	DF	IF	SF	CR
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Deposition Factor	Intake Factor (m^3)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.53E-07	0.83	8	250	25	0.85	3.53E+04	3.85E-08	2.08E-10
Plutonium-239/240	3.45E-07	0.83	8	250	25	0.85	3.53E+04	2.78E-08	3.38E-10
								Total Radionuclide Cancer Risk	5.46E-10
								Total Cancer Risk	5.46E-10

CURRENT WORKER
AREA OF CONCERN NO. 2

CT - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (T_e)	GSF Gamma Shielding Factor ($1-S_e$)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	1.24	0.3	0.5	0.6	4	3.60E-01	4.59E-09	2.05E-09
Plutonium-239/240	2.78	0.3	0.5	0.6	4	3.60E-01	1.37E-11	1.37E-11
							Total Cancer Risk	2.06E-09

RME - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (T_e)	GSF Gamma Shielding Factor ($1-S_e$)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	1.24	0.3	0.8	0.7	25	4.20E+00	4.59E-09	2.39E-08
Plutonium-239/240	2.78	0.3	0.8	0.7	25	4.20E+00	1.37E-11	1.60E-10
							Total Cancer Risk	2.41E-08

SUMMARY OF RISK
FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 2

	Central Tendency		Reasonable Maximum	
Pathway	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Ingestion of surface soil	1.78E-03	6.20E-09	6.34E-03	2.21E-08
Inhalation of particulates from surface soil	-	1.28E-11	-	2.82E-11
Dermal contact with surface soil *	-	-	-	-
External Irradiation	-	6.88E-10	-	8.59E-10
Total	1.78E-03	6.90E-09	6.34E-03	2.30E-08

* Dermal absorption of metals and radionuclides is considered insignificant.

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 2

CT - Soil ingestion

Noncarcinogens

IF =(IR x ED x FC x EF x ME x CF)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Soil Concentration (mg/kg)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	16.49	33	2.5	0.9	65	0.5	0.000001	70	915	3.77E-08	4.00E-04	1.55E-03
Silver	2.31	33	2.5	0.9	65	0.5	0.000001	70	915	3.77E-08	5.00E-03	1.74E-05
Vanadium	36.13	33	2.5	0.9	65	0.5	0.000001	70	915	3.77E-08	7.00E-03	1.94E-04
Zinc	80.46	33	2.5	0.9	65	0.5	0.000001	70	915	3.77E-08	3.00E-01	1.01E-05
											Total Hazard Index	1.78E-03

Radionuclides

IF =IR x ED x FC x EF x ME x CF
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	IF Intake Factor (g)	SF Slope Factor (Risk/pCi)	CR Cancer Risk
Americium-241	1.24	33	2.5	0.9	65	1	0.001	4.83E+00	3.28E-10	1.96E-09
Plutonium-239/240	2.78	33	2.5	0.9	65	1	0.001	4.83E+00	3.16E-10	4.24E-09
									Total Radionuclide Cancer Risk	6.20E-09
									Total Cancer Risk	6.20E-09

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 2

RME - soil ingestion

Noncarcinogens

IF =(IR x ED x FC x EF x ME x CF)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Soil Concentration (mg/kg)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	16.49	106	2.5	1	65	0.5	0.000001	70	915	1.34E-07	4.00E-04	5.54E-03
Silver	2.31	106	2.5	1	65	0.5	0.000001	70	915	1.34E-07	5.00E-03	6.21E-05
Vanadium	36.13	106	2.5	1	65	0.5	0.000001	70	915	1.34E-07	7.00E-03	6.94E-04
Zinc	80.46	106	2.5	1	65	0.5	0.000001	70	915	1.34E-07	3.00E-01	3.61E-05
											Total Hazard Index	6.34E-03

Radionuclides

IF =IR x ED x FC x EF x ME x CF
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminted	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	IF Intake Factor (g)	SF Slope Factor (Risk/pCi)	CR Cancer Risk
Americium-241	1.24	106	2.5	1	65	1	0.001	1.72E+01	3.28E-10	7.01E-09
Plutonium-239/240	2.78	106	2.5	1	65	1	0.001	1.72E+01	3.16E-10	1.51E-08
									Total Radionuclide Cancer Risk	2.21E-08

Total Cancer Risk 2.21E-08

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 2

CT - Inhalation of particulates

Radionuclides

$$IF = IR \times ET \times EF \times ED \times DF$$
$$CR = IF \times C \times SF$$

	C	IR	ET	EF	ED	DF	IF	SF	CR
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Intake Factor (m^3)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.53E-07	0.83	7.2	65	2.5	0.85	8.25E+02	3.85E-08	4.86E-12
Plutonium-239/240	3.45E-07	0.83	7.2	65	2.5	0.85	8.25E+02	2.78E-08	7.92E-12
								Total Radionuclide Cancer Risk	1.28E-11
								Total Cancer Risk	1.28E-11

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 2

RME - Inhalation of particulates

Radionuclides

IF = IR x ET x EF x ED x DF
CR = IF x C x SF

	C	IR	ET	EF	ED	DF	IF	SF	CR
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Intake Factor (m^3)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.53E-07	1.4	8	65	2.5	0.85	1.82E+03	3.85E-08	1.07E-11
Plutonium-239/240	3.45E-07	1.4	8	65	2.5	0.85	1.82E+03	2.78E-08	1.75E-11
								Total Radionuclide Cancer Risk	2.82E-11
								Total Cancer Risk	2.82E-11

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 2

CT - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (T_e)	GSF Gamma Shielding Factor ($1-S_e$)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	1.24	0.3	0.8	0.2	2.5	1.20E-01	4.59E-09	6.83E-10
Plutonium-239/240	2.78	0.3	0.8	0.2	2.5	1.20E-01	1.37E-11	4.57E-12
							Total Cancer Risk	6.88E-10

RME - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (T_e)	GSF Gamma Shielding Factor ($1-S_e$)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	1.24	0.3	1	0.2	2.5	1.50E-01	4.59E-09	8.54E-10
Plutonium-239/240	2.78	0.3	1	0.2	2.5	1.50E-01	1.37E-11	5.71E-12
							Total Cancer Risk	8.59E-10

SUMMARY OF RISK
OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 2

	Central Tendency		Reasonable Maximum	
Pathway	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Ingestion of surface soil by a child	2.15E-03	-	1.08E-02	-
Ingestion of surface soil by an adult	2.31E-04	-	1.15E-03	-
Carcinogenic effects of ingestion of surface soil	-	3.53E-09	-	5.78E-08
Inhalation of particulates from surface soil	-	1.47E-12	-	6.91E-11
Dermal contact with surface soil*	-	-	-	-
External Irradiation	-	1.24E-10	-	2.41E-09
Total	2.38E-03	3.66E-09	1.19E-02	6.03E-08

* Dermal absorption of metals and radionuclides is considered insignificant

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 2

CT - Soil ingestion

Noncarcinogens - Child

IF =(IR-C x ED-C x EF x ME x CF)/(BW-C x AT-C)
HQ = (C x IF)/RfD

Chemical	C Soil Concentration (mg/kg)	IR-C Ingestion Rate (mg/visit)	ED-C Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-C Body Weight (kg)	AT-C Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	16.49	50	2	10	0.5	0.000001	15	730	4.57E-08	4.00E-04	1.88E-03
Silver	2.31	50	2	10	0.5	0.000001	15	730	4.57E-08	5.00E-03	2.11E-05
Vanadium	36.13	50	2	10	0.5	0.000001	15	730	4.57E-08	7.00E-03	2.36E-04
Zinc	80.46	50	2	10	0.5	0.000001	15	730	4.57E-08	3.00E-01	1.22E-05
									Total Hazard Index - Child		2.15E-03

Noncarcinogens - Adult

IF =(IR-A x ED-A x EF x ME x CF)/(BW-A x AT-A)
HQ = (C x IF)/RfD

Chemical	C Soil Concentration (mg/kg)	IR-A Ingestion Rate (mg/visit)	ED-A Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-A Body Weight (kg)	AT-A Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	16.49	25	7	10	0.5	0.000001	70	2555	4.89E-09	4.00E-04	2.02E-04
Silver	2.31	25	7	10	0.5	0.000001	70	2555	4.89E-09	5.00E-03	2.26E-06
Vanadium	36.13	25	7	10	0.5	0.000001	70	2555	4.89E-09	7.00E-03	2.53E-05
Zinc	80.46	25	7	10	0.5	0.000001	70	2555	4.89E-09	3.00E-01	1.31E-06
									Total Hazard Index - Adult		2.31E-04

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 2

CT - Time-weighted average soil ingestion

Radionuclides

$$IF = [(IR\text{-}C \times ED\text{-}C) + (IR\text{-}A \times ED\text{-}A)] \times EF \times ME \times CF$$
$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	IR-A	ED-A	ME	CF	EF	IF	SF	CR
		Child		Adult							
Chemical	Soil Concentration (pCi/g)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Matrix Effect	Conversion Factor (g/mg)	Exposure Frequency (visits/yr)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.24	50	2	25	7	1	0.001	10	2.75E+00	3.28E-10	1.12E-09
Plutonium-239/240	2.78	50	2	25	7	1	0.001	10	2.75E+00	3.16E-10	2.42E-09
										Total Radionuclide Cancer Risk	3.53E-09

Total Cancer Risk 3.53E-09

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 2

RME - Soil ingestion

Noncarcinogens - Child

IF =(IR-C x ED-C x EF x ME x CF)/(BW-C x AT-C)
HQ = (C x IF)/RfD

	C	IR-C	ED-C	EF	ME	CF	BW-C	AT-C	IF	RfD	HQ
Chemical	Soil Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Antimony	16.49	100	6	25	0.5	0.000001	15	2190	2.28E-07	4.00E-04	9.41E-03
Silver	2.31	100	6	25	0.5	0.000001	15	2190	2.28E-07	5.00E-03	1.05E-04
Vanadium	36.13	100	6	25	0.5	0.000001	15	2190	2.28E-07	7.00E-03	1.18E-03
Zinc	80.46	100	6	25	0.5	0.000001	15	2190	2.28E-07	3.00E-01	6.12E-05
									Total Hazard Index - Child		1.08E-02

Noncarcinogens - Adult

IF =(IR-A x ED-A x EF x ME x CF)/(BW-A x AT-A)
HQ = (C x IF)/RfD

	C	IR-A	ED-A	EF	ME	CF	BW-A	AT-A	IF	RfD	HQ
Chemical	Soil Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Antimony	16.49	50	24	25	0.5	0.000001	70	8760	2.45E-08	4.00E-04	1.01E-03
Silver	2.31	50	24	25	0.5	0.000001	70	8760	2.45E-08	5.00E-03	1.13E-05
Vanadium	36.13	50	24	25	0.5	0.000001	70	8760	2.45E-08	7.00E-03	1.26E-04
Zinc	80.46	50	24	25	0.5	0.000001	70	8760	2.45E-08	3.00E-01	6.56E-06
									Total Hazard Index - Adult		1.15E-03

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 2

RME - Time-weighted average soil ingestion

Radionuclides

$$IF = [(IR\text{-}C \times ED\text{-}C) + (IR\text{-}A \times ED\text{-}A)] \times EF \times ME \times CF$$
$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	IR-A	ED-A	ME	CF	EF	IF	SF	CR
		Child		Adult							
Chemical	Soil Concentration (pCi/g)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Matrix Effect	Conversion Factor (g/mg)	Exposure Frequency (visits/yr)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.24	100	6	50	24	1	0.001	25	4.50E+01	3.28E-10	1.83E-08
Plutonium-239/240	2.78	100	6	50	24	1	0.001	25	4.50E+01	3.16E-10	3.95E-08
										Total Radionuclide Cancer Risk	5.78E-08

Total Cancer Risk 5.78E-08

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 2

CT Inhalation of particulates

Radionuclides

IF = IR x ET x EF x ED x DF
CR = IF x C x SF

	C	IR	ET	EF	ED	DF	IF	SF	CR
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/visit)	Exposure Frequency (visits/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Intake Factor (m^3)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.53E-07	0.83	1.5	10	9	0.85	9.52E+01	3.85E-08	5.61E-13
Plutonium-239/240	3.45E-07	0.83	1.5	10	9	0.85	9.52E+01	2.78E-08	9.13E-13
								Total Radionuclide Cancer Risk	1.47E-12
								Total Cancer Risk	1.47E-12

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 2

RME Inhalation of particulates

Radionuclides

$$IF = IR \times ET \times EF \times ED \times DF$$
$$CR = IF \times C \times SF$$

	C	IR	ET	EF	ED	DF	IF	SF	CR
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/visit)	Exposure Frequency (visits/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Intake Factor (m^3)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.53E-07	1.4	5	25	30	0.85	4.46E+03	3.85E-08	2.63E-11
Plutonium-239/240	3.45E-07	1.4	5	25	30	0.85	4.46E+03	2.78E-08	4.28E-11
								Total Radionuclide Cancer Risk	6.91E-11
								Total Cancer Risk	6.91E-11

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 2

CT - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (Te)	GSF Gamma Shielding Factor (1-Se)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	1.24	0.1	0.8	0.03	9	2.16E-02	4.59E-09	1.23E-10
Plutonium-239/240	2.78	0.1	0.8	0.03	9	2.16E-02	1.37E-11	8.23E-13
							Total Cancer Risk	1.24E-10

RME - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (Te)	GSF Gamma Shielding Factor (1-Se)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	1.24	0.2	1	0.07	30	4.20E-01	4.59E-09	2.39E-09
Plutonium-239/240	2.78	0.2	1	0.07	30	4.20E-01	1.37E-11	1.60E-11
							Total Cancer Risk	2.41E-09

SUMMARY OF RISK
FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 2

	Central Tendency		Reasonable Maximum	
Pathway	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Ingestion of subsurface soil	1.15E-04	1.89E-09	6.43E-04	1.06E-08
Inhalation of particulates from surface and subsurface soil	1.16E-07	3.62E-12	1.45E-07	4.51E-12
Dermal contact with subsurface soil*	-	-	-	-
External Irradiation	-	8.02E-10	-	1.00E-09
Total	1.15E-04	2.69E-09	6.43E-04	1.16E-08

*Dermal absorption of metals and radionuclides is considered insignificant.

FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 2

CT - Subsurface soil ingestion

Noncarcinogens

IF = (IR x ED x FC x EF x ME x CF)/(BW x AT)
HQ = (C x IF)/RfD

	C	IR	ED	FC	EF	ME	CF	BW	AT	IF	RfD	HQ
Chemical	Soil Concentration (mg/kg)	Ingestion Rate (mg/day)	Exposure Duration (years)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Barium	159.7	95	1	0.9	30	0.5	0.000001	70	365	5.02E-08	7.00E-02	1.15E-04
											Total Hazard Index	1.15E-04

FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 2

CT - Subsurface soil ingestion

Nonradionuclide Carcinogens

IF =(IR x ED x FC x EF x ME x CF)/(BW x AT)
CR = C x IF x SF

Chemical	C Soil Concentration (mg/kg)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (kg/kg-day)	SF Slope Factor 1/(mg/kg-day)	CR Cancer Risk
Barium	159.7	95	1	0.9	30	0.5	0.000001	70	25550	7.17E-10	-	-
Benzo(a)pyrene	0.13	95	1	0.9	30	1	0.000001	70	25550	1.43E-09	7.30E+00	1.36E-09
Benzo(b)fluoranthene	0.17	95	1	0.9	30	1	0.000001	70	25550	1.43E-09	7.30E-01	1.78E-10
										Total Chemical Cancer Risk		1.54E-09

Radionuclides

IF =IR x ED x FC x EF x ME x CF
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g))	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	IF Intake Factor (kg/kg-day)	SF Slope Factor 1/(mg/kg-day)	CR Cancer Risk
Americium-241	0.025	95	1	0.9	30	1	0.001	2.57E+00	3.28E-10	2.10E-11
Plutonium-239/240	0.138	95	1	0.9	30	1	0.001	2.57E+00	3.16E-10	1.12E-10
Uranium-233/234	0.785	95	1	0.9	30	1	0.001	2.57E+00	4.44E-11	8.94E-11
Uranium-238	0.793	95	1	0.9	30	1	0.001	2.57E+00	6.20E-11	1.26E-10
									Total Radionuclide Cancer Risk	3.48E-10
									Total Cancer Risk	1.89E-09

FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 2

RME - Subsurface soil ingestion

Noncarcinogens

IF =(IR x ED x FC x EF x ME x CF)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Soil Concentration (mg/kg)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Barium	159.7	480	1	1	30	0.5	0.000001	70	365	2.82E-07	7.00E-02	6.43E-04
											Total Hazard Index	6.43E-04

FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 2

RME - Subsurface soil ingestion

Nonradionuclide Carcinogens

IF =(IR x ED x FC x EF x ME x CF)/(BW x AT)
CR = C x IF x SF

Chemical	C Soil Concentration (mg/kg)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (kg/kg-day)	SF Slope Factor 1/(mg/kg-day)	CR Cancer Risk
Benzo(a)pyrene	0.13	480	1	1	30	1	0.000001	70	25550	8.05E-09	7.30E+00	7.64E-09
Benzo(b)fluoranthene	0.17	480	1	1	30	1	0.000001	70	25550	8.05E-09	7.30E-01	9.99E-10
										Total Chemical Cancer Risk		8.64E-09

Radionuclides

IF =IR x ED x FC x EF x ME x CF
CR = C x IF x SF

Radionuclide	C Soil Concentration (mg/kg)	IR Ingestion Rate (mg/day)	ED Exposure Duration (years)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	IF Intake Factor (kg/kg-day)	SF Slope Factor 1/(mg/kg-day)	CR Cancer Risk
Americium-241	0.025	480	1	1	30	1	0.001	1.44E+01	3.28E-10	1.18E-10
Plutonium-239/240	0.138	480	1	1	30	1	0.001	1.44E+01	3.16E-10	6.28E-10
Uranium-233/234	0.785	480	1	1	30	1	0.001	1.44E+01	4.44E-11	5.02E-10
Uranium-238	0.793	480	1	1	30	1	0.001	1.44E+01	6.20E-11	7.08E-10
									Total Radionuclide Cancer Risk	1.96E-09
									Total Cancer Risk	1.06E-08

FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 2

CT - Inhalation of particulates from surface and subsurface soil

Noncarcinogens

$$IF = (IR \times ET \times EF \times ED \times DF)/(BW \times AT)$$
$$HQ = (IF \times C)/RfD$$

	C	IR	ET	EF	ED	DF	BW	AT	IF	RfD	HQ
Chemical	Air Concentration (mg/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Deposition Factor	Body Weight (kg)	Averaging Time (days)	Intake Factor (m^3/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Barium	1.81E-09	1.25	7.2	30	1	0.85	70	365	8.98E-03	1.40E-04	1.16E-07
										Total Hazard Index	1.16E-07

Radionuclides

$$IF = IR \times ET \times EF \times ED \times DF$$
$$CR = IF \times C \times SF$$

	C	IR	ET	EF	ED	DF	IF	SF	CR
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Deposition Factor	Intake Factor (m^3)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.54E-07	1.25	7.2	30	1	0.85	2.30E+02	3.85E-08	1.36E-12
Plutonium-239/240	3.46E-07	1.25	7.2	30	1	0.85	2.30E+02	2.78E-08	2.21E-12
Uranium-233/234	8.91E-09	1.25	7.2	30	1	0.85	2.30E+02	1.40E-08	2.86E-14
Uranium-238	8.96E-09	1.25	7.2	30	1	0.85	2.30E+02	1.24E-08	2.55E-14
								Total Radionuclide Cancer Risk	3.62E-12
								Total Cancer Risk	3.62E-12

FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 2

RME - Inhalation of particulates from surface and subsurface soil

Noncarcinogens

IF = (IR x ET x EF x ED x DF)/(BW x AT)
HQ = (IF x C)/RfD

	C	IR	ET	EF	ED	DF	BW	AT	IF	RfD	HQ
Chemical	Air Concentration (mg/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Deposition Factor	Body Weight (kg)	Averaging Time (days)	Intake Factor ($m^3/kg\text{-}day$)	Reference Dose (mg/kg-day)	Hazard Quotient
Barium	1.81E-09	1.4	8	30	1	0.85	70	365	1.12E-02	1.40E-04	1.45E-07
										Total Hazard Index	1.45E-07

Radionuclides

IF = IR x ET x EF x ED x DF
CR = IF x C x SF

	C	IR	ET	EF	ED	DF	IF	SF	CR
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Deposition Factor	Intake Factor (m^3)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	1.54E-07	1.4	8	30	1	0.85	2.86E+02	3.85E-08	1.69E-12
Plutonium-239/240	3.46E-07	1.4	8	30	1	0.85	2.86E+02	2.78E-08	2.75E-12
Uranium-233/234	8.91E-09	1.4	8	30	1	0.85	2.86E+02	1.40E-08	3.56E-14
Uranium-238	8.96E-09	1.4	8	30	1	0.85	2.86E+02	1.24E-08	3.17E-14
								Total Radionuclide Cancer Risk	4.51E-12
								Total Cancer Risk	4.51E-12

FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 2

CT - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (Te)	GSF Gamma Shielding Factor (1-Se)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	0.025	0.3	0.8	0.08	1	1.92E-02	4.59E-09	2.20E-12
Plutonium-239/240	0.138	0.3	0.8	0.08	1	1.92E-02	1.37E-11	3.63E-14
Uranium-233/234	0.785	0.3	0.8	0.08	1	1.92E-02	2.14E-11	3.23E-13
Uranium-238	0.793	0.3	0.8	0.08	1	1.92E-02	5.25E-08	7.99E-10
							Total Cancer Risk	8.02E-10

RME - External Irradiation

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (Te)	GSF Gamma Shielding Factor (1-Se)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	0.023	0.3	1	0.08	1	2.40E-02	4.59E-09	2.53E-12
Plutonium-239/240	0.138	0.3	1	0.08	1	2.40E-02	1.37E-11	4.54E-14
Uranium-233/234	0.785	0.3	1	0.08	1	2.40E-02	2.14E-11	4.03E-13
Uranium-238	0.793	0.3	1	0.08	1	2.40E-02	5.25E-08	9.99E-10
							Total Cancer Risk	1.00E-09

SUMMARY OF RISK
FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

	Central Tendency		Reasonable Maximum	
Pathway	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Ingestion of pond sediment	7.32E-05	1.79E-09	8.71E-04	2.13E-08
Ingestion of stream/dry sediment	5.57E-06	2.78E-10	6.63E-05	3.30E-09
Inhalation of particulates from stream/dry sediment	-	5.27E-13	-	9.03E-13
Dermal contact with pond sediment	4.55E-04	2.51E-09	4.33E-03	2.39E-08
Dermal contact with stream/dry sediment*	-	-	-	-
Ingestion of surface water	5.60E-08	3.18E-12	4.80E-07	2.73E-11
Dermal contact with surface water	3.55E-06	-	6.08E-06	-
External Irradiation from stream/dry sediment	-	1.67E-11	-	3.62E-11
Total	5.37E-04	4.59E-09	5.28E-03	4.85E-08

*PAHs, metals and radionuclides are the only COCs in stream/dry sediment. Dermal absorption of metals and radionuclides is considered insignificant. EPA has stated that it is inappropriate to assess dermal absorption of PAHs using the oral slope factor. (EPA 1989a)

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

CT - Ingestion of pond sediment

Noncarcinogens

IF = (IR x FC x EF x ME x ED x CF)/(BW x AT)
HQ = (C x IF)/RfD

	C	IR	FC	EF	ME	ED	CF	BW	AT	IF	RfD	HQ
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Antimony	20.46	8	0.9	7	0.5	2.5	0.000001	70	915	9.84E-10	4.00E-04	5.03E-05
Aroclor-1254	0.332	8	0.9	7	0.5	2.5	0.000001	70	915	9.84E-10	2.00E-05	1.63E-05
Bis(2-ethylhexyl)phthalate	2.637	8	0.9	7	1	2.5	0.000001	70	915	1.97E-09	2.00E-02	2.59E-07
Silver	1.65	8	0.9	7	0.5	2.5	0.000001	70	915	9.84E-10	5.00E-03	3.25E-07
Vanadium	42.2	8	0.9	7	0.5	2.5	0.000001	70	915	9.84E-10	7.00E-03	5.93E-06
											Total Hazard Index	7.32E-05

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

CT - Ingestion of pond sediment

Nonradionuclide carcinogens

IF = (IR x FC x EF x ME x ED x CF)/(BW x AT)
CR = C x IF x SF

Chemical	C Sediment Concentration (mg/kg)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	ED Exposure Duration (years)	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (kg/kg-day)	SF Slope Factor 1/(mg/kg-day)	CR Cancer Risk
Aroclor-1254	0.332	8	0.9	7	0.5	2.5	0.000001	70	25550	3.52E-11	7.70E+00	9.00E-11
Benzo(a)pyrene	0.274	8	0.9	7	1	2.5	0.000001	70	25550	7.05E-11	7.30E+00	1.41E-10
Benzo(b)fluoranthene	0.319	8	0.9	7	1	2.5	0.000001	70	25550	7.05E-11	7.30E-01	1.64E-11
Bis(2-ethylhexyl)phthalate	2.637	8	0.9	7	1	2.5	0.000001	70	25550	7.05E-11	1.40E-02	2.60E-12
											Total Chemical Cancer Risk	2.50E-10

Radionuclides

IF = IR x FC x EF x ME x ED x CF
CR = C x IF x SF

Radionuclide	C Sediment Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	ED Exposure Duration (years)	CF Conversion Factor (g/mg)	IF Intake Factor (g)	SF Slope Factor (Risk/pCi)	CR Cancer Risk
Americium-241	9.28	8	0.9	7	1	2.5	0.001	1.26E-01	3.28E-10	3.84E-10
Plutonium-239/240	28.93	8	0.9	7	1	2.5	0.001	1.26E-01	3.16E-10	1.15E-09
									Total Radionuclide Cancer Risk	1.54E-09

Total Cancer Risk 1.79E-09

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

RME - Ingestion of pond sediment

Noncarcinogens

IF = (IR x FC x EF x ME x ED x CF)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Sediment Concentration (mg/kg)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	ED Exposure Duration (years)	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	20.46	50	1	12	0.5	2.5	0.000001	70	915	1.17E-08	4.00E-04	5.99E-04
Aroclor-1254	0.332	50	1	12	0.5	2.5	0.000001	70	915	1.17E-08	2.00E-05	1.94E-04
Bis(2-ethylhexyl)phthalate	2.637	50	1	12	1	2.5	0.000001	70	915	2.34E-08	2.00E-02	3.09E-06
Silver	1.65	50	1	12	0.5	2.5	0.000001	70	915	1.17E-08	5.00E-03	3.86E-06
Vanadium	42.2	50	1	12	0.5	2.5	0.000001	70	915	1.17E-08	7.00E-03	7.06E-05
											Total Hazard Index	8.71E-04

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

RME - Ingestion of pond sediment

Nonradionuclide carcinogens

IF = (IR x FC x EF x ME x ED x CF)/(BW x AT)
CR = C x IF x SF

	C	IR	FC	EF	ME	ED	CF	BW	AT	IF	SF	CR
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Aroclor-1254	0.332	50	1	12	0.5	2.5	0.000001	70	25550	4.19E-10	7.70E+00	1.07E-09
Benzo(a)pyrene	0.274	50	1	12	1	2.5	0.000001	70	25550	8.39E-10	7.30E+00	1.68E-09
Benzo(b)fluoranthene	0.319	50	1	12	1	2.5	0.000001	70	25550	8.39E-10	7.30E-01	1.95E-10
Bis(2-ethylhexyl)phthalate	2.637	50	1	12	1	2.5	0.000001	70	25550	8.39E-10	1.40E-02	3.10E-11
											Total Chemical Cancer Risk	2.98E-09

Radionuclides

IF = IR x FC x EF x ME x ED x CF
CR = C x IF x SF

	C	IR	FC	EF	ME	ED	CF	IF	SF	CR
Radionuclide	Sediment Concentration (pCi/g)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (g/mg)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	9.28	50	1	12	1	2.5	0.001	1.50E+00	3.28E-10	4.57E-09
Plutonium-239/240	28.93	50	1	12	1	2.5	0.001	1.50E+00	3.16E-10	1.37E-08
									Total Radionuclide Cancer Risk	1.83E-08

Total Cancer Risk 2.13E-08

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

CT - Ingestion of stream/dry sediment

Noncarcinogens

IF = (IR x FC x EF x ME x ED x CF)/(BW x AT)
HQ = (C x IF)/RfD

	C	IR	FC	EF	ME	ED	CF	BW	AT	IF	RfD	HQ
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Cobalt	10.98	8	0.9	7	1	2.5	0.000001	70	915	1.97E-09	6.00E-02	3.60E-07
Strontium	69.7	8	0.9	7	1	2.5	0.000001	70	915	1.97E-09	6.00E-01	2.29E-07
Vanadium	31.24	8	0.9	7	0.5	2.5	0.000001	70	915	9.84E-10	7.00E-03	4.39E-06
Zinc	180.58	8	0.9	7	0.5	2.5	0.000001	70	915	9.84E-10	3.00E-01	5.92E-07
											Total Hazard Index	5.57E-06

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

CT - Ingestion of stream/dry sediment

Nonradionuclide carcinogens

IF = (IR x FC x EF x ME x ED x CF)/(BW x AT)
CR = C x IF x SF

	C	IR	FC	EF	ME	ED	CF	BW	AT	IF	SF	CR
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Benzo(a)anthracene	0.19	8	0.9	7	1	2.5	0.000001	70	25550	7.05E-11	7.30E-01	9.77E-12
Benzo(a)pyrene	0.26	8	0.9	7	1	2.5	0.000001	70	25550	7.05E-11	7.30E+00	1.34E-10
Benzo(b)fluoranthene	0.297	8	0.9	7	1	2.5	0.000001	70	25550	7.05E-11	7.30E-01	1.53E-11
Indeno(1,2,3-cd)pyrene	0.11	8	0.9	7	1	2.5	0.000001	70	25550	7.05E-11	7.30E-01	5.66E-12
											Total Chemical Cancer Risk	1.64E-10

Radionuclides

IF = IR x FC x EF x ME x ED x CF
CR = C x IF x SF

	C	IR	FC	EF	ME	ED	CF	IF	SF	CR
Radionuclide	Sediment Concentration (pCi/g)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (g/mg)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.311	8	0.9	7	1	2.5	0.001	1.26E-01	3.28E-10	1.29E-11
Plutonium-239/240	2.519	8	0.9	7	1	2.5	0.001	1.26E-01	3.16E-10	1.00E-10
									Total Radionuclide Cancer Risk	1.13E-10

