APPENDIX C

MILDOS REPORT

Radiological Assessment of the Ludeman Uranium In-Situ Recovery Facility

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Table of Acronyms and Abbreviations

CBM	Coal Bed Methane
CFR	Code of Federal Regulations
Ci	Curies
cm	centimeter
d	day
ERG	Environmental Restoration Group, Inc.
g	gram
gpm	gallons per minute
IX	ion exchange
km	kilometer
L	Liter
m	meter
min	minute
mrem	millirem
pCi	picoCurie
RG	Regulatory Guide
RO	reverse osmosis
Rn	Radon
TEDE	Total Effective Dose Equivalent
UIC	Underground Injection Control
USNRC	United States Nuclear Regulatory Commission
wk	week
WDEQ	Wyoming Department of Environment Quality
yr	year
UAI	Uranium One Americas Inc

1.0 Introduction

On behalf of Uranium One Americas Inc. (UAI), Environmental Restoration Group, Inc. (ERG) performed an assessment of the potential radiological effects of the proposed Ludeman satellite facility (the facility) located in Converse County, Wyoming, approximately 8 miles northeast of the town of Glenrock, Wyoming. This assessment includes evaluation of all potential releases and release pathways important for the evaluation of radiological impacts on potential human and ecological receptors. The methods, assumptions, and results of this assessment are provided herein. This evaluation is in support of a license application to US Nuclear Regulatory Commission (USNRC) for the facility.

2.0 Facility Description

Uranium One is proposing to develop a uranium in-situ recovery (ISR) facility that includes three Satellite plants, each with a maximum production flow of approximately 3000 gallons per minute (gpm) and a restoration flow of 1000 gpm. An assessment of the potential radiological effects of the facility must consider the types of effluent and emissions, the potential exposure pathways present, and an evaluation of potential consequences of radiological emissions.

The facility will use fixed-bed pressurized down-flow ion exchange (IX) columns to separate uranium from the pregnant production fluid and restoration solutions. The IX resin containing the uranium will be removed from the ion exchange column and transported to an off-site facility for further processing.

The groundwater restoration process will also use reverse osmosis (RO) to remove dissolved solids. Liquid and solid wastes will be disposed of via deep well injection. The deep well will be supplied by wastes stored in six surge water ponds, two located near each satellite plant.

Since the drying and packaging operation will be conducted at a separate off-site location, the only expected routine radiological emission at the facility will be radon-222 gas. Radon-222, a decay product of radium-226, is dissolved in the lixiviant as it travels through the ore bearing formation to a production well, where it is brought to the surface. The concentration of radon-222 in the production solution and estimated releases are calculated using the methods found in USNRC Regulatory Guide 3.59, "*Methods for Estimating Radioactive and Toxic Airborne Source Terms for Uranium Milling Operations*" (USNRC, 1987). The details of, and assumptions used in, these calculations are found in Section 3.2.1.

MILDOS-AREA (ANL 1997) was used to model radiological impacts on human and environmental receptors (e.g. air and soil) using site specific radon-222 release estimates, meteorological and population

data, and other parameters. All of the pathways related to air emissions of radon-222 are evaluated by MILDOS-AREA. The estimated radiological impacts resulting from routine site activities are compared to applicable public dose limits as well as naturally occurring background levels.

3.0 Potential Exposure Pathways

Figure 1 depicts conceptually all exposure pathways from all potential sources at the facility. The predominant pathways for planned and unplanned releases are identified. Atmospheric radon-222 is expected to be the predominant pathway for impacts on human and environmental media. Potential impacts of radon-222 releases can be expected in all quadrants surrounding the facility, the magnitude of which is driven predominantly by wind direction and atmospheric stability. As a noble gas, radon-222 itself has very little radiological impact on human health or the environment. Radon-222 has a relatively short half-life (3.8 days) and its decay products include short lived, alpha-emitting, nongaseous radionuclides. These decay products have the potential for radiological impacts to human health and the environment. As Figure 1 depicts, all exposure pathways, with the possible exception of skin absorption, can be important depending on the environmental media impacted.

3.1 Exposures from Water Pathways

The production solution in the ore zone will be controlled and adequately monitored to ensure that migration does not occur laterally in the production sand aquifer. The overlying and underlying aquifers, if present, will also be monitored.

The primary method of waste disposal at the facility will be by deep well injection. The deep well(s) will be completed at depths significantly deeper than zones planned for mining and current operations and will be isolated geologically from underground sources of drinking water. The well(s) will be constructed under a permit from the Wyoming Department of Environment Quality (WDEQ) and all requirements of the Underground Injection Control (UIC) program will be met.

The uranium IX facilities will be located on curbed concrete pads to prevent any liquids from entering the environment. Solutions used to wash down equipment will drain to a sump and will either be pumped back into the processing circuit or to the disposal well. The curbed concrete pads will be of sufficient size to contain the contents of the largest tank in the event of a rupture.

No routine liquid environmental discharges, other than waste disposal via deep well injection, are planned and as such, no definable water related pathways for routine operations exist.

3.2 Exposures from Air Pathways

The only source of planned radionuclide emissions from the facility is radon-222 released into the atmosphere through a vent system in the main plant area, releases from the wellfields, and aeration while discharging into surge ponds associated with the disposal well. As shown in Figure 1, atmospheric releases of radon-222 can result in radiation exposure via three pathways; inhalation, ingestion, and external exposure. These pathways potentially could result in a radiation dose to receptors (i.e. individual members of the public) in and around the permit area. The Total Effective Dose Equivalent (TEDE) to these potential receptors was estimated using MILDOS-AREA. Additionally, radiological impacts to ecological receptors in and around the within the permit area were evaluated with MILDOS-AREA.

3.2.1 Source Term Description and Estimates

The source terms used to estimate radon-222 releases from the facility include seven wellfields and three satellite facilities. Radon-222 releases over the proposed lifetime of the facility were modeled with wellfields either in production, restoration or inactive and the satellite facilities either in production or inactive. Table 1 shows the proposed schedule of wellfield and satellite facility operation and was the basis for defining radon release estimates for a given time period. The parameters used to characterize and estimate releases are provided in Table 2.

Table 1. The Proposed Schedule of Wellfield and Satellite Facility Operation for the Ludeman Facility.

	Year of Operation										
Wellfield #	1	2	3	4	5	6	7	8	9	10	11
1	P	P	P	R	R	R	I	I	I	I	I
2	I	P	P	P	R	R	R	I	I	I	I
3	I	I	P	P	P	R	R	R	I	I	I
4	I	I	P	P	P	R	R	R	I	I	I
5	I	I	I	P	P	P	R	R	R	I	I
6	I	I	I	I	P	P	P	P	R	R	R
7	I	I	I	I	I	P	P	P	R	R	R
Satellite	-	-	-	-	-	-	-	-	-	-	
Leuenberger	P	P	P	P	P	R	R	R	I	I	I
North Platte	I	I	P	P	P	P	R	R	R	I	I
Peterson	I	I	I	I	P	P	P	P	R	R	R
P = Production R = Restoration I = Inactive											

Table 2. Parameters used to Estimate and Characterize Source Terms at the Ludeman Facility.

Parameter	Value	Unit	Source
Average Ore Grade	0.1	%	Correspondence (UAI, 2011)
Ore radium-226 Concentration	282	pCi g^{-1}	Reg. Guide 3.59
Average Lixiviant Flow	1.14 E+04	L m^{-1}	Correspondence (UAI, 2011)
Average Restoration Flow	3.79E+03	L m^{-1}	Correspondence (UAI, 2011)
Operating days per year	365	days	Est. based on planned activities
Ore formation thickness	3	meters	Correspondence (UAI, 2011)
Ore formation porosity	0.25	NA	Correspondence (UAI, 2011)
Ore formation rock density	1.83	g cm^{-3}	Correspondence (UAI, 2011)
Average residence time for lixiviant	7	days	Correspondence (UAI, 2011)
Average residence time for restoration solutions	35	days	Correspondence (UAI, 2011)
Average mass of ore material in mud pit	5.44E+05	g	Est. based on planned activities
Number of mud pits generated per year	600	NA	Est. based on planned activities
Storage time in mud pits	30	days	Est. based on planned activities
Radon-222 emanating power	0.25	NA	NUREG 1569
Resin Porosity	0.3	NA	NUREG 1569
Ion Exchange Column Volume	1.42E+04	L	Est. based on planned activities
Number of Resin Transfers per day	1	NA	Est. based on planned activities
Stack Height	16	m	Est. based on planned activities
Stack Diameter	0.3	m	Est. based on planned activities
Stack Velocity	11	m s^{-1}	Est. based on planned activities
Radon-222 decay constant	0.181	d^{-1}	NUREG 1569

3.2.1.1 Production Releases

Currently plans are to have up to seven wellfields supporting three satellite facilities operating concurrently. The potential radon-222 releases from the production wellfields were estimated using methods described in USNRC Regulatory Guide (RG) 3.59, *"Methods for Estimating Radioactive and Toxic Airborne Source Terms for Uranium Milling Operation"* as follows:

Radon released (equilibrium condition) to production fluid from leaching is calculated using Equation 1:

$$G = R\rho E\frac{(1-p)}{p}x10^{-6} \qquad \text{(Equation 1)}$$

Where:

G = radon released (Ci/m^3)

R = radium content of ore (pCi/g)

E = emanating power

ρ	=	ore formation rock density (g cm^{-3})
p	=	ore formation porosity

The yearly radon released to the production fluid is calculated using Equation 2:

$$Y = 1.44GMD(1 - e^{-\lambda t}) \qquad \text{(Equation 2)}$$

Where:

Y	=	yearly radon released to production fluid (Ci yr^{-1})
G	=	radon released at equilibrium (Ci m^{-3})
M	=	average lixiviant flow rate (L min^{-1})
D	=	production days per year (d)
λ	=	radon-222 decay constant (d^{-1})
t	=	lixiviant residence time
1.44	=	unit conversion factor

Using Equations 1 and 2 and the parameters in Table 1, the yearly radon released to production fluid is 1655 Ci yr^{-1}. USNRC RG 3.59 assumes all the radon-222 that is released to the production fluid is ultimately released to the atmosphere, which in the case of IX columns operating at atmospheric pressure in an open system is an appropriate conservative assumption (NRC,1987). In cases where pressurized down-flow ion exchange columns are used and wellfields are operated under pressure, the majority of radon released to the production fluid stays in solution and is not released. The radon which is released is from occasional wellfield venting for sampling events, small unavoidable leaks in wellfield and IX equipment, maintenance of wellfield and IX equipment, and radon contained in the production bleed going to the surge ponds. For this reason, an annual release of 10% of the radon-222 in the wellfield production fluid and an additional 10% in the IX circuit was assumed. Given this assumption, the annual radon-222 released from production in the wellfield and at the satellite facility/surge pond area is 166 and 149 Ci yr^{-1}, respectively. Of the 10% released from the satellite processing area, one percent is attributable to the production water bleed rate and is assumed to be released at the surge pond location. For purposes of MILDOS-AREA model simulations, the wellfield release of 149 Ci yr^{-1} was assumed to be released from each wellfield in production at the time. The surge ponds were assumed to be co-located with the satellite facilities.

3.2.1.2 Restoration Releases

Radon-222 releases resulting from wellfield restoration activities were estimated in the same manner as the production activities above (i.e. using Equation 2) but modified for the lower restoration flow rate and the longer restoration fluid residence time, both of which are listed in Table 1. The assumption of a 10% release in the wellfield and satellite/surge pond facility results in releases of 76.9 and 69.2 Ci yr^{-1} respectively. For purposes of MILDOS-AREA model simulations, the wellfield release of 67 Ci yr^{-1} was assumed to be released from each wellfield in restoration at the time.

3.2.1.3 New Wellfield Releases

Radon-222 releases resulting from new wellfield development activities were estimated using methods described in NUREG-1569, *Standard Review Plan for In Situ Leach Uranium Extraction License Applications* as follows *(NRC, 2003)*:

$$Rn_{nw} = EL[Ra]TmNx10^{-12} \qquad \text{(Equation 3)}$$

Where:

Rn_{nw}	=	radon-222 release rate from new wellfield (Ci yr^{-1})
E	=	emanating power
[Ra]	=	concentration of radium-226 in ore (pCi g^{-1})
L	=	decay constant of radon-222
T	=	storage time in mud pit (d)
m	=	average mass of ore material in the pit (g)
N	=	number of mud pits generated per year
1×10^{-12}	=	unit conversion factor (Ci pCi^{-1})

Since development of new wellfields are planned to occur throughout the site, the number of mud pits generated per year for the entire site were assumed to be equally distributed among the wellfields supporting the three satellite facilities. Therefore, the number of mud pits generated per year at each facility was assumed to be 200. Using Equation 3 and the parameters in Table 7.3-1, the yearly radon released from new well field development for each facility is 0.041 Ci yr^{-1}. For purposes of the MILDOS-AREA model simulations, the new wellfield release was assumed to occur at each wellfield while in production and restoration.

3.2.1.4 Resin Transfer Releases

Radon-222 releases resulting from resin transfers from neighboring satellite facilities were estimated using methods described in NUREG-1569, *Standard Review Plan for In Situ Leach Uranium Extraction License Applications (NRC, 2003)* as follows:

$$Rn_x = 3.65x10^{-10} F_i C_{Rn} \qquad \text{(Equation 4)}$$

Where:

Rn_x = radon release rate from resin transfers (Ci yr^{-1})

F_i = water discharge rate from resin unloading (L d^{-1})

C_{Rn} = steady state radon-222 concentration in process water (pCi L^{-1})

3.65E-1 0= unit conversion factor (Ci pCi^{-1})(d yr^{-1})

The steady state radon-222 concentration in process water (C_{Rn}) can be estimated from the following expression:

$$C_{Rn} = \frac{Y * 1.9E6}{M} \qquad \text{(Equation 5)}$$

Where:

C_{Rn} = steady state radon-222 concentration in process water (pCi L^{-1})

Y = yearly radon released to production fluid (Ci yr^{-1})

M = lixiviant flow rate (L min^{-1})

1.9E+6 = unit conversion factor (pCi Ci^{-1})(yr min^{1})

The water discharge rate from resin unloading (Fi) can be estimated from the following expression:

$$F_i = N_i * V_i * P_i \qquad \text{(Equation 6)}$$

Where:

F_i = water discharge rate from resin unloading (L d^{-1})

N_i = number of resin transfers per day

V_i = volume of resin in transfer (L)

P_i = porosity of resin

Using Equations 6 and the parameters in Table 2, the yearly radon released from resin transfers from satellite facilities is 0.43 Ci yr^{-1}. For purposes of the MILDOS-AREA model simulations, the resin transfer release was assumed to occur at the satellite plant location.

3.2.1.5 Radon-222 Release Summary

A summary of estimated radon-222 releases from the facility is presented in Table 3. The source coordinates in Table 3 are relative to the North Platte satellite processing area.

Table 3. Estimated Radon-222 Releases (Ci yr^{-1}) from the Ludeman Facility.

Location	X (km)	Y (km)	Production	Restoration	Drilling	Resin Transfer	Total
Leuenberger Satellite	-6.86	-1.65	149	69.2	-	0.43	218.6
North Platte Satellite	0	0	149	69.2	-	0.43	218.6
Peterson Satellite	1.79	-5.51	149	69.2	-	0.43	218.6
Wellfield 1	-7.36	-1.41	166	76.9	0.04	-	242.9
Wellfield 2	-6.63	-2.11	146	76.9	0.04	-	242.9
Wellfield 3	-8.02	-1.14	146	76.9	0.04	-	242.9
Wellfield 4	0.02	-1.44	146	76.9	0.04	-	242.9
Wellfield 5	-2.47	-3.56	146	76.9	0.04	-	242.9
Wellfield 6	-0.09	-5.27	146	76.9	0.04	-	242.9
Wellfield 7	2.53	-6.77	146	76.9	0.04	-	242.9

For the wellfields listed above, the total release was multiplied by 0.68 when in production, 0.32 when in restoration and 0 when inactive in accordance with the schedule in Table 1.0 above. The satellite facility source term was kept constant when in production.

3.2.2 Receptors

Two types of receptors were used in the MILDOS-AREA simulation. First, arbitrary receptors were identified based on a 0.5 km grid system across the site. The grid system was established using a random starting point. A total of 1189 arbitrary receptors were modeled to develop iso-dose curves within the permit boundary using the kriging method described in ArcMap GIS software. Second, potential receptor locations were identified and modeled. Data regarding the arbitraty receptors is shown in Appendix A (Table A.1). Potential receptors used in the MILDOS-AREA model are presented in Table 4. The receptor coordinates in Table 4 are relative to the North Platte satellite processing area. Annual dose estimates for residential receptors are based on 24 hours per day for one year.

Table 4. Potential Ludeman Facility Receptors and Estimated Exposure Times.

Location	X (km)	Y (km)	Distance (km)	Activities	Annual Exposure Hours	Annual Exposure Hours (Calculation)
Resident 1	-5.17	-2.17	5.61	Resident	8760	24hr/d x 365 d/yr
Resident 2	3.5	-11.5	11.54	Resident	8760	24hr/d x 365 d/yr
Resident 3	5.3	-9.8	11.14	Resident	8760	24hr/d x 365 d/yr
Resident 4	7.9	-9.2	12.13	Resident	8760	24hr/d x 365 d/yr
Resident 5	8.5	-9.3	12.6	Resident	8760	24hr/d x 365 d/yr
Resident 6	8.3	-10.0	13.0	Resident	8760	24hr/d x 365 d/yr

3.2.3 Miscellaneous Parameters

The metrological data used in the MILDOS-AREA model is from the Joint Frequency Distribution data presented in Section 2.5 of the facility application (UAI, 2011).

The population distribution used in the MILDOS-AREA model to estimate population doses is from the demographic information presented in Section 2.3 of the facility license application (UAI, 2011).

3.2.4 Estimated Total Effective Dose Equivalent (TEDE) to Receptors.

To show compliance with the annual dose limit found in 10 CFR 20.1301, UAI has demonstrated by calculation that the TEDE to the individual most likely to receive the highest dose from the facility operation is less than 100 mrem per year. The results of the MILDOS-AREA model for each potential receptor are presented in Table 5. Eleven years of operations were modeled, with each year representing the well field and satellite facility operation schedule in Table 1 above. The year with the highest TEDE for each potential receptor are presented in Table 5.

Using the ESRI ArcGIS Spatial Analyst extension, a kriging interpolation of the estimated dose rates for the arbitrary and potential receptor locations was performed over the extent of the permit boundary for each year of operation. Iso-dose contour lines were generated from the interpolation. Figures 2a -2i show the results of the interpolation for the arbitrary and potential receptors, respectively. The MILDOS-AREA results for the arbitrary receptors are shown in table format in Appendix A.

An evaluation of the TEDE follows:

1) The maximum TEDE of 1.56 mrem/yr, is located at the residence along the northwestern project boundary nearest to the Leuenberger plant site and occurs in the third year of operation. This dose represents 1.56 percent of the annual public dose limit of 100 mrem. This receptor also represents the highest potentially exposed member of the public since the time spent in the project area by members of the public using the area for recreational purposes is expected to be much lower than a resident.
2) Since radon-222 is the only radionuclide emitted, public dose requirements in 40 CFR 190 and the 10 mrem/yr constraint rule in 10 CFR 20.1101 do not apply.
3) As shown on Figures 2a -2i all annual dose rates outside of the permit boundary are less than 10 mrem per year and in most cases annual dose rates outside of the permit boundary are less than 1 mrem per year.

Table 5. Estimated Total Effective Dose Equivalent (TEDE) to Receptors Near the Ludeman Facility.

Description	Operating Year with Highest TEDE	Dose Rate (mrem/yr)
Resident 1	3	0.70
Resident 2	5	0.27
Resident 3	3	1.56
Resident 4	6	0.20
Resident 5	6	0.21
Resident 6	7	0.21

3.2.5 Population Dose

The annual population dose commitment to the population in the region within 80 km (50 mi) of the facility is also predicted by the MILDOS-AREA code. The year with the highest radon-222 release (year 5) was used to estimate population doses. These results are contained in Table 6 where TEDE is expressed in terms of person-rems. For comparison, the dose to the population within 80 km of the facility due to background radiation has been included in Table 6. Background radiation doses are based on a North American population of 346 million and an average TEDE of 300 mrem per year from naturally occurring sources (NCRP,2009).

The atmospheric release of radon also results in a dose to the population on the North American continent. This continental dose is calculated by comparison with a previous calculation based on a 1 kilocurie release near Casper, Wyoming, during the year 1978. The results of these calculations are

included in Table 5 and also combined with dose to the region within 80 km of the facility to arrive at the total radiological effects of one year of operation at the facility.

The based on the MILDOS-Area model output, the maximum radiological effect of the facility operation on the continental population is very low and not measurable.

Table 6. Total Effective Dose Equivalent to the Population from One Year's (Year 4) Operation at the Ludeman Facility

Criteria	TEDE (person-rem/yr)
Dose received by population within 80 km of the facility	0.31
Dose received by population beyond 80 km of the facility	11.1
Total Continental Dose	11.4
Background North American Dose	1.0E+8
Fractional increase to background dose	1.1E-7

3.2.6 Exposure to Flora and Fauna

To estimate potential radiological impacts to flora and fauna, the most important pathway for exposure should be identified. Since the only planned emissions from the facility is radon-222 to the atmosphere, the most important pathway for exposure to flora and fauna is deposition of radon-222 decay products on surface water, surface soils, and vegetation. MILDOS-AREA estimates surface deposition rate as a function of distance from the source for the radon-222 decay products and calculates surface concentrations. Table 6 presents the highest surface concentrations of radon-222 decay products predicted by MILDOS-AREA over a 100 year period for the year with the highest radon-222 release (year 5). Soil concentrations were calculated based on a conservative assumption of 1.5 g cm^{-3} bulk soil density.

Table 7. Highest Surface Concentrations of Radon-222 Decay Products Resulting from Ludeman Facility Operation.

Radionuclide	Distance from Site (km)	Direction	Surface Concentration (pCi/m^2)	Soil Concentration in Upper 0.5 cm (pCi/g)
Polonium-218	1.5	S	33.7	0.004
Lead-214	1.5	S	33.7	0.004
Bismuth-214	1.5	S	33.7	0.004
Lead-210	65	E	14.1	0.002

All radionuclide concentrations in Table 7 are similar in magnitude and at least an order of magnitude below most analytical laboratories detection limits

It is likely that soil re-suspension from background soils would be the predominant source of radionuclide concentrations in vegetation, therefore it is expected that the radionuclide concentrations in vegetation would be similar to that of soil.

From this evaluation, the likely impact to flora and fauna from operations at the facility would be minimal and indistinguishable from current conditions.

4.0 References

ANL (Argonne National Laboratory), 1997, Faillace, E.D., LePoire, D.J., Chen, S.Y., Yuan, Y., *MILDOS-AREA: An Update with Incorporation of In Situ Leach Uranium Recovery Technology*, May 1997.

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Figures

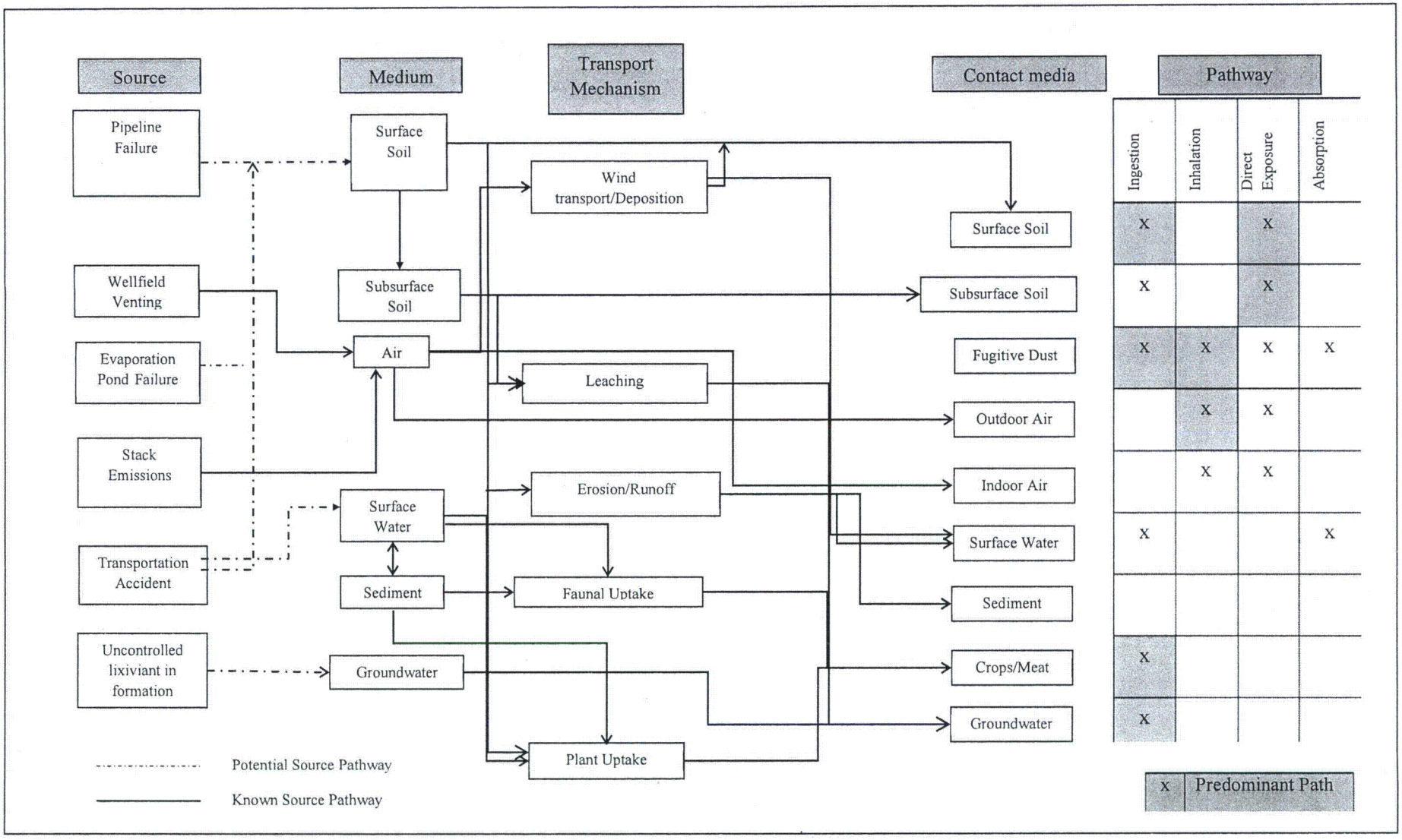

Figure 1. Human Exposure Pathways for Known and Potential Sources from the Ludeman Project