Total Cancer Risk 2.78E-10

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

RME - Ingestion of stream/dry sediment

Noncarcinogens

IF = (IR x FC x EF x ME x ED x CF)/(BW x AT)
HQ = (C x IF)/RfD

	C	IR	FC	EF	ME	ED	CF	BW	AT	IF	RfD	HQ
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Cobalt	10.98	50	1	12	1	2.5	0.000001	70	915	2.34E-08	6.00E-02	4.29E-06
Strontium	69.7	50	1	12	1	2.5	0.000001	70	915	2.34E-08	6.00E-01	2.72E-06
Vanadium	31.24	50	1	12	0.5	2.5	0.000001	70	915	1.17E-08	7.00E-03	5.23E-05
Zinc	180.58	50	1	12	0.5	2.5	0.000001	70	915	1.17E-08	3.00E-01	7.05E-06
											Total Hazard Index	6.63E-05

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

RME - Ingestion of stream/dry sediment

Nonradionuclide carcinogens

IF = (IR x FC x EF x ME x ED x CF)/(BW x AT)
CR = C x IF x SF

	C	IR	FC	EF	ME	ED	CF	BW	AT	IF	SF	CR
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Benzo(a)anthracene	0.19	50	1	12	1	2.5	0.000001	70	25550	8.39E-10	7.30E-01	1.16E-10
Benzo(a)pyrene	0.26	50	1	12	1	2.5	0.000001	70	25550	8.39E-10	7.30E+00	1.59E-09
Benzo(b)fluoranthene	0.297	50	1	12	1	2.5	0.000001	70	25550	8.39E-10	7.30E-01	1.82E-10
Indeno(1,2,3-cd)pyrene	0.11	50	1	12	1	2.5	0.000001	70	25550	8.39E-10	7.30E-01	6.73E-11
											Total Chemical Cancer Risk	1.96E-09

Radionuclides

IF = IR x FC x EF x ME x ED x CF
CR = C x IF x SF

	C	IR	FC	EF	ME	ED	CF	IF	SF	CR
Radionuclide	Sediment Concentration (pCi/g)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (g/mg)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.311	50	1	12	1	2.5	0.001	1.50E+00	3.28E-10	1.53E-10
Plutonium-239/240	2.519	50	1	12	1	2.5	0.001	1.50E+00	3.16E-10	1.19E-09
									Total Radionuclide Cancer Risk	1.35E-09

Total Cancer Risk 3.30E-09

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

CT - Inhalation of particulates from stream/dry sediment

Radionuclides

IF = (IR x EF x ED x CF x DF x RF)/PEF
CR = C x IF x SF

	C	IR	EF	ED	DF	RF	CF	PEF	IF	SF	CR
Radionuclide	Sediment Concentration (pCi/g)	Inhalation Rate (m^3/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Respirable Fraction	Conversion Factor (g/kg)	Particulate Emission Factor (m^3/kg)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americum-241	0.3107	2	7	2.5	0.85	1	1000	4.63E+09	6.43E-06	3.85E-08	7.69E-14
Plutonium-239/240	2.519	2	7	2.5	0.85	1	1000	4.63E+09	6.43E-06	2.78E-08	4.50E-13
										Total Radionuclide Cancer Risk	5.27E-13
										Total Cancer Risk	5.27E-13

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

RME - Inhalation of particulates from stream/dry sediment

Radionuclides

$$IF = (IR \times EF \times ED \times CF \times DF \times RF)/PEF$$
$$CR = C \times IF \times SF$$

	C	IR	EF	ED	DF	RF	CF	PEF	IF	SF	CR
Radionuclide	Sediment Concentration (pCi/g)	Inhalation Rate (m^3/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Respirable Fraction	Conversion Factor (g/kg)	Particulate Emission Factor (m^3/kg)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.3107	2	12	2.5	0.85	1	1000	4.63E+09	1.10E-05	3.85E-08	1.32E-13
Plutonium-239/240	2.519	2	12	2.5	0.85	1	1000	4.63E+09	1.10E-05	2.78E-08	7.71E-13
										Total Radionuclide Cancer Risk	9.03E-13
										Total Cancer Risk	9.03E-13

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

CT - Dermal contact with pond sediment

Noncarcinogens

$$IF = (SA \times FC \times AD \times AB \times EF \times ED \times CF)/(BW \times AT)$$
$$HQ = (C \times IF)/RfD$$

	C	SA	FC	AD	AB	EF	ED	CF	BW	AT
Chemical	Sediment Concentration (mg/kg)	Skin Surface Area (cm^2)	Fraction Contaminated	Soil Adherence (mg/cm^2)	Skin Absorption	Exposure Frequency (days/yr)	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)
Aroclor-1254	0.332	9275	0.9	0.2	0.06	7	2.5	0.000001	70	915
Bis(2-ethylhexyl)phthalate	2.637	9275	0.9	0.2	0.01	7	2.5	0.000001	70	915

	IF	RfD	HQ
Chemical	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Aroclor-1254	2.74E-08	2.00E-05	4.54E-04
Bis(2-ethylhexyl)phthtalate	4.56E-09	2.00E-02	6.01E-07
		Total Hazard Index	4.55E-04

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

CT - Dermal contact with pond sediment
Nonradionuclide carcinogens

$$IF = (SA \times FC \times AD \times AB \times EF \times ED \times CF)/(BW \times AT)$$
$$CR = C \times IF \times SF$$

Chemical	C Sediment Concentration (mg/kg)	SA Skin Surface Area (cm^2)	FC Fraction Contaminted	AD Soil Adherence (mg/cm^2)	AB Skin Absorption	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)
Aroclor-1254	0.332	9275	0.9	0.2	0.06	7	2.5	0.000001	70	25550
Bis(2-ethylhexyl)phthalate	2.637	9275	0.9	0.2	0.01	7	2.5	0.000001	70	25550

Chemical	IF Intake Factor (kg/kg-day)	SF Slope Factor 1/(mg/kg-day)	CR Cancer Risk
Aroclor-1254	9.80E-10	7.70E+00	2.51E-09
Bis(2-ethylhexyl)phthalate	1.63E-10	1.40E-02	6.03E-12
		Total Cancer Risk	2.51E-09

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

RME - Dermal contact with pond sediment

Noncarcinogens

$$IF = (SA \times FC \times AD \times AB \times EF \times ED \times CF)/(BW \times AT)$$
$$HQ = (C \times IF)/RfD$$

	C	SA	FC	AD	AB	EF	ED	CF	BW	AT
Chemical	Sediment Concentration (mg/kg)	Skin Surface Area (cm^2)	Fraction Contaminated	Soil Adherence (mg/cm^2)	Skin Absorption	Exposure Frequency (days/yr)	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)
Aroclor-1254	0.332	9275	1	1	0.06	12	2.5	0.000001	70	915
Bis(2-ethylhexyl)phthalate	2.637	9275	1	1	0.01	12	2.5	0.000001	70	915

	IF	RfD	HQ
Chemical	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Aroclor-1254	2.61E-07	2.00E-05	4.33E-03
Bis(2-ethylhexyl)phthalate	4.34E-08	2.00E-02	5.73E-06
		Total Hazard Index	4.33E-03

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

RME - Dermal contact with pond sediment

Nonradionuclide carcinogens

$$IF = (SA \times FC \times AD \times AB \times EF \times ED \times CF)/(BW \times AT)$$
$$CR = C \times IF \times SF$$

Chemical	C Sediment Concentration (mg/kg)	SA Skin Surface Area (cm^2)	FC Fraction Contaminated	AD Soil Adherence (mg/cm^2)	AB Skin Absorption	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)
Aroclor-1254	0.332	9275	1	1	0.06	12	2.5	0.000001	70	25550
Bis(2-ethylhexyl)phthalate	2.637	9275	1	1	0.01	12	2.5	0.000001	70	25550

Chemical	IF Intake Factor (kg/kg-day)	SF Slope Factor 1/(mg/kg-day)	CR Cancer Risk
Aroclor-1254	9.33E-09	7.70E+00	2.39E-08
Bis(2-ethylhexyl)phthalate	1.56E-09	1.40E-02	5.74E-11
		Total Cancer Risk	2.39E-08

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

CT - Ingestion of surface water

Noncarcinogens

IF = (IR x ET x EF x ED)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Surface Water Concentration (mg/l)	IR Ingestion Rate (l/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (l/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	1.92E-07	0.01	1	7	2.5	70	915	2.73E-06	4.00E-04	1.31E-09
Di-n-butylphthalate	0.002	0.01	1	7	2.5	70	915	2.73E-06	1.00E-01	5.46E-08
									Total Hazard Index	5.60E-08

Radionuclides

IF = IR x ET x EF x ED
CR = C x IF x SF

Radionuclide	C Surface Water Concentration (pCi/l)	IR Ingestion Rate (l/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	IF Intake Factor (l)	SF Slope Factor (Risk/pCi)	CR Cancer Risk
Americium-241	0.014	0.01	1	7	2.5	1.75E-01	3.28E-10	8.04E-13
Plutonium-239/240	0.043	0.01	1	7	2.5	1.75E-01	3.16E-10	2.38E-12
							Total Radionuclide Cancer Risk	3.18E-12

Total Cancer Risk 3.18E-12

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

RME - Ingestion of surface water

Noncarcinogens

IF = (IR x ET x EF x ED)/(BW x AT)
HQ = (C x IF)/RfD

	C	IR	ET	EF	ED	BW	AT	IF	RfD	HQ
Chemical	Surface Water Concentration (mg/l)	Ingestion Rate (l/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Antimony	1.92E-07	0.05	1	12	2.5	70	915	2.34E-05	4.00E-04	1.12E-08
Di-n-butylphthalate	0.002	0.05	1	12	2.5	70	915	2.34E-05	1.00E-01	4.68E-07
									Total Hazard Index	4.80E-07

Radionuclides

IF = IR x ET x EF x ED
CR = C x IF x SF

	C	IR	ET	EF	ED	IF	SF	CR
Radionuclide	Surface Water Concentration (pCi/l)	Ingestion Rate (l/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Intake Factor (l)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.014	0.05	1	12	2.5	1.50E+00	3.28E-10	6.89E-12
Plutonium-239/240	0.043	0.05	1	12	2.5	1.50E+00	3.16E-10	2.04E-11
							Total Radionuclide Cancer Risk	2.73E-11

Total Cancer Risk 2.73E-11

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

CT - External irradiation from stream/dry sediment

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (T_e)	GSF Gamma Shielding Factor ($1-S_e$)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	0.311	0.3	0.8	0.019	2.5	1.14E-02	4.59E-09	1.63E-11
Plutonium-239/240	2.519	0.3	0.8	0.019	2.5	1.14E-02	1.37E-11	3.93E-13
							Total Cancer Risk	1.67E-11

RME - External irradiation from stream/dry sediment

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (T_e)	GSF Gamma Shielding Factor ($1-S_e$)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	0.311	0.3	1	0.033	2.5	2.48E-02	4.59E-09	3.53E-11
Plutonium-239/240	2.519	0.3	1	0.033	2.5	2.48E-02	1.37E-11	8.54E-13
							Total Cancer Risk	3.62E-11

SUMMARY OF RISK
OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

	Central Tendency		Reasonable Maximum	
Pathway	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Ingestion of pond sediment by a child	3.40E-03	-	1.70E-02	-
Ingestion of pond sediment by an adult	3.66E-04	-	1.82E-03	-
Carcinogenic effects of ingestion of pond sediment	-	4.62E-08	-	7.47E-07
Ingestion of stream/dry sediment by a child	2.59E-04	-	1.29E-03	-
Ingestion of stream/dry sediment by an adult	2.77E-05	-	1.39E-04	-
Carcinogenic effects of ingestion of stream/dry sediment	-	1.08E-08	-	1.71E-07
Inhalation of particulates from stream/dry sediment	-	1.69E-12	-	7.90E-11
Dermal contact with pond sediment	7.81E-05	1.55E-09	5.17E-03	3.42E-07
Dermal contact with stream/dry sediment*	-	-	-	-
Ingestion of surface water	5.01E-08	1.02E-11	6.01E-07	4.09E-10
Dermal contact with surface water	6.23E-07	-	7.62E-06	-
External Irradiation from stream/dry sediment	-	3.16E-11	-	6.14E-10
Total	4.13E-03	5.87E-08	2.54E-02	1.26E-06

* PAHs, metals and radionuclides are the only COCs in stream/dry sediment. Dermal absorption of metals and radionuclides is considered insignificant. EPA has stated that it is inappropriate to assess dermal absorption of PAHs using the oral slope factor (EPA 1989a).

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

CT - Pond sediment ingestion

Noncarcinogens - Child

IF =(IR-C x ED-C x EF x ME x CF)/(BW-C x AT-C)
HQ = (C x IF)/RfD

Chemical	C Sediment Concentration (mg/kg)	IR-C Ingestion Rate (mg/visit)	ED-C Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-C Body Weight (kg)	AT-C Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	20.46	50	2	10	0.5	0.000001	15	730	4.57E-08	4.00E-04	2.34E-03
Aroclor-1254	0.332	50	2	10	0.5	0.000001	15	730	4.57E-08	2.00E-05	7.58E-04
Bis(2-ethylhexyl)phthalate	2.637	50	2	10	1	0.000001	15	730	9.13E-08	2.00E-02	1.20E-05
Silver	1.65	50	2	10	0.5	0.000001	15	730	4.57E-08	5.00E-03	1.51E-05
Vanadium	42.2	50	2	10	0.5	0.000001	15	730	4.57E-08	7.00E-03	2.75E-04
									Total Hazard Index - Child		3.40E-03

Noncarcinogens - Adult

IF =(IR-A x ED-A x EF x ME x CF)/(BW-A x AT-A)
HQ = (C x IF)/RfD

Chemical	C Sediment Concentration (mg/kg)	IR-A Ingestion Rate (mg/visit)	ED-A Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-A Body Weight (kg)	AT-A Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	20.46	25	7	10	0.5	0.000001	70	2555	4.89E-09	4.00E-04	2.50E-04
Aroclor-1254	0.332	25	7	10	0.5	0.000001	70	2555	4.89E-09	2.00E-05	8.12E-05
Bis(2-ethylhexyl)phthalate	2.637	25	7	10	1	0.000001	70	2555	9.78E-09	2.00E-02	1.29E-06
Silver	1.65	25	7	10	0.5	0.000001	70	2555	4.89E-09	5.00E-03	1.61E-06
Vanadium	42.2	25	7	10	0.5	0.000001	70	2555	4.89E-09	7.00E-03	2.95E-05
									Total Hazard Index - Adult		3.66E-04

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

CT - Time-weighted average pond sediment ingestion

Nonradionuclide Carcinogens

$$IF = [(IR\text{-}C \times ED\text{-}C)/(BW\text{-}C) + (IR\text{-}A \times ED\text{-}A)/(BW\text{-}A)] \times (EF \times ME \times CF)/AT$$

$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	BW-C	IR-A	ED-A	BW-A	CF	ME	EF
		Child			Adult					
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Conversion Factor (kg/mg)	Matrix Effect	Exposure Frequency (visits/yr)
Aroclor-1254	0.332	50	2	15	25	7	70	0.000001	0.5	10
Benzo(a)pyrene	0.274	50	2	15	25	7	70	0.000001	1	10
Benzo(b)fluoranthene	0.319	50	2	15	25	7	70	0.000001	1	10
Bis(2-ethylhexyl)phthalate	2.637	50	2	15	25	7	70	0.000001	1	10

	AT	IF	SF	CR
Chemical	Averaging Time (days)	Intake Factor (kg/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Aroclor-1254	25550	1.79E-09	7.70E+00	4.59E-09
Benzo(a)pyrene	25550	3.59E-09	7.30E+00	7.18E-09
Benzo(b)fluoranthene	25550	3.59E-09	7.30E-01	8.35E-10
Bis(2-ethylhexyl)phthalate	25550	3.59E-09	1.40E-02	1.32E-10
		Total Chemical Cancer Risk		1.27E-08

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

CT - Time-weighted average pond sediment ingestion

Radionuclides

$$IF = [(IR\text{-}C \times ED\text{-}C) + (IR\text{-}A \times ED\text{-}A)] \times EF \times ME \times CF$$
$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	IR-A	ED-A	ME	CF	EF	IF	SF	CR
		Child		Adult							
Chemical	Sediment Concentration (pCi/g)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Matrix Effect	Conversion Factor (g/mg)	Exposure Frequency (visits/yr)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	9.28	50	2	25	7	1	0.001	10	2.75E+00	3.28E-10	8.37E-09
Plutonium-239/240	28.93	50	2	25	7	1	0.001	10	2.75E+00	3.16E-10	2.51E-08
										Total Radionuclide Cancer Risk	3.35E-08

Total Cancer Risk 4.62E-08

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

RME - Pond sediment ingestion

Noncarcinogens - Child

IF =(IR-C x ED-C x EF x ME x CF)/(BW-C x AT-C)
HQ = (C x IF)/RfD

Chemical	C Sediment Concentration (mg/kg)	IR-C Ingestion Rate (mg/visit)	ED-C Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-C Body Weight (kg)	AT-C Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	20.46	100	6	25	0.5	0.000001	15	2190	2.28E-07	4.00E-04	1.17E-02
Aroclor-1254	0.332	100	6	25	0.5	0.000001	15	2190	2.28E-07	2.00E-05	3.79E-03
Bis(2-ethylhexyl)phthalate	2.637	100	6	25	1	0.000001	15	2190	4.57E-07	2.00E-02	6.02E-05
Silver	1.65	100	6	25	0.5	0.000001	15	2190	2.28E-07	5.00E-03	7.53E-05
Vanadium	42.2	100	6	25	0.5	0.000001	15	2190	2.28E-07	7.00E-03	1.38E-03
									Total Hazard Index - Child		1.70E-02

Noncarcinogens - Adult

IF =(IR-A x ED-A x EF x ME x CF)/(BW-A x AT-A)
HQ = (C x IF)/RfD

Chemical	C Sediment Concentration (mg/kg)	IR-A Ingestion Rate (mg/visit)	ED-A Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-A Body Weight (kg)	AT-A Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	20.46	50	24	25	0.5	0.000001	70	8760	2.45E-08	4.00E-04	1.25E-03
Aroclor-1254	0.332	50	24	25	0.5	0.000001	70	8760	2.45E-08	2.00E-05	4.06E-04
Bis(2-ethylhexyl)phthalate	2.637	50	24	25	1	0.000001	70	8760	4.89E-08	2.00E-02	6.45E-06
Silver	1.65	50	24	25	0.5	0.000001	70	8760	2.45E-08	5.00E-03	8.07E-06
Vanadium	42.2	50	24	25	0.5	0.000001	70	8760	2.45E-08	7.00E-03	1.47E-04
									Total Hazard Index - Adult		1.82E-03

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

RME - Time-weighted average pond sediment ingestion

Nonradionuclide Carcinogens

$$IF = ([(IR\text{-}C \times ED\text{-}C)/(BW\text{-}C) + (IR\text{-}A \times ED\text{-}A)/(BW\text{-}A)] \times EF \times ME \times CF)/AT$$

$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	BW-C	IR-A	ED-A	BW-A	CF	ME	EF
		Child			Adult					
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Conversion Factor (kg/mg)	Matrix Effect	Exposure Frequency (visits/yr)
Aroclor-1254	0.332	100	6	15	50	24	70	0.000001	0.5	25
Benzo(a)pyrene	0.274	100	6	15	50	24	70	0.000001	1	25
Benzo(b)fluoranthene	0.319	100	6	15	50	24	70	0.000001	1	25
Bis(2-ethylhexyl)phthalate	2.637	100	6	15	50	24	70	0.000001	1	25

	AT	IF	SF	CR
Chemical	Averaging Time (days)	Intake Factor (kg/kg-day)	Slope Factor (mg/kg-day)	Cancer Risk
Aroclor-1254	25550	2.80E-08	7.70E+00	7.15E-08
Benzo(a)pyrene	25550	5.59E-08	7.30E+00	1.12E-07
Benzo(b)fluoranthene	25550	5.59E-08	7.30E-01	1.30E-08
Bis(2-ethylhexyl)phthalate	25550	5.59E-08	1.40E-02	2.06E-09
		Total Chemical Cancer Risk		1.98E-07

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

RME - Time-weighted average pond sediment ingestion

Radionuclides

$$IF = [(IR\text{-}C \times ED\text{-}C) + (IR\text{-}A \times ED\text{-}A)] \times EF \times ME \times CF$$
$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	IR-A	ED-A	ME	CF	EF	IF	SF	CR
		Child		Adult							
Chemical	Sediment Concentration (pCi/g)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Matrix Effect	Conversion Factor (g/mg)	Exposure Frequency (visits/yr)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	9.28	100	6	50	24	1	0.001	25	4.50E+01	3.28E-10	1.37E-07
Plutonium-239/240	28.93	100	6	50	24	1	0.001	25	4.50E+01	3.16E-10	4.11E-07
										Total Radionuclide Cancer Risk	5.48E-07

Total Cancer Risk 7.47E-07

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

CT - Stream/dry sediment ingestion

Noncarcinogens - Child

IF =(IR-C x ED-C x EF x ME x CF)/(BW-C x AT-C)
HQ = (C x IF)/RfD

Chemical	C Sediment Concentration (mg/kg)	IR-C Ingestion Rate (mg/visit)	ED-C Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-C Body Weight (kg)	AT-C Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Cobalt	10.98	50	2	10	1	0.000001	15	730	9.13E-08	6.00E-02	1.67E-05
Strontium	69.7	50	2	10	1	0.000001	15	730	9.13E-08	6.00E-01	1.06E-05
Vanadium	31.24	50	2	10	0.5	0.000001	15	730	4.57E-08	7.00E-03	2.04E-04
Zinc	180.58	50	2	10	0.5	0.000001	15	730	4.57E-08	3.00E-01	2.75E-05
									Total Hazard Index - Child		2.59E-04

Noncarcinogens - Adult

IF =(IR-A x ED-A x EF x ME x CF)/(BW-A x AT-A)
HQ = (C x IF)/RfD

Chemical	C Sediment Concentration (mg/kg)	IR-A Ingestion Rate (mg/visit)	ED-A Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-A Body Weight (kg)	AT-A Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Cobalt	10.98	25	7	10	1	0.000001	70	2555	9.78E-09	6.00E-02	1.79E-06
Strontium	69.7	25	7	10	1	0.000001	70	2555	9.78E-09	6.00E-01	1.14E-06
Vanadium	31.24	25	7	10	0.5	0.000001	70	2555	4.89E-09	7.00E-03	2.18E-05
Zinc	180.58	25	7	10	0.5	0.000001	70	2555	4.89E-09	3.00E-01	2.94E-06
									Total Hazard Index - Adult		2.77E-05

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

CT - Time-weighted average stream/dry sediment ingestion

Nonradionuclide Carcinogens

$$IF = [(IR\text{-}C \times ED\text{-}C)/(BW\text{-}C) + (IR\text{-}A \times ED\text{-}A)/(BW\text{-}A)] \times (EF \times ME \times CF)/AT$$

$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	BW-C	IR-A	ED-A	BW-A	CF	ME	EF
		Child			Adult					
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Conversion Factor (kg/mg)	Matrix Effect	Exposure Frequency (visits/yr)
Benzo(a)anthracene	0.19	50	2	15	25	7	70	0.000001	1	10
Benzo(a)pyrene	0.26	50	2	15	25	7	70	0.000001	1	10
Benzo(b)fluoranthene	0.297	50	2	15	25	7	70	0.000001	1	10
Indeno(1,2,3-cd)pyrene	0.11	50	2	15	25	7	70	0.000001	1	10

	AT	IF	SF	CR
Chemical	Averaging Time (days)	Intake Factor (kg/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Benzo(a)anthracene	25550	3.59E-09	7.30E-01	4.98E-10
Benzo(a)pyrene	25550	3.59E-09	7.30E+00	6.81E-09
Benzo(b)fluoranthene	25550	3.59E-09	7.30E-01	7.78E-10
Indeno(1,2,3-cd)pyrene	25550	3.59E-09	7.30E-01	2.88E-10
		Total Chemical Cancer Risk		8.37E-09

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

CT - Time-weighted average stream/dry sediment ingestion

Radionuclides

$$IF = [(IR\text{-}C \times ED\text{-}C) + (IR\text{-}A \times ED\text{-}A)] \times EF \times ME \times CF$$
$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	IR-A	ED-A	ME	CF	EF	IF	SF	CR
		Child		Adult							
Chemical	Sediment Concentration (pCi/g)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Matrix Effect	Conversion Factor (g/mg)	Exposure Frequency (visits/yr)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.311	50	2	25	7	1	0.001	10	2.75E+00	3.28E-10	2.81E-10
Plutonium-239/240	2.519	50	2	25	7	1	0.001	10	2.75E+00	3.16E-10	2.19E-09
										Total Radionuclide Cancer Risk	2.47E-09

Total Cancer Risk 1.08E-08

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

RME - Stream/dry sediment ingestion

Noncarcinogens - Child

IF =(IR-C x ED-C x EF x ME x CF)/(BW-C x AT-C)
HQ = (C x IF)/RfD

Chemical	C Sediment Concentration (mg/kg)	IR-C Ingestion Rate (mg/visit)	ED-C Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-C Body Weight (kg)	AT-C Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Cobalt	10.98	100	6	25	1	0.000001	15	2190	4.57E-07	6.00E-02	8.36E-05
Strontium	69.7	100	6	25	1	0.000001	15	2190	4.57E-07	6.00E-01	5.30E-05
Vanadium	31.24	100	6	25	0.5	0.000001	15	2190	2.28E-07	7.00E-03	1.02E-03
Zinc	180.58	100	6	25	0.5	0.000001	15	2190	2.28E-07	3.00E-01	1.37E-04
										Total Hazard Index - Child	1.29E-03

Noncarcinogens - Adult

IF =(IR-A x ED-A x EF x ME x CF)/(BW-A x AT-A)
HQ = (C x IF)/RfD

Chemical	C Sediment Concentration (mg/kg)	IR-A Ingestion Rate (mg/visit)	ED-A Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-A Body Weight (kg)	AT-A Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Cobalt	10.98	50	24	25	1	0.000001	70	8760	4.89E-08	6.00E-02	8.95E-06
Strontium	69.7	50	24	25	1	0.000001	70	8760	4.89E-08	6.00E-01	5.68E-06
Vanadium	31.24	50	24	25	0.5	0.000001	70	8760	2.45E-08	7.00E-03	1.09E-04
Zinc	180.58	50	24	25	0.5	0.000001	70	8760	2.45E-08	3.00E-01	1.47E-05
										Total Hazard Index - Adult	1.39E-04

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

RME - Time-weighted average stream/dry sediment ingestion

Nonradionuclide Carcinogens

$$IF = ([(IR\text{-}C \times ED\text{-}C)/(BW\text{-}C) + (IR\text{-}A \times ED\text{-}A)/(BW\text{-}A)] \times EF \times ME \times CF)/AT$$

$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	BW-C	IR-A	ED-A	BW-A	CF	ME	EF
		Child			Adult					
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Conversion Factor (kg/mg)	Matrix Effect	Exposure Frequency (visits/yr)
Benzo(a)anthracene	0.19	100	6	15	50	24	70	0.000001	1	25
Benzo(a)pyrene	0.26	100	6	15	50	24	70	0.000001	1	25
Benzo(b)fluoranthene	0.297	100	6	15	50	24	70	0.000001	1	25
Indeno(1,2,3-cd)pyrene	0.11	100	6	15	50	24	70	0.000001	1	25

	AT	IF	SF	CR
Chemical	Averaging Time (days)	Intake Factor (kg/kg-day)	Slope Factor (mg/kg-day)	Cancer Risk
Benzo(a)anthracene	25550	5.59E-08	7.30E-01	7.76E-09
Benzo(a)pyrene	25550	5.59E-08	7.30E+00	1.06E-07
Benzo(b)fluoranthene	25550	5.59E-08	7.30E-01	1.21E-08
Indeno(1,2,3-cd)pyrene	25550	5.59E-08	7.30E-01	4.49E-09
		Total Chemical Cancer Risk		1.30E-07

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

RME - Time-weighted average stream/dry sediment ingestion

Radionuclides

$$IF = [(IR\text{-}C \times ED\text{-}C) + (IR\text{-}A \times ED\text{-}A)] \times EF \times ME \times CF$$
$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	IR-A	ED-A	ME	CF	EF	IF	SF	CR
		Child		Adult							
Chemical	Sediment Concentration (pCi/g)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Matrix Effect	Conversion Factor (g/mg)	Exposure Frequency (visits/yr)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.311	100	6	50	24	1	0.001	25	4.50E+01	3.28E-10	4.59E-09
Plutonium-239/240	2.519	100	6	50	24	1	0.001	25	4.50E+01	3.16E-10	3.58E-08
										Total Radionuclide Cancer Risk	4.04E-08

Total Cancer Risk 1.71E-07

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

CT - Inhalation of particulates from stream/dry sediment

Radionuclides

$$IF = (IR \times ET \times EF \times ED \times CF \times DF \times RF)/PEF$$
$$CR = C \times IF \times SF$$

	C	IR	ET	EF	ED	DF	RF	CF	PEF	IF	SF	CR
Radionuclide	Sediment Concentration (pCi/g)	Inhalation Rate (m^3/day)	Exposure Time (hr/visit)	Exposure Frequency (days/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Respirable Fraction	Conversion Factor (g/kg)	Particulate Emission Factor (m^3/kg)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.311	0.83	1.5	10	9	0.85	1	1000	4.63E+09	2.06E-05	3.85E-08	2.46E-13
Plutonium-239/240	2.519	0.83	1.5	10	9	0.85	1	1000	4.63E+09	2.06E-05	2.78E-08	1.44E-12
											Total Radionuclide Cancer Risk	1.69E-12
											Total Cancer Risk	1.69E-12

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

RME - Inhalation of particulates from stream/dry sediment

Radionuclides

$$IF = (IR \times ET \times EF \times ED \times CF)/PEF$$
$$CR = C \times IF \times SF$$

	C	IR	ET	EF	ED	DF	RF	CF	PEF	IF	SF	CR
Radionuclide	Sediment Concentration (pCi/g)	Inhalation Rate (m^3/day)	Exposure Time (hr/visit)	Exposure Frequency (days/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Respirable Fraction	Conversion Factor (g/kg)	Particulate Emission Factor (m^3/kg)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.311	1.4	5	25	30	0.85	1	1000	4.63E+09	9.64E-04	3.85E-08	1.15E-11
Plutonium-239/240	2.519	1.4	5	25	30	0.85	1	1000	4.63E+09	9.64E-04	2.78E-08	6.75E-11
											Total Radionuclide Cancer Risk	7.90E-11

Total Cancer Risk 7.90E-11

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

CT - Dermal contact with pond sediment

Noncarcinogens

$$IF = (SA \times FC \times AD \times AB \times EF \times ED \times CF)/(BW \times AT)$$
$$HQ = (C \times IF)/RfD$$

	C	SA	FC	AD	AB	EF	ED	CF	BW	AT
Chemical	Sediment Concentration (mg/kg)	Skin Surface Area (cm^2)	Fraction Contaminated	Soil Adherence (mg/cm^2)	Skin Absorption	Exposure Frequency (days/yr)	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)
Aroclor-1254	0.332	2000	0.5	0.2	0.06	10	9	0.000001	70	3285
Bis(2-ethylhexyl)phthalate	2.637	2000	0.5	0.2	0.01	10	9	0.000001	70	3285

	IF	RfD	HQ
Chemical	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Aroclor-1254	4.70E-09	2.00E-05	7.80E-05
Bis(2-ethylhexyl)phthalate	7.83E-10	2.00E-02	1.03E-07
		Total Hazard Index	7.81E-05

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

CT - Dermal contact with pond sediment

Nonradionuclide carcinogens

$$IF = (SA \times FC \times AD \times AB \times EF \times ED \times CF)/(BW \times AT)$$
$$CR = C \times IF \times SF$$

Chemical	C Sediment Concentration (mg/kg)	SA Skin Surface Area (cm^2)	FC Fraction Contaminated	AD Soil Adherence (mg/cm^2)	AB Skin Absorption	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)
Aroclor-1254	0.332	2000	0.5	0.2	0.06	10	9	0.000001	70	25550
Bis(2-ethylhexyl)phthalate	2.637	2000	0.5	0.2	0.01	10	9	0.000001	70	25550

Chemical	IF Intake Factor (kg/kg-day)	SF Slope Factor 1/(mg/kg-day)	CR Cancer Risk
Aroclor-1254	6.04E-10	7.70E+00	1.54E-09
Bis(2-ethylhexyl)phthalate	1.01E-10	1.40E-02	3.72E-12
		Total Cancer Risk	1.55E-09

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

RME - Dermal contact with pond sediment

Noncarcinogens

$$IF = (SA \times FC \times AD \times AB \times EF \times ED \times CF)/(BW \times AT)$$
$$HQ = (C \times IF)/RfD$$

	C	SA	FC	AD	AB	EF	ED	CF	BW	AT
Chemical	Sediment Concentration (mg/kg)	Skin Surface Area (cm^2)	Fraction Contaminated	Soil Adherence (mg/cm^2)	Skin Absorption	Exposure Frequency (days/yr)	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)
Aroclor-1254	0.332	5300	1	1	0.06	25	30	0.000001	70	10950
Bis(2-ethylhexyl)phthalate	2.637	5300	1	1	0.01	25	30	0.000001	70	10950

	IF	RfD	HQ
Chemical	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Aroclor-1254	3.11E-07	2.00E-05	5.17E-03
Bis(2-ethylhexyl)phthalate	5.19E-08	2.00E-02	6.84E-06
		Total Hazard Index	5.17E-03

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

RME - Dermal contact with pond sediment

Nonradionuclide carcinogens

$$IF = (SA \times FC \times AD \times AB \times EF \times ED \times CF)/(BW \times AT)$$
$$CR = C \times IF \times SF$$

	C	SA	FC	AD	AB	EF	ED	CF	BW	AT
Chemical	Sediment Concentration (mg/kg)	Skin Surface Area (cm^2)	Fraction Contaminated	Soil Adherence (mg/cm^2)	Skin Absorption	Exposure Frequency (days/yr)	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)
Aroclor-1254	0.332	5300	1	1	0.06	25	30	0.000001	70	25550
Bis(2-ethylhexyl)phthalate	2.637	5300	1	1	0.01	25	30	0.000001	70	25550

	IF	SF	CR
Chemical	Intake Factor (kg/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Aroclor-1254	1.33E-07	7.70E+00	3.41E-07
Bis(2-ethylhexyl)phthalate	2.22E-08	1.40E-02	8.21E-10
		Total Cancer Risk	3.42E-07

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

CT - Ingestion of surface water

Noncarcinogens

IF = (IR x ET x EF x ED)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Surface Water Concentration (mg/l)	IR Ingestion Rate (l/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (l/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	1.92E-07	0.025	0.5	5	9	70	3285	2.45E-06	4.00E-04	1.17E-09
Di-n-butylphthalate	0.002	0.025	0.5	5	9	70	3285	2.45E-06	1.00E-01	4.89E-08
									Total Hazard Index	5.01E-08

Radionuclides

IF = IR x ET x EF x ED
CR = C x IF x SF

Radionuclide	C Surface Water Concentration (pCi/l)	IR Ingestion Rate (l/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	IF Intake Factor (l)	SF Slope Factor (Risk/pCi)	CR Cancer Risk
Americium-241	0.014	0.025	0.5	5	9	5.63E-01	3.28E-10	2.58E-12
Plutonium-239/240	0.043	0.025	0.5	5	9	5.63E-01	3.16E-10	7.64E-12
							Total Radionuclide Cancer Risk	1.02E-11

Total Cancer Risk 1.02E-11

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

RME - Ingestion of surface water

Noncarcinogens

IF = (IR x ET x EF x ED)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Surface Water Concentration (mg/l)	IR Ingestion Rate (l/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (l/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	1.92E-07	0.05	1	15	30	70	10950	2.94E-05	4.00E-04	1.41E-08
D-n-butylphthalate	0.002	0.05	1	15	30	70	10950	2.94E-05	1.00E-01	5.87E-07
									Total Hazard Index	6.01E-07

Radionuclides

IF = IR x ET x EF x ED
CR = C x IF x SF

Radionuclide	C Surface Water Concentration (pCi/l)	IR Ingestion Rate (l/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	IF Intake Factor (l)	SF Slope Factor (Risk/pCi)	CR Cancer Risk
Americium-241	0.014	0.05	1	15	30	2.25E+01	3.28E-10	1.03E-10
Plutonium-239/240	0.043	0.05	1	15	30	2.25E+01	3.16E-10	3.06E-10
							Total Radionuclide Cancer Risk	4.09E-10

Total Cancer Risk 4.09E-10

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

RME - Dermal contact with surface water

Noncarcinogens

$$IF = (SA \times DP \times ET \times EF \times ED \times CF)/(BW \times AT)$$
$$HQ = (C \times IF)/RfD$$

	C	SA	DP	ET	EF	ED	CF	BW	AT	IF	RfD	HQ
Chemical	Surface Water Concentration (mg/l)	Skin Surface Area (cm^2)	Dermal Permeability (cm/hr)	Exposure Time (hr/day)	Exposure Frequency (day/yr)	Exposure Duration (years)	Conversion Factor (l/cm^3)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Di-n-butylphthalate	0.002	9275	0.07	1	15	30	0.001	70	10950	3.81E-04	1.00E-01	7.62E-06
											Total Hazard Index	7.62E-06

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

CT - External irradiation from stream/dry sediment

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (T_e)	GSF Gamma Shielding Factor ($1-S_e$)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	0.311	0.1	0.8	0.03	9	2.16E-02	4.59E-09	3.08E-11
Plutonium-239/240	2.519	0.1	0.8	0.03	9	2.16E-02	1.37E-11	7.45E-13
							Total Cancer Risk	3.16E-11

RME - External irradiation from stream/dry sediment

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (T_e)	GSF Gamma Shielding Factor ($1-S_e$)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	0.311	0.2	1	0.07	30	4.20E-01	4.59E-09	6.00E-10
Plutonium-239/240	2.519	0.2	1	0.07	30	4.20E-01	1.37E-11	1.45E-11
							Total Cancer Risk	6.14E-10

SUMMARY OF RISK
FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

	Central Tendency		Reasonable Maximum	
Pathway	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Ingestion of pond sediment	2.61E-04	8.15E-09	3.11E-03	9.70E-08
Ingestion of stream/dry sediment	4.78E-06	3.49E-10	5.69E-05	4.48E-09
Inhalation of particulates from stream/dry sediment	-	4.12E-13	-	7.06E-13
Dermal contact with pond sediment	3.32E-03	1.84E-08	3.17E-02	1.75E-07
Dermal contact with stream/dry sediment*	-	-	-	-
Ingestion of surface water	1.34E-06	4.65E-11	1.15E-05	1.52E-10
Dermal contact with surface water	7.48E-05	8.24E-10	1.28E-04	1.41E-09
External Irradiation from stream/dry sediment	-	3.48E-11	-	7.54E-11
Total	3.67E-03	2.78E-08	3.50E-02	2.78E-07

*PAHs, metals and radionuclides are the only COCs in stream/dry sediment. Dermal absorption of metals and radionuclides is considered insignificant. EPA has stated that it is inappropriate to assess dermal absorption of PAHs using the oral slope factor. (EPA 1989a)

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

CT - Ingestion of pond sediment

Noncarcinogens

IF = (IR x FC x EF x ME x ED x CF)/(BW x AT)
HQ = (C x IF)/RfD

	C	IR	FC	EF	ME	ED	CF	BW	AT	IF	RfD	HQ
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Antimony	47.05	8	0.9	7	0.5	2.5	0.000001	70	915	9.84E-10	4.00E-04	1.16E-04
Aroclor-1254	2.424	8	0.9	7	0.5	2.5	0.000001	70	915	9.84E-10	2.00E-05	1.19E-04
Bis(2-ethylhexyl)phthalate	30.26	8	0.9	7	1	2.5	0.000001	70	915	1.97E-09	2.00E-02	2.98E-06
Silver	95.86	8	0.9	7	0.5	2.5	0.000001	70	915	9.84E-10	5.00E-03	1.89E-05
Vanadium	30.59	8	0.9	7	0.5	2.5	0.000001	70	915	9.84E-10	7.00E-03	4.30E-06
											Total Hazard Index	2.61E-04

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

CT - Ingestion of pond sediment

Nonradionuclide carcinogens

IF = (IR x FC x EF x ME x ED x CF)/(BW x AT)
CR = C x IF x SF

	C	IR	FC	EF	ME	ED	CF	BW	AT	IF	SF	CR
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Aroclor-1254	2.424	8	0.9	7	0.5	2.5	0.000001	70	25550	3.52E-11	7.70E+00	6.57E-10
Benzo(a)pyrene	0.383	8	0.9	7	1	2.5	0.000001	70	25550	7.05E-11	7.30E+00	1.97E-10
Benzo(b)fluoranthene	0.861	8	0.9	7	1	2.5	0.000001	70	25550	7.05E-11	7.30E-01	4.43E-11
Bis(2-ethylhexyl)phthalate	30.26	8	0.9	7	1	2.5	0.000001	70	25550	7.05E-11	1.40E-02	2.98E-11
											Total Chemical Cancer Risk	9.29E-10

Radionuclides

IF = IR x FC x EF x ME x ED x CF
CR = C x IF x SF

	C	IR	FC	EF	ME	ED	CF	IF	SF	CR
Radionuclide	Sediment Concentration (pCi/g)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (g/mg)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	99.34	8	0.9	7	1	2.5	0.001	1.26E-01	3.28E-10	4.11E-09
Plutonium-239/240	78.3	8	0.9	7	1	2.5	0.001	1.26E-01	3.16E-10	3.12E-09
									Total Radionuclide Cancer Risk	7.22E-09

Total Cancer Risk 8.15E-09

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

RME - Ingestion of pond sediment

Noncarcinogens

IF = (IR x FC x EF x ME x ED x CF)/(BW x AT)
HQ = (C x IF)/RfD

	C	IR	FC	EF	ME	ED	CF	BW	AT	IF	RfD	HQ
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Antimony	47.05	50	1	12	0.5	2.5	0.000001	70	915	1.17E-08	4.00E-04	1.38E-03
Aroclor-1254	2.424	50	1	12	0.5	2.5	0.000001	70	915	1.17E-08	2.00E-05	1.42E-03
Bis(2-ethylhexyl)phthalate	30.26	50	1	12	1	2.5	0.000001	70	915	2.34E-08	2.00E-02	3.54E-05
Silver	95.86	50	1	12	0.5	2.5	0.000001	70	915	1.17E-08	5.00E-03	2.24E-04
Vanadium	30.59	50	1	12	0.5	2.5	0.000001	70	915	1.17E-08	7.00E-03	5.12E-05
											Total Hazard Index	3.11E-03

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

RME - Ingestion of pond sediment

Nonradionuclide carcinogens

IF = (IR x FC x EF x ME x ED x CF)/(BW x AT)
CR = C x IF x SF

	C	IR	FC	EF	ME	ED	CF	BW	AT	IF	SF	CR
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Aroclor-1254	2.424	50	1	12	0.5	2.5	0.000001	70	25550	4.19E-10	7.70E+00	7.83E-09
Benzo(a)pyrene	0.383	50	1	12	1	2.5	0.000001	70	25550	8.39E-10	7.30E+00	2.34E-09
Benzo(b)fluoranthene	0.861	50	1	12	1	2.5	0.000001	70	25550	8.39E-10	7.30E-01	5.27E-10
Bis(2-ethylhexyl)phthalate	30.26	50	1	12	1	2.5	0.000001	70	25550	8.39E-10	1.40E-02	3.55E-10
										Total Chemical Cancer Risk		1.11E-08

Radionuclides

IF = IR x FC x EF x ME x ED x CF
CR = C x IF x SF

	C	IR	FC	EF	ME	ED	CF	IF	SF	CR
Radionuclide	Sediment Concentration (pCi/g)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (g/mg)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	99.34	50	1	12	1	2.5	0.001	1.50E+00	3.28E-10	4.89E-08
Plutonium-239/240	78.3	50	1	12	1	2.5	0.001	1.50E+00	3.16E-10	3.71E-08
									Total Radionuclide Cancer Risk	8.60E-08

Total Cancer Risk 9.70E-08

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

CT - Ingestion of stream/dry sediment

Noncarcinogens

IF = (IR x FC x EF x ME x ED x CF)/(BW x AT)
HQ = (C x IF)/RfD

	C	IR	FC	EF	ME	ED	CF	BW	AT	IF	RfD	HQ
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Cobalt	8.77	8	0.9	7	1	2.5	0.000001	70	915	1.97E-09	6.00E-02	2.88E-07
Strontium	74.49	8	0.9	7	1	2.5	0.000001	70	915	1.97E-09	6.00E-01	2.44E-07
Vanadium	26.66	8	0.9	7	0.5	2.5	0.000001	70	915	9.84E-10	7.00E-03	3.75E-06
Zinc	152.6	8	0.9	7	0.5	2.5	0.000001	70	915	9.84E-10	3.00E-01	5.00E-07
											Total Hazard Index	4.78E-06

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

CT - Ingestion of stream/dry sediment

Nonradionuclide carcinogens

IF = (IR x FC x EF x ME x ED x CF)/(BW x AT)
CR = C x IF x SF

	C	IR	FC	EF	ME	ED	CF	BW	AT	IF	SF	CR
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Benzo(a)anthracene	0.302	8	0.9	7	1	2.5	0.000001	70	25550	7.05E-11	7.30E-01	1.55E-11
Benzo(a)pyrene	0.48	8	0.9	7	1	2.5	0.000001	70	25550	7.05E-11	7.30E+00	2.47E-10
Benzo(b)fluoranthene	0.41	8	0.9	7	1	2.5	0.000001	70	25550	7.05E-11	7.30E-01	2.11E-11
Indeno(1,2,3-cd)pyrene	0.19	8	0.9	7	1	2.5	0.000001	70	25550	7.05E-11	7.30E-01	9.77E-12
											Total Chemical Cancer Risk	2.93E-10

Radionuclides

IF = IR x FC x EF x ME x ED x CF
CR = C x IF x SF

	C	IR	FC	EF	ME	ED	CF	IF	SF	CR
Radionuclide	Sediment Concentration (pCi/g)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (g/mg)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.66	8	0.9	7	1	2.5	0.001	1.26E-01	3.28E-10	2.73E-11
Pltuonium-239/240	1.392	8	0.9	7	0.5	2.5	0.001	6.30E-02	3.28E-10	2.88E-11
									Total Radionuclide Cancer Risk	5.60E-11
									Total Cancer Risk	3.49E-10

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

RME - Ingestion of stream/dry sediment

Noncarcinogens

$$IF = (IR \times FC \times EF \times ME \times ED \times CF)/(BW \times AT)$$
$$HQ = (C \times IF)/RfD$$

	C	IR	FC	EF	ME	ED	CF	BW	AT	IF	RfD	HQ
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Cobalt	8.77	50	1	12	1	2.5	0.000001	70	915	2.34E-08	6.00E-02	3.42E-06
Strontium	74.49	50	1	12	1	2.5	0.000001	70	915	2.34E-08	6.00E-01	2.91E-06
Vanadium	26.66	50	1	12	0.5	2.5	0.000001	70	915	1.17E-08	7.00E-03	4.46E-05
Zinc	152.6	50	1	12	0.5	2.5	0.000001	70	915	1.17E-08	3.00E-01	5.96E-06
											Total Hazard Index	5.69E-05

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

RME - Ingestion of stream/dry sediment

Nonradionuclide carcinogens

IF = (IR x FC x EF x ME x ED x CF)/(BW x AT)
CR = C x IF x SF

	C	IR	FC	EF	ME	ED	CF	BW	AT	IF	SF	CR
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Benzo(a)anthracene	0.302	50	1	12	1	2.5	0.000001	70	25550	8.39E-10	7.30E-01	1.85E-10
Benzo(a)pyrene	0.48	50	1	12	1	2.5	0.000001	70	25550	8.39E-10	7.30E+00	2.94E-09
Benzo(b)fluoranthene	0.41	50	1	12	1	2.5	0.000001	70	25550	8.39E-10	7.30E-01	2.51E-10
Indeno(1,2,3-cd)pyrene	0.19	50	1	12	1	2.5	0.000001	70	25550	8.39E-10	7.30E-01	1.16E-10
										Total Chemical Cancer Risk		3.49E-09

Radionuclides

IF = IR x FC x EF x ME x ED x CF
CR = C x IF x SF

	C	IR	FC	EF	ME	ED	CF	IF	SF	CR
Radionuclide	Sediment Concentration (pCi/g)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Exposure Duration (years)	Conversion Factor (g/mg)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.66	50	1	12	1	2.5	0.001	1.50E+00	3.28E-10	3.25E-10
Plutonium-239/240	1.392	50	1	12	1	2.5	0.001	1.50E+00	3.16E-10	6.60E-10
									Total Radionuclide Cancer Risk	9.85E-10

Total Cancer Risk 4.48E-09

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

CT - Inhalation of particulates from sediment

Radionuclides

IF = (IR x EF x ED x CF x DF x RF)/PEF
CR = C x IF x SF

Radionuclide	C Sediment Concentration (pCi/g)	IR Inhalation Rate (m^3/day)	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	DF Respiratory Deposition Factor	RF Respirable Fraction	CF Conversion Factor (g/kg)	PEF Particulate Emission Factor (m^3/kg)	IF Intake Factor (g)	SF Slope Factor (Risk/pCi)	CR Cancer Risk
Americium-241	0.66	2	7	2.5	0.85	1	1000	4.63E+09	6.43E-06	3.85E-08	1.63E-13
Plutonium-239/240	1.392	2	7	2.5	0.85	1	1000	4.63E+09	6.43E-06	2.78E-08	2.49E-13
										Total Radionuclide Cancer Risk	4.12E-13

Total Cancer Risk 4.12E-13

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

RME - Inhalation of particulates from sediment

Radionuclides

IF = (IR x EF x ED x CF x DF x RF)/PEF
CR = C x IF x SF

	C	IR	EF	ED	DF	RF	CF	PEF	IF	SF	CR
Radionuclide	Sediment Concentration (pCi/g)	Inhalation Rate (m^3/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Respirable Fraction	Conversion Factor (g/kg)	Particulate Emission Factor (m^3/kg)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.66	2	12	2.5	0.85	1	1000	4.63E+09	1.10E-05	3.85E-08	2.80E-13
Plutonium-239/240	1.392	2	12	2.5	0.85	1	1000	4.63E+09	1.10E-05	2.78E-08	4.26E-13
										Total Radionuclide Cancer Risk	7.06E-13
										Total Cancer Risk	7.06E-13

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

CT - Dermal contact with pond sediment

Noncarcinogens

$$IF = (SA \times FC \times AD \times AB \times EF \times ED \times CF)/(BW \times AT)$$
$$HQ = (C \times IF)/RfD$$

Chemical	C Sediment Concentration (mg/kg)	SA Skin Surface Area (cm^2)	FC Fraction Contaminated	AD Soil Adherence (mg/cm^2)	AB Skin Absorption	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)
Aroclor-1254	2.424	9275	0.9	0.2	0.06	7	2.5	0.000001	70	915
Bis(2-ethylhexyl)phthalate	30.26	9275	0.9	0.2	0.01	7	2.5	0.000001	70	915

Chemical	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Aroclor-1254	2.74E-08	2.00E-05	3.32E-03
Bis(2-ethylhexyl)phthalate	4.56E-09	2.00E-02	6.90E-06
		Total Hazard Index	3.32E-03

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

CT - Dermal contact with pond sediment

Nonradionuclide carcinogens

$$IF = (SA \times FC \times AD \times AB \times EF \times ED \times CF)/(BW \times AT)$$
$$CR = C \times IF \times SF$$

	C	SA	FC	AD	AB	EF	ED	CF	BW	AT
Chemical	Sediment Concentration (mg/kg)	Skin Surface Area (cm^2)	Fraction Contaminated	Soil Adherence (mg/cm^2)	Skin Absorption	Exposure Frequency (days/yr)	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)
Aroclor-1254	2.424	9275	0.9	0.2	0.06	7	2.5	0.000001	70	25550
Bis(2-ethylhexyl)phthalate	30.26	9275	0.9	0.2	0.01	7	2.5	0.000001	70	25550

	IF	SF	CR
Chemical	Intake Factor (kg/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Aroclor-1254	9.80E-10	7.70E+00	1.83E-08
Bis(2-ethylhexyl)phthalate	1.63E-10	1.40E-02	6.92E-11
		Total Cancer Risk	1.84E-08

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

RME - Dermal contact with pond sediment

Noncarcinogens

$$IF = (SA \times FC \times AD \times AB \times EF \times ED \times CF)/(BW \times AT)$$
$$HQ = (C \times IF)/RfD$$

	C	SA	FC	AD	AB	EF	ED	CF	BW	AT
Chemical	Sediment Concentration (mg/kg)	Skin Surface Area (cm^2)	Fraction Contaminated	Soil Adherence (mg/cm^2)	Skin Absorption	Exposure Frequency (days/yr)	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)
Aroclor-1254	2.424	9275	1	1	0.06	12	2.5	0.000001	70	915
Bis(2-ethylhexyl)phthalate	30.26	9275	1	1	0.01	12	2.5	0.000001	70	915

	IF	RfD	HQ
Chemical	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Aroclor-1254	2.61E-07	2.00E-05	3.16E-02
Bis(2-ethylhexyl)phthalate	4.34E-08	2.00E-02	6.57E-05
		Total Hazard Index	3.17E-02

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

RME - Dermal contact with pond sediment

Nonradionuclide carcinogens

$$IF = (SA \times FC \times AD \times AB \times EF \times ED \times CF)/(BW \times AT)$$

$$CR = C \times IF \times SF$$

Chemical	C Sediment Concentration (mg/kg)	SA Skin Surface Area (cm^2)	FC Fraction Contaminated	AD Soil Adherence (mg/cm^2)	AB Skin Absorption	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)
Aroclor-1254	2.424	9275	1	1	0.06	12	2.5	0.000001	70	25550
Bis(2-ethylhexyl)phthalate	30.26	9275	1	1	0.01	12	2.5	0.000001	70	25550

Chemical	IF Intake Factor (kg/kg-day)	SF Slope Factor 1/(mg/kg-day)	CR Cancer Risk
Aroclor-1254	9.33E-09	7.70E+00	1.74E-07
Bis(2-ethylhexyl)phthalate	1.56E-09	1.40E-02	6.59E-10
		Total Cancer Risk	1.75E-07

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

CT - Ingestion of surface water

Noncarcinogens

IF = (IR x ET x EF x ED)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Surface Water Concentration (mg/l)	IR Ingestion Rate (l/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (l/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
1,2-Dichloroethene	0.00253	0.01	1	7	2.5	70	915	2.73E-06	9.00E-03	7.68E-07
Antimony	9.69E-08	0.01	1	7	2.5	70	915	2.73E-06	4.00E-04	6.62E-10
Chloroform	0.002	0.01	1	7	2.5	70	915	2.73E-06	1.00E-02	5.46E-07
Di-n-butylphthalate	0.001	0.01	1	7	2.5	70	915	2.73E-06	1.00E-01	2.73E-08
									Total Hazard Index	1.34E-06

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

CT - Ingestion of surface water

Nonradionuclide carcinogens

IF = (IR x ET x EF x ED)/(BW x AT)
CR = C x IF x SF

	C	IR	ET	EF	ED	BW	AT	IF	SF	CR
Chemical	Surface Water Concentration (mg/l)	Ingestion Rate (l/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Chloroform	0.002	0.01	1	7	2.5	70	25550	9.78E-08	6.10E-03	1.19E-12
Trichloroethene	0.0296	0.01	1	7	2.5	70	25550	9.78E-08	1.10E-02	3.19E-11
									Total Chemical Cancer Risk	3.31E-11

Radionuclides

IF = IR x ET x EF x ED
CR = C x IF x SF

	C	IR	ET	EF	ED	IF	SF	CR
Radionuclide	Surface Water Concentration (pCi/l)	Ingestion Rate (l/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Intake Factor (l)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.167	0.01	1	7	2.5	1.75E-01	3.28E-10	9.59E-12
Plutonium-239/240	0.069	0.01	1	7	2.5	1.75E-01	3.16E-10	3.82E-12
							Total Radionuclide Cancer Risk	1.34E-11

Total Cancer Risk 4.65E-11

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

RME - Ingestion of surface water

Noncarcinogens

$$IF = (IR \times ET \times EF \times ED)/(BW \times AT)$$
$$HQ = (C \times IF)/RfD$$

	C	IR	ET	EF	ED	BW	AT	IF	RfD	HQ
Chemical	Surface Water Concentration (mg/l)	Ingestion Rate (l/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
1,2-Dichloroethene	0.00253	0.05	1	12	2.5	70	915	2.34E-05	9.00E-03	6.58E-06
Antimony	9.69E-08	0.05	1	12	2.5	70	915	2.34E-05	4.00E-04	5.67E-09
Chloroform	0.002	0.05	1	12	2.5	70	915	2.34E-05	1.00E-02	4.68E-06
Di-n-butylphthalate	0.001	0.05	1	12	2.5	70	915	2.34E-05	1.00E-01	2.34E-07
									Total Hazard Index	1.15E-05

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

RME - Ingestion of surface water

Nonradionuclide carcinogens

IF = (IR x ET x EF x ED)/(BW x AT)
CR = C x IF x SF

	C	IR	ET	EF	ED	BW	AT	IF	SF	CR
Chemical	Surface Water Concentration (mg/l)	Ingestion Rate (l/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Chloroform	0.002	0.05	1	12	2.5	70	25550	8.39E-07	6.10E-03	1.02E-11
Trichloroethene	0.00296	0.05	1	12	2.5	70	25550	8.39E-07	1.10E-02	2.73E-11
								Total Chemical Cancer Risk		3.75E-11

Radionuclides

IF = IR x ET x EF x ED
CR = C x IF x SF

	C	IR	ET	EF	ED	IF	SF	CR
Radionuclide	Surface Water Concentration (pCi/l)	Ingestion Rate (l/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Intake Factor (l)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.167	0.05	1	12	2.5	1.50E+00	3.28E-10	8.22E-11
Plutonium-239/240	0.069	0.05	1	12	2.5	1.50E+00	3.16E-10	3.27E-11
							Total Radionuclide Cancer Risk	1.15E-10

Total Cancer Risk 1.52E-10

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

CT - Dermal contact with surface water

Noncarcinogens

IF = (SA x DP x ET x EF x ED x CF)/(BW x AT)
HQ = (C x IF)/RfD

	C	SA	DP	ET	EF	ED	CF	BW	AT	IF	RfD	HQ
Chemical	Surface Water Concentration (mg/l)	Skin Surface Area (cm^2)	Dermal Permeability (cm/hr)	Exposure Time (hr/day)	Exposure Frequency (day/yr)	Exposure Duration (years)	Conversion Factor (l/cm^3)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
1,2-Dichloroethene	0.00253	9275	0.01	1	7	2.5	0.001	70	915	2.53E-05	9.00E-03	7.12E-06
Chloroform	0.002	9275	0.13	1	7	2.5	0.001	70	915	3.29E-04	1.00E-02	6.59E-05
Di-n-butylphthalate	0.001	9275	0.07	1	7	2.5	0.001	70	915	1.77E-04	1.00E-01	1.77E-06
											Total Hazard Index	7.48E-05

Nonradionuclide carcinogens

IF = (SA x DP x ET x EF x ED x CF)/(BW x AT)
CR = C x IF x SF

	C	SA	DP	ET	EF	ED	CF	BW	AT	IF	SF	CR
Chemical	Surface Water Concentration (mg/l)	Skin Surface Area (cm^2)	Dermal Permeability (cm/hr)	Exposure Time (hr/day)	Exposure Frequency (day/yr)	Exposure Duration (years)	Conversion Factor (l/cm^3)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Chloroform	0.002	9275	0.13	1	7	2.5	0.001	70	25550	1.18E-05	6.10E-03	1.44E-10
Trichloroethene	0.00296	9275	0.23	1	7	2.5	0.001	70	25550	2.09E-05	1.10E-02	6.80E-10
											Total Cancer Risk	8.24E-10

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

RME - Dermal contact with surface water

Noncarcinogens

IF = (SA x DP x ET x EF x ED x CF)/(BW x AT)
HQ = (C x IF)/RfD

	C	SA	DP	ET	EF	ED	CF	BW	AT	IF	RfD	HQ
Chemical	Surface Water Concentration (mg/l)	Skin Surface Area (cm^2)	Dermal Permeability (cm/hr)	Exposure Time (hr/day)	Exposure Frequency (day/yr)	Exposure Duration (years)	Conversion Factor (l/cm^3)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
1,2-Dichloroethene	0.00253	9275	0.01	1	12	2.5	0.001	70	915	4.34E-05	9.00E-03	1.22E-05
Chloroform	0.002	9275	0.13	1	12	2.5	0.001	70	915	5.65E-04	1.00E-02	1.13E-04
Di-n-butylphthalate	0.001	9275	0.07	1	12	2.5	0.001	70	915	3.04E-04	1.00E-01	3.04E-06
											Total Hazard Index	1.28E-04

Nonradionuclide carcinogens

IF = (SA x DP x ET x EF x ED x CF)/(BW x AT)
CR = C x IF x SF

	C	SA	DP	ET	EF	ED	CF	BW	AT	IF	SF	CR
Chemical	Surface Water Concentration (mg/l)	Skin Surface Area (cm^2)	Dermal Permeability (cm/hr)	Exposure Time (hr/day)	Exposure Frequency (day/yr)	Exposure Duration (years)	Conversion Factor (l/cm^3)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Chloroform	0.002	9275	0.13	1	12	2.5	0.001	70	25550	2.02E-05	6.10E-03	2.47E-10
Trichloroethene	0.00296	9275	0.23	1	12	2.5	0.001	70	25550	3.58E-05	1.10E-02	1.17E-09
											Total Cancer Risk	1.41E-09

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

CT - External irradiation from stream/dry sediment

IF = TF x GSF x EF x ED
CR = C x IF x SF

	C	TF	GSF	EF	ED	IF	SF	CR
Radionuclide	Soil Concentration (pCi/g)	Gamma Time Factor (T_e)	Gamma Shielding Factor ($1-S_e$)	Percent of year Exposed	Exposure Duration (years)	Intake Factor (years)	Slope Factor (1/pCi-yr/g)	Cancer Risk
Americium-241	0.66	0.3	0.8	0.019	2.5	1.14E-02	4.59E-09	3.45E-11
Plutonium-239/240	1.392	0.3	0.8	0.019	2.5	1.14E-02	1.37E-11	2.17E-13
							Total Cancer Risk	3.48E-11

RME - External irradiation from stream/dry sediment

IF = TF x GSF x EF x ED
CR = C x IF x SF

	C	TF	GSF	EF	ED	IF	SF	CR
Radionuclide	Soil Concentration (pCi/g)	Gamma Time Factor (T_e)	Gamma Shielding Factor ($1-S_e$)	Percent of year Exposed	Exposure Duration (years)	Intake Factor (years)	Slope Factor (1/pCi-yr/g)	Cancer Risk
Americium-241	0.66	0.3	1	0.033	2.5	2.48E-02	4.59E-09	7.50E-11
Plutonium-239/240	1.392	0.3	1	0.033	2.5	2.48E-02	1.37E-11	4.72E-13
							Total Cancer Risk	7.54E-11

SUMMARY OF RISK
OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

	Central Tendency		Reasonable Maximum	
Pathway	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Ingestion of pond sediment by a child	1.21E-02	-	6.06E-02	-
Ingestion of pond sediment by an adult	1.30E-03	-	6.49E-03	-
Carcinogenic effects of ingestion of pond sediment	-	2.05E-07	-	3.32E-06
Ingestion of stream/dry sediment by a child	2.22E-04	-	1.11E-03	-
Ingestion of stream/dry sediment by an adult	2.38E-05	-	1.19E-04	-
Carcinogenic effects of ingestion of stream/dry sediment	-	1.67E-08	-	2.62E-07
Inhalation of particulates from stream/dry sediment	-	1.32E-12	-	6.18E-11
Dermal contact with pond sediment	5.70E-04	1.13E-08	3.78E-02	2.50E-06
Dermal contact with stream/dry sediment*	-	-	-	-
Ingestion of surface water	1.20E-06	5.72E-11	1.44E-05	2.29E-09
Dermal contact with surface water	1.31E-05	5.19E-10	1.61E-04	2.12E-08
External Irradiation from stream/dry sediment	-	6.58E-11	-	1.28E-09
Total	1.42E-02	2.34E-07	1.06E-01	6.10E-06

* PAHs, metals and radionuclides are the only COCs in stream/dry sediment. Dermal absorption of metals and radionuclides is considered insignificant. EPA has stated that it is inappropriate to assess dermal absorption of PAHs using the oral slope factor (EPA 1989).