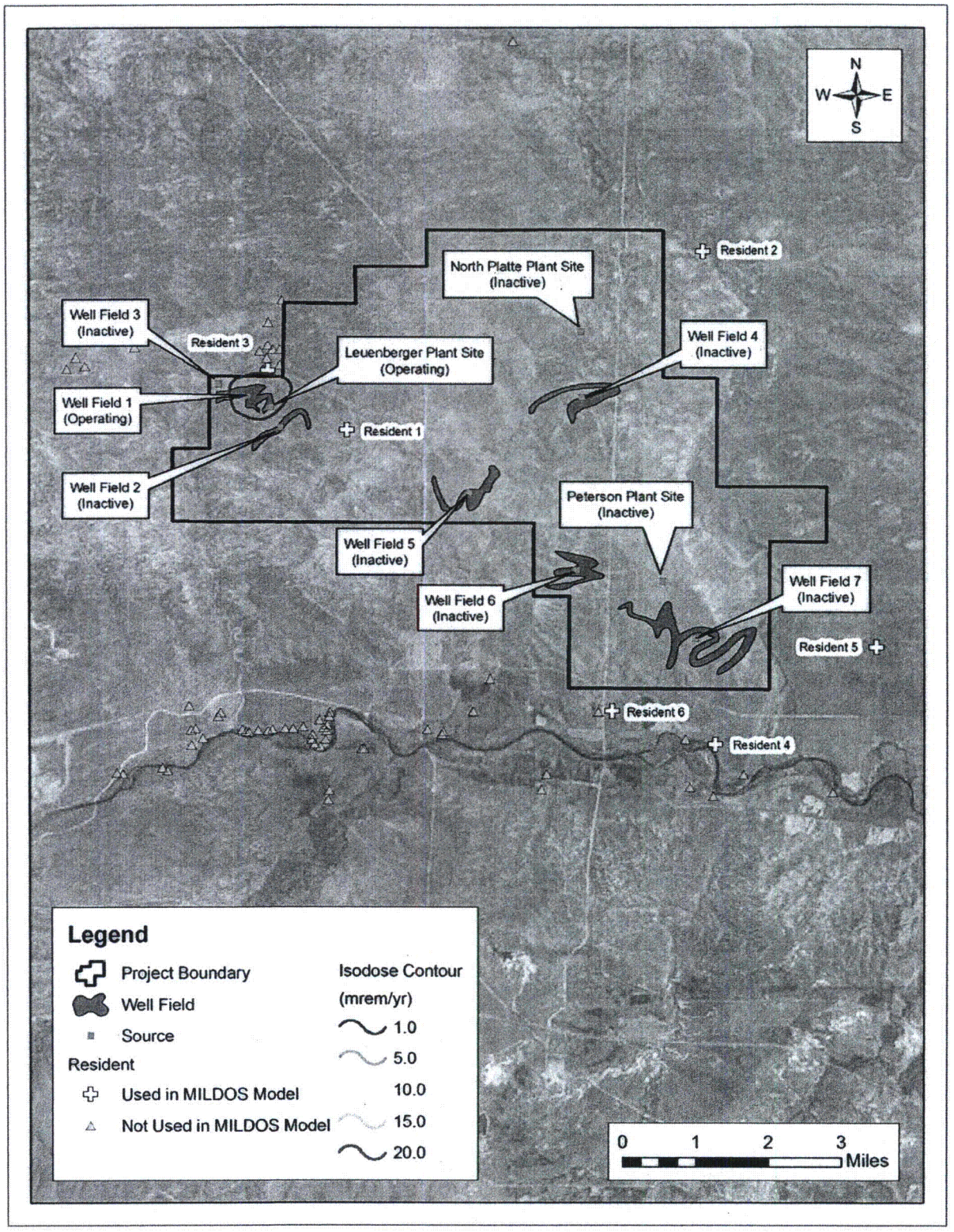

Figure 2a. Iso-Dose Map of Ludeman Project –Year 1

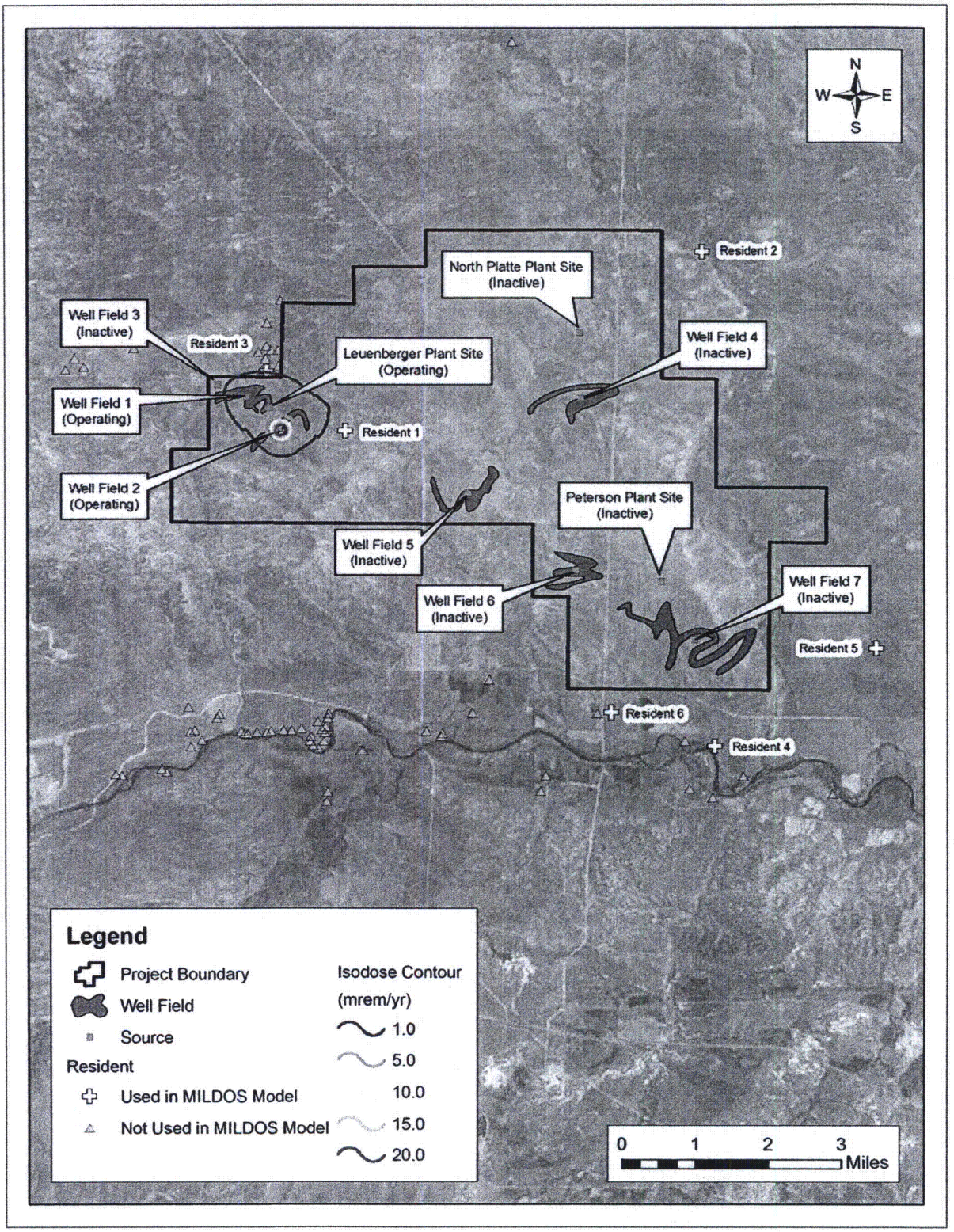

Figure 2b. Iso-Dose Map of Ludeman Project –Year 2

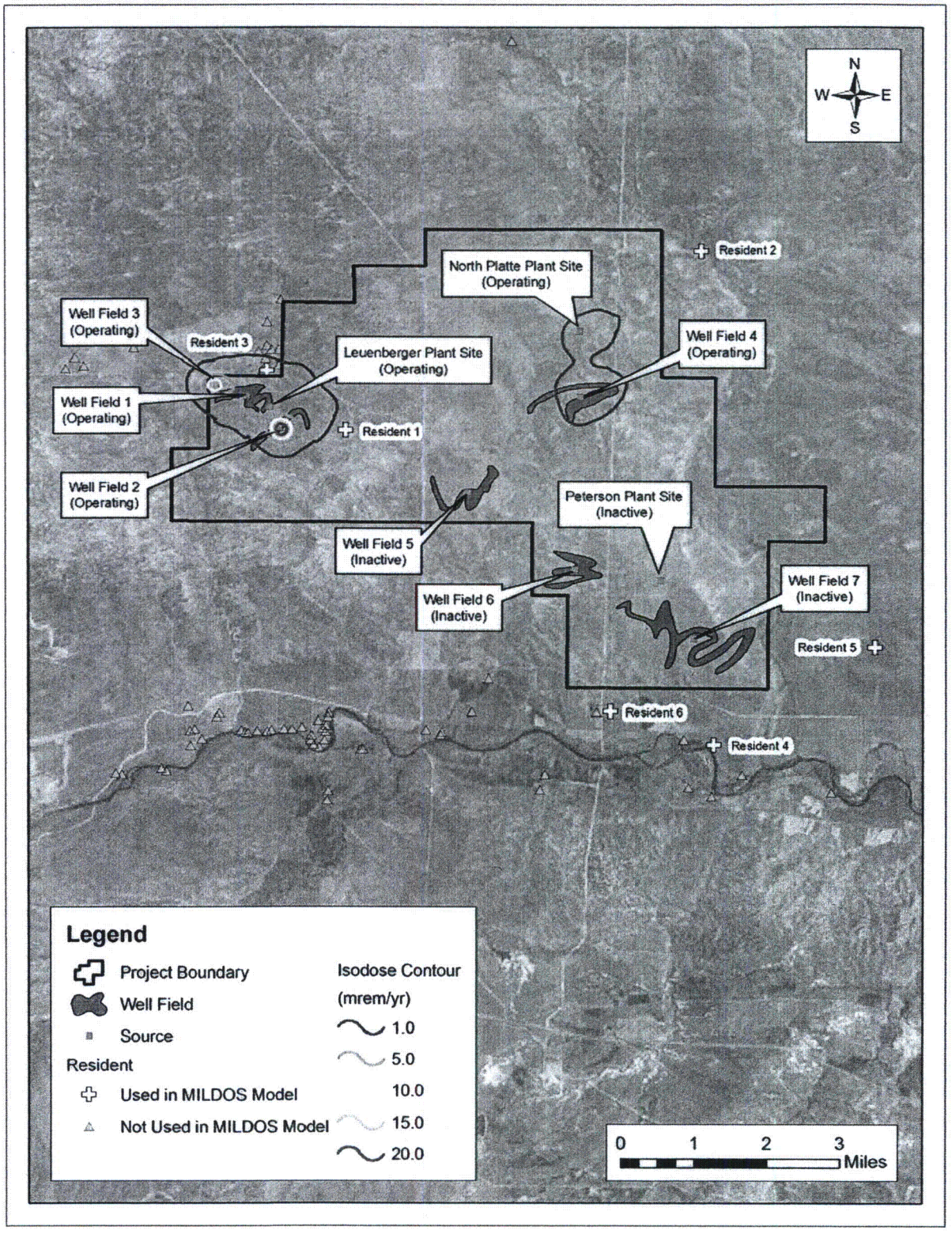

Figure 2c. Iso-Dose Map of Ludeman Project –Year 3

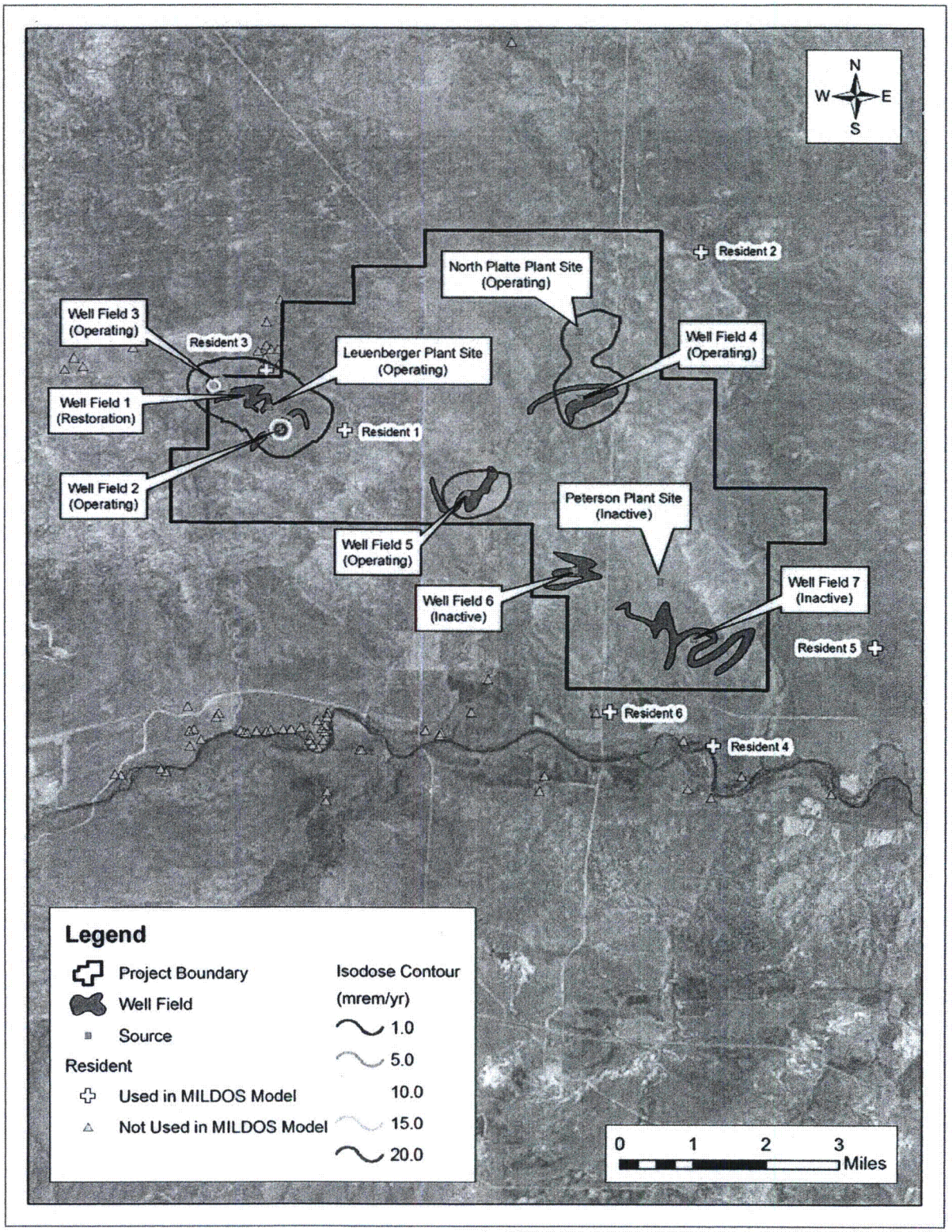

Figure 2d. Iso-Dose Map of Ludeman Project –Year 4

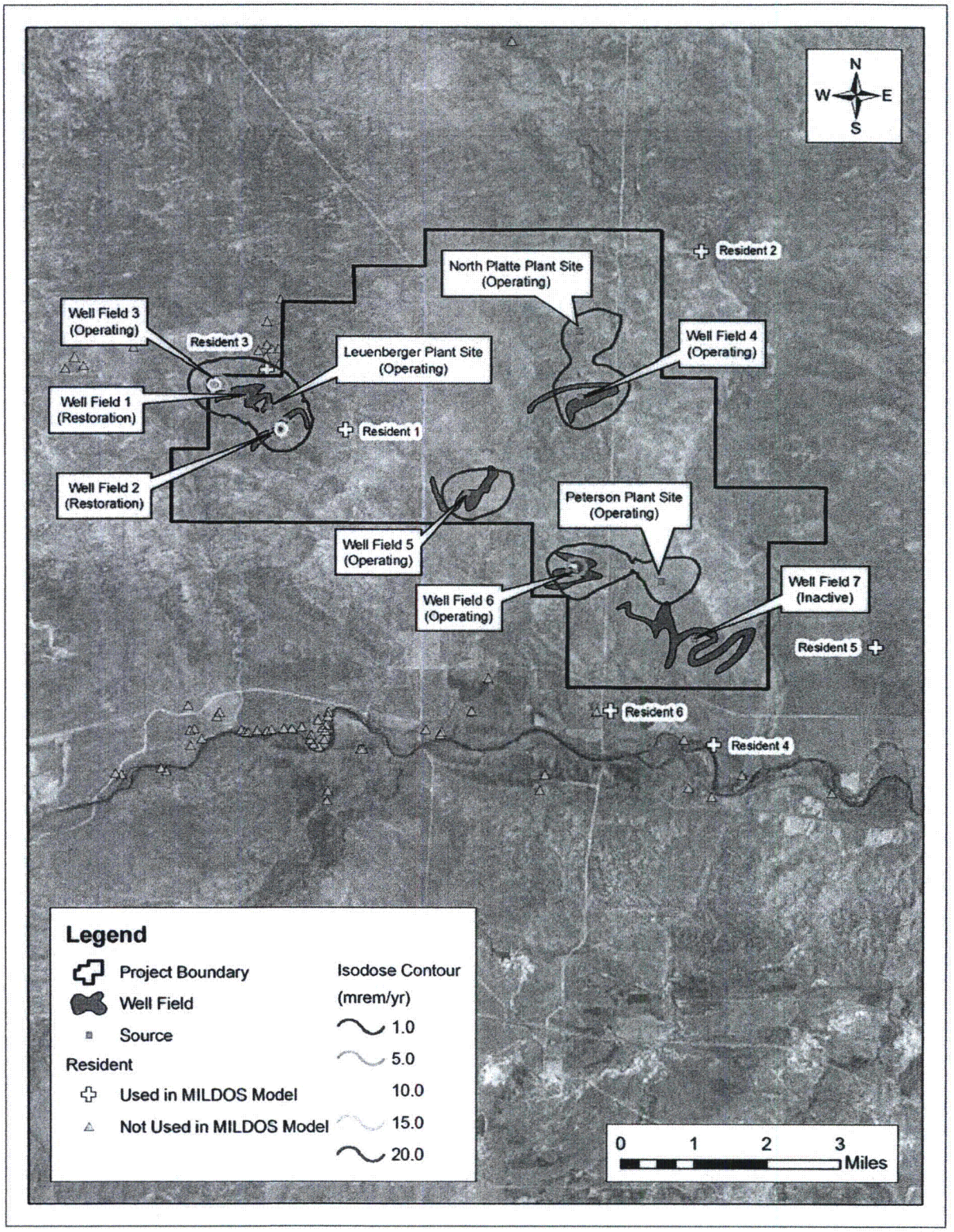

Figure 2e. Iso-Dose Map of Ludeman Project –Year 5

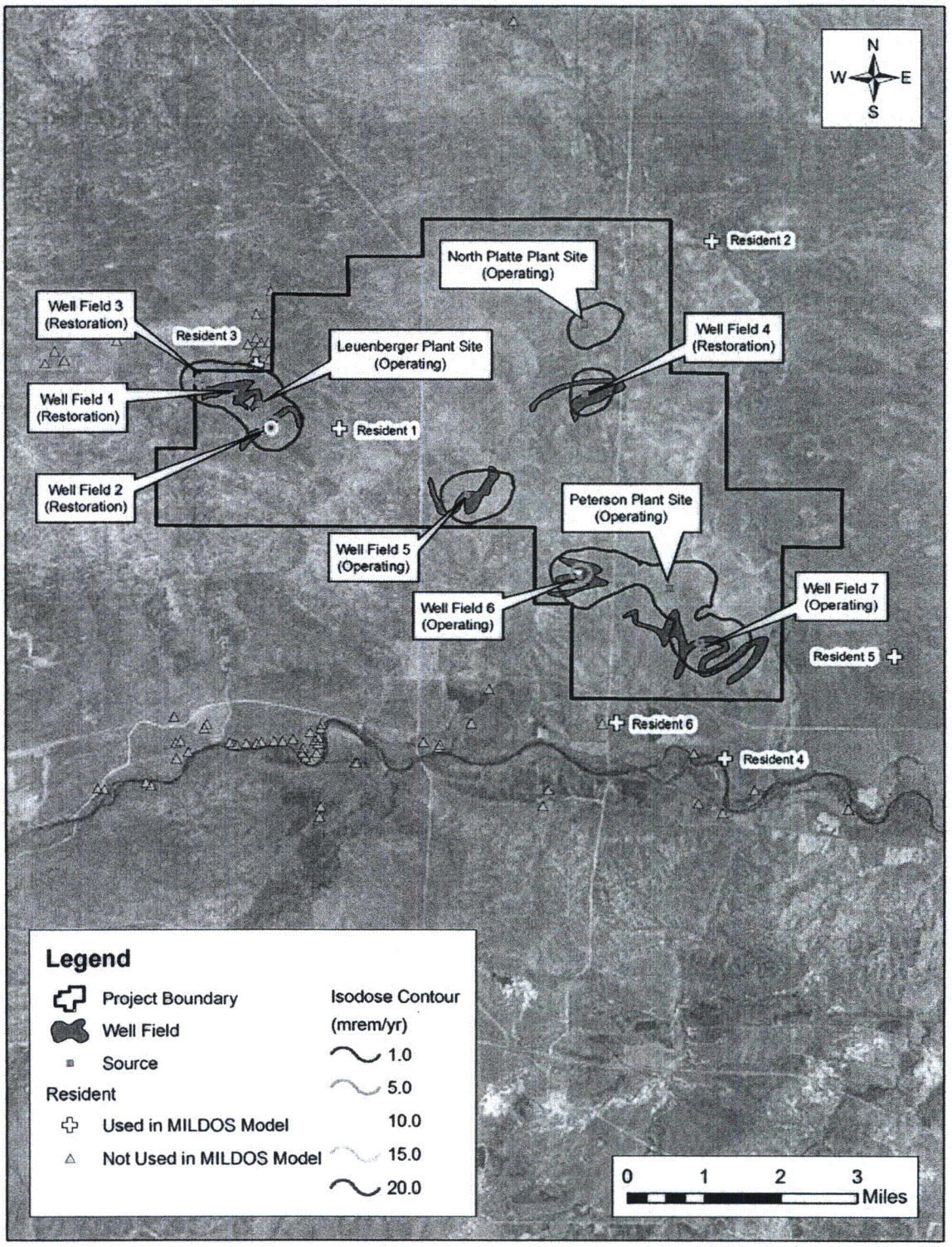

Figure 2f. Iso-Dose Map of Ludeman Project –Year 6

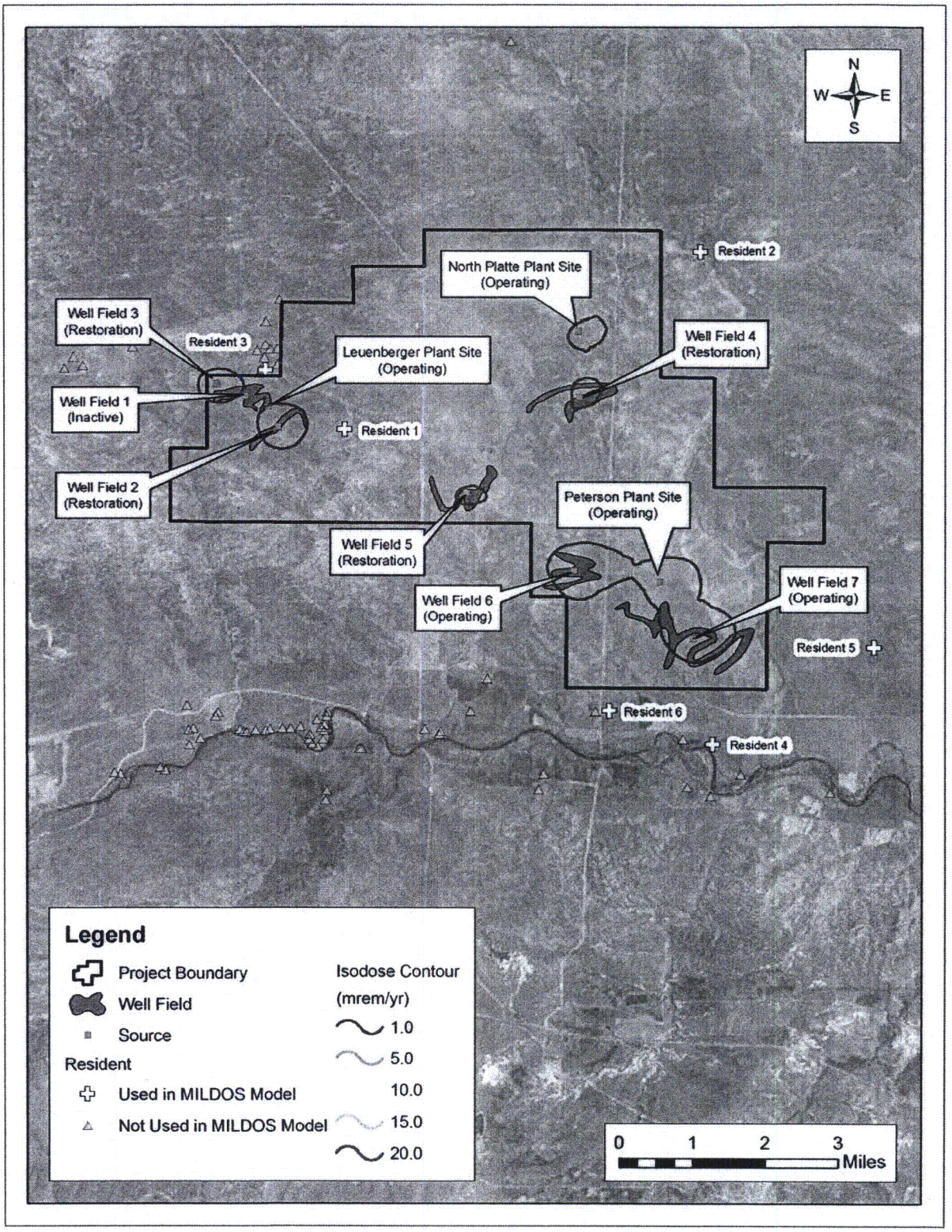

Figure 2g. Iso-Dose Map of Ludeman Project –Year 7

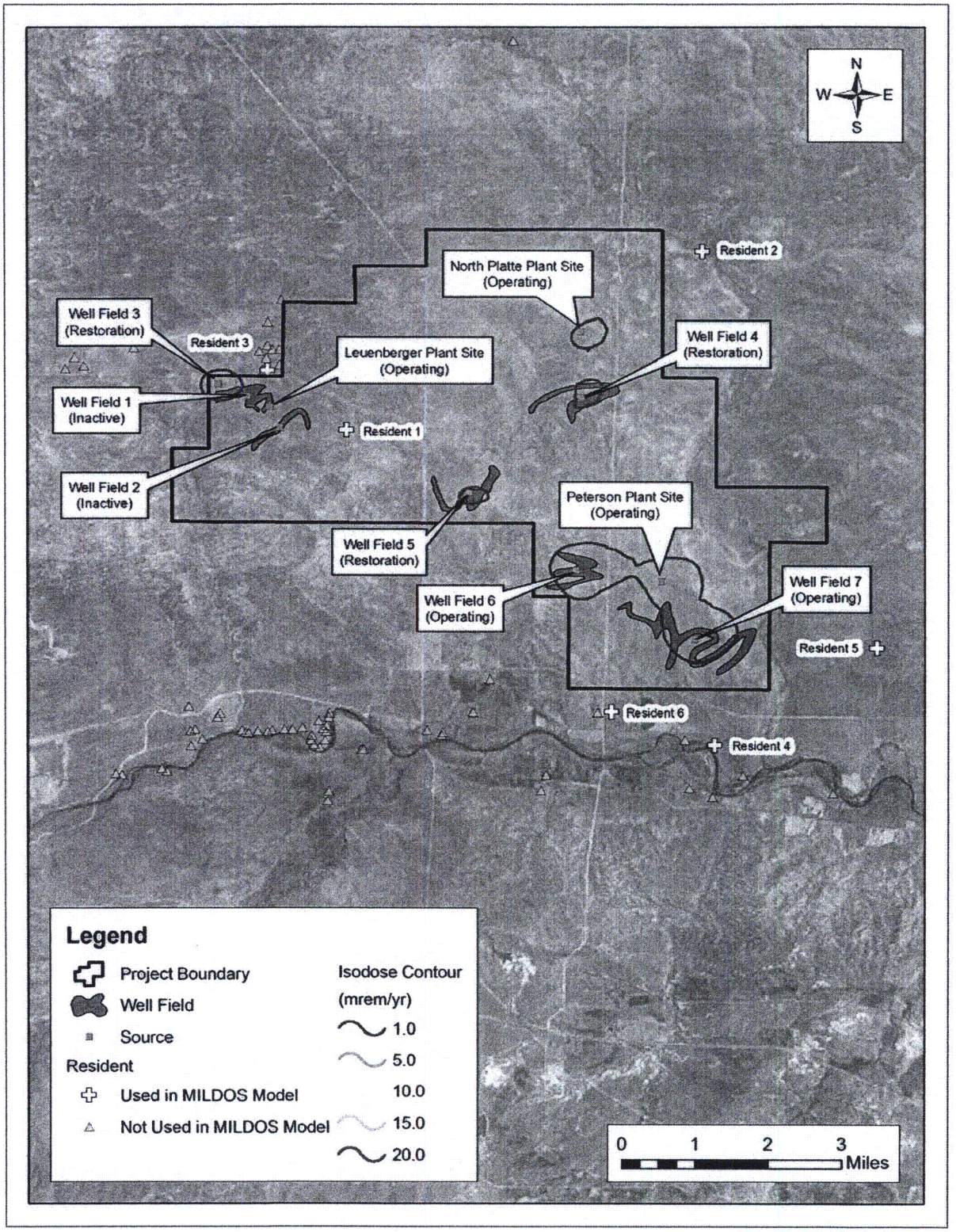

Figure 2h. Iso-Dose Map of Ludeman Project –Year 8

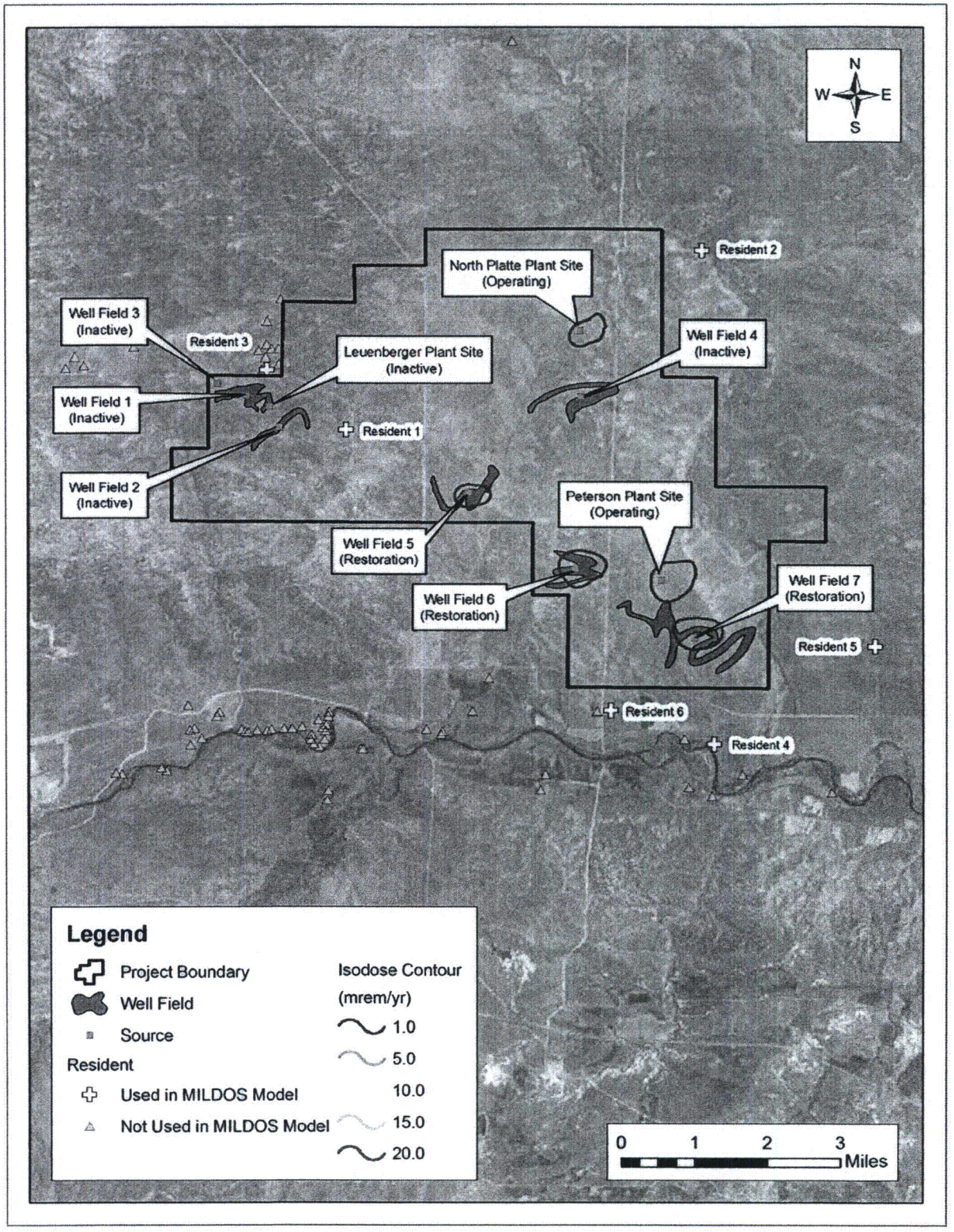

Figure 2i. Iso-Dose Map of Ludeman Project –Year 9

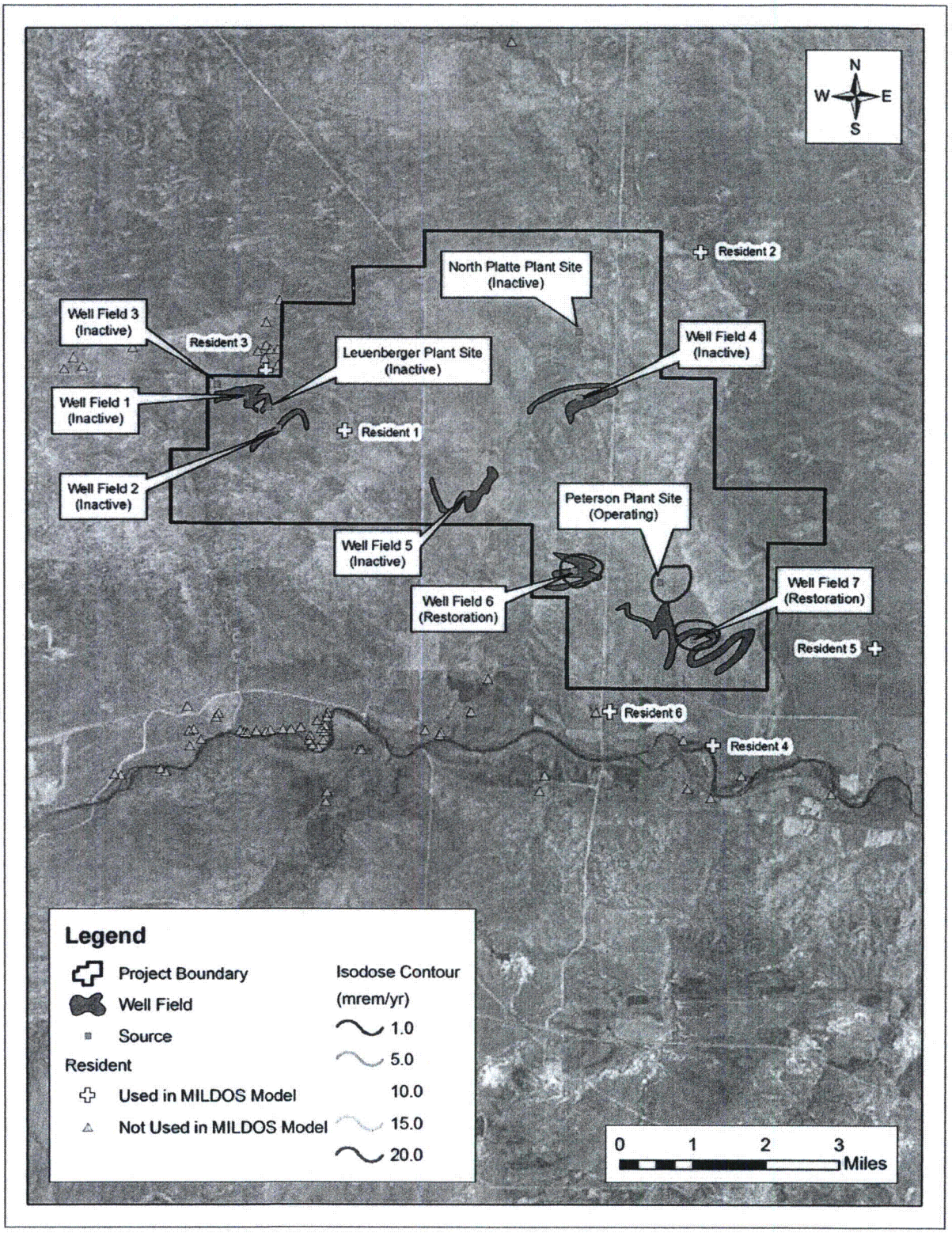

Figure 2j. Iso-Dose Map of Ludeman Project –Year 10

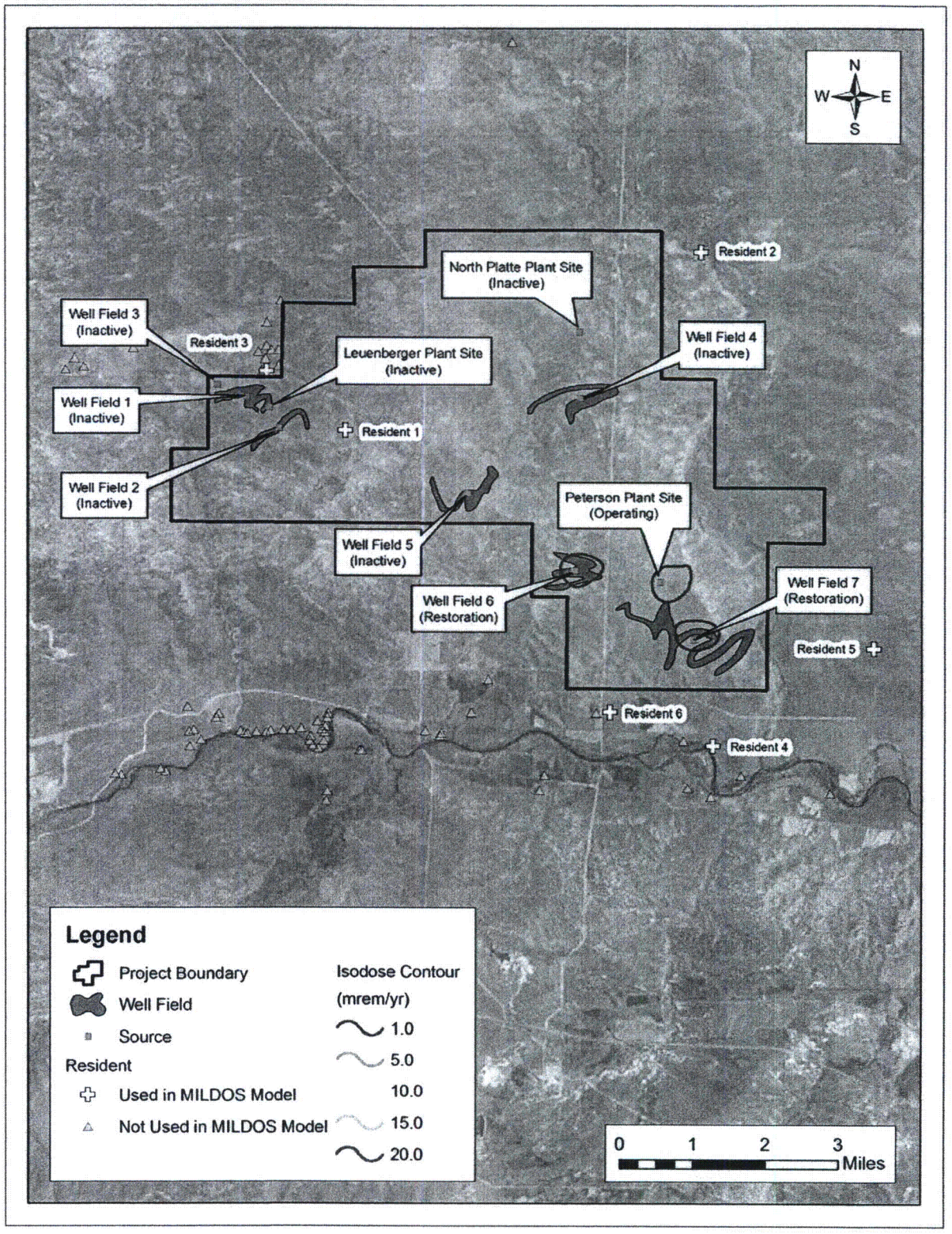

Figure 2k. Iso-Dose Map of Ludeman Project –Year 11

Appendix A.