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

CT - Pond sediment ingestion

Noncarcinogens - Child

IF =(IR-C x ED-C x EF x ME x CF)/(BW-C x AT-C)
HQ = (C x IF)/RfD

Chemical	C Sediment Concentration (mg/kg)	IR-C Ingestion Rate (mg/visit)	ED-C Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-C Body Weight (kg)	AT-C Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	47.05	50	2	10	0.5	0.000001	15	730	4.57E-08	4.00E-04	5.37E-03
Aroclor-1254	2.424	50	2	10	0.5	0.000001	15	730	4.57E-08	2.00E-05	5.53E-03
Bis(2-ethylhexyl)phthalate	30.26	50	2	10	1	0.000001	15	730	9.13E-08	2.00E-02	1.38E-04
Silver	95.86	50	2	10	0.5	0.000001	15	730	4.57E-08	5.00E-03	8.75E-04
Vanadium	30.59	50	2	10	0.5	0.000001	15	730	4.57E-08	7.00E-03	2.00E-04
									Total Hazard Index - Child		1.21E-02

Noncarcinogens - Adult

IF =(IR-A x ED-A x EF x ME x CF)/(BW-A x AT-A)
HQ = (C x IF)/RfD

Chemical	C Sediment Concentration (mg/kg)	IR-A Ingestion Rate (mg/visit)	ED-A Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-A Body Weight (kg)	AT-A Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	47.05	25	7	10	0.5	0.000001	70	2555	4.89E-09	4.00E-04	5.75E-04
Aroclor-1254	2.424	25	7	10	0.5	0.000001	70	2555	4.89E-09	2.00E-05	5.93E-04
Bis(2-ethylhexyl)phthalate	30.26	25	7	10	1	0.000001	70	2555	9.78E-09	2.00E-02	1.48E-05
Silver	95.86	25	7	10	0.5	0.000001	70	2555	4.89E-09	5.00E-03	9.38E-05
Vanadium	30.59	25	7	10	0.5	0.000001	70	2555	4.89E-09	7.00E-03	2.14E-05
									Total Hazard Index - Adult		1.30E-03

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

CT - Time-weighted average pond sediment ingestion

Nonradionuclide Carcinogens

$$IF = [(IR\text{-}C \times ED\text{-}C)/(BW\text{-}C) + (IR\text{-}A \times ED\text{-}A)/(BW\text{-}A)] \times (EF \times ME \times CF)/AT$$

$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	BW-C	IR-A	ED-A	BW-A	CF	ME	EF
		Child			Adult					
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Conversion Factor (kg/mg)	Matrix Effect	Exposure Frequency (visits/yr)
Aroclor-1254	2.424	50	2	15	25	7	70	0.000001	0.5	10
Benzo(a)pyrene	0.383	50	2	15	25	7	70	0.000001	1	10
Benzo(b)fluoranthene	0.861	50	2	15	25	7	70	0.000001	1	10
Bis(2-ethylhexyl)phthalate	30.26	50	2	15	25	7	70	0.000001	1	10

	AT	IF	SF	CR
Chemical	Averaging Time (days)	Intake Factor (kg/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Aroclor-1254	25550	1.79E-09	7.70E+00	3.35E-08
Benzo(a)pyrene	25550	3.59E-09	7.30E+00	1.00E-08
Benzo(b)fluoranthene	25550	3.59E-09	7.30E-01	2.26E-09
Bis(2-ethylhexyl)phthalate	25550	3.59E-09	1.40E-02	1.52E-09
		Total Chemical Cancer Risk		4.73E-08

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

CT - Time-weighted average pond sediment ingestion

Radionuclides

$$IF = [(IR\text{-}C \times ED\text{-}C) + (IR\text{-}A \times ED\text{-}A)] \times EF \times ME \times CF$$
$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	IR-A	ED-A	ME	CF	EF	IF	SF	CR
		Child		Adult							
Chemical	Sediment Concentration (pCi/g)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Matrix Effect	Conversion Factor (g/mg)	Exposure Frequency (visits/yr)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	99.34	50	2	25	7	1	0.001	10	2.75E+00	3.28E-10	8.96E-08
Plutonium-239/240	78.3	50	2	25	7	1	0.001	10	2.75E+00	3.16E-10	6.80E-08
										Total Radionuclide Cancer Risk	1.58E-07

Total Cancer Risk 2.05E-07

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

RME - Pond sediment ingestion

Noncarcinogens - Child

IF =(IR-C x ED-C x EF x ME x CF)/(BW-C x AT-C)
HQ = (C x IF)/RfD

Chemical	C Sediment Concentration (mg/kg)	IR-C Ingestion Rate (mg/visit)	ED-C Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-C Body Weight (kg)	AT-C Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	47.05	100	6	25	0.5	0.000001	15	2190	2.28E-07	4.00E-04	2.69E-02
Aroclor-1254	2.424	100	6	25	0.5	0.000001	15	2190	2.28E-07	2.00E-05	2.77E-02
Bis(2-ethylhexyl)phthalate	30.26	100	6	25	1	0.000001	15	2190	4.57E-07	2.00E-02	6.91E-04
Silver	95.86	100	6	25	0.5	0.000001	15	2190	2.28E-07	5.00E-03	4.38E-03
Vanadium	30.59	100	6	25	0.5	0.000001	15	2190	2.28E-07	7.00E-03	9.98E-04
									Total Hazard Index - Child		6.06E-02

Noncarcinogens - Adult

IF =(IR-A x ED-A x EF x ME x CF)/(BW-A x AT-A)
HQ = (C x IF)/RfD

Chemical	C Sediment Concentration (mg/kg)	IR-A Ingestion Rate (mg/visit)	ED-A Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-A Body Weight (kg)	AT-A Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Antimony	47.05	50	24	25	0.5	0.000001	70	8760	2.45E-08	4.00E-04	2.88E-03
Aroclor-1254	2.424	50	24	25	0.5	0.000001	70	8760	2.45E-08	2.00E-05	2.96E-03
Bis(2-ethylhexyl)phthalate	30.26	50	24	25	1	0.000001	70	8760	4.89E-08	2.00E-02	7.40E-05
Silver	95.86	50	24	25	0.5	0.000001	70	8760	2.45E-08	5.00E-03	4.69E-04
Vanadium	30.59	50	24	25	0.5	0.000001	70	8760	2.45E-08	7.00E-03	1.07E-04
									Total Hazard Index - Adult		6.49E-03

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

RME - Time-weighted average pond sediment ingestion

Nonradionuclide Carcinogens

$$IF = ([(IR\text{-}C \times ED\text{-}C)/(BW\text{-}C) + (IR\text{-}A \times ED\text{-}A)/(BW\text{-}A)] \times EF \times ME \times CF)/AT$$

$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	BW-C	IR-A	ED-A	BW-A	CF	ME	EF
		Child				Adult				
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Conversion Factor (kg/mg)	Matrix Effect	Exposure Frequency (visits/yr)
Aroclor-1254	2.424	100	6	15	50	24	70	0.000001	0.5	25
Benzo(a)pyrene	0.383	100	6	15	50	24	70	0.000001	1	25
Benzo(b)fluoranthene	0.861	100	6	15	50	24	70	0.000001	1	25
Bis(2-ethylhexyl)phthalate	30.26	100	6	15	50	24	70	0.000001	1	25

	AT	IF	SF	CR
Chemical	Averaging Time (days)	Intake Factor (kg/kg-day)	Slope Factor (mg/kg-day)	Cancer Risk
Aroclor-1254	25550	2.80E-08	7.70E+00	5.22E-07
Benzo(a)pyrene	25550	5.59E-08	7.30E+00	1.56E-07
Benzo(b)fluoranthene	25550	5.59E-08	7.30E-01	3.51E-08
Bis(2-ethylhexyl)phthalate	25550	5.59E-08	1.40E-02	2.37E-08
		Total Chemical Cancer Risk		7.37E-07

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

RME - Time-weighted average pond sediment ingestion

Radionuclides

$$IF = [(IR\text{-}C \times ED\text{-}C) + (IR\text{-}A \times ED\text{-}A)] \times EF \times ME \times CF$$

$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	IR-A	ED-A	ME	CF	EF	IF	SF	CR
		Child		Adult							
Chemical	Sediment Concentration (pCi/g)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Matrix Effect	Conversion Factor (g/mg)	Exposure Frequency (visits/yr)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	99.34	100	6	50	24	1	0.001	25	4.50E+01	3.28E-10	1.47E-06
Plutonium-239/240	78.3	100	6	50	24	1	0.001	25	4.50E+01	3.16E-10	1.11E-06
										Total Radionuclide Cancer Risk	2.58E-06

Total Cancer Risk 3.32E-06

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

CT - Stream/dry sediment ingestion

Noncarcinogens - Child

IF =(IR-C x ED-C x EF x ME x CF)/(BW-C x AT-C)
HQ = (C x IF)/RfD

Chemical	C Sediment Concentration (mg/kg)	IR-C Ingestion Rate (mg/visit)	ED-C Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-C Body Weight (kg)	AT-C Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Cobalt	8.77	50	2	10	1	0.000001	15	730	9.13E-08	6.00E-02	1.33E-05
Strontium	74.49	50	2	10	1	0.000001	15	730	9.13E-08	6.00E-01	1.13E-05
Vanadium	26.66	50	2	10	0.5	0.000001	15	730	4.57E-08	7.00E-03	1.74E-04
Zinc	152.6	50	2	10	0.5	0.000001	15	730	4.57E-08	3.00E-01	2.32E-05
									Total Hazard Index - Child		2.22E-04

Noncarcinogens - Adult

IF =(IR-A x ED-A x EF x ME x CF)/(BW-A x AT-A)
HQ = (C x IF)/RfD

Chemical	C Sediment Concentration (mg/kg)	IR-A Ingestion Rate (mg/visit)	ED-A Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-A Body Weight (kg)	AT-A Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Cobalt	8.77	25	7	10	1	0.000001	70	2555	9.78E-09	6.00E-02	1.43E-06
Strontium	74.49	25	7	10	1	0.000001	70	2555	9.78E-09	6.00E-01	1.21E-06
Vanadium	26.66	25	7	10	0.5	0.000001	70	2555	4.89E-09	7.00E-03	1.86E-05
Zinc	152.6	25	7	10	0.5	0.000001	70	2555	4.89E-09	3.00E-01	2.49E-06
									Total Hazard Index - Adult		2.38E-05

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

CT - Time-weighted average stream/dry sediment ingestion

Nonradionuclide Carcinogens

$$IF = [(IR\text{-}C \times ED\text{-}C)/(BW\text{-}C) + (IR\text{-}A \times ED\text{-}A)/(BW\text{-}A)] \times (EF \times ME \times CF)/AT$$

$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	BW-C	IR-A	ED-A	BW-A	CF	ME	EF
		Child			Adult					
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Conversion Factor (kg/mg)	Matrix Effect	Exposure Frequency (visits/yr)
Benzo(a)anthracene	0.302	50	2	15	25	7	70	0.000001	1	10
Benzo(a)pyrene	0.48	50	2	15	25	7	70	0.000001	1	10
Benzo(b)fluoranthene	0.41	50	2	15	25	7	70	0.000001	1	10
Indeno(1,2,3-cd)pyrene	0.19	50	2	15	25	7	70	0.000001	1	10

	AT	IF	SF	CR
Chemical	Averaging Time (days)	Intake Factor (kg/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Benzo(a)anthracene	25550	3.59E-09	7.30E-01	7.91E-10
Benzo(a)pyrene	25550	3.59E-09	7.30E+00	1.26E-08
Benzo(b)fluoranthene	25550	3.59E-09	7.30E-01	1.07E-09
Indeno(1,2,3-cd)pyrene	25550	3.59E-09	7.30E-01	4.98E-10
		Total Chemical Cancer Risk		1.49E-08

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

CT - Time-weighted average stream/dry sediment ingestion

Radionuclides

$$IF = [(IR\text{-}C \times ED\text{-}C) + (IR\text{-}A \times ED\text{-}A)] \times EF \times ME \times CF$$
$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	IR-A	ED-A	ME	CF	EF	IF	SF	CR
		Child		Adult							
Chemical	Sediment Concentration (pCi/g)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Matrix Effect	Conversion Factor (g/mg)	Exposure Frequency (visits/yr)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.66	50	2	25	7	1	0.001	10	2.75E+00	3.28E-10	5.95E-10
Plutonium-239/240	1.392	50	2	25	7	1	0.001	10	2.75E+00	3.16E-10	1.21E-09
										Total Radionuclide Cancer Risk	1.80E-09

Total Cancer Risk 1.67E-08

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

RME - Stream/dry sediment ingestion

Noncarcinogens - Child

IF =(IR-C x ED-C x EF x ME x CF)/(BW-C x AT-C)
HQ = (C x IF)/RfD

Chemical	C Sediment Concentration (mg/kg)	IR-C Ingestion Rate (mg/visit)	ED-C Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-C Body Weight (kg)	AT-C Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Cobalt	8.77	100	6	25	1	0.000001	15	2190	4.57E-07	6.00E-02	6.67E-05
Strontium	74.49	100	6	25	1	0.000001	15	2190	4.57E-07	6.00E-01	5.67E-05
Vanadium	26.66	100	6	25	0.5	0.000001	15	2190	2.28E-07	7.00E-03	8.70E-04
Zinc	152.6	100	6	25	0.5	0.000001	15	2190	2.28E-07	3.00E-01	1.16E-04
										Total Hazard Index - Child	1.11E-03

Noncarcinogens - Adult

IF =(IR-A x ED-A x EF x ME x CF)/(BW-A x AT-A)
HQ = (C x IF)/RfD

Chemical	C Sediment Concentration (mg/kg)	IR-A Ingestion Rate (mg/visit)	ED-A Exposure Duration (years)	EF Exposure Frequency (visits/yr)	ME Matrix Effect	CF Conversion Factor (kg/mg)	BW-A Body Weight (kg)	AT-A Averaging Time (days)	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Cobalt	8.77	50	24	25	1	0.000001	70	8760	4.89E-08	6.00E-02	7.15E-06
Strontium	74.49	50	24	25	1	0.000001	70	8760	4.89E-08	6.00E-01	6.07E-06
Vanadium	26.66	50	24	25	0.5	0.000001	70	8760	2.45E-08	7.00E-03	9.32E-05
Zinc	152.6	50	24	25	0.5	0.000001	70	8760	2.45E-08	3.00E-01	1.24E-05
										Total Hazard Index - Adult	1.19E-04

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

RME - Time-weighted average stream/dry sediment ingestion

Nonradionuclide Carcinogens

$$IF = ([(IR\text{-}C \times ED\text{-}C)/(BW\text{-}C) + (IR\text{-}A \times ED\text{-}A)/(BW\text{-}A)] \times EF \times ME \times CF)/AT$$

$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	BW-C	IR-A	ED-A	BW-A	CF	ME	EF
		Child				Adult				
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Conversion Factor (kg/mg)	Matrix Effect	Exposure Frequency (visits/yr)
Benzo(a)anthracene	0.302	100	6	15	50	24	70	0.000001	1	25
Benzo(a)pyrene	0.48	100	6	15	50	24	70	0.000001	1	25
Benzo(b)fluoranthene	0.41	100	6	15	50	24	70	0.000001	1	25
Indeno(1,2,3-cd)pyrene	0.19	100	6	15	50	24	70	0.000001	1	25

	AT	IF	SF	CR
Chemical	Averaging Time (days)	Intake Factor (kg/kg-day)	Slope Factor (mg/kg-day)	Cancer Risk
Benzo(a)anthracene	25550	5.59E-08	7.30E-01	1.23E-08
Benzo(a)pyrene	25550	5.59E-08	7.30E+00	1.96E-07
Benzo(b)fluoranthene	25550	5.59E-08	7.30E-01	1.67E-08
Indeno(1,2,3-cd)pyrene	25550	5.59E-08	7.30E-01	7.76E-09
		Total Chemical Cancer Risk		2.33E-07

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

RME - Time-weighted average stream/dry sediment ingestion

Radionuclides

IF =[(IR-C x ED-C) + (IR-A x ED-A)] x EF x ME x CF
CR = C x IF x SF

	C	IR-C	ED-C	IR-A	ED-A	ME	CF	EF	IF	SF	CR
		Child		Adult							
Chemical	Sediment Concentration (pCi/g)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Matrix Effect	Conversion Factor (g/mg)	Exposure Frequency (visits/yr)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.66	100	6	50	24	1	0.001	25	4.50E+01	3.28E-10	9.74E-09
Plutonium-239/240	1.392	100	6	50	24	1	0.001	25	4.50E+01	3.16E-10	1.98E-08
									Total Radionuclide Cancer Risk		2.95E-08

Total Cancer Risk 2.62E-07

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

CT - Inhalation of particulates from stream/dry sediment

Radionuclides

IF = (IR x ET x EF x ED x DF x RF x CF)/PEF
CR = C x IF x SF

	C	IR	ET	EF	ED	DF	RF	CF	PEF	IF	SF	CR
Radionuclide	Sediment Concentration (pCi/g)	Inhalation Rate (m^3/day)	Exposure Time (hr/visit)	Exposure Frequency (days/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Respirable Fraction	Conversion Factor (g/kg)	Particulate Emission Factor (m^3/kg)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.66	0.83	1.5	10	9	0.85	1	1000	4.63E+09	2.06E-05	3.85E-08	5.23E-13
Plutonium-239/240	1.392	0.83	1.5	10	9	0.85	1	1000	4.63E+09	2.06E-05	2.78E-08	7.96E-13
											Total Radionuclide Cancer Risk	1.32E-12

Total Cancer Risk 1.32E-12

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

RME - Inhalation of particulates from stream/dry sediment

Radionuclides

IF = (IR x ET x EF x ED x DF x RF x CF)/PEF
CR = C x IF x SF

	C	IR	ET	EF	ED	DF	RF	CF	PEF	IF	SF	CR
Radionuclide	Sediment Concentration (pCi/g)	Inhalation Rate (m^3/day)	Exposure Time (hr/visit)	Exposure Frequency (days/yr)	Exposure Duration (years)	Respiratory Deposition Factor	Respirable Fraction	Conversion Factor (g/kg)	Particulate Emission Factor (m^3/kg)	Intake Factor (g)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.66	1.4	5	25	30	0.85	1	1000	4.63E+09	9.64E-04	3.85E-08	2.45E-11
Plutonium-239/240	1.392	1.4	5	25	30	0.85	1	1000	4.63E+09	9.64E-04	2.78E-08	3.73E-11
											Total Radionuclide Cancer Risk	6.18E-11

Total Cancer Risk 6.18E-11

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

CT - Dermal contact with pond sediment

Noncarcinogens

$$IF = (SA \times FC \times AD \times AB \times EF \times ED \times CF)/(BW \times AT)$$
$$HQ = (C \times IF)/RfD$$

Chemical	C Sediment Concentration (mg/kg)	SA Skin Surface Area (cm^2)	FC Fraction Contaminated	AD Soil Adherence (mg/cm^2)	AB Skin Absorption	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)
Aroclor-1254	2.424	2000	0.5	0.2	0.06	10	9	0.000001	70	3285
Bis(2-ethylhexyl)phthalate	30.26	2000	0.5	0.2	0.01	10	9	0.000001	70	3285

Chemical	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Aroclor-1254	4.70E-09	2.00E-05	5.69E-04
Bis(2-ethylhexyl)phthalate	7.83E-10	2.00E-02	1.18E-06
		Total Hazard Index	5.70E-04

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

CT - Dermal contact with pond sediment

Nonradionuclide carcinogens

IF = (SA x FC x AD x AB x EF x ED x CF)/(BW x AT)
CR = C x IF x SF

	C	SA	FC	AD	AB	EF	ED	CF	BW	AT
Chemical	Sediment Concentration (mg/kg)	Skin Surface Area (cm^2)	Fraction Contaminated	Soil Adherence (mg/cm^2)	Skin Absorption	Exposure Frequency (days/yr)	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)
Aroclor-1254	2.424	2000	0.5	0.2	0.06	10	9	0.000001	70	25550
Bis(2-ethylhexyl)phthalate	30.26	2000	0.5	0.2	0.01	10	9	0.000001	70	25550

	IF	SF	CR
Chemical	Intake Factor (kg/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Aroclor-1254	6.04E-10	7.70E+00	1.13E-08
Bis(2-ethylhexyl)phthalate	1.01E-10	1.40E-02	4.26E-11
		Total Cancer Risk	1.13E-08

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

RME - Dermal contact with pond sediment

Noncarcinogens

$$IF = (SA \times FC \times AD \times AB \times EF \times ED \times CF)/(BW \times AT)$$
$$HQ = (C \times IF)/RfD$$

Chemical	C Sediment Concentration (mg/kg)	SA Skin Surface Area (cm^2)	FC Fraction Contaminated	AD Soil Adherence (mg/cm^2)	AB Skin Absorption	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	CF Conversion Factor (kg/mg)	BW Body Weight (kg)	AT Averaging Time (days)
Aroclor-1254	2.424	5300	1	1	0.06	25	30	0.000001	70	10950
Bis(2-ethylhexyl)phthalate	30.26	5300	1	1	0.01	25	30	0.000001	70	10950

Chemical	IF Intake Factor (kg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
Aroclor-1254	3.11E-07	2.00E-05	3.77E-02
Bis(2-ethylhexyl)phthalate	5.19E-08	2.00E-02	7.85E-05
		Total Hazard Index	3.78E-02

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

RME - Dermal contact with pond sediment

Nonradionuclide carcinogens

$$IF = (SA \times FC \times AD \times AB \times EF \times ED \times CF)/(BW \times AT)$$
$$CR = C \times IF \times SF$$

	C	SA	FC	AD	AB	EF	ED	CF	BW	AT
Chemical	Sediment Concentration (mg/kg)	Skin Surface Area (cm^2)	Fraction Contaminated	Soil Adherence (mg/cm^2)	Skin Absorption	Exposure Frequency (days/yr)	Exposure Duration (years)	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)
Aroclor-1254	2.424	5300	1	1	0.06	25	30	0.000001	70	25550
Bis(2-ethylhexyl)phthalate	30.26	5300	1	1	0.01	25	30	0.000001	70	25550

	IF	SF	CR
Chemical	Intake Factor (kg/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Aroclor-1254	1.33E-07	7.70E+00	2.49E-06
Bis(2-ethylhexyl)phthalate	2.22E-08	1.40E-02	9.42E-09
		Total Cancer Risk	2.50E-06

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

CT - Ingestion of surface water

Noncarcinogens

IF = (IR x ET x EF x ED)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Surface Water Concentration (mg/l)	IR Ingestion Rate (l/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (l/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
1,2-Dichloroethene	0.00253	0.025	0.5	5	9	70	3285	2.45E-06	9.00E-03	6.88E-07
Antimony	9.69E-08	0.025	0.5	5	9	70	3285	2.45E-06	4.00E-04	5.93E-10
Chloroform	0.002	0.025	0.5	5	9	70	3285	2.45E-06	1.00E-02	4.89E-07
Di-n-butylphthalate	0.001	0.025	0.5	5	9	70	3285	2.45E-06	1.00E-01	2.45E-08
									Total Hazard Index	1.20E-06

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

CT - Ingestion of surface water

Nonradionuclide carcinogens

IF = (IR x ET x EF x ED)/(BW x AT)
CR = C x IF x SF

	C	IR	ET	EF	ED	BW	AT	IF	SF	CR
Chemical	Surface Water Concentration (mg/l)	Ingestion Rate (l/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Chloroform	0.002	0.025	0.5	5	9	70	25550	3.15E-07	6.10E-03	3.84E-12
Trichloroethene	0.00296	0.025	0.5	5	9	70	25550	3.15E-07	1.10E-02	1.02E-11
									Total Chemical Cancer Risk	1.41E-11

Radionuclides

IF = IR x ET x EF x ED
CR = C x IF x SF

	C	IR	ET	EF	ED	IF	SF	CR
Radionuclide	Surface Water Concentration (pCi/l)	Ingestion Rate (l/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Intake Factor (l)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.167	0.025	0.5	5	9	5.63E-01	3.28E-10	3.08E-11
Plutonium-239/240	0.069	0.025	0.5	5	9	5.63E-01	3.16E-10	1.23E-11
							Total Radionuclide Cancer Risk	4.31E-11

Total Cancer Risk 5.72E-11

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

RME - Ingestion of surface water

Noncarcinogens

IF = (IR x ET x EF x ED)/(BW x AT)
HQ = (C x IF)/RfD

Chemical	C Surface Water Concentration (mg/l)	IR Ingestion Rate (l/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (l/kg-day)	RfD Reference Dose (mg/kg-day)	HQ Hazard Quotient
1,2-Dichloroethene	0.00253	0.05	1	15	30	70	10950	2.94E-05	9.00E-03	8.25E-06
Antimony	9.69E-08	0.05	1	15	30	70	10950	2.94E-05	4.00E-04	7.11E-09
Chloroform	0.002	0.05	1	15	30	70	10950	2.94E-05	1.00E-02	5.87E-06
Di-n-butylphthalate	0.001	0.05	1	15	30	70	10950	2.94E-05	1.00E-01	2.94E-07
									Total Hazard Index	1.44E-05

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

RME - Ingestion of surface water

Nonradionuclide carcinogens

IF = (IR x ET x EF x ED)/(BW x AT)
CR = C x IF x SF

	C	IR	ET	EF	ED	BW	AT	IF	SF	CR
Chemical	Surface Water Concentration (mg/l)	Ingestion Rate (l/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Chloroform	0.002	0.05	1	15	30	70	25550	1.26E-05	6.10E-03	1.53E-10
Trichloroethene	0.00296	0.05	1	15	30	70	25550	1.26E-05	1.10E-02	4.10E-10
									Total Chemical Cancer Risk	5.63E-10

Radionuclides

IF = IR x ET x EF x ED
CR = C x IF x SF

	C	IR	ET	EF	ED	IF	SF	CR
Radionuclide	Surface Water Concentration (pCi/l)	Ingestion Rate (l/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Exposure Duration (years)	Intake Factor (l)	Slope Factor (Risk/pCi)	Cancer Risk
Americium-241	0.167	0.05	1	15	30	2.25E+01	3.28E-10	1.23E-09
Plutonium-239/240	0.069	0.05	1	15	30	2.25E+01	3.16E-10	4.91E-10
							Total Radionuclide Cancer Risk	1.72E-09

Total Cancer Risk 2.29E-09

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

CT - Dermal contact with surface water

Noncarcinogens

$$IF = (SA \times DP \times ET \times EF \times ED \times CF)/(BW \times AT)$$
$$HQ = (C \times IF)/RfD$$

	C	SA	DP	ET	EF	ED	CF	BW	AT	IF	RfD	HQ
Chemical	Surface Water Concentration (mg/l)	Skin Surface Area (cm^2)	Dermal Permeability (cm/hr)	Exposure Time (hr/day)	Exposure Frequency (day/yr)	Exposure Duration (years)	Conversion Factor (l/cm^3)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
1,2-Dichloroethene	0.00253	4550	0.01	0.5	5	9	0.001	70	3285	4.45E-06	9.00E-03	1.25E-06
Chloroform	0.002	4550	0.13	0.5	5	9	0.001	70	3285	5.79E-05	1.00E-02	1.16E-05
Di-n-butylphthalate	0.001	4550	0.07	0.5	5	9	0.001	70	3285	3.12E-05	1.00E-01	3.12E-07
											Total Hazard Index	1.31E-05