Table A.1. Arbitrary Receptor Locations and MILDOS-AREA Modeled Dose Rate

Insert Excel File Output

AR167	438500	4754500	0.04950	0.07130	0.12600	0.12300	0.12800	0.11200	0.09260	0.08230	0.03090	0.01530	0.01530
AR168	439000	4754500	0.05180	0.07460	0.13400	0.13100	0.13600	0.11800	0.09700	0.08620	0.03200	0.01570	0.01570
AR169	439500	4754500	0.05650	0.08000	0.14300	0.14000	0.14500	0.12500	0.10200	0.09140	0.03320	0.01600	0.01600
AR170	440000	4754500	0.06010	0.08350	0.14800	0.14400	0.14900	0.12900	0.10600	0.09490	0.03440	0.01640	0.01640
AR171	440500	4754500	0.06360	0.08720	0.16200	0.15800	0.16400	0.13800	0.11400	0.10300	0.03560	0.01670	0.01670
AR172	441000	4754500	0.07170	0.09840	0.18400	0.17600	0.18100	0.15100	0.12300	0.11100	0.03690	0.01700	0.01700
AR173	441500	4754500	0.07990	0.11000	0.20600	0.19500	0.19800	0.16300	0.13300	0.11800	0.03820	0.01730	0.01730
AR174	442000	4754500	0.08640	0.11900	0.22000	0.20700	0.20900	0.17200	0.13900	0.12300	0.03950	0.01760	0.01750
AR175	442500	4754500	0.09400	0.13000	0.24700	0.23000	0.23100	0.18600	0.15000	0.13400	0.04080	0.01770	0.01770
AR176	443000	4754500	0.10300	0.14300	0.26100	0.24100	0.24000	0.19500	0.15700	0.13800	0.04190	0.01780	0.01780
AR177	443500	4754500	0.11200	0.15100	0.27700	0.25500	0.25400	0.20600	0.16500	0.14600	0.04370	0.01770	0.01770
AR178	444000	4754500	0.11800	0.16400	0.28200	0.26000	0.25600	0.21200	0.16900	0.14800	0.04640	0.01790	0.01790
AR179	444500	4754500	0.12300	0.17000	0.30000	0.28100	0.27600	0.22700	0.18400	0.16200	0.04910	0.01790	0.01790
AR180	445000	4754500	0.12100	0.16900	0.30500	0.28900	0.28400	0.23400	0.19400	0.17100	0.05250	0.01810	0.01810
AR181	445500	4754500	0.12700	0.17600	0.31300	0.29500	0.29000	0.24200	0.19800	0.17500	0.05650	0.01870	0.01870
AR182	446000	4754500	0.12800	0.17500	0.31100	0.29300	0.29000	0.24400	0.20000	0.17800	0.06130	0.01920	0.01920
AR183	446500	4754500	0.12400	0.16600	0.30700	0.29300	0.29300	0.24800	0.20400	0.18400	0.06920	0.02010	0.02010
AR184	447000	4754500	0.12000	0.16800	0.31600	0.30200	0.30000	0.25700	0.21300	0.19000	0.07850	0.02080	0.02080
AR185	447500	4754500	0.11500	0.16600	0.31900	0.30600	0.30400	0.26400	0.22200	0.19800	0.09050	0.02170	0.02160
AR186	448000	4754500	0.11200	0.16400	0.33000	0.32100	0.31900	0.28000	0.23800	0.21400	0.10800	0.02220	0.02220
AR187	448500	4754500	0.10500	0.15700	0.35200	0.34800	0.34700	0.30700	0.26700	0.24200	0.13500	0.02280	0.02280
AR188	449000	4754500	0.10000	0.15100	0.37500	0.37400	0.37400	0.33300	0.29500	0.27100	0.16400	0.02290	0.02290
AR189	449500	4754500	0.09430	0.14300	0.41100	0.41300	0.41300	0.37100	0.33400	0.31100	0.20500	0.02340	0.02340
AR190	450000	4754500	0.08740	0.13500	0.45400	0.45900	0.46100	0.41900	0.38300	0.36100	0.25900	0.02430	0.02430
AR191	450500	4754500	0.08130	0.12800	0.49800	0.50500	0.50900	0.46500	0.42900	0.40800	0.30500	0.02540	0.02540
AR192	451000	4754500	0.07580	0.11800	0.46000	0.46800	0.47600	0.43200	0.39800	0.37800	0.27800	0.02630	0.02630
AR193	451500	4754500	0.07080	0.11100	0.48300	0.49100	0.50100	0.45600	0.42300	0.40500	0.30600	0.02660	0.02650
AR194	452000	4754500	0.06640	0.10400	0.42000	0.43000	0.44000	0.39800	0.36700	0.34900	0.25500	0.02640	0.02640
AR195	452500	4754500	0.06270	0.09840	0.35000	0.36100	0.37500	0.33800	0.30700	0.29000	0.20200	0.02780	0.02780
AR196	453000	4754500	0.05960	0.09350	0.31800	0.33200	0.34700	0.30700	0.27500	0.25900	0.16900	0.02920	0.02920
AR197	453500	4754500	0.05670	0.08910	0.28700	0.30400	0.32100	0.28200	0.25100	0.23600	0.14600	0.03060	0.03060
AR198	454000	4754500	0.05410	0.08490	0.26000	0.27900	0.29800	0.26200	0.23000	0.21600	0.12900	0.03130	0.03130
AR199	454500	4754500	0.05180	0.08110	0.24300	0.26200	0.28300	0.24800	0.21700	0.20300	0.11800	0.03190	0.03180
AR200	455000	4754500	0.04960	0.07760	0.22800	0.24700	0.26800	0.23600	0.20600	0.19200	0.11000	0.03190	0.03190
AR201	455500	4754500	0.04760	0.07440	0.21500	0.23500	0.25700	0.22600	0.19600	0.18400	0.10400	0.03250	0.03240
AR202	456000	4754500	0.04570	0.07140	0.19900	0.21900	0.24200	0.21500	0.18600	0.17400	0.09830	0.03260	0.03260
AR203	456500	4754500	0.04390	0.06870	0.18700	0.20700	0.23000	0.20600	0.17800	0.16700	0.09390	0.03290	0.03290
AR204	457000	4754500	0.04230	0.06610	0.17700	0.19700	0.22100	0.20000	0.17300	0.16200	0.09080	0.03390	0.03380
AR205	457500	4754500	0.04080	0.06370	0.16700	0.18700	0.21300	0.19400	0.16800	0.15700	0.08760	0.03430	0.03420
AR206	437500	4754000	0.04620	0.06770	0.11700	0.11500	0.12000	0.10600	0.08770	0.07760	0.02940	0.01510	0.01510
AR207	438000	4754000	0.05060	0.07310	0.12600	0.12400	0.12900	0.11300	0.09340	0.08290	0.03060	0.01560	0.01560
AR208	438500	4754000	0.05720	0.08130	0.14100	0.13800	0.14200	0.12300	0.10100	0.08980	0.03150	0.01580	0.01580
AR209	439000	4754000	0.06060	0.08640	0.15300	0.14800	0.15300	0.13000	0.10700	0.09510	0.03260	0.01620	0.01620

AR210	439500	4754000	0.06690	0.09440	0.17000	0.16300	0.16700	0.14100	0.11500	0.10200	0.03390	0.01660	0.01660
AR211	440000	4754000	0.07560	0.10400	0.18900	0.18000	0.18400	0.15300	0.12400	0.11100	0.03520	0.01710	0.01710
AR212	440500	4754000	0.08190	0.11200	0.20000	0.18900	0.19300	0.16100	0.13000	0.11600	0.03660	0.01750	0.01750
AR213	441000	4754000	0.08680	0.11700	0.22600	0.21500	0.21800	0.17600	0.14300	0.12900	0.03810	0.01790	0.01790
AR214	441500	4754000	0.10200	0.13800	0.26100	0.24400	0.24500	0.19600	0.15700	0.14000	0.03960	0.01830	0.01830
AR215	442000	4754000	0.11200	0.15300	0.29400	0.27300	0.27200	0.21300	0.17000	0.15100	0.04120	0.01870	0.01870
AR216	442500	4754000	0.13200	0.17600	0.34300	0.31400	0.31200	0.24100	0.19200	0.17100	0.04270	0.01900	0.01900
AR217	443000	4754000	0.14600	0.19800	0.37100	0.33700	0.33100	0.25700	0.20200	0.17800	0.04430	0.01920	0.01920
AR218	443500	4754000	0.15300	0.20400	0.36200	0.32600	0.32000	0.25500	0.20000	0.17600	0.04560	0.01930	0.01930
AR219	444000	4754000	0.17200	0.23300	0.40800	0.37000	0.35900	0.28600	0.22700	0.19800	0.04790	0.01930	0.01930
AR220	444500	4754000	0.16200	0.22400	0.39900	0.36900	0.35800	0.28500	0.23100	0.20200	0.05120	0.01950	0.01950
AR221	445000	4754000	0.17500	0.24000	0.40700	0.37300	0.36100	0.29400	0.23500	0.20400	0.05470	0.01950	0.01950
AR222	445500	4754000	0.17400	0.23500	0.39400	0.36200	0.35200	0.29200	0.23200	0.20300	0.05890	0.01990	0.01990
AR223	446000	4754000	0.16400	0.21800	0.36900	0.34200	0.33700	0.28400	0.22700	0.20200	0.06450	0.02050	0.02050
AR224	446500	4754000	0.15300	0.21500	0.36700	0.34700	0.33800	0.28800	0.23500	0.20600	0.07290	0.02120	0.02120
AR225	447000	4754000	0.14400	0.20700	0.36600	0.35000	0.34100	0.29300	0.24100	0.21200	0.08440	0.02220	0.02220
AR226	447500	4754000	0.13100	0.19400	0.36700	0.35500	0.34700	0.30100	0.25400	0.22400	0.09970	0.02290	0.02290
AR227	448000	4754000	0.12300	0.18500	0.37800	0.37300	0.36700	0.32200	0.27700	0.24800	0.12600	0.02390	0.02390
AR228	448500	4754000	0.11200	0.17200	0.40700	0.40800	0.40500	0.36000	0.31600	0.28800	0.17100	0.02480	0.02480
AR229	449000	4754000	0.10200	0.15900	0.49400	0.49700	0.49500	0.44600	0.40400	0.37700	0.26000	0.02520	0.02520
AR230	449500	4754000	0.09390	0.14900	0.70400	0.70900	0.71000	0.65800	0.61800	0.59200	0.47700	0.02570	0.02570
AR231	450000	4754000	0.08660	0.13600	0.96200	0.97100	0.97500	0.92100	0.88100	0.85800	0.74400	0.02640	0.02630
AR232	450500	4754000	0.08010	0.12600	1.30000	1.31000	1.32000	1.26000	1.22000	1.20000	1.08000	0.02790	0.02780
AR233	451000	4754000	0.07440	0.11800	0.98700	0.99900	1.01000	0.94900	0.91300	0.89300	0.77700	0.02910	0.02900
AR234	451500	4754000	0.06990	0.11100	0.63000	0.64200	0.65500	0.59600	0.56200	0.54200	0.42900	0.02930	0.02930
AR235	452000	4754000	0.06600	0.10400	0.46300	0.47800	0.49100	0.44000	0.40600	0.38800	0.28400	0.02900	0.02900
AR236	452500	4754000	0.06250	0.09870	0.39700	0.41500	0.43100	0.37300	0.33900	0.32200	0.21300	0.03040	0.03040
AR237	453000	4754000	0.05930	0.09360	0.34500	0.36600	0.38500	0.33100	0.29600	0.28000	0.17400	0.03260	0.03260
AR238	453500	4754000	0.05640	0.08890	0.30400	0.32600	0.34800	0.29900	0.26500	0.25000	0.14900	0.03400	0.03400
AR239	454000	4754000	0.05380	0.08470	0.27100	0.29400	0.31700	0.27500	0.24100	0.22600	0.13100	0.03440	0.03440
AR240	454500	4754000	0.05140	0.08080	0.25000	0.27400	0.29700	0.25800	0.22500	0.21100	0.11900	0.03430	0.03420
AR241	455000	4754000	0.04920	0.07720	0.22800	0.25200	0.27600	0.24300	0.21100	0.19800	0.11200	0.03530	0.03530
AR242	455500	4754000	0.04710	0.07390	0.21200	0.23500	0.26100	0.23100	0.20000	0.18700	0.10600	0.03580	0.03580
AR243	456000	4754000	0.04520	0.07090	0.19800	0.22100	0.24700	0.22000	0.19000	0.17800	0.10000	0.03590	0.03590
AR244	456500	4754000	0.04350	0.06810	0.18500	0.20800	0.23600	0.21400	0.18500	0.17300	0.09690	0.03710	0.03710
AR245	457000	4754000	0.04190	0.06550	0.17400	0.19700	0.22700	0.20800	0.17900	0.16800	0.09380	0.03760	0.03750
AR246	457500	4754000	0.04040	0.06310	0.16500	0.18600	0.21600	0.19900	0.17200	0.16100	0.08940	0.03750	0.03750
AR247	437500	4753500	0.04700	0.06910	0.12000	0.11800	0.12300	0.10800	0.08910	0.07870	0.02990	0.01540	0.01540
AR248	438000	4753500	0.05230	0.07620	0.13200	0.12900	0.13400	0.11700	0.09580	0.08460	0.03100	0.01580	0.01580
AR249	438500	4753500	0.05820	0.08390	0.14800	0.14300	0.14800	0.12700	0.10400	0.09210	0.03210	0.01630	0.01630
AR250	439000	4753500	0.06670	0.09520	0.16900	0.16200	0.16600	0.14000	0.11500	0.10200	0.03370	0.01710	0.01710
AR251	439500	4753500	0.07720	0.10800	0.19400	0.18600	0.18800	0.15700	0.12800	0.11300	0.03510	0.01730	0.01730
AR252	440000	4753500	0.08930	0.12400	0.23000	0.21600	0.21700	0.17600	0.14200	0.12600	0.03620	0.01770	0.01770

AR253	440500	4753500	0.10500	0.14300	0.27400	0.25500	0.25500	0.20000	0.16000	0.14200	0.03770	0.01830	0.01830
AR254	441000	4753500	0.12000	0.16200	0.30900	0.28500	0.28300	0.22100	0.17500	0.15500	0.03940	0.01880	0.01880
AR255	441500	4753500	0.13400	0.17600	0.37800	0.35000	0.34900	0.25800	0.20800	0.18800	0.04110	0.01930	0.01930
AR256	442000	4753500	0.16900	0.22100	0.47200	0.42900	0.42300	0.30700	0.24300	0.21800	0.04290	0.01980	0.01980
AR257	442500	4753500	0.20500	0.26500	0.55700	0.50000	0.49100	0.35400	0.27600	0.24700	0.04480	0.02030	0.02020
AR258	443000	4753500	0.24100	0.31100	0.57800	0.50700	0.49300	0.36900	0.27800	0.24500	0.04670	0.02070	0.02070
AR259	443500	4753500	0.26400	0.33600	0.62700	0.55200	0.53700	0.40200	0.30700	0.27400	0.04850	0.02100	0.02100
AR260	444000	4753500	0.25300	0.34000	0.60100	0.53800	0.51500	0.39700	0.31300	0.27200	0.05010	0.02120	0.02120
AR261	444500	4753500	0.27100	0.36000	0.58700	0.51500	0.49200	0.39300	0.30100	0.25900	0.05280	0.02120	0.02120
AR262	445000	4753500	0.25300	0.34100	0.53000	0.46900	0.44600	0.36900	0.28200	0.24100	0.05670	0.02140	0.02140
AR263	445500	4753500	0.22500	0.30000	0.46800	0.42200	0.40600	0.34100	0.26300	0.22800	0.06120	0.02160	0.02160
AR264	446000	4753500	0.19600	0.28400	0.44100	0.40800	0.38700	0.33000	0.26300	0.22100	0.06620	0.02200	0.02200
AR265	446500	4753500	0.17300	0.26000	0.41400	0.39300	0.37300	0.32200	0.26200	0.22100	0.07430	0.02270	0.02270
AR266	447000	4753500	0.15400	0.23500	0.39900	0.38900	0.37300	0.32100	0.26700	0.22800	0.08530	0.02350	0.02350
AR267	447500	4753500	0.13700	0.21100	0.39000	0.38400	0.37200	0.32000	0.26900	0.23400	0.09940	0.02460	0.02460
AR268	448000	4753500	0.12300	0.19500	0.40100	0.40200	0.39300	0.33800	0.28900	0.25500	0.12300	0.02570	0.02570
AR269	448500	4753500	0.11100	0.17600	0.42400	0.43200	0.42800	0.37100	0.32300	0.29200	0.16400	0.02700	0.02700
AR270	449000	4753500	0.10100	0.16000	0.49500	0.50500	0.50500	0.44500	0.39900	0.37100	0.24400	0.02790	0.02790
AR271	449500	4753500	0.09180	0.14700	0.69300	0.70700	0.71000	0.63700	0.59300	0.56700	0.43400	0.02790	0.02790
AR272	450000	4753500	0.08440	0.13500	1.72000	1.74000	1.74000	1.66000	1.62000	1.59000	1.45000	0.02880	0.02880
AR273	450500	4753500	0.07870	0.12600	1.39000	1.41000	1.42000	1.32000	1.28000	1.26000	1.11000	0.03080	0.03080
AR274	451000	4753500	0.07370	0.11800	0.89000	0.90700	0.92100	0.82500	0.78700	0.76600	0.61600	0.03230	0.03230
AR275	451500	4753500	0.06930	0.11000	0.60000	0.62000	0.63700	0.55500	0.51700	0.49700	0.36100	0.03260	0.03260
AR276	452000	4753500	0.06530	0.10400	0.50200	0.52700	0.54400	0.45300	0.41400	0.39600	0.25300	0.03220	0.03210
AR277	452500	4753500	0.06180	0.09800	0.42200	0.44900	0.47000	0.38800	0.34900	0.33200	0.19900	0.03440	0.03440
AR278	453000	4753500	0.05860	0.09280	0.36000	0.38900	0.41300	0.34400	0.30600	0.29000	0.16700	0.03660	0.03660
AR279	453500	4753500	0.05570	0.08810	0.30900	0.33800	0.36400	0.30900	0.27200	0.25700	0.14600	0.03790	0.03790
AR280	454000	4753500	0.05310	0.08380	0.27100	0.30000	0.32700	0.28200	0.24600	0.23100	0.13000	0.03800	0.03800
AR281	454500	4753500	0.05070	0.07980	0.24500	0.27300	0.30100	0.26300	0.22800	0.21400	0.12000	0.03850	0.03850
AR282	455000	4753500	0.04850	0.07630	0.22500	0.25300	0.28200	0.24900	0.21500	0.20200	0.11400	0.03930	0.03930
AR283	455500	4753500	0.04640	0.07300	0.20900	0.23600	0.26600	0.23700	0.20400	0.19200	0.10800	0.03950	0.03950
AR284	456000	4753500	0.04460	0.06990	0.19400	0.22100	0.25400	0.22900	0.19800	0.18600	0.10500	0.04100	0.04090
AR285	456500	4753500	0.04290	0.06720	0.18200	0.20600	0.24000	0.22000	0.19000	0.17900	0.09990	0.04150	0.04150
AR286	457000	4753500	0.04120	0.06460	0.17100	0.19400	0.22900	0.21100	0.18300	0.17200	0.09590	0.04140	0.04140
AR287	457500	4753500	0.03980	0.06220	0.16200	0.18300	0.21900	0.20300	0.17700	0.16600	0.09210	0.04110	0.04110
AR288	437500	4753000	0.04730	0.07060	0.12100	0.11900	0.12400	0.10900	0.08950	0.07850	0.02990	0.01570	0.01560
AR289	438000	4753000	0.05310	0.07850	0.13500	0.13200	0.13600	0.11900	0.09710	0.08510	0.03110	0.01620	0.01620
AR290	438500	4753000	0.06020	0.08820	0.15400	0.14900	0.15200	0.13100	0.10700	0.09350	0.03230	0.01670	0.01670
AR291	439000	4753000	0.07060	0.10200	0.18000	0.17200	0.17500	0.14700	0.11900	0.10400	0.03370	0.01730	0.01730
AR292	439500	4753000	0.08440	0.11800	0.21400	0.20300	0.20400	0.16700	0.13500	0.11900	0.03490	0.01770	0.01770
AR293	440000	4753000	0.10100	0.14200	0.26600	0.24900	0.24700	0.19600	0.15700	0.13800	0.03670	0.01860	0.01860
AR294	440500	4753000	0.12400	0.17100	0.34300	0.31700	0.31300	0.23700	0.18900	0.16700	0.03860	0.01910	0.01910
AR295	441000	4753000	0.16200	0.21800	0.48100	0.44000	0.43200	0.30800	0.24500	0.21900	0.04000	0.01960	0.01960

AR296	441500	4753000	0.21300	0.27700	0.70400	0.64000	0.62900	0.41900	0.33500	0.30500	0.04190	0.02020	0.02020
AR297	442000	4753000	0.26500	0.33000	1.11000	1.03000	1.02000	0.61900	0.51500	0.48400	0.04390	0.02090	0.02080
AR298	442500	4753000	0.38300	0.47000	1.33000	1.18000	1.16000	0.72400	0.56600	0.52500	0.04600	0.02150	0.02150
AR299	443000	4753000	0.46900	0.57300	1.32000	1.12000	1.09000	0.71700	0.51200	0.46300	0.04820	0.02210	0.02210
AR300	443500	4753000	0.42700	0.53900	0.99900	0.83400	0.80000	0.57600	0.39600	0.34300	0.05040	0.02260	0.02260
AR301	444000	4753000	0.49900	0.63500	0.94600	0.77500	0.72900	0.58400	0.39900	0.33500	0.05240	0.02310	0.02310
AR302	444500	4753000	0.42100	0.56100	0.79500	0.66600	0.61800	0.51500	0.36800	0.30200	0.05400	0.02340	0.02340
AR303	445000	4753000	0.32200	0.44000	0.63100	0.54900	0.51300	0.43300	0.32400	0.26900	0.05710	0.02350	0.02350
AR304	445500	4753000	0.26200	0.40100	0.56700	0.51600	0.46900	0.40400	0.31600	0.25100	0.06180	0.02380	0.02380
AR305	446000	4753000	0.21500	0.34400	0.49700	0.46600	0.42500	0.36900	0.29500	0.23400	0.06640	0.02410	0.02410
AR306	446500	4753000	0.18100	0.29500	0.44500	0.42800	0.39500	0.34300	0.28000	0.22600	0.07180	0.02460	0.02460
AR307	447000	4753000	0.15500	0.25800	0.41500	0.41200	0.38700	0.33400	0.27500	0.22700	0.08050	0.02540	0.02530
AR308	447500	4753000	0.13600	0.22000	0.39000	0.39200	0.37800	0.32200	0.26800	0.22800	0.08830	0.02640	0.02640
AR309	448000	4753000	0.12100	0.19600	0.38700	0.39900	0.39000	0.32800	0.27400	0.23900	0.09950	0.02770	0.02770
AR310	448500	4753000	0.10800	0.17600	0.40300	0.42100	0.41900	0.34200	0.29000	0.25800	0.11100	0.02950	0.02950
AR311	449000	4753000	0.09840	0.16000	0.46500	0.48500	0.48900	0.39100	0.34200	0.31300	0.15100	0.03090	0.03090
AR312	449500	4753000	0.09060	0.14600	0.57900	0.60500	0.61200	0.48800	0.43900	0.41200	0.23000	0.03140	0.03130
AR313	450000	4753000	0.08390	0.13500	1.00000	1.03000	1.04000	0.85800	0.81100	0.78700	0.55900	0.03170	0.03160
AR314	450500	4753000	0.07810	0.12500	0.87800	0.90100	0.91600	0.71000	0.66700	0.64500	0.39200	0.03420	0.03420
AR315	451000	4753000	0.07300	0.11700	0.72500	0.75200	0.77100	0.58800	0.54500	0.52400	0.29200	0.03630	0.03630
AR316	451500	4753000	0.06860	0.10900	0.63200	0.66500	0.68600	0.50700	0.46300	0.44400	0.21600	0.03670	0.03670
AR317	452000	4753000	0.06460	0.10300	0.52000	0.55500	0.57800	0.43500	0.39200	0.37400	0.18100	0.03620	0.03610
AR318	452500	4753000	0.06100	0.09680	0.41600	0.45200	0.48000	0.38000	0.33700	0.32100	0.16700	0.03930	0.03930
AR319	453000	4753000	0.05780	0.09150	0.34900	0.38400	0.41500	0.34000	0.29900	0.28300	0.15200	0.04150	0.04150
AR320	453500	4753000	0.05490	0.08680	0.29900	0.33400	0.36600	0.30900	0.26900	0.25500	0.13900	0.04250	0.04240
AR321	454000	4753000	0.05230	0.08250	0.26200	0.29600	0.32800	0.28300	0.24500	0.23100	0.12700	0.04200	0.04200
AR322	454500	4753000	0.04990	0.07860	0.23400	0.26800	0.30100	0.26600	0.22900	0.21600	0.12000	0.04350	0.04340
AR323	455000	4753000	0.04770	0.07500	0.21700	0.24700	0.28200	0.25100	0.21700	0.20400	0.11400	0.04420	0.04420
AR324	455500	4753000	0.04570	0.07170	0.20100	0.22900	0.26800	0.24200	0.20900	0.19700	0.11000	0.04560	0.04560
AR325	456000	4753000	0.04380	0.06870	0.18700	0.21400	0.25400	0.23300	0.20200	0.19000	0.10600	0.04640	0.04640
AR326	456500	4753000	0.04210	0.06600	0.17600	0.20100	0.24100	0.22400	0.19400	0.18300	0.10200	0.04620	0.04620
AR327	457000	4753000	0.04050	0.06340	0.16500	0.18900	0.23000	0.21500	0.18700	0.17600	0.09790	0.04590	0.04590
AR328	457500	4753000	0.03910	0.06100	0.15600	0.17900	0.22300	0.21000	0.18300	0.17300	0.09720	0.04830	0.04830
AR329	437500	4752500	0.04820	0.07200	0.12200	0.12100	0.12600	0.11100	0.09130	0.08010	0.02990	0.01590	0.01590
AR330	438000	4752500	0.05380	0.08010	0.13700	0.13400	0.13800	0.12000	0.09860	0.08620	0.03110	0.01640	0.01640
AR331	438500	4752500	0.06060	0.09000	0.15500	0.15100	0.15400	0.13200	0.10800	0.09420	0.03230	0.01700	0.01700
AR332	439000	4752500	0.07110	0.10400	0.18200	0.17400	0.17600	0.14900	0.12100	0.10500	0.03380	0.01770	0.01770
AR333	439500	4752500	0.08650	0.12400	0.22000	0.20800	0.20800	0.17100	0.13800	0.12000	0.03520	0.01820	0.01820
AR334	440000	4752500	0.10600	0.15100	0.27700	0.25800	0.25500	0.20300	0.16200	0.14000	0.03690	0.01900	0.01900
AR335	440500	4752500	0.13600	0.19000	0.37200	0.34100	0.33400	0.25200	0.19900	0.17400	0.03840	0.01960	0.01950
AR336	441000	4752500	0.18700	0.25400	0.57200	0.51800	0.50500	0.35200	0.27800	0.24600	0.04030	0.02040	0.02040
AR337	441500	4752500	0.29700	0.38400	1.25000	1.14000	1.12000	0.68000	0.55900	0.51800	0.04260	0.02140	0.02140
AR338	442000	4752500	0.57800	0.69100	21.00000	20.80000	20.70000	10.00000	9.75000	9.70000	0.04470	0.02190	0.02190

AR339	442500	4752500	1.43000	1.56000	4.84000	4.14000	4.10000	2.38000	1.73000	1.67000	0.04680	0.02270	0.02260
AR340	443000	4752500	2.62000	2.81000	3.65000	2.40000	2.33000	1.90000	0.74700	0.65800	0.04930	0.02350	0.02340
AR341	443500	4752500	1.47000	1.69000	2.12000	1.50000	1.40000	1.20000	0.60000	0.49300	0.05190	0.02420	0.02420
AR342	444000	4752500	0.69000	0.97100	1.26000	1.00000	0.88000	0.74900	0.48200	0.34900	0.05430	0.02500	0.02500
AR343	444500	4752500	0.46800	0.70400	0.91900	0.78700	0.69100	0.59800	0.43700	0.32600	0.05690	0.02560	0.02560
AR344	445000	4752500	0.34100	0.59900	0.77600	0.69800	0.59100	0.51900	0.40600	0.28500	0.05870	0.02610	0.02610
AR345	445500	4752500	0.25900	0.47300	0.62800	0.58400	0.50000	0.44000	0.35200	0.25100	0.06190	0.02630	0.02630
AR346	446000	4752500	0.21100	0.37700	0.51900	0.50000	0.44200	0.38900	0.31300	0.23500	0.06680	0.02670	0.02660
AR347	446500	4752500	0.17700	0.30700	0.44600	0.44200	0.40300	0.35300	0.28700	0.22500	0.07050	0.02720	0.02720
AR348	447000	4752500	0.15200	0.25800	0.40200	0.41300	0.38900	0.33700	0.27400	0.22500	0.07520	0.02790	0.02790
AR349	447500	4752500	0.13200	0.21900	0.37800	0.39500	0.38300	0.32500	0.26600	0.22500	0.08080	0.02870	0.02870
AR350	448000	4752500	0.11800	0.19400	0.38500	0.41500	0.40900	0.34100	0.28000	0.24400	0.09610	0.03000	0.03000
AR351	448500	4752500	0.10700	0.17500	0.42800	0.46200	0.46300	0.37000	0.31200	0.28000	0.11300	0.03190	0.03190
AR352	449000	4752500	0.09780	0.15900	0.54200	0.58200	0.59000	0.43800	0.38000	0.35100	0.13500	0.03430	0.03430
AR353	449500	4752500	0.09000	0.14500	0.90900	0.94900	0.96200	0.63200	0.57700	0.55100	0.18000	0.03550	0.03550
AR354	450000	4752500	0.08340	0.13400	2.03000	2.06000	2.08000	1.21000	1.16000	1.14000	0.28900	0.03560	0.03560
AR355	450500	4752500	0.07760	0.12400	2.50000	2.54000	2.56000	1.41000	1.35000	1.33000	0.23100	0.03860	0.03850
AR356	451000	4752500	0.07250	0.11500	1.24000	1.29000	1.31000	0.80300	0.75100	0.73100	0.20300	0.04120	0.04120
AR357	451500	4752500	0.06800	0.10800	0.70600	0.75300	0.78100	0.53700	0.48700	0.46800	0.17800	0.04170	0.04160
AR358	452000	4752500	0.06410	0.10100	0.49700	0.54400	0.57400	0.42800	0.37900	0.36200	0.16000	0.04170	0.04160
AR359	452500	4752500	0.06050	0.09540	0.38400	0.42900	0.46500	0.36600	0.31900	0.30300	0.14400	0.04540	0.04540
AR360	453000	4752500	0.05740	0.09020	0.31500	0.35800	0.39700	0.32600	0.28100	0.26600	0.13200	0.04740	0.04740
AR361	453500	4752500	0.05450	0.08550	0.27300	0.31600	0.35500	0.30200	0.25900	0.24500	0.12700	0.04780	0.04780
AR362	454000	4752500	0.05190	0.08130	0.24300	0.28000	0.31900	0.27900	0.24000	0.22600	0.12100	0.04820	0.04820
AR363	454500	4752500	0.04950	0.07740	0.22000	0.25400	0.29600	0.26500	0.22800	0.21500	0.11800	0.05010	0.05000
AR364	455000	4752500	0.04730	0.07390	0.20500	0.23700	0.28200	0.25600	0.22100	0.20900	0.11500	0.05190	0.05180
AR365	455500	4752500	0.04530	0.07070	0.19100	0.22100	0.26800	0.24600	0.21400	0.20200	0.11100	0.05240	0.05240
AR366	456000	4752500	0.04350	0.06770	0.17900	0.20700	0.25500	0.23700	0.20600	0.19500	0.10700	0.05210	0.05210
AR367	456500	4752500	0.04180	0.06500	0.16800	0.19400	0.24300	0.22800	0.19900	0.18800	0.10400	0.05180	0.05180
AR368	457000	4752500	0.04030	0.06260	0.15900	0.18400	0.23500	0.22300	0.19500	0.18500	0.10400	0.05470	0.05460
AR369	457500	4752500	0.03890	0.06030	0.15100	0.17400	0.22700	0.21700	0.19000	0.18000	0.10200	0.05600	0.05600
AR370	437500	4752000	0.04800	0.07160	0.11700	0.11600	0.12100	0.10900	0.09020	0.07910	0.02980	0.01620	0.01620
AR371	438000	4752000	0.05340	0.07960	0.13000	0.12800	0.13200	0.11800	0.09710	0.08480	0.03100	0.01680	0.01680
AR372	438500	4752000	0.05990	0.08940	0.14600	0.14300	0.14600	0.12900	0.10600	0.09190	0.03230	0.01730	0.01730
AR373	439000	4752000	0.06950	0.10300	0.16800	0.16200	0.16500	0.14300	0.11600	0.10100	0.03370	0.01800	0.01800
AR374	439500	4752000	0.08220	0.12100	0.19800	0.18900	0.18800	0.16200	0.13000	0.11200	0.03520	0.01860	0.01860
AR375	440000	4752000	0.09810	0.14600	0.23800	0.22300	0.21900	0.18500	0.14700	0.12400	0.03690	0.01940	0.01940
AR376	440500	4752000	0.12500	0.18500	0.29400	0.27000	0.26100	0.21800	0.17000	0.14100	0.03870	0.02020	0.02020
AR377	441000	4752000	0.16600	0.24500	0.39200	0.35200	0.33300	0.27100	0.20700	0.17000	0.04060	0.02100	0.02100
AR378	441500	4752000	0.24100	0.35000	0.64600	0.57400	0.54000	0.40000	0.30500	0.25300	0.04270	0.02190	0.02190
AR379	442000	4752000	0.37400	0.53800	1.54000	1.41000	1.35000	0.83100	0.67800	0.60100	0.04480	0.02260	0.02260
AR380	442500	4752000	1.25000	1.53000	2.14000	1.56000	1.44000	1.14000	0.58900	0.45800	0.04760	0.02410	0.02410
AR381	443000	4752000	2.09000	2.54000	2.90000	1.97000	1.76000	1.59000	0.71600	0.50600	0.05050	0.02480	0.02480

AR382	443500	4752000	0.96600	1.84000	2.07000	1.75000	1.32000	1.21000	0.88400	0.47500	0.05290	0.02580	0.02580
AR383	444000	4752000	0.59100	1.49000	1.70000	1.53000	1.08000	0.99300	0.79600	0.37200	0.05610	0.02680	0.02680
AR384	444500	4752000	0.40600	1.08000	1.25000	1.16000	0.83300	0.76300	0.62900	0.31300	0.05960	0.02780	0.02780
AR385	445000	4752000	0.30900	0.69100	0.83800	0.79000	0.62000	0.56200	0.46000	0.28000	0.06290	0.02870	0.02870
AR386	445500	4752000	0.24500	0.49300	0.62500	0.60000	0.50200	0.45200	0.36900	0.25200	0.06440	0.02940	0.02940
AR387	446000	4752000	0.20000	0.37600	0.49900	0.49400	0.43500	0.39000	0.31600	0.23300	0.06830	0.02980	0.02980
AR388	446500	4752000	0.16700	0.30000	0.42100	0.43800	0.40200	0.35900	0.28800	0.22500	0.07610	0.03030	0.03030
AR389	447000	4752000	0.14600	0.25100	0.38100	0.41200	0.39300	0.34800	0.27900	0.23000	0.08470	0.03130	0.03120
AR390	447500	4752000	0.13000	0.21500	0.36000	0.40200	0.39400	0.34500	0.27600	0.23600	0.09410	0.03210	0.03210
AR391	448000	4752000	0.11700	0.19000	0.35900	0.41800	0.41900	0.36000	0.28700	0.25200	0.10800	0.03320	0.03320
AR392	448500	4752000	0.10600	0.17100	0.38500	0.44500	0.45300	0.37600	0.30500	0.27500	0.11700	0.03530	0.03530
AR393	449000	4752000	0.09740	0.15600	0.46700	0.53500	0.55000	0.43100	0.36000	0.33300	0.14000	0.03840	0.03840
AR394	449500	4752000	0.08980	0.14200	0.63900	0.69900	0.72000	0.51300	0.44900	0.42500	0.15700	0.04070	0.04070
AR395	450000	4752000	0.08330	0.13100	2.71000	2.78000	2.81000	1.53000	1.46000	1.44000	0.21700	0.04150	0.04150
AR396	450500	4752000	0.07760	0.12200	1.84000	1.92000	1.95000	1.11000	1.05000	1.02000	0.20000	0.04450	0.04450
AR397	451000	4752000	0.07260	0.11400	0.86100	0.92800	0.96500	0.63000	0.56900	0.54900	0.17100	0.04800	0.04800
AR398	451500	4752000	0.06820	0.10600	0.55800	0.61900	0.65800	0.47600	0.41900	0.40100	0.16000	0.04920	0.04920
AR399	452000	4752000	0.06430	0.09990	0.41700	0.47600	0.51700	0.40100	0.34700	0.33000	0.14800	0.04930	0.04930
AR400	452500	4752000	0.06080	0.09420	0.34000	0.39200	0.43800	0.35700	0.30700	0.29200	0.14300	0.05310	0.05310
AR401	453000	4752000	0.05760	0.08910	0.28800	0.33400	0.38200	0.32300	0.27800	0.26300	0.13400	0.05480	0.05470
AR402	453500	4752000	0.05480	0.08450	0.25000	0.29200	0.34000	0.29600	0.25400	0.24000	0.12500	0.05530	0.05530
AR403	454000	4752000	0.05220	0.08040	0.22200	0.26100	0.31100	0.27900	0.23900	0.22600	0.11900	0.05720	0.05720
AR404	454500	4752000	0.04980	0.07670	0.20100	0.23600	0.29200	0.26700	0.23000	0.21700	0.11700	0.05970	0.05970
AR405	455000	4752000	0.04770	0.07320	0.19000	0.22300	0.28000	0.25900	0.22400	0.21200	0.11500	0.06000	0.06000
AR406	455500	4752000	0.04570	0.07010	0.17900	0.20900	0.26600	0.25000	0.21700	0.20600	0.11200	0.05960	0.05960
AR407	456000	4752000	0.04380	0.06720	0.16900	0.19700	0.25400	0.24200	0.21100	0.20000	0.10900	0.05940	0.05940
AR408	456500	4752000	0.04220	0.06460	0.16000	0.18600	0.24700	0.23700	0.20800	0.19700	0.11000	0.06260	0.06260
AR409	457000	4752000	0.04060	0.06210	0.15200	0.17700	0.23900	0.23000	0.20300	0.19200	0.10900	0.06390	0.06390
AR410	457500	4752000	0.03920	0.05990	0.14500	0.16800	0.23100	0.22300	0.19700	0.18700	0.10700	0.06390	0.06390
AR411	437500	4751500	0.04190	0.06550	0.10500	0.10600	0.11200	0.10200	0.08470	0.07360	0.02960	0.01640	0.01640
AR412	438000	4751500	0.04610	0.07220	0.11500	0.11500	0.12000	0.11000	0.09040	0.07810	0.03080	0.01700	0.01700
AR413	438500	4751500	0.05080	0.08020	0.12600	0.12600	0.13000	0.11800	0.09720	0.08340	0.03210	0.01770	0.01770
AR414	439000	4751500	0.05800	0.09140	0.14100	0.13900	0.14200	0.12900	0.10500	0.08970	0.03350	0.01830	0.01830
AR415	439500	4751500	0.06750	0.10600	0.15800	0.15400	0.15500	0.14100	0.11500	0.09660	0.03510	0.01910	0.01910
AR416	440000	4751500	0.07690	0.12400	0.18800	0.18300	0.18000	0.16000	0.13000	0.10800	0.03670	0.01980	0.01980
AR417	440500	4751500	0.08740	0.14600	0.23100	0.22400	0.21600	0.18600	0.15200	0.12400	0.03850	0.02070	0.02070
AR418	441000	4751500	0.10200	0.17900	0.29200	0.28300	0.26600	0.22100	0.18300	0.14600	0.04050	0.02160	0.02160
AR419	441500	4751500	0.15000	0.25900	0.44200	0.41400	0.38200	0.30100	0.24400	0.19300	0.04280	0.02270	0.02270
AR420	442000	4751500	0.23200	0.40500	0.76300	0.70100	0.63500	0.46200	0.37100	0.29000	0.04490	0.02350	0.02350
AR421	442500	4751500	0.42900	0.76800	1.00000	0.83600	0.68500	0.57700	0.38800	0.22900	0.04790	0.02500	0.02500
AR422	443000	4751500	0.59400	1.69000	1.89000	1.71000	1.15000	1.07000	0.86100	0.34300	0.05040	0.02580	0.02580
AR423	443500	4751500	0.48500	52.10000	52.30000	52.20000	24.90000	24.80000	24.70000	0.36100	0.05330	0.02720	0.02720
AR424	444000	4751500	0.30200	2.32000	2.46000	2.39000	1.36000	1.30000	1.19000	0.24200	0.05730	0.02880	0.02880

AR425	444500	4751500	0.27000	0.92600	1.04000	1.02000	0.70400	0.66100	0.57400	0.26500	0.06170	0.02990	0.02990
AR426	445000	4751500	0.22700	0.57000	0.67800	0.67300	0.52700	0.48900	0.40800	0.24600	0.06820	0.03120	0.03120
AR427	445500	4751500	0.19200	0.41300	0.51800	0.53000	0.45100	0.41600	0.33700	0.23300	0.07510	0.03260	0.03250
AR428	446000	4751500	0.16500	0.32300	0.42600	0.45200	0.40700	0.37400	0.29900	0.22500	0.08090	0.03370	0.03370
AR429	446500	4751500	0.14400	0.26500	0.36800	0.41400	0.38900	0.35800	0.28100	0.22400	0.09040	0.03430	0.03430
AR430	447000	4751500	0.12700	0.22400	0.33300	0.40100	0.39000	0.35700	0.27500	0.23000	0.10200	0.03490	0.03490
AR431	447500	4751500	0.11300	0.19300	0.30900	0.40100	0.40200	0.36800	0.27700	0.24000	0.11800	0.03680	0.03680
AR432	448000	4751500	0.10200	0.17200	0.29500	0.41300	0.42300	0.38700	0.28600	0.25400	0.13400	0.03840	0.03840
AR433	448500	4751500	0.09370	0.15600	0.29500	0.42100	0.43700	0.39700	0.29500	0.26600	0.14700	0.03950	0.03950
AR434	449000	4751500	0.08640	0.14200	0.33500	0.44200	0.46500	0.40300	0.31400	0.28800	0.14900	0.04290	0.04290
AR435	449500	4751500	0.08010	0.13100	0.43300	0.55700	0.58800	0.48000	0.38400	0.36000	0.18000	0.04710	0.04710
AR436	450000	4751500	0.07470	0.12200	0.78800	0.90700	0.94200	0.65500	0.56400	0.54200	0.20400	0.04930	0.04930
AR437	450500	4751500	0.06990	0.11300	0.60000	0.70400	0.74800	0.55200	0.47000	0.45000	0.19300	0.05360	0.05350
AR438	451000	4751500	0.06570	0.10600	0.45400	0.54600	0.59600	0.46200	0.38800	0.36900	0.16700	0.05710	0.05710
AR439	451500	4751500	0.06190	0.09970	0.36400	0.43600	0.48800	0.39800	0.33700	0.31900	0.15600	0.05900	0.05900
AR440	452000	4751500	0.05860	0.09410	0.29600	0.35800	0.41400	0.35400	0.29900	0.28200	0.14600	0.06000	0.06000
AR441	452500	4751500	0.05560	0.08900	0.27000	0.32600	0.38600	0.33300	0.28300	0.26700	0.14100	0.06400	0.06400
AR442	453000	4751500	0.05280	0.08440	0.24500	0.29400	0.35300	0.31200	0.26600	0.25100	0.13500	0.06410	0.06410
AR443	453500	4751500	0.05040	0.08030	0.22200	0.26600	0.32700	0.29700	0.25400	0.24000	0.13100	0.06640	0.06640
AR444	454000	4751500	0.04810	0.07660	0.20200	0.24200	0.31000	0.28700	0.24800	0.23500	0.13000	0.07070	0.07070
AR445	454500	4751500	0.04600	0.07320	0.18500	0.22100	0.29100	0.27400	0.23800	0.22500	0.12500	0.07080	0.07070
AR446	455000	4751500	0.04410	0.07010	0.17400	0.20700	0.27600	0.26200	0.22800	0.21600	0.11900	0.06940	0.06940
AR447	455500	4751500	0.04240	0.06720	0.16300	0.19400	0.26200	0.25300	0.22100	0.20900	0.11500	0.06930	0.06930
AR448	456000	4751500	0.04080	0.06460	0.15500	0.18300	0.25500	0.24900	0.21800	0.20700	0.11700	0.07310	0.07300
AR449	456500	4751500	0.03930	0.06210	0.14800	0.17400	0.24800	0.24200	0.21400	0.20300	0.11600	0.07410	0.07410
AR450	457000	4751500	0.03790	0.05990	0.14200	0.16600	0.23900	0.23500	0.20700	0.19700	0.11400	0.07360	0.07360
AR451	457500	4751500	0.03660	0.05780	0.13600	0.15900	0.23200	0.22800	0.20200	0.19200	0.11200	0.07300	0.07290
AR452	437500	4751000	0.03500	0.05610	0.08960	0.09210	0.09900	0.09300	0.07710	0.06720	0.02920	0.01660	0.01650
AR453	438000	4751000	0.03800	0.06130	0.09520	0.09790	0.10400	0.09850	0.08160	0.07070	0.03040	0.01720	0.01720
AR454	438500	4751000	0.04140	0.06710	0.10400	0.10700	0.11300	0.10600	0.08800	0.07590	0.03170	0.01790	0.01790
AR455	439000	4751000	0.04560	0.07440	0.11600	0.11900	0.12500	0.11500	0.09630	0.08280	0.03310	0.01860	0.01860
AR456	439500	4751000	0.04970	0.08260	0.13200	0.13600	0.14000	0.12700	0.10700	0.09170	0.03460	0.01940	0.01940
AR457	440000	4751000	0.05770	0.09650	0.15500	0.15800	0.16000	0.14200	0.11900	0.10100	0.03630	0.02030	0.02020
AR458	440500	4751000	0.07140	0.11800	0.18700	0.18600	0.18500	0.16200	0.13400	0.11200	0.03810	0.02120	0.02120
AR459	441000	4751000	0.09190	0.14900	0.24200	0.23500	0.23000	0.19500	0.15900	0.13200	0.04010	0.02210	0.02210
AR460	441500	4751000	0.11800	0.18900	0.30500	0.29000	0.27900	0.23200	0.18600	0.15200	0.04220	0.02320	0.02320
AR461	442000	4751000	0.17400	0.25700	0.45500	0.42200	0.40500	0.31600	0.24900	0.21100	0.04460	0.02430	0.02430
AR462	442500	4751000	0.27300	0.41700	0.58200	0.50200	0.45400	0.38400	0.27200	0.20400	0.04740	0.02570	0.02570
AR463	443000	4751000	0.28400	0.60700	0.74000	0.65700	0.51700	0.46400	0.34500	0.19400	0.05040	0.02700	0.02700
AR464	443500	4751000	0.22400	1.25000	1.37000	1.32000	0.81300	0.76900	0.68100	0.19700	0.05420	0.02840	0.02840
AR465	444000	4751000	0.22300	0.67900	0.78600	0.76600	0.55900	0.52000	0.44200	0.22700	0.05940	0.03000	0.03000
AR466	444500	4751000	0.20900	0.49600	0.59500	0.59300	0.47800	0.44500	0.36900	0.23500	0.06630	0.03160	0.03160
AR467	445000	4751000	0.17200	0.35900	0.44900	0.46900	0.41000	0.38300	0.31000	0.22200	0.07590	0.03420	0.03420

AR468	445500	4751000	0.14600	0.30000	0.38400	0.43300	0.39300	0.37100	0.29400	0.22200	0.08820	0.03560	0.03550
AR469	446000	4751000	0.12500	0.24800	0.32700	0.40600	0.38600	0.36700	0.28300	0.22500	0.10300	0.03750	0.03750
AR470	446500	4751000	0.11500	0.21400	0.29600	0.40500	0.39800	0.37900	0.28200	0.23500	0.12000	0.03910	0.03910
AR471	447000	4751000	0.10500	0.18700	0.27000	0.43000	0.43400	0.41500	0.29400	0.25500	0.14600	0.04060	0.04060
AR472	447500	4751000	0.09540	0.16500	0.25500	0.48500	0.49700	0.47600	0.32000	0.28700	0.18200	0.04190	0.04190
AR473	448000	4751000	0.08700	0.14800	0.25300	0.52700	0.55000	0.52400	0.34600	0.31700	0.21100	0.04520	0.04520
AR474	448500	4751000	0.07980	0.13500	0.25900	0.49800	0.52800	0.49600	0.33900	0.31200	0.20100	0.04750	0.04750
AR475	449000	4751000	0.07380	0.12400	0.27200	0.53800	0.57200	0.53100	0.36100	0.33700	0.21900	0.04860	0.04860
AR476	449500	4751000	0.06920	0.11600	0.32400	0.54300	0.59000	0.52600	0.38300	0.36100	0.22000	0.05550	0.05550
AR477	450000	4751000	0.06500	0.10800	0.44600	0.61100	0.66300	0.54000	0.42700	0.40700	0.21200	0.05990	0.05980
AR478	450500	4751000	0.06130	0.10100	0.38200	0.50700	0.57100	0.47600	0.38600	0.36700	0.19500	0.06590	0.06590
AR479	451000	4751000	0.05800	0.09520	0.31600	0.41400	0.48300	0.41200	0.33700	0.32000	0.17000	0.06950	0.06950
AR480	451500	4751000	0.05500	0.08990	0.27300	0.35000	0.42700	0.37500	0.31300	0.29600	0.16000	0.07470	0.07470
AR481	452000	4751000	0.05230	0.08520	0.25000	0.31300	0.38900	0.34800	0.29400	0.27800	0.15200	0.07460	0.07460
AR482	452500	4751000	0.04990	0.08090	0.22100	0.27700	0.35500	0.32400	0.27500	0.26000	0.14800	0.07850	0.07850
AR483	453000	4751000	0.04760	0.07700	0.19800	0.24800	0.32900	0.30900	0.26400	0.25000	0.14300	0.08080	0.08080
AR484	453500	4751000	0.04560	0.07350	0.18500	0.22900	0.31700	0.30400	0.26300	0.25000	0.14500	0.08620	0.08620
AR485	454000	4751000	0.04370	0.07030	0.17500	0.21500	0.30500	0.29500	0.25700	0.24400	0.14200	0.08680	0.08680
AR486	454500	4751000	0.04190	0.06730	0.16600	0.20100	0.28800	0.28000	0.24500	0.23300	0.13400	0.08300	0.08300
AR487	455000	4751000	0.04030	0.06460	0.15700	0.19000	0.27500	0.27100	0.23800	0.22700	0.13000	0.08270	0.08270
AR488	455500	4751000	0.03880	0.06210	0.14900	0.17900	0.26800	0.26700	0.23500	0.22400	0.13100	0.08710	0.08700
AR489	456000	4751000	0.03750	0.05980	0.14200	0.16900	0.25800	0.25800	0.22900	0.21800	0.12800	0.08760	0.08760
AR490	456500	4751000	0.03620	0.05770	0.13600	0.16100	0.24800	0.24800	0.22000	0.21000	0.12500	0.08590	0.08590
AR491	457000	4751000	0.03500	0.05570	0.12900	0.15200	0.23500	0.23600	0.21000	0.20000	0.11800	0.08290	0.08290
AR492	457500	4751000	0.03380	0.05380	0.12500	0.14700	0.22500	0.23100	0.20600	0.19700	0.11700	0.08200	0.08190
AR493	437500	4750500	0.02980	0.04850	0.07730	0.08170	0.09000	0.08630	0.07250	0.06370	0.02860	0.01660	0.01660
AR494	438000	4750500	0.03150	0.05160	0.08320	0.08840	0.09670	0.09180	0.07760	0.06810	0.02980	0.01730	0.01730
AR495	438500	4750500	0.03460	0.05640	0.09150	0.09680	0.10500	0.09880	0.08350	0.07330	0.03110	0.01800	0.01800
AR496	439000	4750500	0.03880	0.06240	0.10200	0.10700	0.11500	0.10700	0.09050	0.07930	0.03240	0.01880	0.01880
AR497	439500	4750500	0.04600	0.07170	0.11600	0.12000	0.12800	0.11800	0.09870	0.08660	0.03390	0.01960	0.01960
AR498	440000	4750500	0.05280	0.08120	0.13100	0.13400	0.14100	0.12800	0.10600	0.09260	0.03550	0.02050	0.02050
AR499	440500	4750500	0.06260	0.09310	0.15400	0.15500	0.16300	0.14400	0.11800	0.10400	0.03730	0.02150	0.02150
AR500	441000	4750500	0.07500	0.11000	0.18300	0.18100	0.18800	0.16300	0.13200	0.11600	0.03920	0.02260	0.02260
AR501	441500	4750500	0.09830	0.14600	0.24400	0.23600	0.23700	0.20000	0.16000	0.13800	0.04130	0.02370	0.02370
AR502	442000	4750500	0.12300	0.19200	0.32500	0.31100	0.30300	0.24700	0.19900	0.16700	0.04370	0.02500	0.02500
AR503	442500	4750500	0.19000	0.28900	0.40900	0.36900	0.34700	0.29900	0.22300	0.17700	0.04720	0.02640	0.02640
AR504	443000	4750500	0.20600	0.37100	0.46200	0.42300	0.36700	0.33500	0.25500	0.17800	0.05060	0.02790	0.02790
AR505	443500	4750500	0.16600	0.50200	0.59300	0.58400	0.44000	0.40900	0.34900	0.19100	0.05550	0.02950	0.02950
AR506	444000	4750500	0.16500	0.36200	0.44400	0.44500	0.37600	0.35200	0.28900	0.19600	0.06210	0.03160	0.03160
AR507	444500	4750500	0.14700	0.30000	0.38000	0.39800	0.35500	0.33300	0.26900	0.19700	0.06990	0.03340	0.03340
AR508	445000	4750500	0.13200	0.26100	0.33800	0.37600	0.35000	0.33100	0.26200	0.20100	0.08150	0.03610	0.03610
AR509	445500	4750500	0.11700	0.21700	0.28900	0.35800	0.35000	0.33400	0.25500	0.20800	0.09720	0.03820	0.03810
AR510	446000	4750500	0.10500	0.18600	0.25500	0.37500	0.38200	0.36900	0.26800	0.23000	0.12400	0.04100	0.04100

AR511	446500	4750500	0.09440	0.16400	0.23400	0.45100	0.46700	0.45600	0.30900	0.27600	0.17200	0.04410	0.04400
AR512	447000	4750500	0.08850	0.15200	0.22600	0.67900	0.70300	0.69000	0.42100	0.39100	0.28700	0.04740	0.04740
AR513	447500	4750500	0.07950	0.13600	0.21600	1.12000	1.15000	1.14000	0.63300	0.60700	0.50500	0.05010	0.05010
AR514	448000	4750500	0.07460	0.12700	0.21600	1.29000	1.33000	1.31000	0.71700	0.69200	0.59100	0.05240	0.05240
AR515	448500	4750500	0.06990	0.11800	0.21800	1.07000	1.12000	1.09000	0.62000	0.59800	0.49200	0.05830	0.05820
AR516	449000	4750500	0.06550	0.11000	0.23400	0.67400	0.73200	0.70200	0.44400	0.42300	0.30900	0.06230	0.06220
AR517	449500	4750500	0.06140	0.10300	0.25800	0.52400	0.59300	0.55300	0.38900	0.36900	0.24300	0.06720	0.06720
AR518	450000	4750500	0.05770	0.09660	0.31800	0.49600	0.57300	0.50500	0.38800	0.37000	0.21700	0.07400	0.07400
AR519	450500	4750500	0.05500	0.09150	0.29300	0.42200	0.51800	0.46100	0.37100	0.35400	0.20300	0.08610	0.08610
AR520	451000	4750500	0.05250	0.08680	0.24300	0.34000	0.43900	0.40200	0.33000	0.31400	0.18200	0.08850	0.08850
AR521	451500	4750500	0.05020	0.08260	0.22100	0.29700	0.40700	0.37800	0.31800	0.30200	0.17200	0.09780	0.09770
AR522	452000	4750500	0.04800	0.07870	0.20400	0.26500	0.36800	0.34900	0.29700	0.28300	0.16400	0.09550	0.09550
AR523	452500	4750500	0.04610	0.07520	0.19300	0.24700	0.36400	0.34700	0.30000	0.28600	0.16900	0.10600	0.10600
AR524	453000	4750500	0.04420	0.07190	0.17800	0.22500	0.34600	0.33700	0.29500	0.28200	0.16600	0.10900	0.10900
AR525	453500	4750500	0.04250	0.06890	0.16500	0.20600	0.32800	0.32700	0.28800	0.27500	0.16400	0.11200	0.11200
AR526	454000	4750500	0.04090	0.06620	0.15400	0.19200	0.30600	0.30800	0.27200	0.26000	0.15500	0.10600	0.10600
AR527	454500	4750500	0.03950	0.06360	0.14600	0.18000	0.29000	0.29700	0.26300	0.25200	0.15100	0.10400	0.10400
AR528	455000	4750500	0.03810	0.06130	0.14100	0.17200	0.28600	0.29400	0.26200	0.25100	0.15200	0.10800	0.10800
AR529	455500	4750500	0.03680	0.05910	0.13600	0.16400	0.27200	0.28000	0.25000	0.23900	0.14600	0.10500	0.10500
AR530	456000	4750500	0.03560	0.05700	0.13100	0.15700	0.25900	0.26600	0.23800	0.22800	0.14000	0.10100	0.10100
AR531	456500	4750500	0.03450	0.05510	0.12600	0.15000	0.24700	0.25400	0.22800	0.21800	0.13300	0.09700	0.09700
AR532	457000	4750500	0.03340	0.05340	0.12100	0.14300	0.23400	0.24700	0.22200	0.21300	0.12900	0.09490	0.09490
AR533	457500	4750500	0.03240	0.05170	0.11600	0.13700	0.22400	0.24000	0.21600	0.20700	0.12500	0.09310	0.09300
AR534	437500	4750000	0.02690	0.04270	0.07070	0.07670	0.08640	0.08290	0.07030	0.06290	0.02810	0.01660	0.01660
AR535	438000	4750000	0.02980	0.04640	0.07670	0.08270	0.09280	0.08840	0.07470	0.06690	0.02920	0.01730	0.01730
AR536	438500	4750000	0.03330	0.05060	0.08330	0.08900	0.09960	0.09430	0.07930	0.07120	0.03040	0.01800	0.01800
AR537	439000	4750000	0.03660	0.05430	0.09000	0.09540	0.10700	0.10000	0.08360	0.07530	0.03170	0.01880	0.01880
AR538	439500	4750000	0.04090	0.05830	0.09730	0.10200	0.11500	0.10700	0.08810	0.07990	0.03320	0.01970	0.01970
AR539	440000	4750000	0.04750	0.06790	0.11300	0.11700	0.12900	0.11800	0.09750	0.08780	0.03470	0.02060	0.02060
AR540	440500	4750000	0.05470	0.08050	0.13300	0.13600	0.14600	0.13200	0.10800	0.09590	0.03630	0.02170	0.02170
AR541	441000	4750000	0.06460	0.09740	0.15600	0.15600	0.16500	0.14800	0.11900	0.10400	0.03840	0.02280	0.02280
AR542	441500	4750000	0.07970	0.12100	0.20200	0.20000	0.20500	0.17700	0.14300	0.12300	0.04090	0.02410	0.02400
AR543	442000	4750000	0.10000	0.15200	0.25100	0.24400	0.24500	0.20800	0.16600	0.14200	0.04370	0.02540	0.02540
AR544	442500	4750000	0.14000	0.21800	0.31100	0.29000	0.28000	0.24700	0.19000	0.15300	0.04720	0.02700	0.02690
AR545	443000	4750000	0.15000	0.26600	0.34000	0.32100	0.29300	0.27100	0.21000	0.15600	0.05120	0.02860	0.02860
AR546	443500	4750000	0.12800	0.30600	0.37800	0.37700	0.31800	0.29800	0.24700	0.16300	0.05590	0.03050	0.03050
AR547	444000	4750000	0.12100	0.24200	0.31100	0.32200	0.29600	0.27900	0.22700	0.17000	0.06220	0.03260	0.03260
AR548	444500	4750000	0.11000	0.21300	0.27700	0.30100	0.28700	0.27400	0.21900	0.17000	0.07030	0.03500	0.03500
AR549	445000	4750000	0.10200	0.18700	0.25100	0.29300	0.29200	0.28100	0.22100	0.18000	0.08140	0.03790	0.03790
AR550	445500	4750000	0.09380	0.17100	0.23500	0.30500	0.31300	0.30200	0.23000	0.19400	0.09710	0.04070	0.04070
AR551	446000	4750000	0.08870	0.15500	0.22000	0.33900	0.35700	0.34700	0.25200	0.22100	0.12400	0.04410	0.04410
AR552	446500	4750000	0.08270	0.13900	0.20500	0.43400	0.46400	0.45600	0.30500	0.27900	0.18000	0.04860	0.04860
AR553	447000	4750000	0.07590	0.12300	0.19200	0.78200	0.82500	0.81700	0.47800	0.45500	0.35600	0.05370	0.05370