Nonradionuclide carcinogens

$$IF = (SA \times DP \times ET \times EF \times ED \times CF)/(BW \times AT)$$
$$CR = C \times IF \times SF$$

	C	SA	DP	ET	EF	ED	CF	BW	AT	IF	SF	CR
Chemical	Surface Water Concentration (mg/l)	Skin Surface Area (cm^2)	Dermal Permeability (cm/hr)	Exposure Time (hr/day)	Exposure Frequency (day/yr)	Exposure Duration (years)	Conversion Factor (l/cm^3)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Chloroform	0.002	4550	0.13	0.5	5	9	0.001	70	25550	7.44E-06	6.10E-03	9.08E-11
Trichloroethene	0.00296	4550	0.23	0.5	5	9	0.001	70	25550	1.32E-05	1.10E-02	4.29E-10
											Total Cancer Risk	5.19E-10

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

RME - Dermal contact with surface water

Noncarcinogens

IF = (SA x DP x ET x EF x ED x CF)/(BW x AT)
HQ = (C x IF)/RfD

	C	SA	DP	ET	EF	ED	CF	BW	AT	IF	RfD	HQ
Chemical	Surface Water Concentration (mg/l)	Skin Surface Area (cm^2)	Dermal Permeability (cm/hr)	Exposure Time (hr/day)	Exposure Frequency (day/yr)	Exposure Duration (years)	Conversion Factor (l/cm^3)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
1,2-Dichloroethene	0.00253	9275	0.01	1	15	30	0.001	70	10950	5.45E-05	9.00E-03	1.53E-05
Chloroform	0.002	9275	0.13	1	15	30	0.001	70	10950	7.08E-04	1.00E-02	1.42E-04
Di-n-butylphthalate	0.001	9275	0.07	1	15	30	0.001	70	10950	3.81E-04	1.00E-01	3.81E-06
											Total Hazard Index	1.61E-04

Nonradionuclide carcinogens

IF = (SA x DP x ET x EF x ED x CF)/(BW x AT)
CR = C x IF x SF

	C	SA	DP	ET	EF	ED	CF	BW	AT	IF	SF	CR
Chemical	Surface Water Concentration (mg/l)	Skin Surface Area (cm^2)	Dermal Permeability (cm/hr)	Exposure Time (hr/day)	Exposure Frequency (day/yr)	Exposure Duration (years)	Conversion Factor (l/cm^3)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Chloroform	0.002	9275	0.13	1	15	30	0.001	70	25550	3.03E-04	6.10E-03	3.70E-09
Trichloroethene	0.00296	9275	0.23	1	15	30	0.001	70	25550	5.37E-04	1.10E-02	1.75E-08
											Total Cancer Risk	2.12E-08

OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

CT - External irradiation from stream/dry sediment

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (T_e)	GSF Gamma Shielding Factor ($1-S_e$)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	0.66	0.1	0.8	0.03	9	2.16E-02	4.59E-09	6.54E-11
Plutonium-239/240	1.392	0.1	0.8	0.03	9	2.16E-02	1.37E-11	4.12E-13
							Total Cancer Risk	6.58E-11

RME - External irradiation from stream/dry sediment

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	TF Gamma Time Factor (T_e)	GSF Gamma Shielding Factor ($1-S_e$)	EF Percent of year Exposed	ED Exposure Duration (years)	IF Intake Factor (years)	SF Slope Factor (1/pCi-yr/g)	CR Cancer Risk
Americium-241	0.66	0.2	1	0.07	30	4.20E-01	4.59E-09	1.27E-09
Plutonium-239/240	1.392	0.2	1	0.07	30	4.20E-01	1.37E-11	8.01E-12
							Total Cancer Risk	1.28E-09

CHEMICALS OF INTEREST IN GROUNDWATER
RESIDENTIAL EXPOSURE
AOC NO. 2

CT - Groundwater Ingestion

Noncarcinogens

IF = (IR x FC x EF x ED)/(BW x AT)

HQ = (C x IF)/RfD

	C	IR	FC	EF	ED	BW	AT	IF	RfD	HQ
Chemical	Groundwater Concentration (mg/l)	Ingestion Rate (l/day)	Fraction Ingested from Source	Exposure Frequency (days/yr)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Antimony	0.0165	1.4	0.3	234	9	70	3285	3.85E-03	4.00E-04	1.59E-01
Arsenic	0.00248	1.4	0.3	234	9	70	3285	3.85E-03	3.00E-04	3.18E-02
Beryllium	0.001	1.4	0.3	234	9	70	3285	3.85E-03	5.00E-03	7.69E-04
Manganese (in water)	1.448	1.4	0.3	234	9	70	3285	3.85E-03	5.00E-03	1.11E+00
									Total Hazard Index	1.31E+00

Nonradionuclide Carcinogens

IF = (IR x FC x EF x ED)/(BW x AT)

CR = C x IF x SF

	C	IR	FC	EF	ED	BW	AT	IF	SF	CR
Chemical	Groundwater Concentration (mg/l)	Ingestion Rate (l/day)	Fraction Ingested from Source	Exposure Frequency (days/yr)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Antimony	0.0165	1.4	0.3	234	9	70	25550	4.95E-04	-	-
Arsenic	0.00248	1.4	0.3	234	9	70	25550	4.95E-04	1.70E+00	2.09E-06
Beryllium	0.001	1.4	0.3	234	9	70	25550	4.95E-04	4.30E+00	2.13E-06
Manganese (in water)	1.448	1.4	0.3	234	9	70	25550	4.95E-04	-	-
									Total Cancer Risk	4.21E-06

CHEMICALS OF INTEREST IN GROUNDWATER
RESIDENTIAL EXPOSURE
AOC NO. 2

RME - Groundwater Ingestion

Noncarcinogens

IF = (IR x FC x EF x ED)/(BW x AT)

HQ = (C x IF)/RfD

	C	IR	FC	EF	ED	BW	AT	IF	RfD	HQ
Chemical	Groundwater Concentration (mg/l)	Ingestion Rate (l/day)	Fraction Ingested from Source	Exposure Frequency (days/yr)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Antimony	0.0165	2	1	350	30	70	10950	2.74E-02	4.00E-04	1.13E+00
Arsenic	0.00248	2	1	350	30	70	10950	2.74E-02	3.00E-04	2.26E-01
Beryllium	0.001	2	1	350	30	70	10950	2.74E-02	5.00E-03	5.48E-03
Manganese (in water)	1.448	2	1	350	30	70	10950	2.74E-02	5.00E-03	7.93E+00
									Total Hazard Index	9.30E+00

Nonradionuclide Carcinogens

IF = (IR x FC x EF x ED)/(BW x AT)

CR = C x IF x SF

	C	IR	FC	EF	ED	BW	AT	IF	SF	CR
Chemical	Groundwater Concentration (mg/l)	Ingestion Rate (l/day)	Fraction Ingested from Source	Exposure Frequency (days/yr)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Antimony	0.0165	2	1	350	30	70	25550	1.17E-02	-	-
Arsenic	0.00248	2	1	350	30	70	25550	1.17E-02	1.70E+00	4.95E-05
Beryllium	0.001	2	1	350	30	70	25550	1.17E-02	4.30E+00	5.05E-05
Manganese (in water)	1.448	2	1	350	30	70	25550	1.17E-02	-	-
									Total Chemical Risk	1.00E-04

CHEMICALS OF INTEREST IN GROUNDWATER
RESIDENTIAL EXPOSURE
BACKGROUND

CT - Groundwater Ingestion

Noncarcinogens

IF = (IR x FC x EF x ED)/(BW x AT)

HQ = (C x IF)/RfD

	C	IR	FC	EF	ED	BW	AT	IF	RfD	HQ
Chemical	Groundwater Concentration (mg/l)	Ingestion Rate (l/day)	Fraction Ingested from Source	Exposure Frequency (days/yr)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Antimony	0.017	1.4	0.3	234	9	70	3285	3.85E-03	4.00E-04	1.63E-01
Arsenic	0.002	1.4	0.3	234	9	70	3285	3.85E-03	3.00E-04	2.56E-02
Beryllium	0.001	1.4	0.3	234	9	70	3285	3.85E-03	5.00E-03	7.69E-04
Manganese (in water)	0.112	1.4	0.3	234	9	70	3285	3.85E-03	5.00E-03	8.62E-02
									Total Hazard Index	2.76E-01

Nonradionuclide Carcinogens

IF = (IR x FC x EF x ED)/(BW x AT)

CR = C x IF x SF

	C	IR	FC	EF	ED	BW	AT	IF	SF	CR
Chemical	Groundwater Concentration (mg/l)	Ingestion Rate (l/day)	Fraction Ingested from Source	Exposure Frequency (days/yr)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Antimony	0.017	1.4	0.3	234	9	70	25550	4.95E-04	-	-
Arsenic	0.002	1.4	0.3	234	9	70	25550	4.95E-04	1.70E+00	1.68E-06
Beryllium	0.001	1.4	0.3	234	9	70	25550	4.95E-04	4.30E+00	2.13E-06
Manganese (in water)	0.112	1.4	0.3	234	9	70	25550	4.95E-04	-	-
									Total Cancer Risk	3.81E-06

CHEMICALS OF INTEREST IN GROUNDWATER
RESIDENTIAL EXPOSURE
BACKGROUND

RME - Groundwater Ingestion

Noncarcinogens

IF = (IR x FC x EF x ED)/(BW x AT)

HQ = (C x IF)/RfD

	C	IR	FC	EF	ED	BW	AT	IF	RfD	HQ
Chemical	Groundwater Concentration (mg/l)	Ingestion Rate (l/day)	Fraction Ingested from Source	Exposure Frequency (days/yr)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Antimony	0.017	2	1	350	30	70	10950	2.74E-02	4.00E-04	1.16E+00
Arsenic	0.002	2	1	350	30	70	10950	2.74E-02	3.00E-04	1.83E-01
Beryllium	0.001	2	1	350	30	70	10950	2.74E-02	5.00E-03	5.48E-03
Manganese (in water)	0.112	2	1	350	30	70	10950	2.74E-02	5.00E-03	6.14E-01
									Total Hazard Index	1.97E+00

Nonradionuclide Carcinogens

IF = (IR x FC x EF x ED)/(BW x AT)

CR = C x IF x SF

	C	IR	FC	EF	ED	BW	AT	IF	SF	CR
Chemical	Groundwater Concentration (mg/l)	Ingestion Rate (l/day)	Fraction Ingested from Source	Exposure Frequency (days/yr)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (days)	Intake Factor (l/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Antimony	0.017	2	1	350	30	70	25550	1.17E-02	-	-
Arsenic	0.002	2	1	350	30	70	25550	1.17E-02	1.70E+00	3.99E-05
Beryllium	0.001	2	1	350	30	70	25550	1.17E-02	4.30E+00	5.05E-05
Manganese (in water)	0.112	2	1	350	30	70	25550	1.17E-02	-	-
									Total Chemical Risk	9.04E-05

VINYL CHLORIDE IN GROUNDWATER
RESIDENTIAL EXPOSURE
AOC NO. 2

CT - Groundwater Ingestion

Nonradionuclide Carcinogens

IF = (IR x FC x EF x ED)/(BW x AT)

CR = C x IF x SF

Chemical	C Groundwater Concentration (mg/l)	IR Ingestion Rate (l/day)	FC Fraction Ingested from Source	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (l/kg-day)	SF Slope Factor 1/(mg/kg-day)	CR Cancer Risk
Vinyl chloride	0.461	1.4	0.3	234	9	70	25550	4.95E-04	1.90E+00	4.33E-04
									Total Cancer Risk	4.33E-04

RME - Groundwater Ingestion

Nonradionuclide Carcinogens

IF = (IR x FC x EF x ED)/(BW x AT)

CR = C x IF x SF

Chemical	C Groundwater Concentration (mg/l)	IR Ingestion Rate (l/day)	FC Fraction Ingested from Source	EF Exposure Frequency (days/yr)	ED Exposure Duration (years)	BW Body Weight (kg)	AT Averaging Time (days)	IF Intake Factor (l/kg-day)	SF Slope Factor 1/(mg/kg-day)	CR Cancer Risk
Vinyl chloride	0.461	2	1	350	30	70	25550	1.17E-02	1.90E+00	1.03E-02
									Total Chemical Risk	1.03E-02

ARSENIC IN STREAM/DRY SEDIMENT
OPEN SPACE RECREATIONAL USE
AOC NO. 3

CT - Stream/dry sediment ingestion

Noncarcinogens - Child

IF =(IR-C x ED-C x EF x ME x CF)/(BW-C x AT-C)
HQ = (C x IF)/RfD

	C	IR-C	ED-C	EF	ME	CF	BW-C	AT-C	IF	RfD	HQ
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Arsenic	6.49	15	2	10	0.5	0.000001	15	730	8.89E-08	3.00E-04	1.92E-03
										Total Hazard Index - Child	1.92E-03

Noncarcinogens - Adult

IF =(IR-A x ED-A x EF x ME x CF)/(BW-A x AT-A)
HQ = (C x IF)/RfD

	C	IR-A	ED-A	EF	ME	CF	BW-A	AT-A	IF	RfD	HQ
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Arsenic	6.49	8	7	10	0.5	0.000001	70	2555	1.57E-09	3.00E-04	3.39E-05
										Total Hazard Index - Adult	3.39E-05

ARSENIC IN STREAM/DRY SEDIMENT
OPEN SPACE RECREATIONAL USE
AOC NO. 3

CT - Time-weighted average stream/dry sediment ingestion

Nonradionuclide Carcinogens

$$IF = [(IR\text{-}C \times ED\text{-}C)/(BW\text{-}C) + (IR\text{-}A \times ED\text{-}A)/(BW\text{-}A)] \times (EF \times ME \times CF)/AT$$

$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	BW-C	IR-A	ED-A	BW-A	CF	ME	EF
		Child			Adult					
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Conversion Factor (kg/mg)	Matrix Effect	Exposure Frequency (visits/yr)
Arsenic	6.49	15	2	15	8	7	70	0.000001	0.5	10

	AT	IF	SF	CR
Chemical	Averaging Time (days)	Intake Factor (kg/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Arsenic	25550	5.48E-10	1.70E+00	6.05E-09
		Total Chemical Cancer Risk		6.05E-09

ARSENIC IN STREAM/DRY SEDIMENT
OPEN SPACE RECREATIONAL USE
AOC NO. 3

RME - Stream/dry sediment ingestion

Noncarcinogens - Child

IF =(IR-C x ED-C x EF x ME x CF)/(BW-C x AT-C)
HQ = (C x IF)/RfD

	C	IR-C	ED-C	EF	ME	CF	BW-C	AT-C	IF	RfD	HQ
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Arsenic	6.49	100	6	25	0.5	0.000001	15	2190	2.28E-07	3.00E-04	4.94E-03
										Total Hazard Index - Child	4.94E-03

Noncarcinogens - Adult

IF =(IR-A x ED-A x EF x ME x CF)/(BW-A x AT-A)
HQ = (C x IF)/RfD

	C	IR-A	ED-A	EF	ME	CF	BW-A	AT-A	IF	RfD	HQ
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Arsenic	6.49	50	24	25	0.5	0.000001	70	8760	2.45E-08	3.00E-04	5.29E-04
										Total Hazard Index - Adult	5.29E-04

ARSENIC IN STREAM/DRY SEDIMENT
OPEN SPACE RECREATIONAL USE
AOC NO. 3

RME - Time-weighted average stream/dry sediment ingestion

Nonradionuclide Carcinogens

$$IF = ([(IR\text{-}C \times ED\text{-}C)/(BW\text{-}C) + (IR\text{-}A \times ED\text{-}A)/(BW\text{-}A)] \times EF \times ME \times CF)/AT$$

$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	BW-C	IR-A	ED-A	BW-A	CF	ME	EF
		Child			Adult					
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Conversion Factor (kg/mg)	Matrix Effect	Exposure Frequency (visits/yr)
Arsenic	6.49	100	6	15	50	24	70	0.000001	0.5	25

	AT	IF	SF	CR
Chemical	Averaging Time (days)	Intake Factor (kg/kg-day)	Slope Factor (mg/kg-day)	Cancer Risk
Arsenic	25550	2.80E-08	1.70E+00	3.08E-07
		Total Chemical Cancer Risk		3.08E-07

ARSENIC IN STREAM/DRY SEDIMENT
OPEN SPACE RECREATIONAL USE
AOC NO. 4

CT - Stream/dry sediment ingestion

Noncarcinogens - Child

IF =(IR-C x ED-C x EF x ME x CF)/(BW-C x AT-C)
HQ = (C x IF)/RfD

	C	IR-C	ED-C	EF	ME	CF	BW-C	AT-C	IF	RfD	HQ
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Arsenic	4.88	15	2	10	0.5	0.000001	15	730	6.68E-08	3.00E-04	1.09E-03
									Total Hazard Index - Child		1.09E-03

Noncarcinogens - Adult

IF =(IR-A x ED-A x EF x ME x CF)/(BW-A x AT-A)
HQ = (C x IF)/RfD

	C	IR-A	ED-A	EF	ME	CF	BW-A	AT-A	IF	RfD	HQ
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Arsenic	4.88	8	7	10	0.5	0.000001	70	2555	1.57E-09	3.00E-04	2.55E-05
									Total Hazard Index - Adult		2.55E-05

ARSENIC IN STREAM/DRY SEDIMENT
OPEN SPACE RECREATIONAL USE
AOC NO. 4

CT - Time-weighted average stream/dry sediment ingestion

Nonradionuclide Carcinogens

$$IF = [(IR\text{-}C \times ED\text{-}C)/(BW\text{-}C) + (IR\text{-}A \times ED\text{-}A)/(BW\text{-}A)] \times (EF \times ME \times CF)/AT$$

$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	BW-C	IR-A	ED-A	BW-A	CF	ME	EF
		Child			Adult					
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Conversion Factor (kg/mg)	Matrix Effect	Exposure Frequency (visits/yr)
Arsenic	4.88	15	2	15	8	7	70	0.000001	0.5	10

	AT	IF	SF	CR
Chemical	Averaging Time (days)	Intake Factor (kg/kg-day)	Slope Factor 1/(mg/kg-day)	Cancer Risk
Arsenic	25550	5.48E-10	1.70E+00	4.55E-09
		Total Chemical Cancer Risk		4.55E-09

ARSENIC IN STREAM/DRY SEDIMENT
OPEN SPACE RECREATIONAL USE
AOC NO. 4

RME - Stream/dry sediment ingestion

Noncarcinogens - Child

IF =(IR-C x ED-C x EF x ME x CF)/(BW-C x AT-C)
HQ = (C x IF)/RfD

	C	IR-C	ED-C	EF	ME	CF	BW-C	AT-C	IF	RfD	HQ
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Arsenic	4.88	100	6	25	0.5	0.000001	15	2190	2.28E-07	3.00E-04	3.71E-03
										Total Hazard Index - Child	3.71E-03

Noncarcinogens - Adult

IF =(IR-A x ED-A x EF x ME x CF)/(BW-A x AT-A)
HQ = (C x IF)/RfD

	C	IR-A	ED-A	EF	ME	CF	BW-A	AT-A	IF	RfD	HQ
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Arsenic	4.88	50	24	25	0.5	0.000001	70	8760	2.45E-08	3.00E-04	3.98E-04
										Total Hazard Index - Adult	3.98E-04

ARSENIC IN STREAM/DRY SEDIMENT
OPEN SPACE RECREATIONAL USE
AOC NO. 4

RME - Time-weighted average stream/dry sediment ingestion

Nonradionuclide Carcinogens

$$IF = ([(IR\text{-}C \times ED\text{-}C)/(BW\text{-}C) + (IR\text{-}A \times ED\text{-}A)/(BW\text{-}A)] \times EF \times ME \times CF)/AT$$

$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	BW-C	IR-A	ED-A	BW-A	CF	ME	EF
		Child			Adult					
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Conversion Factor (kg/mg)	Matrix Effect	Exposure Frequency (visits/yr)
Arsenic	4.88	100	6	15	50	24	70	0.000001	0.5	25

	AT	IF	SF	CR
Chemical	Averaging Time (days)	Intake Factor (kg/kg-day)	Slope Factor (mg/kg-day)	Cancer Risk
Arsenic	25550	2.80E-08	1.70E+00	2.32E-07
		Total Chemical Cancer Risk		2.32E-07

ARSENIC IN BACKGROUND STREAM SEDIMENT
OPEN SPACE RECREATIONAL USE

CT - Stream/dry sediment ingestion

Noncarcinogens - Child

IF =(IR-C x ED-C x EF x ME x CF)/(BW-C x AT-C)
HQ = (C x IF)/RfD

	C	IR-C	ED-C	EF	ME	CF	BW-C	AT-C	IF	RfD	HQ
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Arsenic	4.9	15	2	10	0.5	0.000001	15	730	6.71E-08	3.00E-04	1.10E-03
									Total Hazard Index - Child		1.10E-03

Noncarcinogens - Adult

IF =(IR-A x ED-A x EF x ME x CF)/(BW-A x AT-A)
HQ = (C x IF)/RfD

	C	IR-A	ED-A	EF	ME	CF	BW-A	AT-A	IF	RfD	HQ
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Arsenic	4.9	8	7	10	0.5	0.000001	70	2555	1.57E-09	3.00E-04	2.56E-05
									Total Hazard Index - Adult		2.56E-05

ARSENIC IN BACKGROUND STREAM SEDIMENT
OPEN SPACE RECREATIONAL USE

CT - Time-weighted average stream/dry sediment ingestion

Nonradionuclide Carcinogens

$$IF = [(IR\text{-}C \times ED\text{-}C)/(BW\text{-}C) + (IR\text{-}A \times ED\text{-}A)/(BW\text{-}A)] \times (EF \times ME \times CF)/AT$$

$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	BW-C	IR-A	ED-A	BW-A	CF	ME	EF
		Child			Adult					
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Conversion Factor (kg/mg)	Matrix Effect	Exposure Frequency (visits/yr)
Arsenic	4.9	15	2	15	8	7	70	0.000001	0.5	10

Chemical	AT Averaging Time (days)	IF Intake Factor (kg/kg-day)	SF Slope Factor 1/(mg/kg-day)	CR Cancer Risk
Arsenic	25550	5.48E-10	1.70E+00	4.56E-09
		Total Chemical Cancer Risk		4.56E-09

ARSENIC IN BACKGROUND STREAM SEDIMENT
OPEN SPACE RECREATIONAL USE

RME - Stream/dry sediment ingestion

Noncarcinogens - Child

IF =(IR-C x ED-C x EF x ME x CF)/(BW-C x AT-C)
HQ = (C x IF)/RfD

	C	IR-C	ED-C	EF	ME	CF	BW-C	AT-C	IF	RfD	HQ
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Arsenic	4.9	100	6	25	0.5	0.000001	15	2190	2.28E-07	3.00E-04	3.73E-03
									Total Hazard Index - Child		3.73E-03

Noncarcinogens - Adult

IF =(IR-A x ED-A x EF x ME x CF)/(BW-A x AT-A)
HQ = (C x IF)/RfD

	C	IR-A	ED-A	EF	ME	CF	BW-A	AT-A	IF	RfD	HQ
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (kg/mg)	Body Weight (kg)	Averaging Time (days)	Intake Factor (kg/kg-day)	Reference Dose (mg/kg-day)	Hazard Quotient
Arsenic	4.9	50	24	25	0.5	0.000001	70	8760	2.45E-08	3.00E-04	4.00E-04
									Total Hazard Index - Adult		4.00E-04

ARSENIC IN BACKGROUND STREAM SEDIMENT
OPEN SPACE RECREATIONAL USE

RME - Time-weighted average stream/dry sediment ingestion

Nonradionuclide Carcinogens

$$IF = ([(IR\text{-}C \times ED\text{-}C)/(BW\text{-}C) + (IR\text{-}A \times ED\text{-}A)/(BW\text{-}A)] \times EF \times ME \times CF)/AT$$

$$CR = C \times IF \times SF$$

	C	IR-C	ED-C	BW-C	IR-A	ED-A	BW-A	CF	ME	EF
		Child			Adult					
Chemical	Sediment Concentration (mg/kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Ingestion Rate (mg/visit)	Exposure Duration (years)	Body Weight (kg)	Conversion Factor (kg/mg)	Matrix Effect	Exposure Frequency (visits/yr)
Arsenic	4.9	100	6	15	50	24	70	0.000001	0.5	25

Chemical	AT Averaging Time (days)	IF Intake Factor (kg/kg-day)	SF Slope Factor (mg/kg-day)	CR Cancer Risk
Arsenic	25550	2.80E-08	1.70E+00	2.33E-07
		Total Chemical Cancer Risk		2.33E-07

ATTACHMENT J4
RADIATION DOSE CALCULATIONS

SUMMARY OF RADIATION DOSE
CURRENT WORKER
AREA OF CONCERN NO. 1

Pathway	Annual Radiation Exposure	
	Central Tendency	Reasonable Maximum
Ingestion of surface soil	1.11E-03	7.05E-03
Inhalation of particulates from surface soil	1.86E-03	2.36E-03
External Irradiation from surface soil	3.90E-03	7.12E-03
Total Annual Radiation Exposure (mrem/yr)	6.87E-03	1.65E-02

CURRENT INDUSTRIAL WORKER
AREA OF CONCERN NO. 1

CT - Surface soil ingestion

ARI =C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.151	10	0.9	219	1	0.001	2.98E-01	3.64E-03	1.08E-03
Plutonium-239/240	0.284	10	0.9	219	1	0.001	5.60E-01	5.18E-05	2.90E-05
								Total Effective Dose Equivalent	1.11E-03

RME - Surface soil ingestion

ARI =C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.151	50	1	250	1	0.001	1.89E+00	3.64E-03	6.87E-03
Plutonium-239/240	0.284	50	1	250	1	0.001	3.55E+00	5.18E-05	1.84E-04
								Total Effective Dose Equivalent	7.05E-03

CURRENT INDUSTRIAL WORKER
AREA OF CONCERN NO. 1

CT - Inhalation of particulates from surface soil

ARI = C x IR x ET x EF x DF
EDE = ARI x EDC

Radionuclides	C Air Concentration (pCi/m^3)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	DF Respiratory Deposition Factor	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.63E-06	0.83	7.2	219	0.85	1.81E-03	4.44E-01	8.05E-04
Plutonium-239/240	3.07E-06	0.83	7.2	219	0.85	3.42E-03	3.08E-01	1.05E-03
							Total Effective Dose Equivalent	1.86E-03

RME - Inhalation of particulates from surface soil

ARI = C x IR x ET x EF x DF
EDE = ARI x EDC

Radionuclides	C Air Concentration (pCi/m^3)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	DF Respiratory Deposition Factor	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.63E-06	0.83	8	250	0.85	2.30E-03	4.44E-01	1.02E-03
Plutonium-239/240	3.07E-06	0.83	8	250	0.85	4.33E-03	3.08E-01	1.33E-03
							Total Effective Dose Equivalent	2.36E-03

CURRENT INDUSTRIAL WORKER
AREA OF CONCERN NO. 1

CT - External irradiation from surface soil

ER = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor ($1-S_e$)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.151	1840	0.5	0.051	1000	7.08E+03	1.58E+03	3.41E-10	3.81E-03
Plutonium-239/240	0.284	1840	0.5	0.051	1000	1.33E+04	1.58E+03	4.31E-12	9.06E-05
								Total Effective Dose Equivalent	3.90E-03

RME - External irradiation from surface soil

ER = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor ($1-S_e$)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.151	1840	0.8	0.051	1000	1.13E+04	1.80E+03	3.41E-10	6.96E-03
Plutonium-239/240	0.284	1840	0.8	0.051	1000	2.13E+04	1.80E+03	4.31E-12	1.65E-04
								Total Effective Dose Equivalent	7.12E-03

SUMMARY OF RADIATION DOSE
FUTURE OFFICE WORKER
AREA OF CONCERN NO. 1

	Annual Radiation Exposure	
Pathway	Central Tendency	Reasonable Maximum
Ingestion of surface soil	5.56E-04	7.05E-03
Inhalation of particulates from surface soil	1.41E-03	2.36E-03
External Irradiation from surface soil	3.90E-03	7.12E-03
Total Annual Radiation Exposure (mrem/yr)	5.87E-03	1.65E-02

FUTURE OFFICE WORKER
AREA OF CONCERN NO. 1

CT - Surface soil ingestion

ARI =C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.151	5	0.9	219	1	0.001	1.49E-01	3.64E-03	5.42E-04
Plutonium-239/240	0.284	5	0.9	219	1	0.001	2.80E-01	5.18E-05	1.45E-05
								Total Effective Dose Equivalent	5.56E-04

RME - Surface soil ingestion

ARI =C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.151	50	1	250	1	0.001	1.89E+00	3.64E-03	6.87E-03
Plutonium-239/240	0.284	50	1	250	1	0.001	3.55E+00	5.18E-05	1.84E-04
								Total Effective Dose Equivalent	7.05E-03

FUTURE OFFICE WORKER
AREA OF CONCERN NO. 1

CT - Inhalation of particulates from surface soil

ARI = C x IR x ET x EF x DF
EDE = ARI x EDC

	C	IR	ET	EF	DF	ARI	EDC	EDE
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Respiratory Deposition Factor	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	1.63E-06	0.63	7.2	219	0.85	1.38E-03	4.44E-01	6.11E-04
Plutonium-239/240	3.07E-06	0.63	7.2	219	0.85	2.59E-03	3.08E-01	7.98E-04
							Total Effective Dose Equivalent	1.41E-03

RME - Inhalation of particulates from surface soil

ARI = C x IR x ET x EF x DF
EDE = ARI x EDC

	C	IR	ET	EF	DF	ARI	EDC	EDE
Radionuclides	Air Concentration (pCi/m^3)	Inhalation Rate (m^3/hr)	Exposure Time (hr/day)	Exposure Frequency (days/yr)	Respiratory Deposition Factor	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	1.63E-06	0.83	8	250	0.85	2.30E-03	4.44E-01	1.02E-03
Plutonium-239/240	3.07E-06	0.83	8	250	0.85	4.33E-03	3.08E-01	1.33E-03
							Total Effective Dose Equivalent	2.36E-03

FUTURE OFFICE WORKER
AREA OF CONCERN NO. 1

CT - External Irradiation from surface soil

ER = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor (1-Se)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF Effective Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.151	1840	0.5	0.051	1000	7.08E+03	1.58E+03	3.41E-10	3.81E-03
Plutonium-239/240	0.284	1840	0.5	0.051	1000	1.33E+04	1.58E+03	4.31E-12	9.06E-05
								Total Effective Dose Equivalent	3.90E-03

RME - External Irradiation from surface soil

ER = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor (1-Se)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF Effective Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.151	1840	0.8	0.051	1000	1.13E+04	1.80E+03	3.41E-10	6.96E-03
Plutonium-239/240	0.284	1840	0.8	0.051	1000	2.13E+04	1.80E+03	4.31E-12	1.65E-04
								Total Effective Dose Equivalent	7.12E-03

SUMMARY OF RADIATION DOSE
FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 1

Pathway	Annual Radiation Exposure	
	Central Tendency	Reasonable Maximum
Ingestion of surface soil	1.09E-03	3.89E-03
Inhalation of particulates from surface soil	5.51E-04	1.03E-03
External Irradiation from surface soil	1.85E-03	2.32E-03
Total Annual Radiation Exposure (mrem/yr)	3.49E-03	7.24E-03

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 1

CT - Surface soil ingestion

ARI = C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.151	33	0.9	65	1	0.001	2.92E-01	3.64E-03	1.06E-03
Plutonium-239/240	0.284	33	0.9	65	1	0.001	5.48E-01	5.18E-05	2.84E-05
								Total Effective Dose Equivalent	1.09E-03

RME - Surface soil ingestion

ARI = C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminted	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.151	106	1	65	1	0.001	1.04E+00	3.64E-03	3.79E-03
Plutonium-239/240	0.284	106	1	65	1	0.001	1.96E+00	5.18E-05	1.01E-04
								Total Effective Dose Equivalent	3.89E-03

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 1

CT - Inhalation of particulates from surface soil

ARI = C x IR x ET x EF x DF
EDE = ARI x EDC

Radionuclides	C Air Concentration (pCi/m^3)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	DF Respiratory Deposition Factor	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.63E-06	0.83	7.2	65	0.85	5.38E-04	4.44E-01	2.39E-04
Plutonium-239/240	3.07E-06	0.83	7.2	65	0.85	1.01E-03	3.08E-01	3.12E-04
							Total Effective Dose Equivalent	5.51E-04

RME - Inhalation of particulates from surface soil

ARI = C x IR x ET x EF
EDE = ARI x EDC

Radionuclides	C Air Concentration (pCi/m^3)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	DF Respiratory Deposition Factor	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.63E-06	1.4	8	65	0.85	1.01E-03	4.44E-01	4.48E-04
Plutonium-239/240	3.07E-06	1.4	8	65	0.85	1.90E-03	3.08E-01	5.85E-04
							Total Effective Dose Equivalent	1.03E-03

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 1

CT - External Irradiation from surface soil

ARI = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor ($1-S_e$)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.151	1840	0.8	0.051	1000	1.13E+04	4.68E+02	3.41E-10	1.81E-03
Plutonium-239/240	0.284	1840	0.8	0.051	1000	2.13E+04	4.68E+02	4.31E-12	4.30E-05
								Total Effective Dose Equivalent	1.85E-03

RME - External Irradiation from surface soil

ARI = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor ($1-S_e$)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.151	1840	1	0.051	1000	1.42E+04	4.68E+02	3.41E-10	2.26E-03
Plutonium-239/240	0.284	1840	1	0.051	1000	2.67E+04	4.68E+02	4.31E-12	5.38E-05
								Total Effective Dose Equivalent	2.32E-03

SUMMARY OF RADIATION DOSE
FUTURE OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 1

	Annual Radiation Exposure	
Pathway	Central Tendency	Reasonable Maximum
Ingestion of surface soil	1.72E-04	8.47E-04
Inhalation of particulates from surface soil	1.77E-05	2.48E-04
External Irradiation from surface soil	4.75E-05	2.85E-04
Total Annual Radiation Exposure (mrem/yr)	2.37E-04	1.38E-03

FUTURE OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 1

CT - Surface soil ingestion

ARI = C x [(IR-C x TE-C) + (IR-A x TE-A)] x EF x ME x CF
EDE = ARI x EDC

	C	IR-C	TE-C	IR-A	TE-A	EF	ME	CF	ARI	EDC	EDE
		Child		Adult							
Radionuclide	Soil Concentration (pCi/g)	Ingestion Rate (mg/visit)	Percent of time exposed	Ingestion Rate (mg/visit)	Percent of time exposed	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (g/mg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	0.151	50	0.22	25	0.78	10	1	0.001	4.61E-02	3.64E-03	1.68E-04
Plutonium-239/240	0.284	50	0.22	25	0.78	10	1	0.001	8.66E-02	5.18E-05	4.49E-06
										Total Effective Dose Equivalent	1.72E-04

RME - Surface soil ingestion

ARI = C x [(IR-C x TE-C) + (IR-A x TE-A)] x EF x ME x CF
EDE = ARI x EDC

	C	IR-C	TE-C	IR-A	TE-A	EF	ME	CF	ARI	EDC	EDE
		Child		Adult							
Radionuclide	Soil Concentration (pCi/g)	Ingestion Rate (mg/visit)	Percent of time exposed	Ingestion Rate (mg/visit)	Percent of time exposed	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (g/mg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	0.151	100	0.2	50	0.8	25	1	0.001	2.27E-01	3.64E-03	8.24E-04
Plutonium-239/240	0.284	100	0.2	50	0.8	25	1	0.001	4.26E-01	5.18E-05	2.21E-05
										Total Effective Dose Equivalent	8.47E-04

FUTURE OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 1

CT - Inhalation of particulates from surface soil

ARI = C x IR x ET x EF x DF
EDE = ARI x EDC

Radionuclides	C Air Concentration (pCi/m^3)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	DF Respiratory Deposition Factor	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.63E-06	0.83	1.5	10	0.85	1.72E-05	4.44E-01	7.66E-06
Plutonium-239/240	3.07E-06	0.83	1.5	10	0.85	3.25E-05	3.08E-01	1.00E-05
							Total Effective Dose Equivalent	1.77E-05

RME - Inhalation of particulates from surface soil

ARI = C x IR x ET x EF
EDE = ARI x EDC

Radionuclides	C Air Concentration (pCi/m^3)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	DF Respiratory Deposition Factor	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.63E-06	1.4	5	25	0.85	2.42E-04	4.44E-01	1.08E-04
Plutonium-239/240	3.07E-06	1.4	5	25	0.85	4.57E-04	3.08E-01	1.41E-04
							Total Effective Dose Equivalent	2.48E-04

FUTURE OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 1

CT - External irradiation from surface soil

ARI = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor ($1-S_e$)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.151	1840	0.8	0.051	1000	1.13E+04	1.20E+01	3.41E-10	4.64E-05
Plutonium-239/240	0.284	1840	0.8	0.051	1000	2.13E+04	1.20E+01	4.31E-12	1.10E-06
								Total Effective Dose Equivalent	4.75E-05

RME - External irradiation from surface soil

ARI = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor ($1-S_e$)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.151	1840	0.8	0.051	1000	1.13E+04	7.20E+01	3.41E-10	2.78E-04
Plutonium-239/240	0.284	1840	0.8	0.051	1000	2.13E+04	7.20E+01	4.31E-12	6.62E-06
								Total Effective Dose Equivalent	2.85E-04

SUMMARY OF RADIATION DOSE
FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 1

Pathway	Annual Radiation Exposure	
	Central Tendency	Reasonable Maximum
Ingestion of subsurface soil	2.72E-04	1.53E-03
Inhalation of particulates from surface and subsurface soil	3.84E-04	4.78E-04
External Irradiation from subsurface soil	3.76E-04	4.70E-04
Total Annual Radiation Exposure (mrem/yr)	1.03E-03	2.47E-03

FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 1

CT - Subsurface soil ingestion

ARI =C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.013	95	0.9	30	1	0.001	3.33E-02	3.64E-03	1.21E-04
Plutonium-239/240	0.021	95	0.9	30	1	0.001	5.39E-02	5.18E-05	2.79E-06
Uranium-233/234	0.8	95	0.9	30	1	0.001	2.05E+00	2.61E-05	5.36E-05
Uranium-238	1.54	95	0.9	30	1	0.001	3.95E+00	2.38E-05	9.40E-05
								Total Effective Dose Equivalent	2.72E-04

RME - Subsurface soil ingestion

ARI =C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.013	480	1	30	1	0.001	1.87E-01	3.64E-03	6.81E-04
Plutonium-239/240	0.021	480	1	30	1	0.001	3.02E-01	5.18E-05	1.57E-05
Uranium-233/234	0.8	480	1	30	1	0.001	1.15E+01	2.61E-05	3.01E-04
Uranium-238	1.54	480	1	30	1	0.001	2.22E+01	2.38E-05	5.28E-04
								Total Effective Dose Equivalent	1.53E-03

FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 1

CT - Inhalation of particulates from surface and subsurface soil

ARI= C x IR x ET x EF x DF
EDE = ARI x EDC

Radionuclides	C Air Concentration (pCi/m^3)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	DF Respiratory Deposition Factor	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.63E-06	1.25	7.2	30	0.85	3.74E-04	4.44E-01	1.66E-04
Plutonium-239/240	3.07E-06	1.25	7.2	30	0.85	7.05E-04	3.08E-01	2.17E-04
Uranium-233/234	9.10E-09	1.25	7.2	30	0.85	2.09E-06	1.33E-01	2.78E-07
Uranium-238	1.74E-08	1.25	7.2	30	0.85	3.99E-06	1.19E-01	4.75E-07
							Total Effective Dose Equivalent	3.84E-04

RME - Inhalation of particulates from surface and subsurface soil

ARI= C x IR x ET x EF x DF
EDE = ARI x EDC

Radionuclides	C Air Concentration (pCi/m^3)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	DF Respiratory Deposition Factor	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.63E-06	1.4	8	30	0.85	4.66E-04	4.44E-01	2.07E-04
Plutonium-239/240	3.07E-06	1.4	8	30	0.85	8.77E-04	3.08E-01	2.70E-04
Uranium-233/234	9.10E-09	1.4	8	30	0.85	2.60E-06	1.33E-01	3.46E-07
Uranium-238	1.74E-08	1.4	8	30	0.85	4.97E-06	1.19E-01	5.91E-07
							Total Effective Dose Equivalent	4.78E-04

FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 1

CT - External irradiation from subsurface soil

ER = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor (1-Se)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.0129	1840	0.8	0.051	1000	9.68E+02	2.16E+02	3.41E-10	7.13E-05
Plutonium-239/240	0.0207	1840	0.8	0.051	1000	1.55E+03	2.16E+02	4.31E-12	1.45E-06
Uranium-233/234	0.8	1840	0.8	0.051	1000	6.01E+04	2.16E+02	9.21E-12	1.19E-04
Uranium-238	1.54	1840	0.8	0.051	1000	1.16E+05	2.16E+02	7.37E-12	1.84E-04
								Total Effective Dose Coefficient	3.76E-04

RME - External irradiation from subsurface soil

ER = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor (1-Se)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.0129	1840	1	0.051	1000	1.21E+03	2.16E+02	3.41E-10	8.92E-05
Plutonium-239/240	0.0207	1840	1	0.051	1000	1.94E+03	2.16E+02	4.31E-12	1.81E-06
Uranium-233/234	0.8	1840	1	0.051	1000	7.51E+04	2.16E+02	9.21E-12	1.49E-04
Uranium-238	1.54	1840	1	0.051	1000	1.45E+05	2.16E+02	7.37E-12	2.30E-04
								Total Effective Dose Coefficient	4.70E-04

SUMMARY OF RADIATION DOSE
FUTURE OFFICE WORKER
AREA OF CONCERN NO. 2
30-ACRE AREA

Pathway	Annual Radiation Exposure	
	Central Tendency	Reasonable Maximum
Ingestion of surface soil	4.71E-03	5.98E-02
Inhalation of particulates from surface soil	1.54E-02	2.57E-02
External irradiation from surface soil	3.30E-02	6.03E-02
Total Annual Radiation Exposure (mrem/yr)	5.31E-02	1.46E-01

FUTURE OFFICE WORKER
AREA OF CONCERN NO. 2
30-ACRE AREA

CT - Surface soil ingestion

ARI =C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.27	5	0.9	219	1	0.001	1.25E+00	3.64E-03	4.56E-03
Plutonium-239/240	3.1	5	0.9	219	1	0.001	3.06E+00	5.18E-05	1.58E-04
								Total Effective Dose Equivalent	4.71E-03

RME - Surface soil ingestion

ARI =C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.27	50	1	250	1	0.001	1.59E+01	3.64E-03	5.78E-02
Plutonium-239/240	3.1	50	1	250	1	0.001	3.88E+01	5.18E-05	2.01E-03
								Total Effective Dose Equivalent	5.98E-02

FUTURE OFFICE WORKER
AREA OF CONCERN NO. 2
30-ACRE AREA

CT - Inhalation of particulates from surface soil

ARI = C x IR x ET x EF x DF
EDE = ARI x EDC

Radionuclides	C Air Concentration (pCi/m^3)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	DF Respiratory Deposition Factor	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.52E-05	0.63	7.2	219	0.85	1.28E-02	4.44E-01	5.70E-03
Plutonium-239/240	3.72E-05	0.63	7.2	219	0.85	3.14E-02	3.08E-01	9.67E-03
							Total Effective Dose Equivalent	1.54E-02

RME - Inhalation of particulates from surface soil

ARI = C x IR x ET x EF x DF
EDE = ARI x EDC

Radionuclides	C Air Concentration (pCi/m^3)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	DF Respiratory Deposition Factor	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.52E-05	0.83	8	250	0.85	2.14E-02	4.44E-01	9.52E-03
Plutonium-239/240	3.72E-05	0.83	8	250	0.85	5.25E-02	3.08E-01	1.62E-02
							Total Effective Dose Equivalent	2.57E-02

FUTURE OFFICE WORKER
AREA OF CONCERN NO. 2
30-ACRE AREA

CT - External irradiation from surface soil

ER = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor (1-Se)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF Effective Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.27	1840	0.5	0.051	1000	5.96E+04	1.58E+03	3.41E-10	3.20E-02
Plutonium-239/240	3.1	1840	0.5	0.051	1000	1.45E+05	1.58E+03	4.31E-12	9.89E-04
								Total Effective Dose Equivalent	3.30E-02

RME - External irradiation from surface soil

ER = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor (1-Se)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF Effective Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.27	1840	0.8	0.051	1000	9.53E+04	1.80E+03	3.41E-10	5.85E-02
Plutonium-239/240	3.1	1840	0.8	0.051	1000	2.33E+05	1.80E+03	4.31E-12	1.81E-03
								Total Effective Dose Equivalent	6.03E-02

SUMMARY OF RADIATION DOSE
CURRENT INDUSTRIAL WORKER
AREA OF CONCERN NO. 2

	Annual Radiation Exposure	
Pathway	Central Tendency	Reasonable Maximum
Ingestion of surface soil	9.18E-03	5.82E-02
Inhalation of particulates from surface soil	1.94E-04	2.46E-04
External Irradiation from surface soil	3.22E-02	5.88E-02
Total Annual Radiation Exposure (mrem/yr)	4.15E-02	1.17E-01

CURRENT WORKER
AREA OF CONCERN NO. 2

CT - Surface soil ingestion

ARI =C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.24	10	0.9	219	1	0.001	2.44E+00	3.64E-03	8.90E-03
Plutonium-239/240	2.78	10	0.9	219	1	0.001	5.48E+00	5.18E-05	2.84E-04
								Total Effective Dose Equivalent	9.18E-03

RME - Surface soil ingestion

ARI =C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.24	50	1	250	1	0.001	1.55E+01	3.64E-03	5.64E-02
Plutonium-239/240	2.78	50	1	250	1	0.001	3.48E+01	5.18E-05	1.80E-03
								Total Effective Dose Equivalent	5.82E-02

CURRENT INDUSTRIAL WORKER
AREA OF CONCERN NO. 2

CT - Inhalation of particulates from surface soil

ARI = C x IR x ET x EF x DF
EDE = ARI x EDC

Radionuclides	C Air Concentration (pCi/m^3)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	DF Respiratory Deposition Factor	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.53E-07	0.83	7.2	219	0.85	1.70E-04	4.44E-01	7.56E-05
Plutonium-239/240	3.45E-07	0.83	7.2	219	0.85	3.84E-04	3.08E-01	1.18E-04
							Total Effective Dose Equivalent	1.94E-04

RME - Inhalation of particulates from surface soil

ARI = C x IR x ET x EF x DF
EDE = ARI x EDC

Radionuclides	C Air Concentration (pCi/m^3)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	DF Respiratory Deposition Factor	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.53E-07	0.83	8	250	0.85	2.16E-04	4.44E-01	9.59E-05
Plutonium-239/240	3.45E-07	0.83	8	250	0.85	4.87E-04	3.08E-01	1.50E-04
							Total Effective Dose Equivalent	2.46E-04

CURRENT INDUSTRIAL WORKER
AREA OF CONCERN NO. 2

CT - External irradiation from surface soil

ER = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor ($1-S_e$)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.24	1840	0.5	0.051	1000	5.82E+04	1.58E+03	3.41E-10	3.13E-02
Plutonium-239/240	2.78	1840	0.5	0.051	1000	1.30E+05	1.58E+03	4.31E-12	8.87E-04
								Total Effective Dose Equivalent	3.22E-02

RME - External irradiation from surface soil

ER = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor ($1-S_e$)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.24	1840	0.8	0.051	1000	9.31E+04	1.80E+03	3.41E-10	5.71E-02
Plutonium-239/240	2.78	1840	0.8	0.051	1000	2.09E+05	1.80E+03	4.31E-12	1.62E-03
								Total Effective Dose Equivalent	5.88E-02

SUMMARY OF RADIATION DOSE
FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 2

	Annual Radiation Exposure	
Pathway	Central Tendency	Reasonable Maximum
Ingestion of surface soil	8.99E-03	3.21E-02
Inhalation of particulates from surface soil	5.75E-05	1.08E-04
External Irradiation from surface soil	1.53E-02	1.91E-02
Total Annual Radiation Exposure (mrem/yr)	2.43E-02	5.13E-02

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 2

CT - Surface soil ingestion

ARI = C x IR x FC x EF x ME x CF
EDE = ARI x EDC

	C	IR	FC	EF	ME	CF	ARI	EDC	EDE
Radionuclide	Soil Concentration (pCi/g)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Conversion Factor (g/mg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	1.24	33	0.9	65	1	0.001	2.39E+00	3.64E-03	8.71E-03
Plutonium-239/240	2.78	33	0.9	65	1	0.001	5.37E+00	5.18E-05	2.78E-04
								Total Effective Dose Equivalent	8.99E-03

RME - Surface soil ingestion

ARI = C x IR x FC x EF x ME x CF
EDE = ARI x EDC

	C	IR	FC	EF	ME	CF	ARI	EDC	EDE
Radionuclide	Soil Concentration (pCi/g)	Ingestion Rate (mg/day)	Fraction Contaminted	Exposure Frequency (days/yr)	Matrix Effect	Conversion Factor (g/mg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	1.24	106	1	65	1	0.001	8.54E+00	3.64E-03	3.11E-02
Plutonium-239/240	2.78	106	1	65	1	0.001	1.92E+01	5.18E-05	9.92E-04
								Total Effective Dose Equivalent	3.21E-02

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 2

CT - Inhalation of particulates from surface soil

ARI = C x IR x ET x EF x DF
EDE = ARI x EDC

Radionuclides	C Air Concentration (pCi/m^3)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	DF Respiratory Deposition Factor	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.53E-07	0.83	7.2	65	0.85	5.05E-05	4.44E-01	2.24E-05
Plutonium-239/240	3.45E-07	0.83	7.2	65	0.85	1.14E-04	3.08E-01	3.51E-05
							Total Effective Dose Equivalent	5.75E-05

RME - Inhalation of particulates from surface soil

ARI = C x IR x ET x EF
EDE = ARI x EDC

Radionuclides	C Air Concentration (pCi/m^3)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	DF Respiratory Deposition Factor	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.53E-07	1.4	8	65	0.85	9.47E-05	4.44E-01	4.20E-05
Plutonium-239/240	3.45E-07	1.4	8	65	0.85	2.13E-04	3.08E-01	6.58E-05
							Total Effective Dose Equivalent	1.08E-04

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 2

CT - External irradiation from surface soil

ARI = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor ($1-S_c$)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.24	1840	0.8	0.051	1000	9.31E+04	4.68E+02	3.41E-10	1.49E-02
Plutonium-239/240	2.78	1840	0.8	0.051	1000	2.09E+05	4.68E+02	4.31E-12	4.21E-04
								Total Effective Dose Equivalent	1.53E-02

RME - External irradiation from surface soil

ARI = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor ($1-S_c$)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.24	1840	1	0.051	1000	1.16E+05	4.68E+02	3.41E-10	1.86E-02
Plutonium-239/240	2.78	1840	1	0.051	1000	2.61E+05	4.68E+02	4.31E-12	5.26E-04
								Total Effective Dose Equivalent	1.91E-02

SUMMARY OF RADIATION DOSE
FUTURE OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 2

	Annual Radiation Exposure	
Pathway	Central Tendency	Reasonable Maximum
Ingestion of surface soil	1.42E-03	6.99E-03
Inhalation of particulates from surface soil	1.84E-06	2.59E-05
External Irradiation from surface soil	3.92E-04	2.35E-03
Total Annual Radiation Exposure (mrem/yr)	1.81E-03	9.36E-03

FUTURE OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 2

CT - Surface soil ingestion

ARI = C x [(IR-C x TE-C) + (IR-A x TE-A)] x EF x ME x CF
EDE = ARI x EDC

	C	IR-C	TE-C	IR-A	TE-A	EF	ME	CF	ARI	EDC	EDE
		Child		Adult							
Radionuclide	Soil Concentration (pCi/g)	Ingestion Rate (mg/visit)	Percent of time exposed	Ingestion Rate (mg/visit)	Percent of time exposed	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (g/mg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	1.24	50	0.22	25	0.78	10	1	0.001	3.78E-01	3.64E-03	1.38E-03
Plutonium-239/240	2.78	50	0.22	25	0.78	10	1	0.001	8.48E-01	5.18E-05	4.39E-05
										Total Effective Dose Equivalent	1.42E-03

RME - Surface soil ingestion

ARI = C x [(IR-C x TE-C) + (IR-A x TE-A)] x EF x ME x CF
EDE = ARI x EDC

	C	IR-C	TE-C	IR-A	TE-A	EF	ME	CF	ARI	EDC	EDE
		Child		Adult							
Radionuclide	Soil Concentration (pCi/g)	Ingestion Rate (mg/visit)	Percent of time exposed	Ingestion Rate (mg/visit)	Percent of time exposed	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (g/mg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	1.24	100	0.2	50	0.8	25	1	0.001	1.86E+00	3.64E-03	6.77E-03
Plutonium-239/240	2.78	100	0.2	50	0.8	25	1	0.001	4.17E+00	5.18E-05	2.16E-04
										Total Effective Dose Equivalent	6.99E-03

FUTURE OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 2

CT - Inhalation of particulates from surface soil

ARI = C x IR x ET x EF x DF
EDE = ARI x EDC

Radionuclides	C Air Concentration (pCi/m^3)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	DF Respiratory Deposition Factor	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.53E-07	0.83	1.5	10	0.85	1.62E-06	4.44E-01	7.19E-07
Plutonium-239/240	3.45E-07	0.83	1.5	10	0.85	3.65E-06	3.08E-01	1.12E-06
							Total Effective Dose Equivalent	1.84E-06

RME - Inhalation of particulates from surface soil

ARI = C x IR x ET x EF
EDE = ARI x EDC

Radionuclides	C Air Concentration (pCi/m^3)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	DF Respiratory Deposition Factor	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.53E-07	1.4	5	25	0.85	2.28E-05	4.44E-01	1.01E-05
Plutonium-239/240	3.45E-07	1.4	5	25	0.85	5.13E-05	3.08E-01	1.58E-05
							Total Effective Dose Equivalent	2.59E-05

FUTURE OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 2

CT - External irradiation from surface soil

ARI = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor ($1-S_e$)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.24	1840	0.8	0.051	1000	9.31E+04	1.20E+01	3.41E-10	3.81E-04
Plutonium-239/240	2.78	1840	0.8	0.051	1000	2.09E+05	1.20E+01	4.31E-12	1.08E-05
								Total Effective Dose Equivalent	3.92E-04

RME - External irradiation from surface soil

ARI = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor ($1-S_e$)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.24	1840	0.8	0.051	1000	9.31E+04	7.20E+01	3.41E-10	2.29E-03
Plutonium-239/240	2.78	1840	0.8	0.051	1000	2.09E+05	7.20E+01	4.31E-12	6.48E-05
								Total Effective Dose Equivalent	2.35E-03

SUMMARY OF RADIATION DOSE
FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 2

Pathway	Annual Radiation Exposure	
	Cental Tendency	Reasonable Maximum
Ingestion of subsurface soil	3.53E-04	1.98E-03
Inhalation of particulates from surface and subsurface soil	4.05E-05	5.04E-05
External Irradiation from subsurface soil	3.60E-04	4.50E-04
Total Annual Radiation Exposure (mrem/yr)	7.53E-04	2.48E-03

FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 2

CT - Subsurface soil ingestion

ARI =C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.025	95	0.9	30	1	0.001	6.41E-02	3.64E-03	2.33E-04
Plutonium-239/240	0.138	95	0.9	30	1	0.001	3.54E-01	5.18E-05	1.83E-05
Uranium-233/234	0.785	95	0.9	30	1	0.001	2.01E+00	2.61E-05	5.26E-05
Uranium-238	0.793	95	0.9	30	1	0.001	2.03E+00	2.38E-05	4.84E-05
								Total Effective Dose Equivalent	3.53E-04

RME - Subsurface soil ingestion

ARI =C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Soil Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.025	480	1	30	1	0.001	3.60E-01	3.64E-03	1.31E-03
Plutonium-239/240	0.138	480	1	30	1	0.001	1.99E+00	5.18E-05	1.03E-04
Uranium-233/234	0.785	480	1	30	1	0.001	1.13E+01	2.61E-05	2.95E-04
Uranium-238	0.793	480	1	30	1	0.001	1.14E+01	2.38E-05	2.72E-04
								Total Effective Dose Equivalent	1.98E-03

FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 2

CT - Inhalation of particulates from surface and subsurface soil

ARI = C x IR x ET x EF x DF
EDE = ARI x EDC

Radionuclides	C Air Concentration (pCi/m^3)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	DF Respiratory Deposition Factor	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.53E-07	1.25	7.2	30	0.85	3.51E-05	4.44E-01	1.56E-05
Plutonium-239/240	3.45E-07	1.25	7.2	30	0.85	7.92E-05	3.08E-01	2.44E-05
Uranium-233/234	8.91E-09	1.25	7.2	30	0.85	2.04E-06	1.33E-01	2.72E-07
Uranium-238	8.96E-09	1.25	7.2	30	0.85	2.06E-06	1.19E-01	2.45E-07
							Total Effective Dose Equivalent	4.05E-05

RME - Inhalation of particulates from surface and subsurface soil

ARI = C x IR x ET x EF x DF
EDE = ARI x EDC

Radionuclides	C Air Concentration (pCi/m^3)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	DF Respiratory Deposition Factor	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	1.53E-07	1.4	8	30	0.85	4.37E-05	4.44E-01	1.94E-05
Plutonium-239/240	3.45E-07	1.4	8	30	0.85	9.85E-05	3.08E-01	3.03E-05
Uranium-233/234	8.91E-09	1.4	8	30	0.85	2.54E-06	1.33E-01	3.38E-07
Uranium-238	8.96E-09	1.4	8	30	0.85	2.56E-06	1.19E-01	3.05E-07
							Total Effective Dose Equivalent	5.04E-05

FUTURE CONSTRUCTION WORKER
AREA OF CONCERN NO. 2

CT - External irradiation from subsurface soil

ER = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor (1-Se)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.025	1840	0.8	0.051	1000	1.88E+03	2.16E+02	3.41E-10	1.38E-04
Plutonium-239/240	0.138	1840	0.8	0.051	1000	1.04E+04	2.16E+02	4.31E-12	9.64E-06
Uranium-233/234	0.785	1840	0.8	0.051	1000	5.89E+04	2.16E+02	9.21E-12	1.17E-04
Uranium-238	0.793	1840	0.8	0.051	1000	5.95E+04	2.16E+02	7.37E-12	9.48E-05
								Total Effective Dose Equivalent	3.60E-04

RME - External irradiation from subsurface soil

ER = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor (1-Se)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/hr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.025	1840	1	0.051	1000	2.35E+03	2.16E+02	3.41E-10	1.73E-04
Plutonium-239/240	0.138	1840	1	0.051	1000	1.29E+04	2.16E+02	4.31E-12	1.21E-05
Uranium-233/234	0.785	1840	1	0.051	1000	7.37E+04	2.16E+02	9.21E-12	1.47E-04
Uranium-238	0.793	1840	1	0.051	1000	7.44E+04	2.16E+02	7.37E-12	1.18E-04
								Total Effective Dose Equivalent	4.50E-04

SUMMARY OF RADIATION DOSE
FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

Pathway	Annual Radiation Exposure	
	Central Tendency	Reasonable Maximum
Ingestion of pond sediment	1.78E-03	2.12E-02
Ingestion of stream/dry sediment	6.36E-05	7.58E-04
Inhalation of particulates from stream/dry sediment	8.46E-07	1.45E-06
Ingestion of surface water	3.72E-06	3.19E-05
External Irradiation from stream/dry sediments	4.42E-04	9.48E-04
Total Annual Radiation Exposure (mrem/yr)	2.29E-03	2.29E-02

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

CT - Ingestion of pond sediment

ARI = C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Sediment Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	9.28	8	0.9	7	1	0.001	4.68E-01	3.64E-03	1.70E-03
Plutonium-239/240	28.93	8	0.9	7	1	0.001	1.46E+00	5.18E-05	7.55E-05
								Total Effective Dose Equivalent	1.78E-03

RME - Ingestion of pond sediment

ARI = C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Sediment Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	9.28	50	1	12	1	0.001	5.57E+00	3.64E-03	2.03E-02
Plutonium-239/240	28.93	50	1	12	1	0.001	1.74E+01	5.18E-05	8.99E-04
								Total Effective Dose Equivalent	2.12E-02

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

CT - Ingestion of stream/dry sediment

ARI = C x IR x FC x EF x ME x CF
EDE = ARI x EDC

	C	IR	FC	EF	ME	CF	ARI	EDC	EDE
Radionuclide	Sediment Concentration (pCi/g)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Conversion Factor (g/mg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	0.311	8	0.9	7	1	0.001	1.57E-02	3.64E-03	5.71E-05
Plutonium-239/240	2.519	8	0.9	7	1	0.001	1.27E-01	5.18E-05	6.58E-06
								Total Effective Dose Equivalent	6.36E-05