AR554	447500	4750000	0.07100	0.11200	0.18400	4.53000	4.59000	4.58000	2.26000	2.24000	2.13000	0.06050	0.06050
AR555	448000	4750000	0.06720	0.10800	0.18500	3.01000	3.08000	3.07000	1.55000	1.53000	1.42000	0.06520	0.06520
AR556	448500	4750000	0.06160	0.10100	0.18700	0.98700	1.06000	1.05000	0.60200	0.58300	0.47500	0.07030	0.07030
AR557	449000	4750000	0.05880	0.09660	0.19800	0.57800	0.67100	0.65500	0.43300	0.41500	0.29700	0.08280	0.08280
AR558	449500	4750000	0.05600	0.09200	0.22200	0.45200	0.56200	0.53400	0.39200	0.37500	0.24300	0.09170	0.09170
AR559	450000	4750000	0.05320	0.08750	0.25000	0.40700	0.52500	0.48500	0.38200	0.36600	0.21900	0.09630	0.09630
AR560	450500	4750000	0.05060	0.08320	0.23700	0.35200	0.50100	0.46900	0.38900	0.37300	0.21800	0.11800	0.11800
AR561	451000	4750000	0.04810	0.07910	0.19800	0.28600	0.44700	0.43300	0.36800	0.35300	0.21000	0.12800	0.12800
AR562	451500	4750000	0.04610	0.07570	0.18600	0.25600	0.41500	0.40300	0.34700	0.33400	0.19800	0.13200	0.13200
AR563	452000	4750000	0.04440	0.07260	0.17600	0.23300	0.40300	0.39800	0.35100	0.33700	0.20000	0.14100	0.14100
AR564	452500	4750000	0.04290	0.06980	0.16500	0.21600	0.39900	0.39800	0.35400	0.34200	0.20900	0.15200	0.15200
AR565	453000	4750000	0.04130	0.06710	0.15900	0.20400	0.38200	0.38700	0.34700	0.33500	0.20600	0.15400	0.15400
AR566	453500	4750000	0.03990	0.06460	0.15000	0.19000	0.35100	0.36300	0.32500	0.31400	0.19300	0.14400	0.14400
AR567	454000	4750000	0.03860	0.06230	0.14100	0.17800	0.32800	0.34000	0.30600	0.29500	0.18300	0.13800	0.13800
AR568	454500	4750000	0.03730	0.06010	0.13600	0.16900	0.31600	0.33400	0.30200	0.29100	0.18500	0.14100	0.14100
AR569	455000	4750000	0.03610	0.05810	0.12900	0.16000	0.29700	0.31600	0.28500	0.27500	0.17500	0.13400	0.13400
AR570	455500	4750000	0.03500	0.05610	0.12500	0.15300	0.27800	0.29400	0.26500	0.25500	0.16200	0.12300	0.12300
AR571	456000	4750000	0.03400	0.05430	0.11900	0.14500	0.26000	0.27800	0.25100	0.24100	0.15300	0.11600	0.11600
AR572	456500	4750000	0.03300	0.05260	0.11500	0.14000	0.24600	0.26900	0.24300	0.23400	0.14600	0.11100	0.11100
AR573	457000	4750000	0.03200	0.05100	0.11200	0.13500	0.23000	0.25600	0.23200	0.22300	0.13700	0.10300	0.10300
AR574	457500	4750000	0.03110	0.04950	0.10800	0.13000	0.21700	0.24400	0.22100	0.21200	0.12800	0.09710	0.09710
AR575	437500	4749500	0.02610	0.03870	0.06530	0.07060	0.08170	0.07870	0.06650	0.06060	0.02710	0.01650	0.01640
AR576	438000	4749500	0.02810	0.04070	0.06900	0.07420	0.08610	0.08250	0.06930	0.06340	0.02810	0.01710	0.01710
AR577	438500	4749500	0.03020	0.04390	0.07400	0.07900	0.09130	0.08700	0.07270	0.06620	0.02920	0.01790	0.01790
AR578	439000	4749500	0.03250	0.04730	0.07920	0.08400	0.09670	0.09180	0.07620	0.06920	0.03040	0.01870	0.01870
AR579	439500	4749500	0.03640	0.05340	0.08880	0.09360	0.10600	0.09980	0.08280	0.07480	0.03170	0.01960	0.01960
AR580	440000	4749500	0.04150	0.06180	0.10200	0.10700	0.11900	0.11000	0.09100	0.08140	0.03360	0.02060	0.02060
AR581	440500	4749500	0.04780	0.07210	0.11700	0.12000	0.13100	0.12100	0.09930	0.08790	0.03530	0.02160	0.02160
AR582	441000	4749500	0.05670	0.08560	0.13700	0.13800	0.14800	0.13500	0.11000	0.09670	0.03750	0.02280	0.02280
AR583	441500	4749500	0.06650	0.10000	0.16700	0.16800	0.17800	0.15700	0.12900	0.11300	0.04000	0.02410	0.02410
AR584	442000	4749500	0.08720	0.13300	0.21200	0.20600	0.21100	0.18500	0.14900	0.12700	0.04280	0.02560	0.02560
AR585	442500	4749500	0.10900	0.16600	0.24100	0.22900	0.23000	0.20700	0.16200	0.13500	0.04600	0.02720	0.02720
AR586	443000	4749500	0.11600	0.20400	0.26800	0.25900	0.24500	0.22900	0.18100	0.14000	0.04970	0.02900	0.02900
AR587	443500	4749500	0.10600	0.22200	0.27900	0.28000	0.25400	0.24200	0.19900	0.14400	0.05400	0.03110	0.03110
AR588	444000	4749500	0.09130	0.18300	0.24100	0.25400	0.24400	0.23300	0.19300	0.15000	0.05940	0.03340	0.03340
AR589	444500	4749500	0.09050	0.16000	0.21800	0.23700	0.24200	0.23300	0.18900	0.15600	0.06590	0.03610	0.03610
AR590	445000	4749500	0.08410	0.15000	0.20600	0.23500	0.24700	0.24000	0.19300	0.16200	0.07380	0.03930	0.03920
AR591	445500	4749500	0.07720	0.13400	0.19100	0.23400	0.25500	0.24800	0.19700	0.17000	0.08330	0.04290	0.04290
AR592	446000	4749500	0.07180	0.12400	0.18400	0.23700	0.26700	0.26000	0.20600	0.18100	0.09300	0.04710	0.04710
AR593	446500	4749500	0.06910	0.11700	0.17800	0.27300	0.31400	0.30900	0.23300	0.21100	0.12000	0.05310	0.05310
AR594	447000	4749500	0.06550	0.10800	0.17100	0.37500	0.42900	0.42500	0.29300	0.27300	0.17900	0.05980	0.05980
AR595	447500	4749500	0.06120	0.09940	0.16500	0.83500	0.90600	0.90400	0.52600	0.50800	0.40900	0.06900	0.06900
AR596	448000	4749500	0.05870	0.09320	0.16400	0.65500	0.74700	0.74400	0.46300	0.44700	0.33600	0.08040	0.08040

AR597	448500	4749500	0.05620	0.08840	0.16400	0.47000	0.58600	0.58200	0.40000	0.38500	0.26400	0.09410	0.09410
AR598	449000	4749500	0.05360	0.08370	0.17000	0.35100	0.48700	0.48100	0.36700	0.35300	0.22400	0.10700	0.10700
AR599	449500	4749500	0.05140	0.08110	0.19000	0.33200	0.51400	0.50000	0.40800	0.39400	0.23800	0.13400	0.13400
AR600	450000	4749500	0.04800	0.07710	0.20400	0.31900	0.53700	0.51700	0.44000	0.42600	0.25000	0.15600	0.15600
AR601	450500	4749500	0.04620	0.07440	0.19700	0.28800	0.53700	0.52200	0.45800	0.44500	0.25400	0.17200	0.17200
AR602	451000	4749500	0.04440	0.07170	0.17500	0.24900	0.51500	0.51300	0.45800	0.44500	0.26500	0.19400	0.19400
AR603	451500	4749500	0.04260	0.06900	0.15900	0.22000	0.51500	0.52000	0.47200	0.46000	0.27700	0.21700	0.21700
AR604	452000	4749500	0.04090	0.06630	0.15200	0.20300	0.49500	0.50700	0.46500	0.45300	0.27700	0.22600	0.22600
AR605	452500	4749500	0.03940	0.06390	0.14600	0.19200	0.46600	0.48100	0.44200	0.43000	0.27300	0.22300	0.22300
AR606	453000	4749500	0.03830	0.06190	0.13900	0.18000	0.42600	0.45000	0.41400	0.40200	0.26200	0.21500	0.21500
AR607	453500	4749500	0.03720	0.06000	0.13500	0.17200	0.39500	0.42300	0.38900	0.37800	0.24900	0.20500	0.20500
AR608	454000	4749500	0.03610	0.05810	0.13000	0.16400	0.37300	0.40300	0.37100	0.36100	0.24200	0.20100	0.20100
AR609	454500	4749500	0.03500	0.05630	0.12500	0.15500	0.34000	0.37300	0.34300	0.33300	0.22200	0.18300	0.18300
AR610	455000	4749500	0.03400	0.05460	0.12000	0.14900	0.31000	0.34000	0.31100	0.30200	0.19900	0.16200	0.16200
AR611	455500	4749500	0.03310	0.05300	0.11600	0.14200	0.28000	0.30900	0.28200	0.27300	0.17600	0.14000	0.14000
AR612	456000	4749500	0.03220	0.05140	0.11100	0.13600	0.25600	0.29200	0.26600	0.25700	0.16200	0.12800	0.12800
AR613	456500	4749500	0.03130	0.05000	0.10700	0.13000	0.23800	0.27600	0.25200	0.24300	0.15100	0.11900	0.11900
AR614	457000	4749500	0.03050	0.04860	0.10300	0.12400	0.22100	0.26100	0.23800	0.22900	0.14100	0.11000	0.11000
AR615	457500	4749500	0.02970	0.04720	0.10000	0.12000	0.20800	0.24700	0.22500	0.21600	0.13100	0.10200	0.10200
AR616	437500	4749000	0.02380	0.03460	0.05930	0.06400	0.07580	0.07340	0.06170	0.05670	0.02590	0.01620	0.01620
AR617	438000	4749000	0.02520	0.03700	0.06290	0.06750	0.07960	0.07690	0.06430	0.05880	0.02690	0.01690	0.01690
AR618	438500	4749000	0.02660	0.03980	0.06740	0.07200	0.08420	0.08090	0.06740	0.06120	0.02810	0.01770	0.01770
AR619	439000	4749000	0.02910	0.04410	0.07390	0.07850	0.09070	0.08680	0.07230	0.06530	0.02950	0.01850	0.01850
AR620	439500	4749000	0.03320	0.05010	0.08290	0.08710	0.09940	0.09430	0.07850	0.07050	0.03080	0.01940	0.01940
AR621	440000	4749000	0.03800	0.05700	0.09310	0.09710	0.10900	0.10300	0.08590	0.07690	0.03250	0.02030	0.02030
AR622	440500	4749000	0.04380	0.06540	0.10400	0.10700	0.11900	0.11200	0.09260	0.08240	0.03440	0.02140	0.02140
AR623	441000	4749000	0.05100	0.07560	0.12200	0.12500	0.13700	0.12600	0.10400	0.09280	0.03640	0.02260	0.02260
AR624	441500	4749000	0.05810	0.08930	0.14600	0.14800	0.15800	0.14300	0.11900	0.10500	0.03870	0.02390	0.02390
AR625	442000	4749000	0.07570	0.11400	0.17800	0.17400	0.18200	0.16400	0.13300	0.11500	0.04130	0.02540	0.02540
AR626	442500	4749000	0.09020	0.13400	0.19700	0.18900	0.19700	0.18000	0.14400	0.12300	0.04410	0.02710	0.02710
AR627	443000	4749000	0.09490	0.16300	0.22000	0.21300	0.21000	0.19800	0.16000	0.12800	0.04730	0.02900	0.02890
AR628	443500	4749000	0.08910	0.17300	0.22200	0.22100	0.21300	0.20500	0.17000	0.13100	0.05070	0.03110	0.03110
AR629	444000	4749000	0.07650	0.14700	0.19800	0.20600	0.20700	0.20000	0.16900	0.13600	0.05480	0.03360	0.03360
AR630	444500	4749000	0.07420	0.12500	0.17700	0.18600	0.20200	0.19600	0.16400	0.14000	0.05910	0.03650	0.03650
AR631	445000	4749000	0.07210	0.12300	0.17500	0.18800	0.20900	0.20400	0.17000	0.14600	0.06470	0.03990	0.03990
AR632	445500	4749000	0.06750	0.11400	0.16600	0.19100	0.21900	0.21600	0.17800	0.15600	0.07430	0.04390	0.04390
AR633	446000	4749000	0.06380	0.10600	0.15900	0.20300	0.24100	0.23800	0.19200	0.17200	0.08880	0.04910	0.04910
AR634	446500	4749000	0.06010	0.09910	0.15500	0.22200	0.27200	0.27000	0.21300	0.19500	0.10800	0.05590	0.05590
AR635	447000	4749000	0.05600	0.09270	0.15000	0.27600	0.34100	0.34100	0.25300	0.23600	0.14500	0.06480	0.06480
AR636	447500	4749000	0.05250	0.08720	0.14800	0.41500	0.50200	0.50300	0.34200	0.32500	0.22500	0.07760	0.07760
AR637	448000	4749000	0.05020	0.08230	0.14700	0.34800	0.46600	0.46800	0.34200	0.32700	0.21200	0.09510	0.09510
AR638	448500	4749000	0.04900	0.07860	0.14800	0.30000	0.47000	0.47300	0.37400	0.36000	0.22000	0.12300	0.12300
AR639	449000	4749000	0.04760	0.07480	0.15300	0.27200	0.53000	0.53300	0.45300	0.44000	0.25600	0.17000	0.17000

AR640	449500	4749000	0.04600	0.07180	0.16600	0.26100	0.62800	0.62700	0.56100	0.54900	0.30700	0.22900	0.22900
AR641	450000	4749000	0.04440	0.06780	0.17400	0.24600	0.80100	0.79800	0.74500	0.73400	0.39900	0.32900	0.32900
AR642	450500	4749000	0.04350	0.06700	0.17000	0.22600	0.89100	0.89100	0.84600	0.83500	0.45800	0.39600	0.39600
AR643	451000	4749000	0.04030	0.06360	0.15300	0.20700	0.84800	0.86100	0.82000	0.80900	0.45300	0.39600	0.39600
AR644	451500	4749000	0.03910	0.06200	0.13800	0.18600	0.74300	0.76800	0.73000	0.71900	0.44000	0.38900	0.38900
AR645	452000	4749000	0.03780	0.06030	0.13300	0.17500	0.65700	0.68900	0.65300	0.64300	0.43400	0.38900	0.38900
AR646	452500	4749000	0.03660	0.05850	0.13000	0.16900	0.61000	0.64700	0.61300	0.60300	0.43100	0.38800	0.38800
AR647	453000	4749000	0.03540	0.05670	0.12500	0.16100	0.55600	0.60600	0.57400	0.56400	0.41100	0.37000	0.37000
AR648	453500	4749000	0.03420	0.05500	0.12000	0.15300	0.49300	0.54700	0.51600	0.50700	0.37000	0.33000	0.33000
AR649	454000	4749000	0.03340	0.05360	0.11800	0.14800	0.42000	0.47600	0.44700	0.43800	0.31100	0.27300	0.27300
AR650	454500	4749000	0.03260	0.05220	0.11400	0.14200	0.35100	0.40100	0.37400	0.36500	0.24900	0.21400	0.21400
AR651	455000	4749000	0.03180	0.05090	0.11000	0.13600	0.30600	0.35700	0.33100	0.32200	0.21200	0.17900	0.17900
AR652	455500	4749000	0.03110	0.04960	0.10700	0.13200	0.27300	0.33100	0.30600	0.29700	0.18900	0.15700	0.15700
AR653	456000	4749000	0.03030	0.04830	0.10400	0.12700	0.24700	0.30400	0.28000	0.27100	0.16900	0.13700	0.13700
AR654	456500	4749000	0.02960	0.04710	0.10100	0.12200	0.22900	0.28100	0.25800	0.25000	0.15400	0.12400	0.12400
AR655	457000	4749000	0.02890	0.04590	0.09740	0.11700	0.21300	0.26400	0.24200	0.23400	0.14300	0.11400	0.11400
AR656	457500	4749000	0.02820	0.04480	0.09410	0.11300	0.19900	0.24800	0.22700	0.21900	0.13200	0.10400	0.10400
AR657	437500	4748500	0.02130	0.03200	0.05510	0.05910	0.07090	0.06920	0.05810	0.05310	0.02520	0.01600	0.01600
AR658	438000	4748500	0.02230	0.03410	0.05840	0.06250	0.07440	0.07240	0.06060	0.05510	0.02620	0.01670	0.01670
AR659	438500	4748500	0.02490	0.03800	0.06380	0.06790	0.08000	0.07760	0.06510	0.05900	0.02730	0.01740	0.01740
AR660	439000	4748500	0.02850	0.04300	0.07130	0.07510	0.08730	0.08410	0.07060	0.06380	0.02860	0.01820	0.01820
AR661	439500	4748500	0.03210	0.04810	0.07870	0.08230	0.09480	0.09090	0.07640	0.06880	0.03000	0.01910	0.01910
AR662	440000	4748500	0.03590	0.05330	0.08590	0.08880	0.10200	0.09730	0.08130	0.07310	0.03150	0.02010	0.02010
AR663	440500	4748500	0.03870	0.05780	0.09150	0.09410	0.10700	0.10300	0.08560	0.07660	0.03320	0.02110	0.02110
AR664	441000	4748500	0.04460	0.06770	0.11000	0.11200	0.12500	0.11700	0.09810	0.08720	0.03510	0.02230	0.02230
AR665	441500	4748500	0.05400	0.08150	0.13100	0.13100	0.14300	0.13200	0.11000	0.09720	0.03710	0.02360	0.02350
AR666	442000	4748500	0.06630	0.09730	0.15300	0.14900	0.16000	0.14700	0.12100	0.10600	0.03920	0.02500	0.02500
AR667	442500	4748500	0.07660	0.11600	0.17100	0.16500	0.17300	0.16100	0.13100	0.11300	0.04150	0.02660	0.02660
AR668	443000	4748500	0.08020	0.13400	0.18600	0.17900	0.18200	0.17300	0.14300	0.11700	0.04400	0.02850	0.02850
AR669	443500	4748500	0.07640	0.14100	0.18700	0.18200	0.18300	0.17700	0.14900	0.11900	0.04630	0.03060	0.03060
AR670	444000	4748500	0.06860	0.12500	0.16900	0.17100	0.17900	0.17500	0.15000	0.12400	0.05030	0.03300	0.03300
AR671	444500	4748500	0.06300	0.10700	0.15400	0.16300	0.18100	0.17700	0.15100	0.13000	0.05590	0.03590	0.03590
AR672	445000	4748500	0.06110	0.10000	0.14800	0.16300	0.18800	0.18600	0.15600	0.13800	0.06300	0.03930	0.03930
AR673	445500	4748500	0.05870	0.09720	0.14600	0.16900	0.20000	0.19900	0.16500	0.14700	0.07160	0.04350	0.04350
AR674	446000	4748500	0.05460	0.09010	0.13900	0.17200	0.21300	0.21300	0.17500	0.15900	0.08230	0.04880	0.04880
AR675	446500	4748500	0.05410	0.08690	0.13700	0.19100	0.24400	0.24600	0.19800	0.18200	0.10000	0.05590	0.05590
AR676	447000	4748500	0.05140	0.08270	0.13600	0.21000	0.27800	0.28100	0.22400	0.20900	0.12000	0.06550	0.06550
AR677	447500	4748500	0.04840	0.07900	0.13500	0.28100	0.37200	0.37600	0.28100	0.26600	0.16800	0.07910	0.07900
AR678	448000	4748500	0.04510	0.07420	0.13300	0.26100	0.38900	0.39600	0.31000	0.29700	0.18200	0.10100	0.10100
AR679	448500	4748500	0.04190	0.06930	0.13200	0.22100	0.42200	0.43000	0.36600	0.35300	0.20500	0.13900	0.13900
AR680	449000	4748500	0.04120	0.06690	0.14000	0.21700	0.59600	0.60600	0.54900	0.53700	0.29500	0.23100	0.23100
AR681	449500	4748500	0.04050	0.06460	0.14800	0.21400	1.34000	1.35000	1.30000	1.29000	0.65500	0.59300	0.59300
AR682	450000	4748500	0.03970	0.06210	0.15400	0.21200	11.80000	11.80000	11.80000	11.80000	5.60000	5.54000	5.54000

AR683	450500	4748500	0.03870	0.05970	0.14800	0.19700	3.16000	3.19000	3.15000	3.14000	1.57000	1.51000	1.51000
AR684	451000	4748500	0.03760	0.05790	0.13800	0.17800	1.24000	1.26000	1.23000	1.22000	0.72500	0.67700	0.67700
AR685	451500	4748500	0.03680	0.05600	0.12500	0.16000	1.04000	1.09000	1.06000	1.05000	0.76400	0.72100	0.72100
AR686	452000	4748500	0.03550	0.05470	0.11800	0.14900	1.27000	1.33000	1.31000	1.30000	1.09000	1.05000	1.05000
AR687	452500	4748500	0.03360	0.05270	0.11400	0.14500	1.34000	1.41000	1.38000	1.37000	1.20000	1.16000	1.16000
AR688	453000	4748500	0.03280	0.05160	0.11300	0.14200	0.80200	0.89500	0.86700	0.85900	0.69300	0.65700	0.65700
AR689	453500	4748500	0.03190	0.05050	0.11000	0.13800	0.53700	0.63400	0.60800	0.59900	0.44800	0.41300	0.41300
AR690	454000	4748500	0.03100	0.04920	0.10600	0.13200	0.40700	0.49800	0.47300	0.46500	0.32800	0.29400	0.29400
AR691	454500	4748500	0.03010	0.04800	0.10400	0.12900	0.33400	0.42500	0.40100	0.39300	0.26300	0.23100	0.23100
AR692	455000	4748500	0.02950	0.04700	0.10100	0.12500	0.28800	0.38500	0.36200	0.35300	0.22600	0.19500	0.19500
AR693	455500	4748500	0.02890	0.04600	0.09870	0.12100	0.25500	0.34400	0.32200	0.31400	0.19500	0.16600	0.16600
AR694	456000	4748500	0.02840	0.04510	0.09660	0.11700	0.23100	0.31000	0.28800	0.28000	0.17100	0.14200	0.14200
AR695	456500	4748500	0.02780	0.04410	0.09420	0.11400	0.21500	0.28500	0.26400	0.25700	0.15500	0.12700	0.12700
AR696	457000	4748500	0.02720	0.04320	0.09170	0.11000	0.20100	0.26000	0.23900	0.23200	0.14000	0.11200	0.11200
AR697	457500	4748500	0.02670	0.04230	0.08910	0.10700	0.18900	0.24100	0.22100	0.21400	0.12800	0.10200	0.10200
AR698	437500	4748000	0.01990	0.03050	0.05220	0.05570	0.06730	0.06610	0.05570	0.05070	0.02450	0.01590	0.01590
AR699	438000	4748000	0.02190	0.03360	0.05640	0.05990	0.07170	0.07040	0.05950	0.05400	0.02560	0.01660	0.01660
AR700	438500	4748000	0.02490	0.03750	0.06230	0.06550	0.07760	0.07560	0.06390	0.05800	0.02670	0.01730	0.01730
AR701	439000	4748000	0.02770	0.04140	0.06800	0.07100	0.08340	0.08100	0.06860	0.06220	0.02790	0.01810	0.01810
AR702	439500	4748000	0.03070	0.04540	0.07370	0.07620	0.08900	0.08620	0.07270	0.06580	0.02920	0.01890	0.01890
AR703	440000	4748000	0.03270	0.04890	0.07890	0.08090	0.09390	0.09080	0.07630	0.06870	0.03050	0.01980	0.01980
AR704	440500	4748000	0.03590	0.05430	0.08760	0.08910	0.10200	0.09800	0.08250	0.07390	0.03200	0.02090	0.02080
AR705	441000	4748000	0.04100	0.06200	0.10200	0.10300	0.11600	0.10900	0.09230	0.08240	0.03360	0.02200	0.02200
AR706	441500	4748000	0.05010	0.07390	0.11900	0.11800	0.13100	0.12200	0.10300	0.09150	0.03520	0.02320	0.02320
AR707	442000	4748000	0.05770	0.08440	0.13500	0.13000	0.14300	0.13200	0.11000	0.09760	0.03690	0.02460	0.02460
AR708	442500	4748000	0.06560	0.10100	0.15100	0.14400	0.15400	0.14500	0.12000	0.10400	0.03920	0.02610	0.02610
AR709	443000	4748000	0.06910	0.11400	0.16100	0.15500	0.16300	0.15500	0.13000	0.10900	0.04180	0.02790	0.02790
AR710	443500	4748000	0.06630	0.11800	0.16200	0.16000	0.16600	0.16100	0.13700	0.11200	0.04520	0.02990	0.02990
AR711	444000	4748000	0.06040	0.10600	0.14800	0.15100	0.16300	0.16100	0.13700	0.11600	0.04920	0.03220	0.03220
AR712	444500	4748000	0.05540	0.09390	0.13700	0.14600	0.16600	0.16400	0.14000	0.12200	0.05420	0.03500	0.03500
AR713	445000	4748000	0.05470	0.08570	0.13000	0.14400	0.17100	0.17000	0.14400	0.12900	0.05990	0.03820	0.03820
AR714	445500	4748000	0.05080	0.08250	0.12800	0.14600	0.17800	0.17900	0.15000	0.13500	0.06700	0.04200	0.04200
AR715	446000	4748000	0.04850	0.07910	0.12500	0.15400	0.19200	0.19500	0.16100	0.14700	0.07710	0.04680	0.04670
AR716	446500	4748000	0.04680	0.07580	0.12300	0.16300	0.21200	0.21600	0.17700	0.16400	0.08940	0.05310	0.05310
AR717	447000	4748000	0.04710	0.07490	0.12400	0.18500	0.24600	0.25200	0.20300	0.19000	0.10800	0.06120	0.06120
AR718	447500	4748000	0.04490	0.07120	0.12300	0.21700	0.29600	0.30300	0.23700	0.22500	0.13500	0.07220	0.07220
AR719	448000	4748000	0.04250	0.06850	0.12200	0.20900	0.31300	0.32300	0.26100	0.24900	0.14800	0.08800	0.08800
AR720	448500	4748000	0.03990	0.06500	0.12300	0.18100	0.32200	0.33600	0.29000	0.27800	0.16100	0.11100	0.11100
AR721	449000	4748000	0.03740	0.06130	0.12800	0.18400	0.36900	0.38600	0.34100	0.33000	0.19200	0.14000	0.14000
AR722	449500	4748000	0.03590	0.05860	0.13300	0.18100	0.61900	0.64100	0.60100	0.59000	0.32100	0.27100	0.27100
AR723	450000	4748000	0.03470	0.05620	0.13700	0.17900	2.15000	2.18000	2.14000	2.13000	1.06000	1.01000	1.01000
AR724	450500	4748000	0.03430	0.05460	0.13300	0.17200	1.05000	1.09000	1.06000	1.05000	0.57600	0.52900	0.52900
AR725	451000	4748000	0.03380	0.05290	0.12500	0.16000	0.75700	0.82300	0.79200	0.78300	0.51200	0.46900	0.46900

AR726	451500	4748000	0.03320	0.05120	0.11500	0.14500	0.88100	0.95700	0.92900	0.92000	0.69600	0.65700	0.65700
AR727	452000	4748000	0.03250	0.05030	0.10700	0.13400	2.36000	2.48000	2.45000	2.45000	2.24000	2.20000	2.20000
AR728	452500	4748000	0.03180	0.04790	0.10300	0.12800	1.16000	1.31000	1.29000	1.28000	1.08000	1.05000	1.05000
AR729	453000	4748000	0.03160	0.04780	0.10300	0.12500	0.66000	0.85000	0.82800	0.82000	0.61500	0.58500	0.58500
AR730	453500	4748000	0.02960	0.04580	0.09940	0.12100	0.45800	0.64600	0.62400	0.61600	0.42600	0.39600	0.39600
AR731	454000	4748000	0.02880	0.04500	0.09680	0.11800	0.35800	0.54300	0.52100	0.51400	0.33400	0.30500	0.30500
AR732	454500	4748000	0.02820	0.04420	0.09410	0.11500	0.29900	0.47900	0.45800	0.45000	0.28000	0.25100	0.25100
AR733	455000	4748000	0.02750	0.04330	0.09280	0.11300	0.26200	0.41200	0.39200	0.38400	0.23400	0.20600	0.20600
AR734	455500	4748000	0.02680	0.04240	0.09080	0.11000	0.23500	0.35300	0.33300	0.32500	0.19600	0.16900	0.16900
AR735	456000	4748000	0.02630	0.04170	0.08870	0.10700	0.21400	0.30700	0.28800	0.28000	0.16700	0.14200	0.14200
AR736	456500	4748000	0.02590	0.04100	0.08730	0.10500	0.20000	0.27500	0.25600	0.24900	0.14900	0.12300	0.12300
AR737	457000	4748000	0.02550	0.04030	0.08550	0.10200	0.18900	0.24900	0.23100	0.22400	0.13400	0.10900	0.10900
AR738	457500	4748000	0.02510	0.03960	0.08360	0.09980	0.17800	0.23300	0.21500	0.20800	0.12400	0.09910	0.09910
AR739	437500	4747500	0.01960	0.03000	0.05040	0.05340	0.06440	0.06370	0.05410	0.04930	0.02350	0.01530	0.01530
AR740	438000	4747500	0.02210	0.03320	0.05520	0.05790	0.06910	0.06800	0.05780	0.05260	0.02450	0.01590	0.01590
AR741	438500	4747500	0.02420	0.03620	0.06000	0.06250	0.07400	0.07250	0.06180	0.05620	0.02540	0.01660	0.01660
AR742	439000	4747500	0.02670	0.03940	0.06480	0.06670	0.07860	0.07670	0.06520	0.05920	0.02650	0.01730	0.01730
AR743	439500	4747500	0.02830	0.04220	0.06890	0.07030	0.08250	0.08030	0.06810	0.06150	0.02760	0.01810	0.01810
AR744	440000	4747500	0.02960	0.04510	0.07390	0.07470	0.08700	0.08430	0.07140	0.06410	0.02880	0.01900	0.01890
AR745	440500	4747500	0.03310	0.05070	0.08340	0.08370	0.09590	0.09180	0.07840	0.07010	0.03000	0.01990	0.01990
AR746	441000	4747500	0.03870	0.05820	0.09610	0.09530	0.10800	0.10100	0.08720	0.07800	0.03120	0.02090	0.02090
AR747	441500	4747500	0.04700	0.06800	0.11000	0.10800	0.12100	0.11300	0.09540	0.08550	0.03310	0.02200	0.02200
AR748	442000	4747500	0.05210	0.07550	0.12200	0.11700	0.13000	0.12100	0.10100	0.09030	0.03500	0.02330	0.02330
AR749	442500	4747500	0.05840	0.08960	0.13500	0.13100	0.14100	0.13300	0.11100	0.09590	0.03740	0.02470	0.02470
AR750	443000	4747500	0.06180	0.09910	0.14300	0.14000	0.14900	0.14300	0.11900	0.10200	0.04000	0.02630	0.02630
AR751	443500	4747500	0.05960	0.10200	0.14400	0.14300	0.15200	0.14800	0.12400	0.10500	0.04290	0.02800	0.02800
AR752	444000	4747500	0.05440	0.09290	0.13100	0.13500	0.14800	0.14700	0.12400	0.10600	0.04630	0.03010	0.03010
AR753	444500	4747500	0.04890	0.08250	0.12200	0.13000	0.14800	0.14800	0.12600	0.11000	0.05010	0.03240	0.03240
AR754	445000	4747500	0.04850	0.07540	0.11600	0.12800	0.15300	0.15400	0.13100	0.11800	0.05500	0.03500	0.03500
AR755	445500	4747500	0.04660	0.07310	0.11500	0.13200	0.16100	0.16300	0.13700	0.12400	0.06130	0.03810	0.03810
AR756	446000	4747500	0.04300	0.06990	0.11300	0.13700	0.16900	0.17300	0.14400	0.13100	0.06880	0.04170	0.04170
AR757	446500	4747500	0.04110	0.06730	0.11200	0.14100	0.17900	0.18400	0.15300	0.14100	0.07620	0.04620	0.04620
AR758	447000	4747500	0.04120	0.06590	0.11200	0.16100	0.20600	0.21300	0.17200	0.16000	0.09110	0.05140	0.05140
AR759	447500	4747500	0.04150	0.06550	0.11300	0.17900	0.23100	0.24100	0.19000	0.17900	0.10600	0.05690	0.05690
AR760	448000	4747500	0.03970	0.06240	0.11200	0.17600	0.23800	0.25100	0.20300	0.19300	0.11400	0.06530	0.06520
AR761	448500	4747500	0.03780	0.06030	0.11600	0.16200	0.25300	0.27000	0.23100	0.22100	0.12700	0.08390	0.08390
AR762	449000	4747500	0.03580	0.05770	0.12000	0.16000	0.29600	0.31700	0.28200	0.27200	0.15400	0.11100	0.11100
AR763	449500	4747500	0.03380	0.05490	0.12400	0.16100	0.39700	0.42700	0.39400	0.38400	0.21100	0.16700	0.16700
AR764	450000	4747500	0.03260	0.05280	0.12600	0.15900	0.64800	0.69200	0.66200	0.65200	0.34000	0.29700	0.29700
AR765	450500	4747500	0.03140	0.05060	0.12200	0.15200	0.47200	0.53900	0.51100	0.50200	0.27700	0.23600	0.23600
AR766	451000	4747500	0.03010	0.04850	0.11500	0.14400	0.44800	0.55300	0.52600	0.51700	0.31400	0.27500	0.27500
AR767	451500	4747500	0.02970	0.04710	0.10800	0.13400	0.53600	0.71300	0.68700	0.67900	0.46100	0.42500	0.42500
AR768	452000	4747500	0.02930	0.04590	0.09910	0.12400	0.76400	1.01000	0.98200	0.97400	0.74700	0.71400	0.71400