RME - Ingestion of stream/dry sediment

ARI = C x IR x FC x EF x ME x CF
EDE = ARI x EDC

	C	IR	FC	EF	ME	CF	ARI	EDC	EDE
Radionuclide	Sediment Concentration (pCi/g)	Ingestion Rate (mg/day)	Fraction Contaminated	Exposure Frequency (days/yr)	Matrix Effect	Conversion Factor (g/mg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	0.311	50	1	12	1	0.001	1.87E-01	3.64E-03	6.79E-04
Plutonium-239/240	2.519	50	1	12	1	0.001	1.51E+00	5.18E-05	7.83E-05
								Total Effective Dose Equivalent	7.58E-04

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

CT - Inhalation of particulates from stream/dry sediment

ARI = (C x IR x EF x CF x DF x RF)/PEF
EDE = ARI x EDC

	C	IR	EF	CF	DF	RF	PEF	ARI	EDC	EDE
Radionuclide	Sediment Concentration (pCi/g)	Inhalation Rate (m^3/day)	Exposure Frequency (days/yr)	Conversion Factor (g/kg)	Respiratory Deposition Factor	Respirable Fraction	Particulate Emission Factor (m^3/kg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americum-241	0.311	2	7	1000	0.85	0.36	4.63E+09	2.88E-07	4.44E-01	1.28E-07
Plutonium-239/240	2.519	2	7	1000	0.85	0.36	4.63E+09	2.33E-06	3.08E-01	7.18E-07
									Total Effective Dose Equivalent	8.46E-07

RME - Inhalation of particulates from stream/dry sediment

ARI = (C x IR x EF x CF x DF x RF)/PEF
EDE = ARI x EDC

	C	IR	EF	CF	DF	RF	PEF	ARI	EDC	EDE
Radionuclide	Sediment Concentration (pCi/g)	Inhalation Rate (m^3/day)	Exposure Frequency (days/yr)	Conversion Factor (g/kg)	Respiratory Deposition Factor	Respirable Fraction	Particulate Emission Factor (m^3/kg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	0.311	2	12	1000	0.85	0.36	4.63E+09	4.93E-07	4.44E-01	2.19E-07
Plutonium-239/240	2.519	2	12	1000	0.85	0.36	4.63E+09	4.00E-06	3.08E-01	1.23E-06
									Total Effective Dose Equivalent	1.45E-06

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

CT - Ingestion of surface water

ARI = C x IR x ET x EF
EDE = ARI x EDC

Radionuclide	C Surface Water Concentration (pCi/l)	IR Ingestion Rate (l/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.014	0.01	1	7	9.80E-04	3.64E-03	3.57E-06
Plutonium-239/240	0.043	0.01	1	7	3.01E-03	5.18E-05	1.56E-07
						Total Effective Dose Equivalent	3.72E-06

RME - Ingestion of surface water

ARI = C x IR x ET x EF
EDE = ARI x EDC

Radionuclide	C Surface Water Concentration (pCi/l)	IR Ingestion Rate (l/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.014	0.05	1	12	8.40E-03	3.64E-03	3.06E-05
Plutonium-239/240	0.043	0.05	1	12	2.58E-02	5.18E-05	1.34E-06
						Total Effective Dose Equivalent	3.19E-05

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 3

CT - External irradiation from stream/dry sediment

$$ER = C \times SD \times GSF \times DP \times CF$$
$$EDE = ER \times EF \times EDCF$$

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor ($1-S_e$)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/yr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.311	1840	0.8	0.051	1000	2.33E+04	5.04E+01	3.41E-10	4.01E-04
Plutonium-239/240	2.519	1840	0.8	0.051	1000	1.89E+05	5.04E+01	4.31E-12	4.11E-05
								Total Effective Dose Equivalent	4.42E-04

RME - External irradiation from stream/dry sediment

$$IF = TF \times GSF \times EF \times ED$$
$$CR = C \times IF \times SF$$

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor ($1-S_e$)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/yr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.311	1840	1	0.051	1000	2.92E+04	8.64E+01	3.41E-10	8.60E-04
Plutonium-239/240	2.519	1840	1	0.051	1000	2.36E+05	8.64E+01	4.31E-12	8.80E-05
								Total Effective Dose Equivalent	9.48E-04

SUMMARY OF RADIATION DOSE
OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

Pathway	Annual Radiation Exposure	
	Central Tendency	Reasonable Maximum
Ingestion of pond sediment	1.08E-02	5.29E-02
Ingestion of stream/dry sediment	3.85E-04	1.89E-03
Inhalation of particulates from stream/dry sediment	7.52E-07	1.06E-05
Ingestion of surface water	3.32E-06	3.99E-05
External Irradiation from stream/dry sediment	1.05E-04	7.90E-04
Total Annual Radiation Exposure (mrem/yr)	1.13E-02	5.57E-02

FUTURE OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

CT - Ingestion of pond sediment

ARI = C x[(IR-C x TE-C) + (IR-A x TE-A)] x FC x EF x ME x CF
EDE = ARI x EDC

	C	IR-C	TE-C	IR-A	TE-A	EF	ME	CF	ARI	EDC	EDE
		Child		Adult							
Radionuclide	Sediment Concentration (pCi/g)	Ingestion Rate (mg/visit)	Percent of time exposed	Ingestion Rate (mg/visit)	Percent of time exposed	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (g/mg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	9.28	50	0.22	25	0.78	10	1	0.001	2.83E+00	3.64E-03	1.03E-02
Plutonium-239/240	28.93	50	0.22	25	0.78	10	1	0.001	8.82E+00	5.18E-05	4.57E-04
										Total Effective Dose Equivalent	1.08E-02

RME - Ingestion of pond sediment

ARI = C x[(IR-C x TE-C) + (IR-A x TE-A)] x FC x EF x ME x CF
EDE = ARI x EDC

	C	IR-C	TE-C	IR-A	TE-A	EF	ME	CF	ARI	EDC	EDE
		Child		Adult							
Radionuclide	Sediment Concentration (pCi/g)	Ingestion Rate (mg/visit)	Percent of time exposed	Ingestion Rate (mg/visit)	Percent of time exposed	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (g/mg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	9.28	100	0.2	50	0.8	25	1	0.001	1.39E+01	3.64E-03	5.07E-02
Plutonium-239/240	28.93	100	0.2	50	0.8	25	1	0.001	4.34E+01	5.18E-05	2.25E-03
										Total Effective Dose Equivalent	5.29E-02

FUTURE OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

CT - Ingestion of stream/dry sediment

ARI = C x[(IR-C x TE-C) + (IR-A x TE-A)] x FC x EF x ME x CF
EDE = ARI x EDC

	C	IR-C	TE-C	IR-A	TE-A	EF	ME	CF	ARI	EDC	EDE
		Child		Adult							
Radionuclide	Sediment Concentration (pCi/g)	Ingestion Rate (mg/visit)	Percent of time exposed	Ingestion Rate (mg/visit)	Percent of time exposed	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (g/mg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	0.311	50	0.22	25	0.78	10	1	0.001	9.49E-02	3.64E-03	3.45E-04
Plutonium-239/240	2.519	50	0.22	25	0.78	10	1	0.001	7.68E-01	5.18E-05	3.98E-05
										Total Effective Dose Equivalent	3.85E-04

RME - Ingestion of stream/dry sediment

ARI = C x[(IR-C x TE-C) + (IR-A x TE-A)] x FC x EF x ME x CF
EDE = ARI x EDC

	C	IR-C	TE-C	IR-A	TE-A	EF	ME	CF	ARI	EDC	EDE
		Child		Adult							
Radionuclide	Sediment Concentration (pCi/g)	Ingestion Rate (mg/visit)	Percent of time exposed	Ingestion Rate (mg/visit)	Percent of time exposed	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (g/mg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	0.311	100	0.2	50	0.8	25	1	0.001	4.67E-01	3.64E-03	1.70E-03
Plutonium-239/240	2.519	100	0.2	50	0.8	25	1	0.001	3.78E+00	5.18E-05	1.96E-04
										Total Effective Dose Equivalent	1.89E-03

FUTURE OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

CT - Inhalation of particulates from stream/dry sediment

ARI = (C x IR x ET x EF x CF x DF x RF)/PEF
EDE = ARI x EDC

	C	IR	ET	EF	CF	DF	RF	PEF	ARI	EDC	EDE
Radionuclide	Sediment Concentration (pCi/g)	Inhalation Rate (m^3/hr)	Exposure Time (hr/visit)	Exposure Frequency (visits/yr)	Conversion Factor (g/kg)	Respiratory Deposition Factor	Respirable Fraction	Particulate Emission Factor (m^3/kg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americum-241	0.311	0.83	1.5	10	1000	0.85	0.36	4.63E+09	2.56E-07	4.44E-01	1.14E-07
Plutonium-239/240	2.519	0.83	1.5	10	1000	0.85	0.36	4.63E+09	2.07E-06	3.08E-01	6.38E-07
										Total Effective Dose Equivalent	7.52E-07

RME - Inhalation of particulates from stream/dry sediment

ARI = (C x IR x ET x EF x CF x DF x RF)/PEF
EDE = ARI x EDC

	C	IR	ET	EF	CF	DF	RF	PEF	ARI	EDC	EDE
Radionuclide	Sediment Concentration (pCi/g)	Inhalation Rate (m^3/hr)	Exposure Time (hr/visit)	Exposure Frequency (visits/yr)	Conversion Factor (g/kg)	Respiratory Deposition Factor	Respirable Fraction	Particulate Emission Factor (m^3/kg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	0.311	1.4	5	25	1000	0.85	0.36	4.63E+09	3.60E-06	4.44E-01	1.60E-06
Plutonium-239/240	2.519	1.4	5	25	1000	0.85	0.36	4.63E+09	2.91E-05	3.08E-01	8.97E-06
										Total Effective Dose Equivalent	1.06E-05

FUTURE OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

CT - Ingestion of surface water

ARI = C x IR x ET x EF
EDE = ARI x EDC

Radionuclide	C Surface Water Concentration (pCi/l)	IR Ingestion Rate (l/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.014	0.025	0.5	5	8.75E-04	3.64E-03	3.19E-06
Plutonium-239/240	0.043	0.025	0.5	5	2.69E-03	5.18E-05	1.39E-07
						Total Effective Dose Equivalent	3.32E-06

RME - Ingestion of surface water

ARI = C x IR x ET x EF
EDE = ARI x EDC

Radionuclide	C Surface Water Concentration (pCi/l)	IR Ingestion Rate (l/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.014	0.05	1	15	1.05E-02	3.64E-03	3.82E-05
Plutonium-239/240	0.043	0.05	1	15	3.23E-02	5.18E-05	1.67E-06
						Total Effective Dose Equivalent	3.99E-05

FUTURE OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 3

CT - External IRradiation from stream/dry sediment

ER = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor ($1-S_e$)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/yr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.311	1840	0.8	0.051	1000	2.33E+04	1.20E+01	3.41E-10	9.55E-05
Plutonium-239/240	2.519	1840	0.8	0.051	1000	1.89E+05	1.20E+01	4.31E-12	9.78E-06
								Total Effective Dose Equivalent	1.05E-04

RME - External irradiation from stream/dry sediment

IF = TF x GSF x EF x ED
CR = C x IF x SF

Radionuclide	C Soil Concentration (pCi/g)	SD Soil Density (kg/m^3)	GSF Gamma Shielding Factor ($1-S_e$)	DP Soil Depth (m)	CF Conversion Factor (g/kg)	ER External Radiation (pCi/m^2)	EF Exposure Frequency (hr/yr)	EDCF External Dose Conversion Factor (mrem/yr per pCi/m^2)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.311	1840	1	0.051	1000	2.92E+04	7.20E+01	3.41E-10	7.17E-04
Plutonium-239/240	2.519	1840	1	0.051	1000	2.36E+05	7.20E+01	4.31E-12	7.34E-05
								Total Effective Dose Equivalent	7.90E-04

SUMMARY OF RADIATION DOSE
FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

	Annual Radiation Exposure	
Pathway	Central Tendency	Reasonable Maximum
Ingestion of pond sediment	1.84E-02	2.19E-01
Ingestion of stream/dry sediment	3.76E-04	1.48E-03
Inhalation of particulates from stream/dry sediment	6.68E-07	1.14E-06
Ingestion of surface water	4.28E-05	3.67E-04
External Irradiation from stream/dry sediment	8.74E-04	1.09E-03
Total Annual Radiation Exposure (mrem/yr)	1.97E-02	2.22E-01

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

CT - Ingestion of pond sediment

ARI = C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Sediment Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	99.34	8	0.9	7	1	0.001	5.01E+00	3.64E-03	1.82E-02
Plutonium-239/240	78.3	8	0.9	7	1	0.001	3.95E+00	5.18E-05	2.04E-04
								Total Effective Dose Equivalent	1.84E-02

RME - Ingestion of pond sediment

ARI = C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Sediment Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	99.34	50	1	12	1	0.001	5.96E+01	3.64E-03	2.17E-01
Plutonium-239/240	78.3	50	1	12	1	0.001	4.70E+01	5.18E-05	2.43E-03
								Total Effective Dose Equivalent	2.19E-01

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

CT - Ingestion of stream/dry sediment

ARI = C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Sediment Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.66	8	0.9	7	1	0.001	3.33E-02	3.64E-03	1.21E-04
Pltuonium-239/240	1.392	8	0.9	7	1	0.001	7.02E-02	3.64E-03	2.55E-04
								Total Effective Dose Equivalent	3.76E-04

RME - Ingestion of stream/dry sediment

ARI = C x IR x FC x EF x ME x CF
EDE = ARI x EDC

Radionuclide	C Sediment Concentration (pCi/g)	IR Ingestion Rate (mg/day)	FC Fraction Contaminated	EF Exposure Frequency (days/yr)	ME Matrix Effect	CF Conversion Factor (g/mg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.66	50	1	12	1	0.001	3.96E-01	3.64E-03	1.44E-03
Plutonium-239/240	1.392	50	1	12	1	0.001	8.35E-01	5.18E-05	4.33E-05
								Total Effective Dose Equivalent	1.48E-03

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

CT - Inhalation of particulates from stream/dry sediment

ARI = (C x IR x EF x CF x DF x RF)/PEF
EDE = ARI x EDC

	C	IR	EF	CF	DF	RF	PEF	ARI	EDC	EDE
Radionuclide	Sediment Concentration (pCi/g)	Inhalation Rate (m^3/day)	Exposure Frequency (days/yr)	Conversion Factor (g/kg)	Respiratory Deposition Factor	Respirable Fraction	Particulate Emission Factor (m^3/kg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	0.66	2	7	1000	0.85	0.36	4.63E+09	6.11E-07	4.44E-01	2.71E-07
Plutonium-239/240	1.392	2	7	1000	0.85	0.36	4.63E+09	1.29E-06	3.08E-01	3.97E-07
									Total Effective Dose Equivalent	6.68E-07

RME - Inhalation of particulates from stream/dry sediment

ARI = (C x IR x EF x CF x DF x RF)/PEF
EDE = ARI x EDC

	C	IR	EF	CF	DF	RF	PEF	ARI	EDC	EDE
Radionuclide	Sediment Concentration (pCi/g)	Inhalation Rate (m^3/day)	Exposure Frequency (days/yr)	Conversion Factor (g/kg)	Respiratory Deposition Factor	Respirable Fraction	Particulate Emission Factor (m^3/kg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	0.66	2	12	1000	0.85	0.36	4.63E+09	1.05E-06	4.44E-01	4.65E-07
Plutonium-239/240	1.392	2	12	1000	0.85	0.36	4.63E+09	2.21E-06	3.08E-01	6.80E-07
									Total Effective Dose Equivalent	1.14E-06

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

CT - Ingestion of surface water

ARI = C x IR x ET x EF
EDE = ARI x EDC

Radionuclide	C Surface Water Concentration (pCi/l)	IR Ingestion Rate (l/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.167	0.01	1	7	1.17E-02	3.64E-03	4.26E-05
Plutonium-239/240	0.069	0.01	1	7	4.83E-03	5.18E-05	2.50E-07
						Total Effective Dose Equivalent	4.28E-05

RME - Ingestion of surface water

ARI = C x IR x ET x EF
EDE = ARI x EDC

Radionuclide	C Surface Water Concentration (pCi/l)	IR Ingestion Rate (l/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.167	0.05	1	12	1.00E-01	3.64E-03	3.65E-04
Plutonium-239/240	0.069	0.05	1	12	4.14E-02	5.18E-05	2.14E-06
						Total Effective Dose Equivalent	3.67E-04

FUTURE ECOLOGICAL WORKER
AREA OF CONCERN NO. 4

CT - External irradiation from stream/dry sediment

ER = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

	C	SD	GSF	DP	CF	ER	EF	EDCF	EDE
Radionuclide	Soil Concentration (pCi/g)	Soil Density (kg/m^3)	Gamma Shielding Factor ($1-S_e$)	Soil Depth (m)	Conversion Factor (g/kg)	External Radiation (pCi/m^2)	Exposure Frequency (hr/yr)	External Dose Conversion Factor (mrem/hr per pCi/m^2)	Effective Dose Equivalent (mrem/yr)
Americium-241	0.66	1840	0.8	0.051	1000	4.95E+04	5.04E+01	3.41E-10	8.52E-04
Plutonium-239/240	1.392	1840	0.8	0.051	1000	1.05E+05	5.04E+01	4.31E-12	2.27E-05
								Total Effective Dose Equivalent	8.74E-04

RME - External irradiation from stream/dry sediment

ER = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

	C	SD	GSF	DP	CF	ER	EF	EDCF	EDE
Radionuclide	Soil Concentration (pCi/g)	Soil Density (kg/m^3)	Gamma Shielding Factor ($1-S_e$)	Soil Depth (m)	Conversion Factor (g/kg)	External Radiation (pCi/m^2)	Exposure Frequency (hr/yr)	External Dose Conversion Factor (mrem/hr per pCi/m^2)	Effective Dose Equivalent (mrem/yr)
Americium-241	0.66	1840	1	0.051	1000	6.19E+04	5.04E+01	3.41E-10	1.06E-03
Plutonium-239/240	1.392	1840	1	0.051	1000	1.31E+05	5.04E+01	4.31E-12	2.84E-05
								Total Effective Dose Equivalent	1.09E-03

SUMMARY OF RADIATION DOSE
FUTURE OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

	Annual Radiation Exposure	
Pathway	Central Tendency	Reasonable Maximum
Ingestion of pond sediment	1.12E-01	5.48E-01
Ingestion of stream/dry sediment	2.28E-03	1.48E-03
Inhalation of particulates from stream/dry sediment	5.94E-07	8.35E-06
Ingestion of surface water	3.82E-05	4.59E-04
External Irradiation from stream/dry sediment	2.08E-04	1.56E-03
Total Annual Radiation Exposure (mrem/yr)	1.14E-01	5.52E-01

FUTURE OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

CT - Ingestion of pond sediment

ARI = C x [(IR-C x TE-C) + (IR-A x TE-A)] x FC x EF x ME x CF
EDE = ARI x EDC

	C	IR-C	TE-C	IR-A	TE-A	EF	ME	CF	ARI	EDC	EDE
		Child		Adult							
Radionuclide	Sediment Concentration (pCi/g)	Ingestion Rate (mg/visit)	Percent of time exposed	Ingestion Rate (mg/visit)	Percent of time exposed	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (g/mg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	99.34	50	0.22	25	0.78	10	1	0.001	3.03E+01	3.64E-03	1.10E-01
Plutonium-239/240	78.3	50	0.22	25	0.78	10	1	0.001	2.39E+01	5.18E-05	1.24E-03
										Total Effective Dose Equivalent	1.12E-01

RME - Ingestion of pond sediment

ARI = C x [(IR-C x TE-C) + (IR-A x TE-A)] x FC x EF x ME x CF
EDE = ARI x EDC

	C	IR-C	TE-C	IR-A	TE-A	EF	ME	CF	ARI	EDC	EDE
		Child		Adult							
Radionuclide	Sediment Concentration (pCi/g)	Ingestion Rate (mg/visit)	Percent of time exposed	Ingestion Rate (mg/visit)	Percent of time exposed	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (g/mg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	99.34	100	0.2	50	0.8	25	1	0.001	1.49E+02	3.64E-03	5.42E-01
Plutonium-239/240	78.3	100	0.2	50	0.8	25	1	0.001	1.17E+02	5.18E-05	6.08E-03
										Total Effective Dose Equivalent	5.48E-01

FUTURE OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

CT - Ingestion of stream/dry sediment

ARI = C x [(IR-C x TE-C) + (IR-A x TE-A)] x FC x EF x ME x CF
EDE = ARI x EDC

	C	IR-C	TE-C	IR-A	TE-A	EF	ME	CF	ARI	EDC	EDE
		Child		Adult							
Radionuclide	Sediment Concentration (pCi/g)	Ingestion Rate (mg/visit)	Percent of time exposed	Ingestion Rate (mg/visit)	Percent of time exposed	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (g/mg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	0.66	50	0.22	25	0.78	10	1	0.001	2.01E-01	3.64E-03	7.33E-04
Pltuonium-239/240	1.392	50	0.22	25	0.78	10	1	0.001	4.25E-01	3.64E-03	1.55E-03
										Total Effective Dose Equivalent	2.28E-03

RME - Ingestion of stream/dry sediment

ARI = C x [(IR-C x TE-C) + (IR-A x TE-A)] x FC x EF x ME x CF
EDE = ARI x EDC

	C	IR-C	TE-C	IR-A	TE-A	EF	ME	CF	ARI	EDC	EDE
		Child		Adult							
Radionuclide	Sediment Concentration (pCi/g)	Ingestion Rate (mg/visit)	Percent of time exposed	Ingestion Rate (mg/visit)	Percent of time exposed	Exposure Frequency (visits/yr)	Matrix Effect	Conversion Factor (g/mg)	Annual Radionuclide Intake (pCi/yr)	Effective Dose Coefficient (mrem/pCi)	Effective Dose Equivalent (mrem/yr)
Americium-241	0.66	100	0.2	50	0.8	10	1	0.001	3.96E-01	3.64E-03	1.44E-03
Plutonium-239/240	1.392	100	0.2	50	0.8	10	1	0.001	8.35E-01	5.18E-05	4.33E-05
										Total Effective Dose Equivalent	1.48E-03

FUTURE OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

CT - Inhalation of particulates from stream/dry sediment

ARI = (C x IR x ET x EF x CF x DF x RF)/PEF
EDE = ARI x EDC

Radionuclide	C Sediment Concentration (pCi/g)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/visit)	EF Exposure Frequency (visits/yr)	CF Conversion Factor (g/kg)	DF Respiratory Deposition Factor	RF Respirable Fraction	PEF Particulate Emission Factor (m^3/kg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.66	0.83	1.5	10	1000	0.85	0.36	4.63E+09	5.43E-07	4.44E-01	2.41E-07
Plutonium-239/240	1.392	0.83	1.5	10	1000	0.85	0.36	4.63E+09	1.15E-06	3.08E-01	3.53E-07
										Total Effective Dose Equivalent	5.94E-07

RME - Inhalation of particulates from stream/dry sediment

ARI = (C x IR x ET x EF x CF x DF x RF)/PEF
EDE = ARI x EDC

Radionuclide	C Sediment Concentration (pCi/g)	IR Inhalation Rate (m^3/hr)	ET Exposure Time (hr/visit)	EF Exposure Frequency (visits/yr)	CF Conversion Factor (g/kg)	DF Respiratory Deposition Factor	RF Respirable Fraction	PEF Particulate Emission Factor (m^3/kg)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.66	1.4	5	25	1000	0.85	0.36	4.63E+09	7.63E-06	4.44E-01	3.39E-06
Plutonium-239/240	1.392	1.4	5	25	1000	0.85	0.36	4.63E+09	1.61E-05	3.08E-01	4.96E-06
										Total Effective Dose Equivalent	8.35E-06

FUTURE OPEN-SPACE RECREATIONAL USER
AREA OF CONCERN NO. 4

CT - Ingestion of surface water

ARI = C x IR x ET x EF
EDE = ARI x EDC

Radionuclide	C Surface Water Concentration (pCi/l)	IR Ingestion Rate (l/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.167	0.025	0.5	5	1.04E-02	3.64E-03	3.80E-05
Plutonium-239/240	0.069	0.025	0.5	5	4.31E-03	5.18E-05	2.23E-07
						Total Effective Dose Equivalent	3.82E-05

RME - Ingestion of surface water

ARI = C x IR x ET x EF
EDE = ARI x EDC

Radionuclide	C Surface Water Concentration (pCi/l)	IR Ingestion Rate (l/hr)	ET Exposure Time (hr/day)	EF Exposure Frequency (days/yr)	ARI Annual Radionuclide Intake (pCi/yr)	EDC Effective Dose Coefficient (mrem/pCi)	EDE Effective Dose Equivalent (mrem/yr)
Americium-241	0.167	0.05	1	15	1.25E-01	3.64E-03	4.56E-04
Plutonium-239/240	0.069	0.05	1	15	5.18E-02	5.18E-05	2.68E-06
						Total Effective Dose Equivalent	4.59E-04

FUTURE OPEN SPACE RECREATIONAL USE
AREA OF CONCERN NO. 4

CT - External irradiation from stream/dry sediment

ER = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

	C	SD	GSF	DP	CF	ER	EF	EDCF	EDE
Radionuclide	Soil Concentration (pCi/g)	Soil Density (kg/m^3)	Gamma Shielding Factor ($1-S_e$)	Soil Depth (m)	Conversion Factor (g/kg)	External Radiation (pCi/m^2)	Exposure Frequency (hr/yr)	External Dose Conversion Factor (mrem/hr per pCi/m^2)	Effective Dose Equivalent (mrem/yr)
Americium-241	0.6601	1840	0.8	0.051	1000	4.96E+04	1.20E+01	3.41E-10	2.03E-04
Plutonium-239/240	1.392	1840	0.8	0.051	1000	1.05E+05	1.20E+01	4.31E-12	5.40E-06
								Total Effective Dose Equivalent	2.08E-04

RME - External irradiation from stream/dry sediment

ER = C x SD x GSF x DP x CF
EDE = ER x EF x EDCF

	C	SD	GSF	DP	CF	ER	EF	EDCF	EDE
Radionuclide	Soil Concentration (pCi/g)	Soil Density (kg/m^3)	Gamma Shielding Factor ($1-S_e$)	Soil Depth (m)	Conversion Factor (g/kg)	External Radiation (pCi/m^2)	Exposure Frequency (hr/yr)	External Dose Conversion Factor (mrem/hr per pCi/m^2)	Effective Dose Equivalent (mrem/yr)
Americium-241	0.6601	1840	1	0.051	1000	6.19E+04	7.20E+01	3.41E-10	1.52E-03
Plutonium-239/240	1.392	1840	1	0.051	1000	1.31E+05	7.20E+01	4.31E-12	4.05E-05
								Total Effective Dose Equivalent	1.56E-03

ATTACHMENT J5

1994 POND SEDIMENT SAMPLING AND RISK EVALUATION

ATTACHMENT J5
1994 POND SEDIMENT SAMPLING AND RISK EVALUATION

During the summer of 1994, subsequent to the OU6 Phase I field investigation, additional pond sediment samples were collected in the A- and B-series ponds. These ponds were chosen for additional study to support the ongoing Ecological Risk Assessment. Sediment samples collected from ponds A-1, A-2, B-1, and B-2 were analyzed for Am-241, Pu-239/240, U-233,-234, U-235, U-238, gross alpha, gross beta, and for Aroclors-1248, -1254, and -1260. Some samples were also collected in the other A- and B-series ponds and analyzed for Aroclors.

Sediment sample locations were approximately the same as those of the previous samples used in the OU6 human health risk assessment (HHRA). However, the 1994 samples were collected at a depth of 0 to 6 inches, rather than 0 to 24 inches. The 0-to-6-inch interval is more representative of the sediment layer to which human or ecological receptors may be exposed. Due to the difference in depth intervals, the sample results from the two sampling rounds are not strictly comparable, and the results were not combined for risk assessment. Instead, a separate risk evaluation using the 1994 results was performed for comparison to the results of the OU6 risk assessment for Area of Concern (AOC) No. 3 (A-series ponds) and AOC No. 4 (B-series ponds). As discussed below, the concentrations of pond sediment chemicals of concern (COCs) in the two sampling rounds, while somewhat different, did not produce substantially different risk results, and the risk evaluation of the 1994 data supports the conclusion drawn in the HHRA that exposure to sediment does not produce unacceptable risk under the exposure conditions evaluated.

For the risk evaluation, the 1994 sample results were aggregated from Ponds A-1 and A-2 and from Ponds B-1 and B-2, consistent with the different flow regimes in the A- and B-series ponds and with the identification of AOC No. 3 and AOC No. 4. Using results from these ponds also provides an upperbound estimate on exposure potential because analyte concentrations are generally higher in sediments from these ponds than in other ponds in each series. Only compounds identified as OU-wide COCs in pond sediment were carried forward in the risk assessment. These are Aroclor-1254, Am-241, and Pu-239/240.

The 95 percent upper confidence limit (95% UCL) on the mean concentrations of the COCs in the two sampling rounds are shown below:

Concentrations of Pond Sediment COCs, 1992 and 1994 Sampling Rounds
mg/kg or pCi/g

	A series		B series	
Analyte	1992 (0 to 24")	1994 (0 to 6")	1992 (0 to 24")	1994 (0 to 6")
Aroclor-1254	0.332	0.105	2.424	2.047
Am-241	5.98	1.516	54.5	73.81
Pu-239/240	15.95	5.54	60.91	403.3

Exposure scenarios evaluated were ingestion of and dermal contact with pond sediment by ecological researchers and open space recreational users. Exposure to dry sediment by inhalation and external irradiation was also evaluated for the maximum exposure condition (open space recreational user at the B-series ponds) to verify that these exposure pathways were relatively insignificant.

Table 1 summarizes the results of the risk evaluation. Table 2 shows the analytical results for the COCs and 95% UCL concentrations. Spreadsheets following Table 2 show the exposure assumptions and risk calculations.

As shown in Table 1, the highest cancer risk estimate was 9E-06 (open space recreational user, assuming 25 visits/year for 30 years at Ponds B-1 and B-2). This result is within EPA's target risk range of 1E-06 to 1E-04. The highest cancer risk estimate using the 1994 sampling results is somewhat, but not substantially, higher than the highest cancer risk estimate for the ponds calculated using the 1992 sample results (cancer risk of 6E-06, AOC No. 4).