AR769	452500	4747500	0.02890	0.04470	0.09500	0.11800	0.48100	0.94600	0.92400	0.91600	0.58100	0.55200	0.55200
AR770	453000	4747500	0.02850	0.04380	0.09380	0.11400	0.38700	0.97100	0.95000	0.94200	0.54900	0.52200	0.52200
AR771	453500	4747500	0.02800	0.04260	0.09210	0.11100	0.30900	0.84300	0.82300	0.81600	0.45500	0.42800	0.42800
AR772	454000	4747500	0.02780	0.04180	0.09030	0.10800	0.27800	0.67200	0.65300	0.64700	0.36500	0.33800	0.33800
AR773	454500	4747500	0.02680	0.04080	0.08750	0.10400	0.24900	0.50500	0.48700	0.48100	0.27700	0.25100	0.25100
AR774	455000	4747500	0.02560	0.03970	0.08420	0.10100	0.22500	0.40300	0.38600	0.37900	0.22100	0.19600	0.19600
AR775	455500	4747500	0.02510	0.03910	0.08320	0.09960	0.20700	0.33700	0.31900	0.31300	0.18300	0.15900	0.15900
AR776	456000	4747500	0.02460	0.03850	0.08190	0.09790	0.19200	0.29000	0.27300	0.26700	0.15600	0.13300	0.13300
AR777	456500	4747500	0.02410	0.03790	0.08020	0.09580	0.18200	0.25800	0.24100	0.23500	0.13800	0.11500	0.11500
AR778	457000	4747500	0.02370	0.03730	0.07910	0.09420	0.17300	0.23400	0.21700	0.21100	0.12400	0.10200	0.10200
AR779	457500	4747500	0.02340	0.03680	0.07790	0.09250	0.16500	0.21800	0.20200	0.19500	0.11500	0.09270	0.09270
AR780	437500	4747000	0.01980	0.02980	0.05000	0.05210	0.06250	0.06210	0.05320	0.04840	0.02270	0.01490	0.01490
AR781	438000	4747000	0.02150	0.03220	0.05370	0.05560	0.06630	0.06570	0.05640	0.05140	0.02350	0.01550	0.01550
AR782	438500	4747000	0.02350	0.03470	0.05760	0.05900	0.07010	0.06910	0.05920	0.05390	0.02430	0.01610	0.01610
AR783	439000	4747000	0.02490	0.03700	0.06130	0.06210	0.07330	0.07210	0.06160	0.05590	0.02520	0.01670	0.01670
AR784	439500	4747000	0.02600	0.03930	0.06480	0.06500	0.07630	0.07490	0.06400	0.05770	0.02610	0.01740	0.01740
AR785	440000	4747000	0.02750	0.04250	0.06970	0.06980	0.08110	0.07940	0.06780	0.06070	0.02730	0.01820	0.01820
AR786	440500	4747000	0.03160	0.04820	0.08000	0.08000	0.09140	0.08770	0.07550	0.06770	0.02850	0.01900	0.01900
AR787	441000	4747000	0.03770	0.05560	0.09160	0.09080	0.10300	0.09730	0.08330	0.07490	0.03000	0.01990	0.01990
AR788	441500	4747000	0.04340	0.06220	0.10200	0.09980	0.11200	0.10600	0.08910	0.08030	0.03170	0.02090	0.02090
AR789	442000	4747000	0.04730	0.07030	0.11300	0.11000	0.12100	0.11400	0.09520	0.08440	0.03360	0.02200	0.02200
AR790	442500	4747000	0.05230	0.08080	0.12300	0.12000	0.13000	0.12300	0.10200	0.08900	0.03560	0.02320	0.02320
AR791	443000	4747000	0.05590	0.08880	0.13000	0.12800	0.13700	0.13200	0.11000	0.09460	0.03770	0.02450	0.02450
AR792	443500	4747000	0.05430	0.09130	0.13100	0.13100	0.13900	0.13600	0.11500	0.09740	0.04040	0.02600	0.02600
AR793	444000	4747000	0.04880	0.08260	0.12000	0.12300	0.13400	0.13400	0.11300	0.09690	0.04290	0.02760	0.02750
AR794	444500	4747000	0.04480	0.07530	0.11100	0.11800	0.13300	0.13400	0.11400	0.09990	0.04610	0.02930	0.02930
AR795	445000	4747000	0.04310	0.06890	0.10700	0.11800	0.13700	0.13900	0.11900	0.10700	0.05010	0.03120	0.03120
AR796	445500	4747000	0.04280	0.06540	0.10500	0.12000	0.14300	0.14600	0.12300	0.11200	0.05480	0.03330	0.03330
AR797	446000	4747000	0.04010	0.06360	0.10500	0.12400	0.14800	0.15200	0.12600	0.11500	0.05930	0.03540	0.03540
AR798	446500	4747000	0.03670	0.06020	0.10200	0.12600	0.15200	0.15700	0.13000	0.11900	0.06430	0.03770	0.03770
AR799	447000	4747000	0.03660	0.05930	0.10200	0.14100	0.17300	0.18100	0.14600	0.13500	0.07630	0.04230	0.04230
AR800	447500	4747000	0.03660	0.05820	0.10200	0.15200	0.19400	0.20400	0.16400	0.15400	0.08800	0.04870	0.04870
AR801	448000	4747000	0.03710	0.05820	0.10500	0.15300	0.20700	0.22100	0.18200	0.17200	0.09760	0.05680	0.05680
AR802	448500	4747000	0.03560	0.05550	0.10800	0.14600	0.21500	0.23200	0.19800	0.18900	0.10500	0.06640	0.06630
AR803	449000	4747000	0.03400	0.05380	0.11200	0.14000	0.23600	0.25900	0.23100	0.22200	0.11900	0.08350	0.08350
AR804	449500	4747000	0.03230	0.05180	0.11500	0.14500	0.28100	0.31300	0.28400	0.27500	0.14900	0.11100	0.11100
AR805	450000	4747000	0.03080	0.04960	0.11700	0.14400	0.39000	0.43800	0.41100	0.40200	0.21500	0.17700	0.17700
AR806	450500	4747000	0.02980	0.04800	0.11400	0.13800	0.32800	0.40300	0.37900	0.37000	0.20800	0.17200	0.17200
AR807	451000	4747000	0.02880	0.04630	0.10800	0.13100	0.33100	0.46100	0.43700	0.42900	0.25200	0.21700	0.21700
AR808	451500	4747000	0.02780	0.04460	0.10100	0.12400	0.35400	0.61200	0.58900	0.58100	0.35300	0.32000	0.32000
AR809	452000	4747000	0.02680	0.04280	0.09370	0.11500	0.42800	1.16000	1.14000	1.13000	0.65800	0.62800	0.62800
AR810	452500	4747000	0.02600	0.04130	0.08810	0.10900	0.31600	6.07000	6.05000	6.04000	2.92000	2.89000	2.89000
AR811	453000	4747000	0.02580	0.04050	0.08620	0.10500	0.27100	4.87000	4.85000	4.84000	2.34000	2.31000	2.31000

AR812	453500	4747000	0.02560	0.03960	0.08530	0.10300	0.24500	1.22000	1.21000	1.20000	0.61700	0.59200	0.59200
AR813	454000	4747000	0.02520	0.03870	0.08380	0.10000	0.22000	0.64800	0.63000	0.62400	0.33600	0.31200	0.31200
AR814	454500	4747000	0.02490	0.03830	0.08210	0.09730	0.19900	0.44700	0.43000	0.42400	0.23300	0.20900	0.20900
AR815	455000	4747000	0.02470	0.03700	0.07950	0.09410	0.18500	0.35000	0.33400	0.32800	0.18300	0.16000	0.16000
AR816	455500	4747000	0.02440	0.03680	0.07790	0.09070	0.17600	0.29500	0.27900	0.27300	0.15500	0.13300	0.13300
AR817	456000	4747000	0.02320	0.03560	0.07550	0.08870	0.16700	0.25700	0.24200	0.23600	0.13600	0.11400	0.11400
AR818	456500	4747000	0.02260	0.03500	0.07420	0.08740	0.16100	0.23100	0.21600	0.21000	0.12200	0.10100	0.10100
AR819	457000	4747000	0.02220	0.03460	0.07310	0.08610	0.15500	0.21100	0.19600	0.19000	0.11100	0.09020	0.09020
AR820	457500	4747000	0.02190	0.03410	0.07220	0.08500	0.14900	0.19800	0.18400	0.17800	0.10400	0.08340	0.08330
AR821	437500	4746500	0.01940	0.02890	0.04860	0.05010	0.05990	0.05950	0.05140	0.04690	0.02150	0.01420	0.01420
AR822	438000	4746500	0.02100	0.03100	0.05200	0.05290	0.06310	0.06230	0.05370	0.04900	0.02220	0.01470	0.01470
AR823	438500	4746500	0.02210	0.03290	0.05510	0.05550	0.06580	0.06480	0.05580	0.05070	0.02290	0.01530	0.01530
AR824	439000	4746500	0.02310	0.03470	0.05810	0.05860	0.06900	0.06790	0.05810	0.05260	0.02400	0.01590	0.01590
AR825	439500	4746500	0.02390	0.03690	0.06130	0.06150	0.07190	0.07070	0.06040	0.05430	0.02490	0.01650	0.01650
AR826	440000	4746500	0.02660	0.04090	0.06780	0.06830	0.07870	0.07660	0.06570	0.05900	0.02610	0.01720	0.01710
AR827	440500	4746500	0.02990	0.04540	0.07610	0.07700	0.08760	0.08400	0.07250	0.06520	0.02730	0.01790	0.01790
AR828	441000	4746500	0.03640	0.05270	0.08690	0.08660	0.09740	0.09260	0.07890	0.07120	0.02870	0.01860	0.01860
AR829	441500	4746500	0.04020	0.05720	0.09440	0.09310	0.10400	0.09870	0.08290	0.07490	0.03010	0.01950	0.01950
AR830	442000	4746500	0.04320	0.06520	0.10500	0.10300	0.11300	0.10600	0.08860	0.07830	0.03160	0.02040	0.02040
AR831	442500	4746500	0.04790	0.07410	0.11400	0.11200	0.12000	0.11400	0.09490	0.08260	0.03320	0.02130	0.02130
AR832	443000	4746500	0.05100	0.08080	0.12000	0.11800	0.12600	0.12100	0.10200	0.08750	0.03520	0.02230	0.02230
AR833	443500	4746500	0.04980	0.08290	0.12000	0.12100	0.12700	0.12500	0.10500	0.08940	0.03700	0.02340	0.02340
AR834	444000	4746500	0.04520	0.07570	0.11100	0.11400	0.12300	0.12300	0.10300	0.08900	0.03940	0.02460	0.02460
AR835	444500	4746500	0.04120	0.06900	0.10300	0.11000	0.12100	0.12200	0.10300	0.09010	0.04190	0.02570	0.02570
AR836	445000	4746500	0.03870	0.06300	0.09840	0.10900	0.12300	0.12500	0.10600	0.09470	0.04470	0.02680	0.02680
AR837	445500	4746500	0.03930	0.05990	0.09720	0.11000	0.12800	0.13100	0.11100	0.10100	0.04840	0.02870	0.02870
AR838	446000	4746500	0.03740	0.05800	0.09680	0.11200	0.13100	0.13500	0.11400	0.10400	0.05180	0.03070	0.03070
AR839	446500	4746500	0.03480	0.05580	0.09550	0.11800	0.14100	0.14600	0.12100	0.11100	0.05850	0.03370	0.03370
AR840	447000	4746500	0.03250	0.05320	0.09360	0.12500	0.15400	0.16100	0.13100	0.12100	0.06670	0.03710	0.03710
AR841	447500	4746500	0.03290	0.05290	0.09420	0.13300	0.16700	0.17700	0.14400	0.13400	0.07470	0.04080	0.04080
AR842	448000	4746500	0.03300	0.05210	0.09650	0.13500	0.17600	0.18800	0.15600	0.14700	0.08170	0.04630	0.04630
AR843	448500	4746500	0.03350	0.05230	0.10200	0.13400	0.19000	0.20500	0.17600	0.16700	0.09100	0.05660	0.05660
AR844	449000	4746500	0.03210	0.04990	0.10400	0.12800	0.20300	0.22300	0.19900	0.19000	0.10300	0.07090	0.07090
AR845	449500	4746500	0.03090	0.04860	0.10700	0.13000	0.24200	0.26800	0.24500	0.23600	0.12800	0.09500	0.09500
AR846	450000	4746500	0.02950	0.04690	0.10900	0.13100	0.29100	0.32800	0.30500	0.29600	0.16100	0.12600	0.12600
AR847	450500	4746500	0.02820	0.04520	0.10600	0.12700	0.27000	0.32500	0.30300	0.29500	0.16600	0.13300	0.13300
AR848	451000	4746500	0.02740	0.04390	0.10200	0.12100	0.25700	0.34100	0.32000	0.31200	0.18300	0.15200	0.15200
AR849	451500	4746500	0.02660	0.04260	0.09620	0.11500	0.28400	0.40600	0.38600	0.37800	0.23500	0.20600	0.20600
AR850	452000	4746500	0.02580	0.04120	0.08990	0.10800	0.29700	0.57300	0.55200	0.54500	0.33000	0.30300	0.30300
AR851	452500	4746500	0.02500	0.03980	0.08450	0.10300	0.24200	1.33000	1.31000	1.30000	0.66300	0.63700	0.63700
AR852	453000	4746500	0.02420	0.03840	0.08100	0.09830	0.22400	1.06000	1.04000	1.03000	0.52900	0.50600	0.50600
AR853	453500	4746500	0.02340	0.03700	0.07930	0.09570	0.20100	0.59600	0.57800	0.57100	0.30500	0.28200	0.28200
AR854	454000	4746500	0.02300	0.03610	0.07820	0.09360	0.18800	0.44800	0.43100	0.42500	0.23300	0.21000	0.21000

AR855	454500	4746500	0.02280	0.03540	0.07680	0.09120	0.17600	0.35800	0.34200	0.33600	0.18700	0.16500	0.16500
AR856	455000	4746500	0.02260	0.03470	0.07490	0.08840	0.16200	0.29500	0.27900	0.27400	0.15400	0.13200	0.13200
AR857	455500	4746500	0.02240	0.03440	0.07330	0.08590	0.15200	0.25300	0.23900	0.23300	0.13100	0.11000	0.11000
AR858	456000	4746500	0.02210	0.03360	0.07130	0.08320	0.14500	0.22400	0.21000	0.20500	0.11500	0.09450	0.09450
AR859	456500	4746500	0.02220	0.03320	0.07030	0.08160	0.14100	0.20500	0.19100	0.18600	0.10500	0.08500	0.08500
AR860	457000	4746500	0.02140	0.03240	0.06850	0.07920	0.13700	0.18900	0.17600	0.17000	0.09690	0.07820	0.07820
AR861	457500	4746500	0.02050	0.03160	0.06670	0.07770	0.13300	0.17900	0.16600	0.16100	0.09210	0.07370	0.07370
AR862	437500	4746000	0.01890	0.02800	0.04730	0.04820	0.05750	0.05700	0.04920	0.04500	0.02050	0.01350	0.01350
AR863	438000	4746000	0.01990	0.02960	0.05010	0.05070	0.06010	0.05940	0.05110	0.04650	0.02120	0.01400	0.01400
AR864	438500	4746000	0.02070	0.03110	0.05250	0.05300	0.06250	0.06160	0.05290	0.04800	0.02200	0.01450	0.01440
AR865	439000	4746000	0.02140	0.03290	0.05530	0.05590	0.06530	0.06430	0.05490	0.04950	0.02290	0.01500	0.01490
AR866	439500	4746000	0.02260	0.03520	0.05850	0.05920	0.06860	0.06760	0.05760	0.05170	0.02390	0.01550	0.01550
AR867	440000	4746000	0.02560	0.03910	0.06560	0.06670	0.07610	0.07380	0.06340	0.05700	0.02490	0.01600	0.01600
AR868	440500	4746000	0.02970	0.04400	0.07370	0.07460	0.08410	0.08070	0.06910	0.06230	0.02590	0.01660	0.01660
AR869	441000	4746000	0.03430	0.04920	0.08170	0.08170	0.09150	0.08700	0.07360	0.06660	0.02700	0.01720	0.01720
AR870	441500	4746000	0.03730	0.05430	0.08930	0.08850	0.09780	0.09260	0.07750	0.06950	0.02820	0.01790	0.01790
AR871	442000	4746000	0.03970	0.06060	0.09790	0.09670	0.10400	0.09860	0.08200	0.07220	0.02940	0.01850	0.01850
AR872	442500	4746000	0.04420	0.06850	0.10600	0.10400	0.11100	0.10600	0.08780	0.07630	0.03090	0.01920	0.01920
AR873	443000	4746000	0.04690	0.07410	0.11000	0.11000	0.11500	0.11100	0.09280	0.08000	0.03200	0.01990	0.01990
AR874	443500	4746000	0.04590	0.07580	0.11100	0.11200	0.11700	0.11400	0.09570	0.08170	0.03380	0.02060	0.02060
AR875	444000	4746000	0.04200	0.06970	0.10400	0.10700	0.11300	0.11200	0.09410	0.08100	0.03550	0.02130	0.02130
AR876	444500	4746000	0.03790	0.06350	0.09630	0.10300	0.11100	0.11200	0.09380	0.08170	0.03810	0.02240	0.02240
AR877	445000	4746000	0.03610	0.05890	0.09220	0.10200	0.11300	0.11500	0.09740	0.08670	0.04090	0.02380	0.02380
AR878	445500	4746000	0.03530	0.05470	0.08980	0.10200	0.11700	0.11900	0.10100	0.09210	0.04360	0.02540	0.02540
AR879	446000	4746000	0.03490	0.05310	0.08950	0.10200	0.12000	0.12300	0.10400	0.09570	0.04600	0.02700	0.02700
AR880	446500	4746000	0.03280	0.05160	0.08890	0.10900	0.12900	0.13300	0.11000	0.10100	0.05160	0.02880	0.02880
AR881	447000	4746000	0.03040	0.04920	0.08730	0.11400	0.13800	0.14300	0.11700	0.10800	0.05840	0.03200	0.03200
AR882	447500	4746000	0.02960	0.04810	0.08780	0.11900	0.14800	0.15600	0.12700	0.11800	0.06600	0.03610	0.03610
AR883	448000	4746000	0.02980	0.04770	0.09050	0.12100	0.15900	0.16800	0.14000	0.13200	0.07350	0.04220	0.04220
AR884	448500	4746000	0.03000	0.04710	0.09430	0.12100	0.17000	0.18000	0.15500	0.14700	0.08090	0.04980	0.04980
AR885	449000	4746000	0.03050	0.04750	0.09820	0.11900	0.17900	0.19100	0.16900	0.16100	0.08780	0.05810	0.05810
AR886	449500	4746000	0.02930	0.04530	0.09960	0.11800	0.20600	0.22100	0.20100	0.19300	0.10400	0.07500	0.07500
AR887	450000	4746000	0.02820	0.04420	0.10200	0.12100	0.23600	0.25400	0.23300	0.22500	0.12400	0.09250	0.09250
AR888	450500	4746000	0.02710	0.04280	0.09900	0.11800	0.22800	0.25200	0.23100	0.22400	0.12800	0.09780	0.09780
AR889	451000	4746000	0.02600	0.04150	0.09520	0.11300	0.21100	0.25500	0.23500	0.22800	0.13500	0.10600	0.10600
AR890	451500	4746000	0.02540	0.04050	0.09100	0.10700	0.23200	0.31200	0.29300	0.28600	0.17700	0.15000	0.15000
AR891	452000	4746000	0.02470	0.03940	0.08590	0.10100	0.23500	0.39200	0.37400	0.36700	0.22200	0.19700	0.19700
AR892	452500	4746000	0.02400	0.03820	0.08020	0.09580	0.20300	0.57700	0.55900	0.55200	0.29900	0.27500	0.27500
AR893	453000	4746000	0.02330	0.03700	0.07660	0.09200	0.18400	0.43500	0.41800	0.41100	0.22400	0.20200	0.20200
AR894	453500	4746000	0.02260	0.03590	0.07510	0.08990	0.17600	0.36100	0.34400	0.33800	0.18800	0.16600	0.16600
AR895	454000	4746000	0.02200	0.03470	0.07400	0.08820	0.16400	0.31000	0.29300	0.28700	0.16000	0.13900	0.13900
AR896	454500	4746000	0.02130	0.03360	0.07250	0.08600	0.15600	0.25900	0.24300	0.23700	0.13500	0.11400	0.11400
AR897	455000	4746000	0.02070	0.03260	0.07070	0.08350	0.14800	0.22500	0.21000	0.20400	0.11800	0.09740	0.09730

AR898	455500	4746000	0.02060	0.03200	0.06920	0.08120	0.13900	0.20900	0.19500	0.18900	0.10800	0.08840	0.08840
AR899	456000	4746000	0.02040	0.03150	0.06740	0.07880	0.13200	0.19200	0.17800	0.17300	0.09890	0.07950	0.07950
AR900	456500	4746000	0.02030	0.03110	0.06610	0.07680	0.12600	0.17700	0.16400	0.15900	0.09050	0.07180	0.07180
AR901	457000	4746000	0.02010	0.03080	0.06480	0.07490	0.12200	0.16600	0.15400	0.14800	0.08410	0.06620	0.06610
AR902	457500	4746000	0.02010	0.03010	0.06380	0.07380	0.11900	0.15800	0.14600	0.14100	0.07910	0.06150	0.06150
AR903	437500	4745500	0.01800	0.02690	0.04580	0.04660	0.05510	0.05450	0.04690	0.04280	0.01970	0.01280	0.01280
AR904	438000	4745500	0.01870	0.02800	0.04790	0.04870	0.05730	0.05650	0.04850	0.04410	0.02040	0.01320	0.01320
AR905	438500	4745500	0.01940	0.02960	0.05040	0.05120	0.05970	0.05880	0.05020	0.04540	0.02110	0.01360	0.01360
AR906	439000	4745500	0.02040	0.03150	0.05300	0.05400	0.06240	0.06150	0.05240	0.04710	0.02190	0.01400	0.01400
AR907	439500	4745500	0.02210	0.03410	0.05700	0.05820	0.06660	0.06530	0.05570	0.05000	0.02270	0.01440	0.01440
AR908	440000	4745500	0.02510	0.03780	0.06360	0.06500	0.07330	0.07090	0.06070	0.05470	0.02350	0.01480	0.01480
AR909	440500	4745500	0.02920	0.04250	0.07100	0.07190	0.08030	0.07690	0.06550	0.05920	0.02440	0.01530	0.01530
AR910	441000	4745500	0.03230	0.04660	0.07750	0.07760	0.08580	0.08160	0.06870	0.06200	0.02520	0.01570	0.01570
AR911	441500	4745500	0.03480	0.05140	0.08440	0.08400	0.09120	0.08630	0.07200	0.06420	0.02610	0.01620	0.01610
AR912	442000	4745500	0.03700	0.05680	0.09220	0.09120	0.09700	0.09160	0.07600	0.06670	0.02720	0.01660	0.01660
AR913	442500	4745500	0.04100	0.06360	0.09850	0.09730	0.10200	0.09700	0.08040	0.06980	0.02800	0.01700	0.01700
AR914	443000	4745500	0.04350	0.06830	0.10300	0.10300	0.10700	0.10300	0.08570	0.07400	0.02960	0.01770	0.01770
AR915	443500	4745500	0.04260	0.06990	0.10400	0.10500	0.10800	0.10600	0.08850	0.07560	0.03100	0.01830	0.01830
AR916	444000	4745500	0.03930	0.06460	0.09760	0.10100	0.10700	0.10500	0.08800	0.07610	0.03310	0.01920	0.01920
AR917	444500	4745500	0.03550	0.05910	0.09130	0.09730	0.10500	0.10500	0.08770	0.07660	0.03520	0.02010	0.02010
AR918	445000	4745500	0.03370	0.05510	0.08740	0.09590	0.10600	0.10700	0.09000	0.07990	0.03710	0.02100	0.02100
AR919	445500	4745500	0.03280	0.05150	0.08440	0.09480	0.10900	0.11000	0.09340	0.08460	0.03980	0.02290	0.02290
AR920	446000	4745500	0.03260	0.04970	0.08390	0.09700	0.11400	0.11600	0.09760	0.08950	0.04290	0.02450	0.02450
AR921	446500	4745500	0.03100	0.04790	0.08280	0.10100	0.12100	0.12400	0.10200	0.09450	0.04820	0.02680	0.02680
AR922	447000	4745500	0.02900	0.04610	0.08190	0.10500	0.12800	0.13100	0.10700	0.09920	0.05340	0.02940	0.02930
AR923	447500	4745500	0.02780	0.04480	0.08230	0.10900	0.13700	0.14200	0.11600	0.10800	0.06060	0.03310	0.03310
AR924	448000	4745500	0.02710	0.04380	0.08520	0.11200	0.14600	0.15100	0.12600	0.11800	0.06630	0.03770	0.03770
AR925	448500	4745500	0.02730	0.04340	0.08830	0.11200	0.15300	0.15700	0.13400	0.12600	0.07050	0.04180	0.04180
AR926	449000	4745500	0.02740	0.04290	0.09110	0.11100	0.16200	0.16400	0.14400	0.13600	0.07520	0.04720	0.04720
AR927	449500	4745500	0.02800	0.04340	0.09390	0.11000	0.18100	0.18600	0.16800	0.16000	0.08730	0.06010	0.06010
AR928	450000	4745500	0.02690	0.04140	0.09460	0.11100	0.20100	0.21300	0.19400	0.18700	0.10300	0.07520	0.07510
AR929	450500	4745500	0.02600	0.04050	0.09280	0.10900	0.19500	0.21700	0.19900	0.19200	0.10800	0.08060	0.08060
AR930	451000	4745500	0.02500	0.03940	0.08970	0.10600	0.18700	0.22100	0.20300	0.19600	0.11500	0.08830	0.08820
AR931	451500	4745500	0.02410	0.03830	0.08590	0.10100	0.19500	0.25200	0.23500	0.22800	0.14000	0.11400	0.11400
AR932	452000	4745500	0.02360	0.03750	0.08190	0.09580	0.19700	0.28500	0.26900	0.26200	0.16000	0.13600	0.13600
AR933	452500	4745500	0.02300	0.03660	0.07720	0.09030	0.17800	0.35900	0.34300	0.33700	0.18900	0.16700	0.16700
AR934	453000	4745500	0.02250	0.03560	0.07330	0.08670	0.15600	0.30900	0.29300	0.28600	0.15800	0.13700	0.13700
AR935	453500	4745500	0.02190	0.03460	0.07170	0.08500	0.15300	0.26400	0.24800	0.24200	0.13600	0.11600	0.11600
AR936	454000	4745500	0.02130	0.03360	0.07040	0.08330	0.14800	0.23500	0.21900	0.21400	0.12100	0.10100	0.10100
AR937	454500	4745500	0.02070	0.03270	0.06930	0.08180	0.14100	0.21600	0.20100	0.19600	0.11100	0.09120	0.09120
AR938	455000	4745500	0.02010	0.03170	0.06790	0.07980	0.13500	0.19700	0.18200	0.17700	0.10100	0.08150	0.08150
AR939	455500	4745500	0.01960	0.03070	0.06620	0.07760	0.13000	0.17900	0.16500	0.16000	0.09220	0.07320	0.07320
AR940	456000	4745500	0.01900	0.02980	0.06430	0.07520	0.12400	0.16500	0.15200	0.14700	0.08510	0.06660	0.06660

AR941	456500	4745500	0.01870	0.02920	0.06270	0.07300	0.11800	0.15300	0.14000	0.13600	0.07870	0.06080	0.06070
AR942	457000	4745500	0.01860	0.02870	0.06140	0.07120	0.11400	0.14700	0.13500	0.13000	0.07480	0.05750	0.05740
AR943	457500	4745500	0.01850	0.02840	0.06020	0.06950	0.10800	0.14000	0.12800	0.12400	0.07040	0.05370	0.05370
AR944	437500	4745000	0.01710	0.02550	0.04400	0.04500	0.05280	0.05210	0.04460	0.04060	0.01890	0.01200	0.01200
AR945	438000	4745000	0.01770	0.02690	0.04620	0.04720	0.05480	0.05400	0.04610	0.04180	0.01950	0.01230	0.01230
AR946	438500	4745000	0.01860	0.02860	0.04860	0.04970	0.05720	0.05630	0.04790	0.04320	0.02010	0.01260	0.01260
AR947	439000	4745000	0.01940	0.03010	0.05120	0.05250	0.05980	0.05870	0.04990	0.04480	0.02070	0.01290	0.01290
AR948	439500	4745000	0.02150	0.03290	0.05560	0.05710	0.06430	0.06270	0.05350	0.04810	0.02140	0.01320	0.01320
AR949	440000	4745000	0.02420	0.03620	0.06130	0.06290	0.07000	0.06750	0.05770	0.05200	0.02200	0.01350	0.01350
AR950	440500	4745000	0.02800	0.04050	0.06780	0.06870	0.07570	0.07230	0.06120	0.05530	0.02270	0.01380	0.01380
AR951	441000	4745000	0.03050	0.04370	0.07320	0.07340	0.08010	0.07590	0.06350	0.05730	0.02330	0.01410	0.01410
AR952	441500	4745000	0.03250	0.04860	0.08010	0.07980	0.08520	0.08050	0.06690	0.05930	0.02420	0.01440	0.01440
AR953	442000	4745000	0.03480	0.05360	0.08680	0.08600	0.09070	0.08540	0.07090	0.06200	0.02500	0.01500	0.01490
AR954	442500	4745000	0.03830	0.05930	0.09240	0.09170	0.09560	0.09110	0.07540	0.06550	0.02620	0.01540	0.01540
AR955	443000	4745000	0.04040	0.06340	0.09640	0.09630	0.09990	0.09600	0.08000	0.06920	0.02750	0.01600	0.01590
AR956	443500	4745000	0.03970	0.06480	0.09730	0.09890	0.10200	0.09930	0.08290	0.07110	0.02900	0.01650	0.01650
AR957	444000	4745000	0.03680	0.06020	0.09220	0.09570	0.10100	0.09890	0.08250	0.07150	0.03080	0.01730	0.01730
AR958	444500	4745000	0.03360	0.05560	0.08680	0.09240	0.09990	0.09890	0.08260	0.07220	0.03290	0.01850	0.01850
AR959	445000	4745000	0.03150	0.05160	0.08190	0.08940	0.09940	0.09960	0.08370	0.07420	0.03490	0.01970	0.01970
AR960	445500	4745000	0.03010	0.04810	0.07900	0.08880	0.10200	0.10200	0.08680	0.07840	0.03740	0.02130	0.02130
AR961	446000	4745000	0.03000	0.04540	0.07740	0.09070	0.10700	0.10800	0.09070	0.08340	0.04080	0.02300	0.02300
AR962	446500	4745000	0.02930	0.04440	0.07760	0.09500	0.11400	0.11400	0.09480	0.08770	0.04510	0.02470	0.02470
AR963	447000	4745000	0.02760	0.04330	0.07730	0.09840	0.12000	0.12100	0.09940	0.09210	0.04970	0.02700	0.02700
AR964	447500	4745000	0.02600	0.04170	0.07820	0.10200	0.12800	0.12900	0.10600	0.09810	0.05520	0.02970	0.02970
AR965	448000	4745000	0.02560	0.04120	0.08100	0.10500	0.13500	0.13500	0.11300	0.10500	0.05940	0.03280	0.03280
AR966	448500	4745000	0.02500	0.04020	0.08310	0.10400	0.13900	0.13900	0.11800	0.11100	0.06250	0.03580	0.03580
AR967	449000	4745000	0.02510	0.03990	0.08520	0.10400	0.14900	0.15200	0.13200	0.12500	0.06950	0.04320	0.04320
AR968	449500	4745000	0.02530	0.03940	0.08730	0.10200	0.16200	0.16800	0.15100	0.14400	0.07910	0.05370	0.05370
AR969	450000	4745000	0.02580	0.04000	0.08950	0.10300	0.17500	0.18600	0.16900	0.16200	0.08940	0.06350	0.06350
AR970	450500	4745000	0.02480	0.03820	0.08700	0.10100	0.17000	0.18700	0.17100	0.16400	0.09160	0.06600	0.06600
AR971	451000	4745000	0.02410	0.03740	0.08460	0.09890	0.16900	0.19600	0.18000	0.17300	0.10100	0.07630	0.07630
AR972	451500	4745000	0.02320	0.03640	0.08140	0.09520	0.16800	0.21100	0.19400	0.18800	0.11400	0.09030	0.09030
AR973	452000	4745000	0.02250	0.03550	0.07780	0.09090	0.17000	0.23400	0.21800	0.21200	0.12800	0.10500	0.10500
AR974	452500	4745000	0.02200	0.03490	0.07400	0.08610	0.15800	0.26800	0.25200	0.24600	0.14100	0.12000	0.12000
AR975	453000	4745000	0.02160	0.03410	0.07000	0.08150	0.14100	0.24100	0.22600	0.22100	0.12300	0.10300	0.10300
AR976	453500	4745000	0.02110	0.03330	0.06760	0.07930	0.13400	0.19800	0.18400	0.17800	0.10100	0.08250	0.08250
AR977	454000	4745000	0.02060	0.03250	0.06680	0.07840	0.13200	0.19500	0.18000	0.17500	0.09900	0.08090	0.08090
AR978	454500	4745000	0.02010	0.03170	0.06610	0.07750	0.12900	0.18000	0.16600	0.16100	0.09140	0.07310	0.07310
AR979	455000	4745000	0.01960	0.03080	0.06500	0.07610	0.12400	0.17000	0.15700	0.15100	0.08630	0.06810	0.06810
AR980	455500	4745000	0.01910	0.03000	0.06370	0.07440	0.12000	0.16100	0.14700	0.14200	0.08130	0.06340	0.06340
AR981	456000	4745000	0.01860	0.02910	0.06220	0.07250	0.11700	0.15100	0.13800	0.13300	0.07670	0.05910	0.05910
AR982	456500	4745000	0.01810	0.02830	0.06060	0.07040	0.11200	0.14100	0.12800	0.12400	0.07170	0.05450	0.05450
AR983	457000	4745000	0.01760	0.02750	0.05890	0.06830	0.10700	0.13300	0.12100	0.11600	0.06740	0.05070	0.05070

AR984	457500	4745000	0.01710	0.02680	0.05740	0.06640	0.10300	0.12500	0.11300	0.10900	0.06330	0.04710	0.04710
AR985	437500	4744500	0.01620	0.02470	0.04270	0.04380	0.05060	0.04980	0.04240	0.03850	0.01800	0.01120	0.01120
AR986	438000	4744500	0.01700	0.02610	0.04480	0.04600	0.05260	0.05170	0.04400	0.03970	0.01850	0.01140	0.01140
AR987	438500	4744500	0.01780	0.02750	0.04670	0.04810	0.05450	0.05360	0.04540	0.04090	0.01900	0.01160	0.01160
AR988	439000	4744500	0.01880	0.02910	0.04910	0.05060	0.05690	0.05580	0.04730	0.04250	0.01950	0.01180	0.01180
AR989	439500	4744500	0.02130	0.03210	0.05440	0.05590	0.06190	0.06000	0.05100	0.04590	0.02000	0.01200	0.01200
AR990	440000	4744500	0.02400	0.03530	0.05970	0.06110	0.06690	0.06410	0.05450	0.04920	0.02040	0.01220	0.01220
AR991	440500	4744500	0.02670	0.03870	0.06500	0.06580	0.07170	0.06820	0.05740	0.05180	0.02110	0.01260	0.01260
AR992	441000	4744500	0.02880	0.04200	0.07030	0.07050	0.07600	0.07190	0.06000	0.05380	0.02190	0.01280	0.01280
AR993	441500	4744500	0.03060	0.04620	0.07600	0.07570	0.08030	0.07570	0.06290	0.05550	0.02240	0.01320	0.01320
AR994	442000	4744500	0.03280	0.05060	0.08220	0.08190	0.08600	0.08080	0.06690	0.05850	0.02350	0.01360	0.01360
AR995	442500	4744500	0.03580	0.05560	0.08730	0.08670	0.09030	0.08560	0.07090	0.06160	0.02440	0.01390	0.01390
AR996	443000	4744500	0.03780	0.05920	0.09060	0.09110	0.09500	0.09090	0.07560	0.06550	0.02620	0.01480	0.01480
AR997	443500	4744500	0.03720	0.06040	0.09170	0.09370	0.09740	0.09380	0.07830	0.06740	0.02760	0.01540	0.01540
AR998	444000	4744500	0.03470	0.05630	0.08720	0.09070	0.09660	0.09370	0.07820	0.06800	0.02940	0.01650	0.01640
AR999	444500	4744500	0.03190	0.05240	0.08260	0.08770	0.09560	0.09350	0.07810	0.06840	0.03120	0.01760	0.01760
AR1000	445000	4744500	0.02970	0.04870	0.07810	0.08470	0.09490	0.09360	0.07850	0.06960	0.03300	0.01870	0.01870
AR1001	445500	4744500	0.02840	0.04560	0.07500	0.08340	0.09620	0.09520	0.08040	0.07240	0.03490	0.01990	0.01990
AR1002	446000	4744500	0.02810	0.04320	0.07330	0.08600	0.10100	0.10000	0.08380	0.07670	0.03810	0.02110	0.02110
AR1003	446500	4744500	0.02770	0.04170	0.07250	0.08880	0.10700	0.10600	0.08740	0.08080	0.04150	0.02260	0.02260
AR1004	447000	4744500	0.02630	0.04060	0.07330	0.09250	0.11400	0.11300	0.09320	0.08650	0.04660	0.02510	0.02510
AR1005	447500	4744500	0.02480	0.03920	0.07460	0.09610	0.12100	0.12000	0.09880	0.09200	0.05140	0.02750	0.02750
AR1006	448000	4744500	0.02420	0.03860	0.07690	0.09800	0.12500	0.12500	0.10400	0.09740	0.05470	0.02990	0.02990
AR1007	448500	4744500	0.02380	0.03800	0.07890	0.09830	0.12800	0.12900	0.11000	0.10300	0.05790	0.03280	0.03280
AR1008	449000	4744500	0.02320	0.03720	0.08030	0.09730	0.13800	0.14100	0.12300	0.11700	0.06520	0.04040	0.04040
AR1009	449500	4744500	0.02330	0.03680	0.08180	0.09590	0.14700	0.15200	0.13600	0.12900	0.07160	0.04740	0.04740
AR1010	450000	4744500	0.02340	0.03640	0.08350	0.09580	0.15500	0.16300	0.14700	0.14100	0.07770	0.05360	0.05360
AR1011	450500	4744500	0.02400	0.03700	0.08270	0.09490	0.15200	0.16500	0.15000	0.14400	0.07980	0.05610	0.05610
AR1012	451000	4744500	0.02310	0.03540	0.07970	0.09250	0.15400	0.17600	0.16100	0.15500	0.08990	0.06660	0.06660
AR1013	451500	4744500	0.02240	0.03470	0.07720	0.08980	0.15000	0.18000	0.16500	0.15900	0.09590	0.07330	0.07330
AR1014	452000	4744500	0.02160	0.03390	0.07420	0.08630	0.15000	0.20000	0.18500	0.18000	0.10700	0.08580	0.08580
AR1015	452500	4744500	0.02100	0.03310	0.07080	0.08220	0.14300	0.21600	0.20200	0.19600	0.11300	0.09280	0.09280
AR1016	453000	4744500	0.02070	0.03260	0.06730	0.07790	0.13100	0.20100	0.18700	0.18100	0.10200	0.08360	0.08360
AR1017	453500	4744500	0.02030	0.03200	0.06450	0.07460	0.12000	0.16800	0.15400	0.14900	0.08340	0.06610	0.06610
AR1018	454000	4744500	0.01990	0.03130	0.06370	0.07400	0.11900	0.16300	0.14900	0.14400	0.08170	0.06470	0.06470
AR1019	454500	4744500	0.01940	0.03060	0.06300	0.07330	0.11800	0.15700	0.14400	0.13900	0.07900	0.06210	0.06210
AR1020	455000	4744500	0.01900	0.02990	0.06220	0.07240	0.11500	0.14900	0.13600	0.13100	0.07480	0.05780	0.05780
AR1021	455500	4744500	0.01850	0.02910	0.06120	0.07120	0.11200	0.14300	0.13000	0.12500	0.07160	0.05470	0.05470
AR1022	456000	4744500	0.01810	0.02840	0.06000	0.06970	0.10900	0.13700	0.12500	0.12000	0.06840	0.05180	0.05170
AR1023	456500	4744500	0.01770	0.02770	0.05870	0.06800	0.10600	0.13100	0.11900	0.11500	0.06590	0.04950	0.04950
AR1024	457000	4744500	0.01720	0.02700	0.05720	0.06620	0.10200	0.12500	0.11400	0.10900	0.06300	0.04700	0.04700
AR1025	457500	4744500	0.01680	0.02630	0.05570	0.06430	0.09880	0.11900	0.10800	0.10400	0.05990	0.04430	0.04420
AR1026	437500	4744000	0.01570	0.02400	0.04150	0.04280	0.04860	0.04770	0.04050	0.03660	0.01700	0.01030	0.01030

AR1027	438000	4744000	0.01640	0.02520	0.04330	0.04470	0.05020	0.04930	0.04170	0.03760	0.01740	0.01050	0.01050
AR1028	438500	4744000	0.01700	0.02640	0.04530	0.04680	0.05210	0.05090	0.04300	0.03860	0.01780	0.01060	0.01060
AR1029	439000	4744000	0.01840	0.02830	0.04810	0.04980	0.05500	0.05350	0.04540	0.04080	0.01820	0.01080	0.01080
AR1030	439500	4744000	0.02030	0.03060	0.05240	0.05430	0.05970	0.05740	0.04900	0.04410	0.01880	0.01110	0.01110
AR1031	440000	4744000	0.02350	0.03420	0.05770	0.05900	0.06430	0.06130	0.05190	0.04690	0.01920	0.01120	0.01120
AR1032	440500	4744000	0.02550	0.03640	0.06190	0.06260	0.06810	0.06450	0.05410	0.04890	0.01990	0.01150	0.01150
AR1033	441000	4744000	0.02720	0.04020	0.06720	0.06730	0.07210	0.06790	0.05660	0.05050	0.02030	0.01170	0.01170
AR1034	441500	4744000	0.02910	0.04420	0.07260	0.07270	0.07700	0.07240	0.06000	0.05290	0.02140	0.01220	0.01220
AR1035	442000	4744000	0.03100	0.04790	0.07830	0.07800	0.08220	0.07690	0.06380	0.05590	0.02250	0.01290	0.01290
AR1036	442500	4744000	0.03370	0.05230	0.08250	0.08250	0.08650	0.08160	0.06760	0.05890	0.02370	0.01330	0.01330
AR1037	443000	4744000	0.03550	0.05540	0.08570	0.08660	0.09090	0.08630	0.07170	0.06230	0.02520	0.01410	0.01410
AR1038	443500	4744000	0.03500	0.05660	0.08670	0.08880	0.09330	0.08910	0.07440	0.06420	0.02670	0.01490	0.01490
AR1039	444000	4744000	0.03270	0.05290	0.08270	0.08610	0.09240	0.08860	0.07400	0.06450	0.02820	0.01570	0.01570
AR1040	444500	4744000	0.03030	0.04950	0.07880	0.08330	0.09140	0.08810	0.07360	0.06450	0.02960	0.01660	0.01660
AR1041	445000	4744000	0.02840	0.04630	0.07490	0.08070	0.09070	0.08780	0.07360	0.06520	0.03090	0.01750	0.01740
AR1042	445500	4744000	0.02680	0.04320	0.07120	0.07970	0.09180	0.08970	0.07520	0.06750	0.03320	0.01860	0.01860
AR1043	446000	4744000	0.02570	0.04040	0.06890	0.08140	0.09620	0.09440	0.07900	0.07210	0.03640	0.02000	0.02000
AR1044	446500	4744000	0.02600	0.03910	0.06850	0.08380	0.10200	0.10100	0.08400	0.07780	0.04010	0.02190	0.02190
AR1045	447000	4744000	0.02510	0.03810	0.06930	0.08690	0.10800	0.10700	0.08890	0.08280	0.04440	0.02400	0.02400
AR1046	447500	4744000	0.02380	0.03710	0.07130	0.09080	0.11300	0.11300	0.09390	0.08760	0.04830	0.02590	0.02590
AR1047	448000	4744000	0.02280	0.03620	0.07300	0.09210	0.11700	0.11700	0.09800	0.09170	0.05130	0.02800	0.02800
AR1048	448500	4744000	0.02250	0.03590	0.07500	0.09270	0.12200	0.12400	0.10500	0.09910	0.05570	0.03210	0.03210
AR1049	449000	4744000	0.02210	0.03530	0.07640	0.09210	0.12900	0.13200	0.11500	0.10800	0.06080	0.03730	0.03730
AR1050	449500	4744000	0.02170	0.03450	0.07730	0.09070	0.13400	0.13800	0.12200	0.11600	0.06500	0.04190	0.04190
AR1051	450000	4744000	0.02170	0.03420	0.07850	0.08920	0.13900	0.14500	0.13100	0.12500	0.06910	0.04660	0.04660
AR1052	450500	4744000	0.02180	0.03390	0.07740	0.08810	0.13900	0.15000	0.13600	0.13100	0.07320	0.05120	0.05120
AR1053	451000	4744000	0.02240	0.03450	0.07620	0.08730	0.14000	0.15700	0.14300	0.13700	0.07950	0.05780	0.05780
AR1054	451500	4744000	0.02150	0.03290	0.07320	0.08460	0.13800	0.15900	0.14500	0.14000	0.08320	0.06210	0.06210
AR1055	452000	4744000	0.02090	0.03240	0.07070	0.08190	0.13500	0.17400	0.16100	0.15500	0.09180	0.07150	0.07150
AR1056	452500	4744000	0.02030	0.03170	0.06780	0.07850	0.13000	0.18300	0.16900	0.16400	0.09470	0.07540	0.07540
AR1057	453000	4744000	0.01970	0.03100	0.06470	0.07480	0.12200	0.17300	0.16000	0.15500	0.08800	0.06990	0.06990
AR1058	453500	4744000	0.01940	0.03060	0.06230	0.07180	0.11200	0.15200	0.13900	0.13400	0.07480	0.05810	0.05810
AR1059	454000	4744000	0.01910	0.03010	0.06060	0.06960	0.10900	0.13900	0.12700	0.12200	0.06900	0.05310	0.05310
AR1060	454500	4744000	0.01880	0.02950	0.05990	0.06910	0.10800	0.13800	0.12600	0.12100	0.06870	0.05300	0.05300
AR1061	455000	4744000	0.01840	0.02890	0.05950	0.06870	0.10700	0.13400	0.12200	0.11700	0.06650	0.05070	0.05060
AR1062	455500	4744000	0.01800	0.02830	0.05880	0.06790	0.10500	0.12900	0.11700	0.11200	0.06370	0.04780	0.04780
AR1063	456000	4744000	0.01760	0.02760	0.05780	0.06680	0.10200	0.12400	0.11200	0.10800	0.06150	0.04570	0.04570
AR1064	456500	4744000	0.01720	0.02700	0.05670	0.06550	0.09940	0.12100	0.10900	0.10500	0.05970	0.04410	0.04410
AR1065	457000	4744000	0.01680	0.02640	0.05550	0.06400	0.09710	0.11700	0.10600	0.10200	0.05810	0.04280	0.04280
AR1066	457500	4744000	0.01640	0.02570	0.05420	0.06240	0.09440	0.11300	0.10200	0.09770	0.05610	0.04110	0.04110
AR1067	437500	4743500	0.01520	0.02330	0.04030	0.04170	0.04650	0.04540	0.03840	0.03460	0.01600	0.00940	0.00940
AR1068	438000	4743500	0.01580	0.02440	0.04180	0.04330	0.04820	0.04710	0.03980	0.03570	0.01650	0.00970	0.00970
AR1069	438500	4743500	0.01630	0.02530	0.04330	0.04490	0.04980	0.04860	0.04100	0.03680	0.01690	0.00980	0.00980

AR1070	439000	4743500	0.01820	0.02760	0.04710	0.04880	0.05360	0.05180	0.04390	0.03940	0.01720	0.00990	0.00990
AR1071	439500	4743500	0.02030	0.03000	0.05130	0.05290	0.05780	0.05530	0.04690	0.04230	0.01760	0.01010	0.01010
AR1072	440000	4743500	0.02270	0.03280	0.05580	0.05690	0.06190	0.05870	0.04950	0.04470	0.01820	0.01030	0.01030
AR1073	440500	4743500	0.02430	0.03520	0.05960	0.06020	0.06550	0.06160	0.05160	0.04650	0.01890	0.01090	0.01090
AR1074	441000	4743500	0.02580	0.03860	0.06450	0.06490	0.06970	0.06540	0.05440	0.04840	0.01980	0.01130	0.01120
AR1075	441500	4743500	0.02770	0.04220	0.06970	0.06970	0.07420	0.06930	0.05760	0.05080	0.02060	0.01170	0.01170
AR1076	442000	4743500	0.02940	0.04550	0.07450	0.07470	0.07910	0.07360	0.06100	0.05350	0.02180	0.01230	0.01230
AR1077	442500	4743500	0.03180	0.04930	0.07840	0.07880	0.08340	0.07810	0.06460	0.05640	0.02310	0.01290	0.01290
AR1078	443000	4743500	0.03340	0.05210	0.08130	0.08240	0.08720	0.08200	0.06820	0.05940	0.02430	0.01350	0.01350
AR1079	443500	4743500	0.03300	0.05320	0.08220	0.08440	0.08930	0.08430	0.07040	0.06090	0.02560	0.01420	0.01420
AR1080	444000	4743500	0.03100	0.04990	0.07870	0.08180	0.08840	0.08360	0.06970	0.06080	0.02670	0.01480	0.01480
AR1081	444500	4743500	0.02880	0.04690	0.07520	0.07930	0.08730	0.08360	0.06990	0.06140	0.02820	0.01590	0.01590
AR1082	445000	4743500	0.02720	0.04420	0.07180	0.07710	0.08680	0.08370	0.07020	0.06230	0.02960	0.01670	0.01670
AR1083	445500	4743500	0.02540	0.04110	0.06790	0.07620	0.08790	0.08610	0.07190	0.06460	0.03210	0.01800	0.01800
AR1084	446000	4743500	0.02440	0.03870	0.06550	0.07730	0.09180	0.09080	0.07590	0.06920	0.03520	0.01960	0.01960
AR1085	446500	4743500	0.02430	0.03680	0.06530	0.07960	0.09690	0.09640	0.08050	0.07460	0.03860	0.02120	0.02120
AR1086	447000	4743500	0.02390	0.03580	0.06610	0.08250	0.10200	0.10200	0.08480	0.07930	0.04220	0.02270	0.02270
AR1087	447500	4743500	0.02280	0.03510	0.06810	0.08590	0.10700	0.10700	0.08910	0.08330	0.04560	0.02440	0.02440
AR1088	448000	4743500	0.02150	0.03400	0.06930	0.08680	0.11000	0.11100	0.09330	0.08750	0.04900	0.02710	0.02710
AR1089	448500	4743500	0.02140	0.03390	0.07130	0.08750	0.11600	0.11700	0.10000	0.09440	0.05300	0.03080	0.03080
AR1090	449000	4743500	0.02110	0.03350	0.07270	0.08730	0.12200	0.12400	0.10800	0.10200	0.05700	0.03480	0.03480
AR1091	449500	4743500	0.02070	0.03290	0.07360	0.08630	0.12600	0.12900	0.11400	0.10800	0.06040	0.03850	0.03850
AR1092	450000	4743500	0.02030	0.03220	0.07440	0.08490	0.13000	0.13600	0.12200	0.11600	0.06460	0.04300	0.04300
AR1093	450500	4743500	0.02030	0.03190	0.07290	0.08220	0.12900	0.13800	0.12600	0.12000	0.06790	0.04740	0.04740
AR1094	451000	4743500	0.02040	0.03160	0.07160	0.08160	0.13000	0.14300	0.13000	0.12400	0.07220	0.05190	0.05190
AR1095	451500	4743500	0.02090	0.03220	0.07040	0.08040	0.12900	0.14800	0.13500	0.13000	0.07660	0.05670	0.05670
AR1096	452000	4743500	0.02020	0.03080	0.06730	0.07770	0.12500	0.15600	0.14300	0.13800	0.08140	0.06220	0.06220
AR1097	452500	4743500	0.01960	0.03030	0.06500	0.07500	0.12000	0.16000	0.14700	0.14200	0.08240	0.06400	0.06400
AR1098	453000	4743500	0.01900	0.02970	0.06220	0.07180	0.11400	0.15300	0.14100	0.13600	0.07770	0.06030	0.06030
AR1099	453500	4743500	0.01860	0.02920	0.05930	0.06840	0.10600	0.13900	0.12700	0.12200	0.06880	0.05250	0.05250
AR1100	454000	4743500	0.01830	0.02880	0.05760	0.06620	0.10100	0.12400	0.11200	0.10700	0.06040	0.04540	0.04540
AR1101	454500	4743500	0.01810	0.02830	0.05710	0.06520	0.09990	0.12300	0.11100	0.10700	0.06020	0.04560	0.04560
AR1102	455000	4743500	0.01780	0.02790	0.05680	0.06510	0.09910	0.12100	0.11000	0.10500	0.05950	0.04480	0.04480
AR1103	455500	4743500	0.01740	0.02730	0.05630	0.06460	0.09760	0.11700	0.10600	0.10100	0.05770	0.04280	0.04280
AR1104	456000	4743500	0.01710	0.02680	0.05560	0.06390	0.09590	0.11500	0.10300	0.09890	0.05610	0.04130	0.04120
AR1105	456500	4743500	0.01680	0.02620	0.05470	0.06290	0.09410	0.11100	0.10100	0.09600	0.05460	0.03990	0.03980
AR1106	457000	4743500	0.01640	0.02570	0.05370	0.06170	0.09160	0.10900	0.09790	0.09360	0.05310	0.03840	0.03840
AR1107	457500	4743500	0.01610	0.02510	0.05260	0.06040	0.08980	0.10600	0.09560	0.09130	0.05200	0.03760	0.03760
AR1108	437500	4743000	0.01470	0.02260	0.03900	0.04050	0.04490	0.04380	0.03690	0.03320	0.01530	0.00880	0.00880
AR1109	438000	4743000	0.01520	0.02350	0.04040	0.04200	0.04640	0.04510	0.03800	0.03410	0.01560	0.00890	0.00890
AR1110	438500	4743000	0.01610	0.02480	0.04240	0.04400	0.04850	0.04700	0.03970	0.03560	0.01590	0.00910	0.00910
AR1111	439000	4743000	0.01790	0.02690	0.04600	0.04770	0.05240	0.05020	0.04260	0.03830	0.01640	0.00930	0.00930
AR1112	439500	4743000	0.02020	0.02940	0.05030	0.05170	0.05680	0.05390	0.04580	0.04140	0.01720	0.00980	0.00980

AR1113	440000	4743000	0.02180	0.03160	0.05370	0.05460	0.05980	0.05630	0.04740	0.04280	0.01750	0.01000	0.01000
AR1114	440500	4743000	0.02330	0.03410	0.05770	0.05840	0.06360	0.05950	0.04970	0.04460	0.01840	0.01040	0.01040
AR1115	441000	4743000	0.02480	0.03720	0.06240	0.06260	0.06760	0.06290	0.05240	0.04650	0.01920	0.01080	0.01080
AR1116	441500	4743000	0.02650	0.04040	0.06680	0.06710	0.07190	0.06670	0.05540	0.04880	0.02020	0.01130	0.01130
AR1117	442000	4743000	0.02800	0.04330	0.07130	0.07180	0.07660	0.07070	0.05850	0.05130	0.02130	0.01180	0.01180
AR1118	442500	4743000	0.03020	0.04670	0.07470	0.07540	0.08030	0.07440	0.06160	0.05380	0.02230	0.01230	0.01230
AR1119	443000	4743000	0.03160	0.04920	0.07730	0.07860	0.08370	0.07820	0.06500	0.05670	0.02350	0.01300	0.01300
AR1120	443500	4743000	0.03120	0.05020	0.07820	0.08030	0.08550	0.08040	0.06720	0.05830	0.02470	0.01370	0.01370
AR1121	444000	4743000	0.02940	0.04720	0.07490	0.07780	0.08440	0.08000	0.06680	0.05840	0.02590	0.01440	0.01440
AR1122	444500	4743000	0.02750	0.04460	0.07190	0.07550	0.08350	0.07990	0.06700	0.05890	0.02710	0.01540	0.01540
AR1123	445000	4743000	0.02610	0.04220	0.06890	0.07410	0.08350	0.08090	0.06790	0.06030	0.02870	0.01630	0.01630
AR1124	445500	4743000	0.02450	0.03950	0.06550	0.07370	0.08530	0.08380	0.07000	0.06300	0.03130	0.01760	0.01760
AR1125	446000	4743000	0.02330	0.03700	0.06300	0.07400	0.08780	0.08720	0.07280	0.06640	0.03390	0.01890	0.01890
AR1126	446500	4743000	0.02290	0.03520	0.06200	0.07540	0.09140	0.09170	0.07660	0.07080	0.03700	0.02020	0.02010
AR1127	447000	4743000	0.02280	0.03450	0.06390	0.07910	0.09700	0.09720	0.08130	0.07580	0.04010	0.02160	0.02150
AR1128	447500	4743000	0.02190	0.03330	0.06500	0.08150	0.10100	0.10200	0.08500	0.07960	0.04360	0.02340	0.02340
AR1129	448000	4743000	0.02080	0.03240	0.06630	0.08240	0.10500	0.10500	0.08850	0.08300	0.04640	0.02560	0.02560
AR1130	448500	4743000	0.02030	0.03200	0.06770	0.08280	0.11000	0.11100	0.09490	0.08940	0.05010	0.02910	0.02900
AR1131	449000	4743000	0.02010	0.03180	0.06920	0.08290	0.11500	0.11600	0.10100	0.09560	0.05340	0.03230	0.03230
AR1132	449500	4743000	0.01980	0.03140	0.07010	0.08220	0.11800	0.12200	0.10700	0.10200	0.05650	0.03560	0.03560
AR1133	450000	4743000	0.01950	0.03090	0.07100	0.08130	0.12200	0.12700	0.11400	0.10900	0.06030	0.03970	0.03960
AR1134	450500	4743000	0.01910	0.03020	0.06930	0.07810	0.12100	0.12800	0.11600	0.11100	0.06300	0.04350	0.04340
AR1135	451000	4743000	0.01900	0.02990	0.06780	0.07650	0.12100	0.13100	0.11900	0.11300	0.06610	0.04700	0.04700
AR1136	451500	4743000	0.01920	0.02970	0.06640	0.07570	0.12000	0.13700	0.12500	0.12000	0.07050	0.05170	0.05170
AR1137	452000	4743000	0.01970	0.03030	0.06510	0.07430	0.11700	0.14200	0.12900	0.12400	0.07320	0.05500	0.05500
AR1138	452500	4743000	0.01900	0.02890	0.06210	0.07150	0.11200	0.14300	0.13100	0.12600	0.07310	0.05550	0.05550
AR1139	453000	4743000	0.01850	0.02850	0.05990	0.06900	0.10700	0.13800	0.12600	0.12100	0.06970	0.05290	0.05290
AR1140	453500	4743000	0.01800	0.02800	0.05730	0.06600	0.10100	0.12800	0.11600	0.11100	0.06330	0.04750	0.04750
AR1141	454000	4743000	0.01760	0.02750	0.05560	0.06380	0.09590	0.11600	0.10400	0.09970	0.05610	0.04140	0.04140
AR1142	454500	4743000	0.01740	0.02720	0.05470	0.06260	0.09380	0.11100	0.10000	0.09550	0.05390	0.03960	0.03960
AR1143	455000	4743000	0.01710	0.02680	0.05420	0.06160	0.09230	0.11000	0.09950	0.09490	0.05350	0.03980	0.03980
AR1144	455500	4743000	0.01690	0.02640	0.05390	0.06140	0.09150	0.10900	0.09820	0.09370	0.05300	0.03910	0.03910
AR1145	456000	4743000	0.01660	0.02590	0.05340	0.06100	0.09010	0.10600	0.09540	0.09100	0.05160	0.03760	0.03750
AR1146	456500	4743000	0.01630	0.02550	0.05270	0.06030	0.08860	0.10400	0.09320	0.08890	0.05030	0.03630	0.03630
AR1147	457000	4743000	0.01600	0.02500	0.05190	0.05940	0.08720	0.10100	0.09090	0.08660	0.04910	0.03520	0.03520
AR1148	457500	4743000	0.01570	0.02450	0.05100	0.05840	0.08510	0.09890	0.08880	0.08460	0.04780	0.03410	0.03400
AR1149	437500	4742500	0.01420	0.02190	0.03780	0.03930	0.04340	0.04210	0.03540	0.03180	0.01450	0.00820	0.00820
AR1150	438000	4742500	0.01460	0.02260	0.03920	0.04080	0.04520	0.04360	0.03680	0.03300	0.01500	0.00850	0.00850
AR1151	438500	4742500	0.01580	0.02420	0.04150	0.04320	0.04790	0.04590	0.03890	0.03500	0.01550	0.00880	0.00880
AR1152	439000	4742500	0.01740	0.02600	0.04500	0.04670	0.05150	0.04890	0.04160	0.03760	0.01600	0.00900	0.00900
AR1153	439500	4742500	0.01960	0.02840	0.04850	0.04980	0.05490	0.05170	0.04370	0.03960	0.01640	0.00940	0.00930
AR1154	440000	4742500	0.02100	0.03020	0.05170	0.05280	0.05820	0.05450	0.04560	0.04130	0.01730	0.00970	0.00970
AR1155	440500	4742500	0.02220	0.03290	0.05600	0.05650	0.06170	0.05730	0.04790	0.04280	0.01790	0.01010	0.01010

AR1156	441000	4742500	0.02380	0.03600	0.06010	0.06070	0.06570	0.06080	0.05060	0.04480	0.01880	0.01050	0.01050
AR1157	441500	4742500	0.02530	0.03880	0.06430	0.06490	0.06990	0.06430	0.05330	0.04700	0.01970	0.01090	0.01090
AR1158	442000	4742500	0.02670	0.04130	0.06840	0.06910	0.07400	0.06820	0.05660	0.04970	0.02090	0.01160	0.01160
AR1159	442500	4742500	0.02860	0.04430	0.07140	0.07220	0.07730	0.07160	0.05940	0.05200	0.02180	0.01210	0.01210
AR1160	443000	4742500	0.03000	0.04660	0.07370	0.07500	0.08020	0.07500	0.06250	0.05470	0.02290	0.01270	0.01270
AR1161	443500	4742500	0.02960	0.04750	0.07450	0.07650	0.08170	0.07710	0.06450	0.05610	0.02400	0.01340	0.01340
AR1162	444000	4742500	0.02800	0.04480	0.07150	0.07420	0.08080	0.07690	0.06440	0.05650	0.02510	0.01420	0.01420
AR1163	444500	4742500	0.02630	0.04240	0.06880	0.07260	0.08040	0.07720	0.06470	0.05710	0.02640	0.01500	0.01500
AR1164	445000	4742500	0.02500	0.04040	0.06620	0.07150	0.08100	0.07880	0.06610	0.05880	0.02810	0.01600	0.01600
AR1165	445500	4742500	0.02360	0.03800	0.06340	0.07130	0.08260	0.08140	0.06800	0.06130	0.03050	0.01710	0.01710
AR1166	446000	4742500	0.02210	0.03540	0.06040	0.07070	0.08380	0.08360	0.06970	0.06350	0.03270	0.01810	0.01810
AR1167	446500	4742500	0.02140	0.03340	0.05950	0.07210	0.08720	0.08750	0.07320	0.06760	0.03550	0.01920	0.01920
AR1168	447000	4742500	0.02130	0.03200	0.06050	0.07470	0.09210	0.09220	0.07740	0.07240	0.03860	0.02080	0.02080
AR1169	447500	4742500	0.02100	0.03150	0.06210	0.07740	0.09660	0.09670	0.08110	0.07610	0.04160	0.02240	0.02240
AR1170	448000	4742500	0.02010	0.03090	0.06340	0.07840	0.10000	0.10000	0.08490	0.07980	0.04430	0.02460	0.02460
AR1171	448500	4742500	0.01920	0.03020	0.06440	0.07850	0.10500	0.10500	0.09000	0.08480	0.04750	0.02750	0.02750
AR1172	449000	4742500	0.01910	0.03020	0.06590	0.07880	0.10900	0.11000	0.09590	0.09070	0.05050	0.03040	0.03040
AR1173	449500	4742500	0.01890	0.02990	0.06690	0.07840	0.11200	0.11500	0.10100	0.09590	0.05320	0.03320	0.03320
AR1174	450000	4742500	0.01870	0.02950	0.06780	0.07780	0.11600	0.12000	0.10800	0.10200	0.05720	0.03740	0.03740
AR1175	450500	4742500	0.01840	0.02900	0.06640	0.07460	0.11400	0.12000	0.10800	0.10300	0.05890	0.04030	0.04030
AR1176	451000	4742500	0.01800	0.02840	0.06470	0.07240	0.11300	0.12100	0.11000	0.10500	0.06120	0.04320	0.04320
AR1177	451500	4742500	0.01790	0.02810	0.06310	0.07130	0.11200	0.12700	0.11600	0.11100	0.06510	0.04740	0.04740
AR1178	452000	4742500	0.01810	0.02790	0.06170	0.07020	0.11000	0.13000	0.11800	0.11400	0.06690	0.04950	0.04950
AR1179	452500	4742500	0.01860	0.02850	0.06040	0.06880	0.10500	0.13000	0.11800	0.11400	0.06600	0.04930	0.04930
AR1180	453000	4742500	0.01790	0.02720	0.05750	0.06610	0.10100	0.12500	0.11400	0.11000	0.06310	0.04710	0.04710
AR1181	453500	4742500	0.01740	0.02690	0.05540	0.06370	0.09610	0.11800	0.10700	0.10300	0.05840	0.04320	0.04320
AR1182	454000	4742500	0.01700	0.02640	0.05320	0.06110	0.09040	0.10900	0.09780	0.09340	0.05240	0.03810	0.03810
AR1183	454500	4742500	0.01670	0.02600	0.05180	0.05940	0.08750	0.10200	0.09160	0.08720	0.04880	0.03540	0.03540
AR1184	455000	4742500	0.01650	0.02580	0.05160	0.05880	0.08690	0.10200	0.09150	0.08710	0.04890	0.03580	0.03580
AR1185	455500	4742500	0.01630	0.02540	0.05150	0.05840	0.08580	0.10100	0.09060	0.08630	0.04860	0.03550	0.03550
AR1186	456000	4742500	0.01600	0.02510	0.05120	0.05810	0.08510	0.09910	0.08910	0.08490	0.04790	0.03470	0.03470
AR1187	456500	4742500	0.01580	0.02470	0.05080	0.05770	0.08370	0.09660	0.08670	0.08250	0.04660	0.03340	0.03330
AR1188	457000	4742500	0.01550	0.02430	0.05010	0.05710	0.08240	0.09480	0.08500	0.08090	0.04560	0.03240	0.03240
AR1189	457500	4742500	0.01530	0.02380	0.04940	0.05630	0.08130	0.09270	0.08300	0.07900	0.04470	0.03160	0.03150

APPENDIX D-1

RESRAD DATA INPUT BASIS PARAMETERS

Radium Benchmark Dose Assessment

For

Ludeman Uranium In-situ Recovery Facility

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Radium Benchmark Dose Assessment

1.0 Introduction

On April 12, 1999, the U.S. Nuclear Regulatory Commission (NRC) issued a Final Rule (64 FR 17506) that requires the use of the existing soil radium standard to derive a dose criterion for the cleanup of byproduct material. The amendment to Criterion 6(6) of 10 CFR Part 40, Appendix A was effective on June 11, 1999. This "benchmark approach" requires that NRC licensees model the site-specific dose from the existing radium standard and then use that dose to determine the allowable quantity of other radionuclides that would result in a similar dose to the average member of the critical group. These determinations must then be submitted to NRC with the site reclamation plan or included in license applications. This report documents the modeling and assumptions made by Uranium One, Americas (UOA) to derive a standard for U-nat in soil for the proposed Ludeman in-situ uranium recovery (LISR) facility.