Several analytes detected in sediment in Ponds A-1, A-2, B-1, and B-2 in the 1994 sampling program were not COCs for the human health risk assessment, i.e., Aroclor-1248 and uranium isotopes. Aroclor-1248 was detected in samples from Ponds B-1 and B-2 (results not shown

in this Attachment); the 95% UCL concentration of 0.662 mg/kg is about 3 times lower than the 95% UCL concentration of Aroclor-1254 (2.047 mg/kg) and would be expected to result in a comparably lower risk. In the 1994 samples, maximum levels of U-233,-234 (9.3 pCi/g) and U-238 (26.8 pCi/g) were comparable to or lower than levels in the 1992 samples (maximum U-233,-234 = 15.9 pCi/g and maximum U-238 = 26.4 pCi/g; Table J3-20). Since the uranium isotopes did not contribute significantly to the overall risk factor in the concentration/toxicity screen used to select COCs based on the 1992 data (see Table J3-20), they would not contribute significantly to overall risk using 1994 results, either. Therefore, it is reasonable to compare the risk estimates based on the 1992 and 1994 sampling programs.

ATTACHMENT J5
TABLE 1
SUMMARY OF CANCER RISK ESTIMATES
FOR EXPOSURE TO POND SEDIMENTS (0-6")

A- Series Ponds (A-1 and A-2)

	Cancer Risk	
Pathway	Central Tendency	Reasonable Maximum Exposure
Open Space Recreational User		
Ingestion of sediment	7.63E-09	1.24E-07
Dermal contact with sediment	1.46E-10	5.39E-08
Total	7.78E-09	1.78E-07
Ecological Researcher		
Ingestion of sediment	3.12E-10	3.71E-09
Dermal contact with sediment	7.92E-10	1.47E-07
Total	1.10E-09	1.51E-07

B- Series Ponds (B-1 and B-2)

	Cancer Risk	
Pathway	Central Tendency	Reasonable Maximum Exposure
Open Space Recreational User		
Ingestion of sediment	4.45E-07	7.27E-06
Dermal contact with sediment	2.86E-09	1.05E-06
Inhalation, dry sediment (1)	5.39E-13	2.53E-11
External irradiation, dry sediment (1)	1.11E-08	2.17E-07
Total	4.59E-07	8.54E-06
Ecological Researcher		
Ingestion of sediment	1.97E-08	2.34E-07
Dermal contact with sediment	1.54E-08	1.47E-07
Total	3.51E-08	3.81E-07

(1) Using results of dry sediment samples collected near Pond B-2 (worst case). These exposure pathways were evaluated only for the open space recreational user at the B-series ponds to demonstrate that they are negligible and do not result in significant risk.

Table 2
OU6 1994 Pond Sediment
Sampling Results for Am-241, Pu-239/240, and Aroclor-1254
Ponds A-1, A-2 and Ponds B-1, B-2, 0 to 6"

Location	Sample#	Chemical		Result	Units	Error	Qualifier	Det. Limit	Valid
SED60092	SD00009ST	AMERICIUM-241		0.8759	pCi/G	0.1176		0.013	V
SED60192	SD00008ST	AMERICIUM-241		0.5965	pCi/G	0.0768		0.008	V
SED60292	SD00011ST	AMERICIUM-241		0.7684	pCi/G	0.103		0.0126	V
SED60392	SD00010ST	AMERICIUM-241		0.8486	pCi/G	0.112		0.00666	V
SED60492	SD00006ST	AMERICIUM-241		0.7021	pCi/G	0.0854		0.017	V
SED60592	SD00004ST	AMERICIUM-241		1.131	pCi/G	0.145		0.00319	V
SED60692	SD00003ST	AMERICIUM-241		1.784	pCi/G	0.232		0.00911	V
SED60792	SD00002ST	AMERICIUM-241		1.305	pCi/G	0.194		0.0106	V
SED60892	SD00001ST	AMERICIUM-241		0.9617	pCi/G	0.14		0.00377	V
SED60992	SD00005ST	AMERICIUM-241		2.612	pCi/G	0.31		0.0107	V
			mean	1.158					
			stdev (1)	0.6162					
			95%CI (2)	0.3572					
	A-Series	AMERICIUM-241	95%UCL (3)	1.516	pCi/G				
SED62092	SD00045ST	AMERICIUM-241		29.88	pCi/G	5.7		0.0388	V
SED62192	SD00042ST	AMERICIUM-241		24.75	pCi/G	4		0.0275	V
SED62292	SD00043ST	AMERICIUM-241		33.89	pCi/G	6.55		0.0507	V
SED62392	SD00044ST	AMERICIUM-241		10.01	pCi/G	1.07		0.00496	V
SED62492	SD00041ST	AMERICIUM-241		65.35	pCi/G	6.35		0.0478	V
SED62592	SD00037ST	AMERICIUM-241		132.3	pCi/G	12.9		0.0622	V
SED62692	SD00039ST	AMERICIUM-241		79.03	pCi/G	7.97		0.0653	V
SED62792	SD00034ST	AMERICIUM-241		67.97	pCi/G	6.7		0.0392	V
SED62892	SD00036ST	AMERICIUM-241		59.93	pCi/G	5.92		0.0358	V
SED62992	SD00038ST	AMERICIUM-241		26.60	pCi/G	2.67		0.0182	V
			mean	52.97					
			stdev	35.95					
			95%CI	20.84					
	B-Series	AMERICIUM-241	95% UCL	73.81	pCi/G				

Table 2
OU6 1994 Pond Sediment
Sampling Results for Am-241, Pu-239/240, and Aroclor-1254
Ponds A-1, A-2 and Ponds B-1, B-2, 0 to 6"

Location	Sample#	Chemical		Result	Units	Error	Qualifier	Det. Limit	Valid
SED60092	SD00009ST	AROCLOR-1254		86	UG/KG		J	520	A
SED60192	SD00008ST	AROCLOR-1254		73	UG/KG		J	320	A
SED60292	SD00011ST	AROCLOR-1254		86	UG/KG		J	480	A
SED60392	SD00010ST	AROCLOR-1254		88	UG/KG		J	530	A
SED60492	SD00006ST	AROCLOR-1254		44	UG/KG		J	290	A
SED60592	SD00004ST	AROCLOR-1254		20	UG/KG		U	480	V
SED60692	SD00003ST	AROCLOR-1254		130	UG/KG		J	600	A
SED60792	SD00002ST	AROCLOR-1254		89	UG/KG		J	690	A
SED60892	SD00001ST	AROCLOR-1254		20	UG/KG		U		
SED60992	SD00005ST	AROCLOR-1254		160	UG/KG		J	590	A
			mean	80					
			stdev	44					
			95%CI	26					
	A-Series	AROCLOR-1254	95% UCL	105	UG/KG				
SED62092	SD00045ST	AROCLOR-1254		320	UG/KG		J	390	A
SED62192	SD00042ST	AROCLOR-1254		1600	UG/KG			630	V
SED62292	SD00043ST	AROCLOR-1254		910	UG/KG			300	V
SED62392	SD00044ST	AROCLOR-1254		410	UG/KG		J	430	A
SED62492	SD00041ST	AROCLOR-1254		1100	UG/KG			310	V
SED62592	SD00037ST	AROCLOR-1254		2100	UG/KG			830	JA
SED62692	SD00039ST	AROCLOR-1254		3800	UG/KG			1800	V
SED62792	SD00034ST	AROCLOR-1254		930	UG/KG			630	JA
SED62892	SD00036ST	AROCLOR-1254		1400	UG/KG			410	V
SED62992	SD00038ST	AROCLOR-1254		2000	UG/KG			700	V
			mean	1457					
			stdev	1017					
			95%CI	590					
	B-Series	AROCLOR-1254	95% UCL	2047	UG/KG				

Table 2
OU6 1994 Pond Sediment
Sampling Results for Am-241, Pu-239/240, and Aroclor-1254
Ponds A-1, A-2 and Ponds B-1, B-2, 0 to 6"

Location	Sample#	Chemical		Result	Units	Error	Qualifier	Det. Limit	Valid
SED60092	SD00009ST	PLUTONIUM-239/240		2.887	pCi/G	0.19		0.006	V
SED60192	SD00008ST	PLUTONIUM-239/240		1.713	pCi/G	0.01		0.005	V
SED60292	SD00011ST	PLUTONIUM-239/240		2.206	pCi/G	0.269		0.00441	V
SED60392	SD00010ST	PLUTONIUM-239/240		2.410	pCi/G	0.31		0.0177	V
SED60492	SD00006ST	PLUTONIUM-239/240		2.152	pCi/G	0.119		0.005	V
SED60592	SD00004ST	PLUTONIUM-239/240		4.155	pCi/G	0.199		0.006	V
SED60692	SD00003ST	PLUTONIUM-239/240		6.848	pCi/G	0.307		0.004	V
SED60792	SD00002ST	PLUTONIUM-239/240		4.128	pCi/G	0.211		0.005	V
SED60892	SD00001ST	PLUTONIUM-239/240		2.951	pCi/G	0.145		0.004	V
SED60992	SD00005ST	PLUTONIUM-239/240		10.35	pCi/G	0.438		0.005	V
			mean	3.980					
			stdev	2.691					
			95%CI	1.560					
	A-Series	PLUTONIUM-239/240	95% UCL	5.540	pCi/G				
SED62092	SD00045ST	PLUTONIUM-239/240		24.15	pCi/G	2.2		0.0106	V
SED62192	SD00042ST	PLUTONIUM-239/240		87.56	pCi/G	8.16		0.0425	V
SED62292	SD00043ST	PLUTONIUM-239/240		213.5	pCi/G	17		0.0514	V
SED62392	SD00044ST	PLUTONIUM-239/240		38.56	pCi/G	2.52		0.00301	V
SED62492	SD00041ST	PLUTONIUM-239/240		188.8	pCi/G	17.3		0.032	V
SED62592	SD00037ST	PLUTONIUM-239/240		643.4	pCi/G	62.6		0.028	V
SED62692	SD00039ST	PLUTONIUM-239/240		482.0	pCi/G	34.1		0.1	V
SED62792	SD00034ST	PLUTONIUM-239/240		638.4	pCi/G	33		0.0692	V
SED62892	SD00036ST	PLUTONIUM-239/240		222.4	pCi/G	22.5		0.0506	V
SED62992	SD00038ST	PLUTONIUM-239/240		129.8	pCi/G	10.8		0.0447	V
			mean	266.9					
			stdev	235.5					
			95%CI	136.5					
	B-Series	PLUTONIUM-239/240	95% UCL	403.3	pCi/G				

(1) stdev = standard deviation
(2) CI = confidence interval
(3) UCL = upper confidence limit
(4) U-qualified results for Aroclor are reported as one-half of the instrument Detection limit (40 ug/kg) as provided by the laboratory, rather than one-half of the sample reporting limit.

HUMAN HEALTH RISK ASSESSMENT PATHWAY ANALYSIS

Receptor: Future Open Space Recreational Use
Area Description: A-series Ponds
Media: Pond Sediment
Pathway: Ingestion

Chemical Intake Factor = [(IR-CxED-C/BW-C)+(IR-AxED-A)/(BW-A)]x(CFxMExEF)/AT

Radionuclide Intake Factor = [(IR-CxED-C)+(IR-AxED-A)]xEFxMExCF

		Central Tendency		Reasonable Maximum Exposure	
Exposure Factors Description	Chemical Units	Child Exposure Value	Adult Exposure Value	Child Exposure Value	Adult Exposure Value
Ingestion Rate (IR)	mg\visit	50	25	100	50
Conversion Factor (CF)	kg\mg	1.00E-06	1.00E-06	1.00E-06	1.00E-06
Conversion Factor (CF)	g/mg	1.00E-03	1.00E-03	1.00E-03	1.00E-03
Chemical-specific Matrix Effect	unitless				
Exposure Frequency (EF)	visits\year	10	10	25	25
Exposure Duration (ED)	years	2	7	6	24
Body Weight (BW)	kg	15	70	15	70
Carcinogenic Averaging Time (AT)	days	25550	25550	25550	25550

CARCINOGENIC RISK (CENTRAL TENDENCY)

Chemical	Chemical Concentration (mg\kg or pCi/g)	Intake Factor (kg\kg\day)	Intake (mg\kg\day)	Slope Factor $(mg\backslash kg\backslash day)^{-01}$	Carcinogenic Risk
Arocior-1254	0.105	1.79E-09	1.88E-10	7.70E+00	1.45E-09
Americum-241	1.516	2.75E+00	4.17E+00	3.28E-10	1.37E-09
Plutonium-239/240	5.54	2.75E+00	1.52E+01	3.16E-10	4.81E-09
				TOTAL	7.63E-09

CARCINOGENIC RISK (REASONABLE MAXIMUM EXPOSURE)

Chemical	Chemical Concentration (mg\kg)	Intake Factor (kg\kg\day)	Intake (mg\kg\day)	Slope Factor $(mg\backslash kg\backslash day)^{-01}$	Carcinogenic Risk
Aroclor-1254	0.105	2.80E-08	2.94E-09	7.70E+00	2.26E-08
Americum-241	1.516	4.50E+01	6.82E+01	3.28E-10	2.24E-08
Plutonium-239/240	5.54	4.50E+01	2.49E+02	3.16E-10	7.88E-08
				TOTAL	1.24E-07

HUMAN HEALTH RISK ASSESSMENT PATHWAY ANALYSIS

Receptor: Future Open Space Recreational Use
Area Description: A-series Ponds
Media: Pond Sediment
Pathway: Dermal Contact

Chemical Intake Factor = (SAxFCxADxABxEFxEDxCF)/(BWxAT)

		Central Tendency	Reasonable Maximum Exposure
Exposure Factors Description	Chemical Units	Exposure Value	Exposure Value
Skin Surface Area (SA)	cm^2	2000	5300
Conversion Factor (CF)	kg/mg	1.00E-06	1.00E-06
Soil Adherence Factor (AD)	mg/cm^2	0.2	1.0
Contaminated Source Fraction (FC)	unitless	0.15	0.5
Skin Absorption Factor (AB)	unitless	CS	CS
Exposure Frequency (EF)	events/year	10	25
Exposure Duration (ED)	years	9	30
Body Weight (BW)	kg	70	70
Carcinogenic Averaging Time (AT)	days	25550	25550

CARCINOGENIC RISK (CENTRAL TENDENCY)

Chemical	Chemical Concentration (mg\kg)	Intake Factor (kg\kg\day)	Intake (mg\kg\day)	Slope Factor $(mg\kg\day)^{-01}$	Carcinogenic Risk
Aroclor-1254	0.105	1.81E-10	1.90E-11	7.70E+00	1.46E-10
				TOTAL	1.46E-10

CARCINOGENIC RISK (REASONABLE MAXIMUM EXPOSURE)

Chemical	Chemical Concentration (mg\kg)	Intake Factor (kg\kg\day)	Intake (mg\kg\day)	Slope Factor $(mg\kg\day)^{-01}$	Carcinogenic Risk
Aroclor-1254	0.105	6.67E-08	7.00E-09	7.70E+00	5.39E-08
				TOTAL	5.39E-08

HUMAN HEALTH RISK ASSESSMENT PATHWAY ANALYSIS

Receptor: Future Ecological Researcher
Area Description: A-series Ponds
Media: Pond Sediment
Pathway: Ingestion

Chemical Intake Factor = (IRxFCxEDxCFxMExEF)/(BWxAT)

Radionuclide Intake Factor = IRxFCxEDxCFxMExEF

		Central Tendency	Reasonable Maximum Exposure
Exposure Factors Description	Chemical Units	Exposure Value	Exposure Value
Ingestion Rate (IR)	mg\visit	8	50
Fraction Contaminated (FC)	unitless	0.9	1
Conversion Factor (CF)	kg\mg	1.00E-06	1.00E-06
Conversion Factor (CF)	g/mg	1.00E-03	1.00E-03
Chemical-specific Matrix Effect	unitless	CS	CS
Exposure Frequency (EF)	visits\year	7	12
Exposure Duration (ED)	years	2.5	2.5
Body Weight (BW)	kg	70	70
Carcinogenic Averaging Time (AT)	days	25550	25550

CARCINOGENIC RISK (CENTRAL TENDENCY)

Chemical	Chemical Concentration (mg\kg or pCi/g)	Intake Factor (kg\kg\day)	Intake (mg\kg\day)	Slope Factor $(mg\backslash kg\backslash day)^{-01}$	Carcinogenic Risk
Aroclor-1254	0.105	3.52E-11	3.70E-12	7.70E+00	2.85E-11
Americum-241	1.516	1.26E-01	1.91E-01	3.28E-10	6.27E-11
Plutonium-239/240	5.54	1.26E-01	6.98E-01	3.16E-10	2.21E-10
				TOTAL	3.12E-10

CARCINOGENIC RISK (REASONABLE MAXIMUM EXPOSURE)

Chemical	Chemical Concentration (mg\kg)	Intake Factor (kg\kg\day)	Intake (mg\kg\day)	Slope Factor $(mg\backslash kg\backslash day)^{-01}$	Carcinogenic Risk
Aroclor-1254	0.105	4.19E-10	4.40E-11	7.70E+00	3.39E-10
Americum-241	1.516	1.50E+00	2.27E+00	3.28E-10	7.46E-10
Plutonium-239/240	5.54	1.50E+00	8.31E+00	3.16E-10	2.63E-09
				TOTAL	3.71E-09

HUMAN HEALTH RISK ASSESSMENT PATHWAY ANALYSIS

Receptor: Future Ecological Researcher
Area Description: A-series Ponds
Media: *Pond Sediment*
Pathway: Dermal Contact

Chemical Intake Factor = (SAxFCxADxABxEFxEDxCF)/(BWxAT)

		Central Tendency	Reasonable Maximum Exposure
Exposure Factors Description	Chemical Units	Exposure Value	Exposure Value
Skin Surface Area (SA)	cm^2	9275	9275
Conversion Factor (CF)	kg/mg	1.00E-06	1.00E-06
Soil Adherence Factor (AD)	mg/cm^2	0.2	1.0
Contaminated Source Fraction (FC)	unitless	0.9	1
Skin Absorption Factor (AB)	unitless	CS	CS
Exposure Frequency (EF)	events/year	7	12
Exposure Duration (ED)	years	2.5	2.5
Body Weight (BW)	kg	70	70
Carcinogenic Averaging Time (AT)	days	25550	25550

CARCINOGENIC RISK (CENTRAL TENDENCY)

Chemical	Chemical Concentration (mg\kg)	Intake Factor (kg\kg\day)	Intake (mg\kg\day)	Slope Factor $(mg\kg\day)^{-01}$	Carcinogenic Risk
Aroclor-1254	0.105	9.80E-10	1.03E-10	7.70E+00	7.92E-10
				TOTAL	7.92E-10

CARCINOGENIC RISK (REASONABLE MAXIMUM EXPOSURE)

Chemical	Chemical Concentration (mg\kg)	Intake Factor (kg\kg\day)	Intake (mg\kg\day)	Slope Factor $(mg\kg\day)^{-01}$	Carcinogenic Risk
Aroclor-1254	2.047	9.33E-09	1.91E-08	7.70E+00	1.47E-07
				TOTAL	1.47E-07

HUMAN HEALTH RISK ASSESSMENT PATHWAY ANALYSIS

Receptor: Future Open Space Recreational Use
Area Description: B-series Ponds
Media: Pond Sediment
Pathway: Ingestion

Chemical Intake Factor = [(IR-CxED-C/BW-C)+(IR-AxED-A)/(BW-A)]x(CFxMExEF)/AT

Radionuclide Intake Factor = [(IR-CxED-C)+(IR-AxED-A)]xEFxMExCF

		Central Tendency		Reasonable Maximum Exposure	
Exposure Factors Description	Chemical Units	Child Exposure Value	Adult Exposure Value	Child Exposure Value	Adult Exposure Value
Ingestion Rate (IR)	mg\visit	50	25	100	50
Conversion Factor (CF)	kg\mg	1.00E-06	1.00E-06	1.00E-06	1.00E-06
Conversion Factor (CF)	g/mg	1.00E-03	1.00E-03	1.00E-03	1.00E-03
Chemical-specific Matrix Effect	unitless				
Exposure Frequency (EF)	visits\year	10	10	25	25
Exposure Duration (ED)	years	2	7	6	24
Body Weight (BW)	kg	15	70	15	70
Carcinogenic Averaging Time (AT)	days	25550	25550	25550	25550

CARCINOGENIC RISK (CENTRAL TENDENCY)

Chemical	Chemical Concentration (mg\kg or pCi/g)	Intake Factor (kg\kg\day)	Intake (mg\kg\day)	Slope Factor $(mg\backslash kg\backslash day)^{-01}$	Carcinogenic Risk
Aroclor-1254	2.047	1.79E-09	3.67E-09	7.70E+00	2.83E-08
Americum-241	73.81	2.75E+00	2.03E+02	3.28E-10	6.66E-08
Plutonium-239/240	403.3	2.75E+00	1.11E+03	3.16E-10	3.50E-07
				TOTAL	4.45E-07

CARCINOGENIC RISK (REASONABLE MAXIMUM EXPOSURE)

Chemical	Chemical Concentration (mg\kg)	Intake Factor (kg\kg\day)	Intake (mg\kg\day)	Slope Factor $(mg\backslash kg\backslash day)^{-01}$	Carcinogenic Risk
Aroclor-1254	2.047	2.80E-08	5.72E-08	7.70E+00	4.41E-07
Americum-241	73.81	4.50E+01	3.32E+03	3.28E-10	1.09E-06
Plutonium-239/240	403.3	4.50E+01	1.81E+04	3.16E-10	5.73E-06
				TOTAL	7.27E-06

HUMAN HEALTH RISK ASSESSMENT PATHWAY ANALYSIS

Receptor: Future Open Space Recreational Use
Area Description: B-series Ponds
Media: Pond Sediment
Pathway: Dermal Contact

Chemical Intake Factor = (SAxFCxADxABxEFxEDxCF)/(BWxAT)

		Central Tendency	Reasonable Maximum Exposure
Exposure Factors Description	Chemical Units	Exposure Value	Exposure Value
Skin Surface Area (SA)	cm^2	2000	5300
Conversion Factor (CF)	kg/mg	1.00E-06	1.00E-06
Soil Adherence Factor (AD)	mg/cm^2	0.2	1.0
Contaminated Source Fraction (FC)	unitless	0.15	0.5
Skin Absorption Factor (AB)	unitless	CS	CS
Exposure Frequency (EF)	events/year	10	25
Exposure Duration (ED)	years	9	30
Body Weight (BW)	kg	70	70
Carcinogenic Averaging Time (AT)	days	25550	25550

CARCINOGENIC RISK (CENTRAL TENDENCY)

Chemical	Chemical Concentration (mg\kg)	Intake Factor (kg\kg\day)	Intake (mg\kg\day)	Slope Factor $(mg\kg\day)^{-01}$	Carcinogenic Risk
Aroclor-1254	2.047	1.81E-10	3.71E-10	7.70E+00	2.86E-09
				TOTAL	2.86E-09

CARCINOGENIC RISK (REASONABLE MAXIMUM EXPOSURE)

Chemical	Chemical Concentration (mg\kg)	Intake Factor (kg\kg\day)	Intake (mg\kg\day)	Slope Factor $(mg\kg\day)^{-01}$	Carcinogenic Risk
Aroclor-1254	2.047	6.67E-08	1.36E-07	7.70E+00	1.05E-06
				TOTAL	1.05E-06

HUMAN HEALTH RISK ASSESSMENT PATHWAY ANALYSIS

Receptor: Future Open Space Recreational User
Area Description: Pond B-2
Media: Sediment (dry)
Pathway: External Irradiation

Radionuclide Intake Factor = TFxGSFxEFxED

		Central Tendency	Reasonable Maximum Exposure
Exposure Factors Description	Chemical Units	Exposure Value	Exposure Value
Gamma Time Factor (T_e)	unitless	0.1	0.2
Gamma Shielding Factor ($1-S_e$)	unitless	0.8	1
Percent of Year Exposed (EF)	unitless	0.03	0.07
Exposure Duration (ED)	years	9	30

CARCINOGENIC RISK (CENTRAL TENDENCY)

Chemical	Soil Concentration (pCi/g)(1)	Intake Factor (years)	Intake (pCi/g/yr)	Slope Factor (Risk/yr/pCi/g)	Carcinogenic Risk
Americium-241	1.10E+02	2.16E-02	2.37E+00	4.59E-09	1.09E-08
Plutonium-239/240	6.49E+02	2.16E-02	1.40E+01	1.87E-11	2.62E-10
				TOTAL	1.11E-08

CARCINOGENIC RISK (REASONABLE MAXIMUM EXPOSURE)

Chemical	Soil Concentration (pCi/g)	Intake Factor (years)	Intake (pCi/g/yr)	Slope Factor (Risk/yr/pCi/g)	Carcinogenic Risk
Americium-241	1.10E+02	4.20E-01	4.61E+01	4.59E-09	2.12E-07
Plutonium-239/240	6.49E+02	4.20E-01	2.73E+02	1.87E-11	5.10E-09
				TOTAL	2.17E-07

(1) Soil concentration is based on the 95% UCL unless this value is greater than the maximum concentr in this case, the maximum concentration was used.

HUMAN HEALTH RISK ASSESSMENT PATHWAY ANALYSIS

Receptor: Future Open Space Recreational User
Area Description: Pond B-2
Media: Sediment (dry)
Pathway: Inhalation of Particulates

Radionuclide Intake Factor = IRxETxEFxED

		Central Tendency	Reasonable Maximum Exposure
Exposure Factors Description	Chemical Units	Exposure Value	Exposure Value
Inhalation Rate (IR)	m3/hr	0.83	1.4
Exposure Time (ET)	hr/visit	1.5	5
Exposure Frequency (EF)	visits\year	10	25
Exposure Duration (ED)	years	9	30

CARCINOGENIC RISK (CENTRAL TENDENCY)

Chemical	Maximum Air Concentration (pCi/m^3)	Intake Factor (m3\kg\day	Intake (mg\kg\day)	Slope Factor or (Risk/pCi)	Carcinogenic Risk
Americium-241	2.37E-08	1.12E+02	2.66E-06	3.85E-08	1.02E-13
Plutonium-239/240	1.40E-07	1.12E+02	1.57E-05	2.78E-08	4.37E-13
				TOTAL	5.39E-13

CARCINOGENIC RISK (REASONABLE MAXIMUM EXPOSURE)

Chemical	Maximum Air Concentration (pCi/m^3)	Intake Factor (m3\kg\day	Intake (mg\kg\day)	Slope Factor (Risk/pCi)	Carcinogenic Risk
Americium-241	2.37E-08	5.25E+03	1.25E-04	3.85E-08	4.79E-12
Plutonium-239/240	1.40E-07	5.25E+03	7.36E-04	2.78E-08	2.05E-11
				TOTAL	2.53E-11

HUMAN HEALTH RISK ASSESSMENT PATHWAY ANALYSIS

Receptor: Future Ecological Researcher
Area Description: B-series Ponds
Media: Pond Sediment
Pathway: Ingestion

Chemical Intake Factor = (IRxFCxEDxCFxMExEF)/(BWxAT)

Radionuclide Intake Factor = IRxFCxEDxCFxMExEF

		Central Tendency	Reasonable Maximum Exposure
Exposure Factors Description	Chemical Units	Exposure Value	Exposure Value
Ingestion Rate (IR)	mg\visit	8	50
Fraction Contaminated (FC)	unitless	0.9	1
Conversion Factor (CF)	kg\mg	1.00E-06	1.00E-06
Conversion Factor (CF)	g/mg	1.00E-03	1.00E-03
Chemical-specific Matrix Effect	unitless	CS	CS
Exposure Frequency (EF)	visits\year	7	12
Exposure Duration (ED)	years	2.5	2.5
Body Weight (BW)	kg	70	70
Carcinogenic Averaging Time (AT)	days	25550	25550

CARCINOGENIC RISK (CENTRAL TENDENCY)

Chemical	Chemical Concentration (mg\kg or pCi/g)	Intake Factor (kg\kg\day)	Intake (mg\kg\day)	Slope Factor $(mg\backslash kg\backslash day)^{-01}$	Carcinogenic Risk
Aroclor-1254	2.047	3.52E-11	7.21E-11	7.70E+00	5.55E-10
Americum-241	73.81	1.26E-01	9.30E+00	3.28E-10	3.05E-09
Plutonium-239/240	403.3	1.26E-01	5.08E+01	3.16E-10	1.61E-08
				TOTAL	1.97E-08

CARCINOGENIC RISK (REASONABLE MAXIMUM EXPOSURE)

Chemical	Chemical Concentration (mg\kg)	Intake Factor (kg\kg\day)	Intake (mg\kg\day)	Slope Factor $(mg\backslash kg\backslash day)^{-01}$	Carcinogenic Risk
Aroclor-1254	2.047	4.19E-10	8.58E-10	7.70E+00	6.61E-09
Americum-241	73.81	1.50E+00	1.11E+02	3.28E-10	3.63E-08
Plutonium-239/240	403.3	1.50E+00	6.05E+02	3.16E-10	1.91E-07
				TOTAL	2.34E-07

HUMAN HEALTH RISK ASSESSMENT PATHWAY ANALYSIS

Receptor: Future Ecological Researcher
Area Description: B-series Ponds
Media: Pond Sediment
Pathway: Dermal Contact

Chemical Intake Factor = (SAxFCxADxABxEFxEDxCF)/(BWxAT)

		Central Tendency	Reasonable Maximum Exposure
Exposure Factors Description	Chemical Units	Exposure Value	Exposure Value
Skin Surface Area (SA)	cm^2	9275	9275
Conversion Factor (CF)	kg/mg	1.00E-06	1.00E-06
Soil Adherence Factor (AD)	mg/cm^2	0.2	1.0
Contaminated Source Fraction (FC)	unitless	0.9	1
Skin Absorption Factor (AB)	unitless	CS	CS
Exposure Frequency (EF)	events/year	7	12
Exposure Duration (ED)	years	2.5	2.5
Body Weight (BW)	kg	70	70
Carcinogenic Averaging Time (AT)	days	25550	25550

CARCINOGENIC RISK (CENTRAL TENDENCY)

Chemical	Chemical Concentration (mg\kg)	Intake Factor (kg\kg\day)	Intake (mg\kg\day)	Slope Factor $(mg\kg\day)^{-01}$	Carcinogenic Risk
Aroclor-1254	2.047	9.80E-10	2.01E-09	7.70E+00	1.54E-08
				TOTAL	1.54E-08

CARCINOGENIC RISK (REASONABLE MAXIMUM EXPOSURE)

Chemical	Chemical Concentration (mg\kg)	Intake Factor (kg\kg\day)	Intake (mg\kg\day)	Slope Factor $(mg\kg\day)^{-01}$	Carcinogenic Risk
Aroclor-1254	2.047	9.33E-09	1.91E-08	7.70E+00	1.47E-07
				TOTAL	1.47E-07