Concurrent with publication of the Final Rule, NRC published draft guidance (64 FR 17690) for performing the benchmark dose modeling required to implement the final rule. Final guidance (NRC, 2003) was published as Appendix E to the Standard Review Plan for In Situ Leach License Applications (NUREG-1569). This guidance discusses acceptable models and input parameters. This guidance, guidance from the RESRAD Users Manual (ANL, 2001), the Data Collection Handbook (ANL, 1993) and site-specific parameters were used in the modeling as discussed in the following sections.

2.0 Determination of Radium Benchmark Dose

RESRAD Version 6.4 computer code (RESRAD) was used to model the LISR site and calculate the maximum annual dose rate from the current radium cleanup standard.

The following supporting documentation for determination of the radium benchmark dose and the natural uranium soil standard (explained in Section 3.0) is attached:

- The RESRAD Data Input Basis (Attachment 1) provides a summary of the modeling performed with RESRAD and the values that were used for the input parameters. A sensitivity analysis was performed for parameters which are important to the major component dose pathways and for which no site specific data was available.
- Selected graphs produced with RESRAD that present the results of the sensitivity analysis performed on the input parameters are attached (Attachment 2).
- A full printout of the final RESRAD modeling results for the resident farmer scenario with the chosen input values is attached (Attachments 3.0 and 3.1). The printout provides the modeled maximum annual dose for calculated times for the 1,000-year time span and provides a breakdown of the fraction of dose due to each pathway.
- Graphs produced with RESRAD that present the modeling results for the maximum dose during the 1,000 year time span for radium-226 and natural uranium. A series of graphs depicting the summed dose for all pathways and the component pathways that contributes to the total dose are attached (Attachments 4.0 and 4.1).

The maximum dose from Ra-226 contaminated soil at the 5 pCi/g above background cleanup standard, as determined by RESRAD, for the residential farmer scenario was 39.6 mrem/yr. This dose was based upon the 5 pCi/g surface (0 to 6-inch) Ra-226 standard and was noted at time, t = 0 years. The two major dose pathways were external exposure and plant ingestion (water independent). For these two pathways, a sensitivity analysis was performed for important parameters for which no site specific information was available. The 39.6 mrem/yr dose from radium is the level at which the natural uranium radiological end point soil standard will be based as described in the following section.

3.0 Determination of Natural Uranium Soil Standard

RESRAD was used to determine the concentration of natural uranium (U-nat) in soil distinguishable from background that would result in a maximum dose of 39.6 mrem/yr.

The method involved modeling the dose from a set concentration of U-nat in soil. This dose was then compared to the radium benchmark dose and scaled to arrive at the maximum allowable U-nat concentration in soil.

For ease of calculations, a preset concentration of 100 pCi/g U-nat was used for modeling the dose. The fractions used were 49.2 percent (or pCi/g) U-234, 48.6 percent (or pCi/g) U-238 and 2.2 percent (or pCi/g) U-235. The distribution coefficients that were selected for each radionuclide were RESRAD default values. A sensitivity analysis was performed using a range of distribution coefficients to evaluate potential effects of not using site specific data. All other input parameters were the same as those used in the Ra-226 benchmark modeling.

Using a U-nat concentration in soil of 100 pCi/g, RESRAD determined a maximum dose of 6.9 mrem/yr. at time, t = 0 years. The printout of the RESRAD data summary is provided in Attachment 3.1 and the dose figures generated with RESRAD are provided in Attachment 4.1.

To determine the uranium soil standard, the following formula was used:

$$\text{Uranium Limit} = \left(\frac{100\ \text{pCi/g U - nat}}{6.9\ \text{mrem/yr U - nat dose}}\right) \text{x } 39.6\ \text{mrem/yr radium benchmark dose}$$

$$\text{Uranium Limit} = 574\ \text{pCi/g U - nat}$$

The U-nat limit is applied to soil cleanup with the Ra-226 limit using the unity rule. To determine whether an area exceeds the cleanup standards, the standards are applied according to the following formula:

$$\left(\frac{\text{Soil Uranium Concentration}}{\text{Soil Uranium Limit}}\right) + \left(\frac{\text{Soil Radium Concentration}}{\text{Soil Radium Limit}}\right) < 1$$

This approach will be used at the LISR site to determine the radiological impact on the environment from releases of source and byproduct materials.

3.1 Uranium Chemical Toxicity Assessment

The chemical toxicity effects from uranium exposure are evaluated by assuming the same exposure scenario as that used for the radiation dose assessment. In the benchmark dose assessment for the resident farmer scenario, it was assumed that the diet consisted of 25 percent of the meat, fruits, and vegetables grown at the site. No intake of contaminated food through the aquatic or milk pathways was considered probable since it is unlikely the Ludeman area could support this activity with local vegetation. Also, the model showed that the contamination would not affect the groundwater quality. Therefore, the same model will be used in assessing the chemical toxicity. The intake from eating meat was shown to be negligible compared to the plant pathway and therefore is not shown here. This is confirmed by the results of the RESRAD calculations shown in Attachment 3.1 and the figures generated with RESRAD shown in Attachment 4.1.

The method and parameters for estimating the human intake of uranium from ingestion are taken from NUREG/CR-5512 Vol. 1 (NRC, 1992). The uptake of uranium in food is a product of the uranium concentration in soil and the soil-to-plant conversion factor. The annual intake in humans is then calculated by multiplying the annual consumption by the uranium concentration in the food. Since the soil-plant conversion factor is based on a dry weight, the annual consumption must be adjusted to a dry-weight basis by multiplying by the dry-weight to wet-weight ratio. Parameters for these calculations are given in Section 6.5.9 of the NUREG/CR-5512 Vol. 1 (NRC, 1992). Table 3-1 provides the parameters used in these calculation and results for leafy vegetables, other vegetables, and fruit. Annual intakes of 14 kg/year and 97 kg/year were assumed for leafy vegetables and other vegetables and fruit, respectively. Consistent with Attachment 3.1 dose calculations, it was assumed that 25 percent of the food was grown on the site. It was also assumed that the uranium concentration in the garden or orchard was 574 pCi/g. This corresponds to the uranium benchmark concentration for surface soils. Using a

conversion factor for U-nat of 1 mg = 677 pCi, then 574 pCi/g is equivalent to 848 mg/kg. The human intake shown in the first column of Table 3-1 is equal to the product of the parameters given in the subsequent columns. Table 3-1 shows that the total annual uranium intake from all food sources from the site is 56 mg/yr.

The two-compartment model of uranium toxicity in the kidney from oral ingestion was used (ICRP, 1995) to predict the burden of uranium in the kidney following chronic uranium ingestion. This model allows for the distribution of the two forms of uranium in the blood, and consists of a kidney with two compartments, as well as several other compartments for uranium distribution, storage and elimination including the skeleton, liver, red blood cells and other soft tissues.

Table 3-1: Annual Intake of Uranium from Ingestion

Human Intake (mg/yr)	Soil Concentration (mg/kg)	Soil to Plant Ratio (mg/kg plant to mg/kg soil)	Annual Consumption (kg)	Dry Weight Wet Weight Ratio	Food Source
10.1	848	1.7E-2	3.5	0.2	Leafy Vegetables
38.6	848	1.4E-2	13	0.25	Other Vegetables
7.3	848	4.0E-3	12	0.18	Fruit
56.0					Total

The total burden to the kidney is the sum of the two compartments. The mathematical representation for the kidney burden of uranium at steady state can be derived as follows (ICRP, 1995):

$$Q_P = \frac{IR \times f_1}{\lambda_P \left(1 - f_{ps} - f_{pr} - f_{pl} - f_{pk} - f_{pk1}\right)}$$

Where:

Q_P = uranium burden in the plasma, μg

IR = dietary consumption rate, mg U/d

f_l = fractional transfer of uranium from GI tract to blood, unit less

f_{ps} = fractional transfer of uranium from plasma to skeleton, unit less

f_{pr} = fractional transfer of uranium from plasma to red blood cells, unit less

f_{pl} = fractional transfer of uranium from plasma to liver, unit less

f_{pt} = fractional transfer of uranium from plasma to soft tissue, unit less

f_{pk1} = fractional transfer of uranium from plasma to kidney, compartment 1, unit less

λ_p = biological retention constant in the plasma, d^{-1}

The burden in kidney compartment 1 is:

$$Q_{k1} = \lambda_P \times Q_P \times \frac{f_{pk1}}{\lambda_{k1}}$$

Where:

Q_{k1} = uranium burden in kidney compartment 1, mg

λ_{k1} = biological retention constant of uranium in kidney compartment 1, d^{-1}

Similarly, for compartment 2 in the kidney, the burden is:

$$Q_{k2} = \lambda_P \times Q_P \times \frac{f_{pk2}}{\lambda_{k2}}$$

Where:

Q_{k2} = uranium burden in kidney compartment 2, μg;

λ_{k2} = biological retention constant of uranium in kidney compartment 2, d^{-1};

f_{pk2} = fractional transfer of uranium from plasma to kidney compartment 2, unitless.

The total burden to the kidney is then the sum of the two compartments is:

$$Q_{k1} + Q_{k2} = \frac{IR \times f_1}{\left(1 - f_{ps} - f_{pr} - f_{pl} - f_{pt} - f_{pk1}\right)} \times \left(\frac{f_{pk1}}{\lambda_{k1}} + \frac{f_{pk2}}{\lambda_{k2}}\right)$$

The parameter input values for the two-compartment kidney model include the daily intake of uranium estimated for residents at this site, and the ICRP69 values recommended by the ICRP as listed below (ICRP, 1995). The daily uranium intake rate was estimated to be 0.15 mg/day (56.0 mg/year) from ingestion while residing at this site.

$IR = 0.15$ mg/day
$f_1 = 0.02$
$f_{ps} = 0.105$
$f_{pr} = 0.007$
$f_{pl} = 0.0105$
$f_{pt} = 0.347$
$f_{pk1} = 0.00035$
$f_{pk2} = 0.084$
$\lambda_{k1} = \ln(2)/(5 \text{ yrs} * 365 \text{ days/yr})$
$\lambda_{k2} = \ln(2)/7$ days
where $\ln(2) = 0.693\ldots$

Given a daily uranium intake of 0.15 mg/day at this site and the above equation, the calculated uranium in the kidneys is 0.010 mg U, or a concentration of 0.034 μg U/g kidney. This is 3.4 percent of the 1.0 μg U/g value that has generally been understood to protect the kidney from the toxic effects of uranium. Some researchers have suggested that mild effects may be observable at levels as low as 0.1 μg U/g of kidney tissue. Using 0.1 μg U/g as a criterion, then the intake is 34 percent of the level where mild effects may be observable.

The EPA evaluated the chemical toxicity data and found that mild proteinuria has been observed at drinking water levels between 20 and 100 μg/liter. Assuming water intake of 2 liters/day, this corresponds to an intake of 0.04 to 0.2 mg/day. Using animal data and a

conservative factor of 100, the EPA arrived at a 30 μg/liter limit for use as a National Primary Drinking Water Standard (Federal Register/Vol.65, No.236/ December 7, 2000). This is equivalent to an intake of 0.06 mg/day for the average individual. Naturally, since large diverse populations are potentially exposed to drinking water sources regulated using these standards, the EPA is very conservative in developing limits.

This analysis indicates that a soil limit of 574 pCi/g of U-nat would result in an intake of approximately 0.15 mg/day. Using the most conservative daily limit corresponding to the National Primary Drinking Water standard, a soil limit of 230 pCi/g corresponds to the EPA intake limit from drinking water with a uranium concentration of 0.06 mg/day. Therefore exposure to soils containing 230 pCi/g of natural uranium should not result in chemical toxicity effects. Since the roots of a fruit tree would penetrate to a considerable depth, limiting subsurface uranium concentrations to 230 pCi/g will be considered appropriate as well.

4.0 References

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USGS, 2004, *Estimated Use of Water in the United States in 2000*, U.S. Geological Survey, U.S. Department of the Interior, USGS Circular 1268, Reston, Virginia.

APPENDIX D-1

RESRAD DATA INPUT BASIS PARAMETERS

RESRAD Data Input Basis

Parameters

This document summarizes the data input and modeling scenario that was used to determine the radium benchmark dose for the LISR Project. The modeling was performed using RESRAD for Windows Version 6.4 developed by the Environmental Assessment Division at Argonne National Laboratory.

The resident farmer scenario was used since this is the most likely land use near the site. The following sections describe the data parameters that were used to model site-specific conditions.

The data input was based upon five principal sources:

1. The Data Collection Handbook to Support Modeling Impacts of Radioactive Material in Soil (Data Collection Handbook) (ANL, 1993)

2. The NUREG-1569 (NRC, 2003)

3. Site specific information to be included in the LISR license application

4. The Natural Resources Conservation Service (NRCS) 2003 Annual Natural Resources Inventory, State Report (NRCS, 2007)

5. The US Geological Survey (USGS) Circular 1268 (USGS, 2004)

Soil Concentration

1. Lead-210: Used 5.0 pCi/g per the NUREG-1569 (NRC, 2003).

No sensitivity analysis on this parameter was performed based on the guidance.

2. Radium-226: Used 5.0 pCi/g regulatory limit as basis for determining benchmark.

No sensitivity analysis on this parameter was performed based on the regulatory limit.

Distribution Coefficient (K_d)

The soil in the contaminated, unsaturated, and saturated zones are described as clay loam to loamy sand. All values found in the Data Collection Handbook (ANL, 1993).

1. Lead-210: Used the value for loam, 16,000 cm^3/g, for the contaminated, unsaturated, and saturated zones. The Data Collection Handbook specifies the following values (ANL, 1993):

    - Sand = 270 cm^3/g
    - Loam = 16,000 cm^3/g
    - Clay = 550 cm^3/g

Sensitivity analyses were performed on the external and plant (water independent) pathways with a multiple of 100 on the value for the contaminated zone (i.e. 160, 16,000, 1,600,000). No appreciable impacts on maximum dose were found when using the higher or lower K_d. The range of values covers the range of potential values at the site based upon sandy loam and loamy sand soil types. Graphs attached.

2. Radium 226: Used the value for loam, 36,000 cm^3/g, for the contaminated, unsaturated, and saturated zones. The Data Collection Handbook specifies the following values (ANL, 1993):

    - Sand = 500 cm^3/g
    - Loam = 36,000 cm^3/g
    - Clay = 9,100 cm^3/g

Sensitivity analyses were performed on the external and plant (water independent) pathways with a multiple of 100 on the value for the contaminated zone (i.e. 360, 36,000, 3,600,000). No appreciable impacts on maximum dose were found when using the higher or lower K_d. The range of values covers the range of potential values at the site based upon sandy loam and loamy sand soil types. Graphs attached.

Contaminated Zone

1. Area: Used the default value of 10,000 square meters.

Sensitivity analysis was performed on the external pathway with a multiple of 2 (i.e. 5,000, 10,000, and 20,000). There was no impact on maximum dose rate for the external dose pathway when using the larger value. There was a small decrease in maximum dose rate for the external dose pathway when using the smaller value. Therefore the use of the mid-range value for the area is conservative. Graph attached.

2. Thickness: Used 0.15 m (6 inches) based on regulatory requirement.

No sensitivity analysis on this parameter was performed based on the guidance.

3. Length parallel to aquifer flow: Used the default value of 100 meters, based on the square root of a 10,000 square meter contaminated zone.

No sensitivity analysis was performed since water dependent pathways were not significant contributors to dose.

Cover and Contaminated Zone

The topsoil of the area (the contaminated zone) is described as clay loam to loamy sand.

1. Cover depth: Used 0 meters in accordance with NUREG-1569 (NRC, 2003).

No sensitivity analysis on this parameter was performed based on the guidance.

2. Density of contaminated zone: Used the average density of the contaminated zone, 1.50 g/cm^3, based on site specific data.

No sensitivity analysis was performed because the value is site specific.

3. Contaminated zone erosion rate: Used the erosion rates for Wyoming listed in the NRCS 2003 National Resources Inventory, State Report (NCRS, 2007) to calculate the erosion rate. The erosion rates listed for Wyoming are 0.5 tons/acre-year from water erosion and 3.2 tons/acre-year from wind erosion (3.7 tons/acre-year total). Using the contaminated zone soil density (1.50 g/cm^3), the total erosion rate was calculated as shown below and used in RESRAD.

$$\text{Erosion Rate (m/yr)} = \frac{3.7\ \text{ton}}{\text{acre - yr}} \times \frac{9.07 \times 10^5\ \text{g}}{\text{ton}} \times \frac{\text{acre}}{4.047 \times 10^7\ \text{cm}^2} \times \frac{\text{cm}^3}{1.50\ \text{g}} \times \frac{\text{m}}{100\ \text{cm}} = 0.0006$$

Sensitivity analyses of the external and plant (water independent) pathways were performed with a multiple of 2 (i.e. 0.0012, 0.0006, and 0.0003). The maximum dose rate from the external pathway did not change when the value was changed. The maximum dose rate from the plant (water independent) pathway decreased slightly when using the smaller value. Also, the mid-range value is based on information specific to Wyoming. Therefore the mid-range value is both adequate for the model and conservative. Graph attached.

4. Contaminated zone total porosity: Used the average total porosity of the contaminated zone, 0.25, based on site specific data.

No sensitivity analysis was performed because the value is site specific.

5. Contaminated zone field capacity: Used the value obtained from subtracting the effective porosity of the contaminated zone from the total porosity of the contaminated zone, 0.06. The value used for the effective porosity of the contaminated zone was the average of the mean effective porosities for clay and sand (medium) listed in the Data Collection Handbook, 0.19 (ANL, 1993).

No sensitivity analysis was performed since water dependent pathways were not significant contributors to dose.

6. Contaminated zone hydraulic conductivity: Used the average of the representative hydraulic conductivity values for clay loam and loamy sand listed in the Data Collection Handbook, 2.47 x 10^4 m/yr (ANL, 1993).

No sensitivity analysis was performed since water dependent pathways were not significant contributors to dose.

7. Contaminated zone b parameter: Used the average of the b parameters for clay loam and loamy sand listed in the Data Collection Handbook, 6.45 (ANL, 1993).

No sensitivity analysis was performed since water dependent pathways were not significant contributors to dose.

8. Evapotranspiration Coefficient: Used the maximum evapotranspiration coefficient, 0.999, based on site specific data.

No sensitivity analysis was performed because the value is site specific.

9. Wind Speed: Used the average wind speed, 5.77 m/s, based on site specific data.

No sensitivity analysis was performed because the value is site specific.

10. Precipitation: Used the precipitation rate, 0.29 m/yr, based on site specific data.

No sensitivity analysis was performed because the value is site specific.

11. Irrigation Rate: Used the average irrigation rate for Wyoming listed in the USGS Circular 1268, 1.33 m/yr (4.36 ft/yr) (USGS, 2004).

No sensitivity analysis was performed since water dependent pathways were not significant contributors to dose.

12. Runoff Coefficient: From the Data Collection Handbook, the equation for runoff coefficient for an agricultural environment is shown below (ANL, 1993).

$$\text{Runoff Coefficient} = 1 - c_1 - c_2 - c_3$$

The values of c_1, c_2, and c_3 used were 0.2 (rolling land), 0.2 (intermediate combinations of clay and loam), and 0.1 (cultivated lands), respectively. The resulting runoff coefficient used is 0.5.

No sensitivity analysis was performed since water dependent pathways were not significant contributors to dose.

13. Watershed Area for Nearby Stream or Pond: Used the default value of 1,000,000 m^2.

No sensitivity analysis was performed since water dependent pathways were not significant contributors to dose.

14. Accuracy: Used the default value of 0.001.

No sensitivity analysis was performed since water dependent pathways were not significant contributors to dose.

Saturated Zone

1. Density of saturated zone: Used the average density of the saturated zone, 1.50 g/cm^3, based on site specific data.

No sensitivity analysis was performed because the value is site specific.

2. Saturated zone total porosity: Used the average total porosity of the contaminated zone, 0.25, based on site specific data.

No sensitivity analysis was performed because the value is site specific.

3. Saturated zone effective porosity: Used the value of 0.19 obtained from the average of the mean effective porosities for clay and sand (medium) listed in the Data Collection Handbook, 0.19 (ANL, 1993).

No sensitivity analysis was performed since water dependent pathways were not significant contributors to dose.

4. Saturated zone field capacity: Used the value obtained from subtracting the effective porosity of the saturated zone from the total porosity of the saturated zone, 0.06.

No sensitivity analysis was performed since water dependent pathways were not significant contributors to dose.

5. Saturated zone hydraulic conductivity: Used the average of the representative hydraulic conductivity values for clay loam and loamy sand listed in the Data Collection Handbook, 2.47 x 10^4 m/yr (ANL, 1993).

No sensitivity analysis was performed since water dependent pathways were not significant contributors to dose.

6. Saturated zone hydraulic gradient: Used the default value of 0.02.

No sensitivity analysis was performed since water dependent pathways were not significant contributors to dose.

6. Saturated zone b parameter: Used the average of the b parameters for clay loam and loamy sand listed in the Data Collection Handbook, 6.45 (ANL, 1993).

No sensitivity analysis was performed since water dependent pathways were not significant contributors to dose.

7. Water Table Drop Rate: Used the default value of 0.001 m/yr.

No sensitivity analysis was performed since water dependent pathways were not significant contributors to dose.

8. Well Pump Intake Depth: Used the site specific value of 54.9 m.

No sensitivity analysis was performed because the site specific value is used.

10. Model for Water Transport Parameters: Used non-dispersion per NUREG-1569 (NRC, 2003).

No sensitivity analysis on this parameter was performed based on the guidance.

11. Well Pumping Rate: Used the default value of 250 m^3/yr.

No sensitivity analysis was performed since water dependent pathways were not significant contributors to dose.

Unsaturated Zone

1. Unsaturated zone thickness: Used the site specific value of 53.3 m.

No sensitivity analysis was performed because the value is site specific.

2. Density of unsaturated zone: Used the average density of the saturated zone, 1.50 g/cm^3, based on site specific data.

No sensitivity analysis was performed because the value is site specific.

3. Unsaturated zone total porosity: Used the average total porosity of the contaminated zone, 0.25, based on site specific data.

No sensitivity analysis was performed because the value is site specific.

4. Unsaturated zone effective porosity: Used the value of 0.19 obtained from the average of the mean effective porosities for clay and sand (medium) listed in the Data Collection Handbook, 0.19 (ANL, 1993).

No sensitivity analysis was performed since water dependent pathways were not significant contributors to dose.

5. Unsaturated zone field capacity: Used the value obtained from subtracting the effective porosity of the unsaturated zone from the total porosity of the unsaturated zone, 0.06.

No sensitivity analysis was performed since water dependent pathways were not significant contributors to dose.

6. Unsaturated zone hydraulic conductivity: Used the average of the representative hydraulic conductivity values for clay loam and loamy sand listed in the Data Collection Handbook, 2.47 x 10^4 m/yr (ANL, 1993).

No sensitivity analysis was performed since water dependent pathways were not significant contributors to dose.

7. Unsaturated zone b parameter: Used the average of the b parameters for clay loam and loamy sand listed in the Data Collection Handbook, 6.45 (ANL, 1993).

No sensitivity analysis was performed since water dependent pathways were not significant contributors to dose.

Occupancy

1. Inhalation Rate: Used the default value of 8,400 m^3/yr.

No sensitivity analysis was performed since inhalation pathways were not significant contributors to dose.

2. Mass Loading for Inhalation: Used the default value of 0.0001 g/m^3.

No sensitivity analysis was performed since inhalation pathways were not significant contributors to dose.

3. Exposure Duration: Used the default value of 30 years.

4. Indoor dust filtration factor: Used the default value of 0.4.

No sensitivity analysis was performed since inhalation pathways were not significant contributors to dose.

5. External gamma shielding factor: Used the value of 0.55. The NUREG-1569 requires that a value between 0.33 and 0.55 be used.

Sensitivity analysis of the external pathway was performed using a multiple of 1.5 (i.e., 0.367, 0.55 and 0.825). Using the lower value resulted in a decrease in the maximum dose rate for the external exposure pathway. Using the higher value resulted in an increase in the maximum dose rate for the external exposure pathway. The value 0.55 is the most conservative value in the range specified by the NUREG-1569. Graph attached.

6. Indoor/Outdoor Fractions: Used the defaults of 0.5 indoors and 0.25 outdoors for farmer scenario in the NUREG-1569 (NRC, 2003).

No sensitivity analyses on these parameters were performed based on the guidance.

7. Shape of contaminated zone: A circular shape was used.

Ingestion: Dietary

1. Consumption Rates:

A. Fruit, vegetable and grain: Used the default value of 160 kg/yr. This value was used based upon EPA estimated consumption. NRC Reg. Guide 1.109 has an estimated consumption for an adult of 190 kg/yr. RESRAD adjusts for contaminated and uncontaminated fractions based upon the size of the contaminated area (ANL, 1993).

B. Leafy vegetable: Used the default value of 14 kg/yr. NRC Reg. Guide 1.109 has an estimated consumption for an adult of 64 kg/yr, while NRC estimates for dose from nuclear power plants uses a consumption rate of 30 kg/yr. RESRAD adjusts

for contaminated and uncontaminated fractions based upon the size of the contaminated area (ANL, 1993).

C. Milk: Used the default value of 92 L/yr.

D. Meat and poultry: Used the default value of 63 kg/yr.

E. Fish/Seafood: Used the default values of 5.4 kg/yr for fish and 0.9 kg/yr for other seafood.

F. Soil ingestion: Used the default value of 36.5 g/yr.

G. Drinking water intake: Used the default value of 510 L/yr (1.4 L/d).

2. Contaminated Fractions:

NUREG-1569 states that for sites with over 25 acres (approximately 10,000 square meters) of contamination, the fraction of diet from contaminated area should be assumed to be 25% (0.25) (NRC, 2003).

No sensitivity analyses on these parameters were performed.

A. Water: Used the value of 0 due to the aquifer being exempt from being used for drinking water.

B. Livestock Water: Used default value of 1 (i.e., 100% is from contaminated water). All current water use for livestock around the site is from private wells and will likely continue to be in the foreseeable future.

C. Irrigation Water: Used the default value of 1 (i.e., 100% is from contaminated water). All current water use for irrigation around the site is from private wells and will likely continue to be in the foreseeable future.

D. Plant food: Used 0.25 as percentage of plant food that is contaminated.

E. Meat: Used 0.25 as percentage of meat that is contaminated.

F. Aquatic food: Used the value of 0 due to the semiarid environment of the site.

G. Milk: Used the value of 0 due to no consumption of locally produced and consumed milk per NUREG-1569 (NRC, 2003).

Ingestion: Nondietary

1. Consumption Rates:

A. Livestock fodder intake for meat: Used the default value of 68 kg/day.

B. Livestock water intake for meat: Used the default value of 50 L/day. According to NRC Regulatory Guide 1.109 (NRC, 1977), the water ingestion rate for beef cattle is 50 L/d.

C. Livestock intake of soil for meat: Used the default value of 0.5 g/day.

D. Mass loading for foliar deposition: Used the default value of 0.0001 g/m^3.

Sensitivity analysis on the plant (water independent) pathway was run with a multiple of 100 (i.e., 0.000001, 0.0001, and 0.01 g/m^3). Using the higher value resulted in a small increase in the maximum dose rate. Using the lower value did not result in a change in the maximum dose rate. According to the Data Collection Handbook, the mid-range

value has been used by the EPA for screening calculations. Therefore the mid-range value is justified for use in the model. Graph attached.

E. Depth of soil mixing layer: Used the default value of 0.15 meters.

F. Depth of roots: Used 0.3 meters as a screening level based upon NUREG-1569. The root depth varies for different plants. For some plants, such as beets, carrots, lettuce, and so forth, it does not extend below about 0.3 m, which is the basis of the NRC guidance. For others, such as fruit trees, the roots may extend 2 or 3 m below the surface. Tap roots for some crops (e.g., alfalfa) can extend to 5 m. Most of the plant roots from which nutrients are obtained, however, usually extend to less than 1 m below the surface.

Sensitivity analysis on the plant (water independent) pathway was run with a multiple of 2 (i.e. 0.15, 0.3, and 0.6). There was a significant impact on the maximum dose. Assumption of a shallow root system increased the dose significantly. The NRC guidance is based on the shallow-rooted plants used for consumption. Therefore, the use of the root depth recommended in the NUREG-1569 in the model is conservative. Graph attached.

G. Groundwater fractional usage:

- Drinking water: Used the value of 0 due to the aquifer being exempt from being used for drinking water.
- Livestock water: Used the default value of 1.
- Irrigation water: Used the default value of 1.

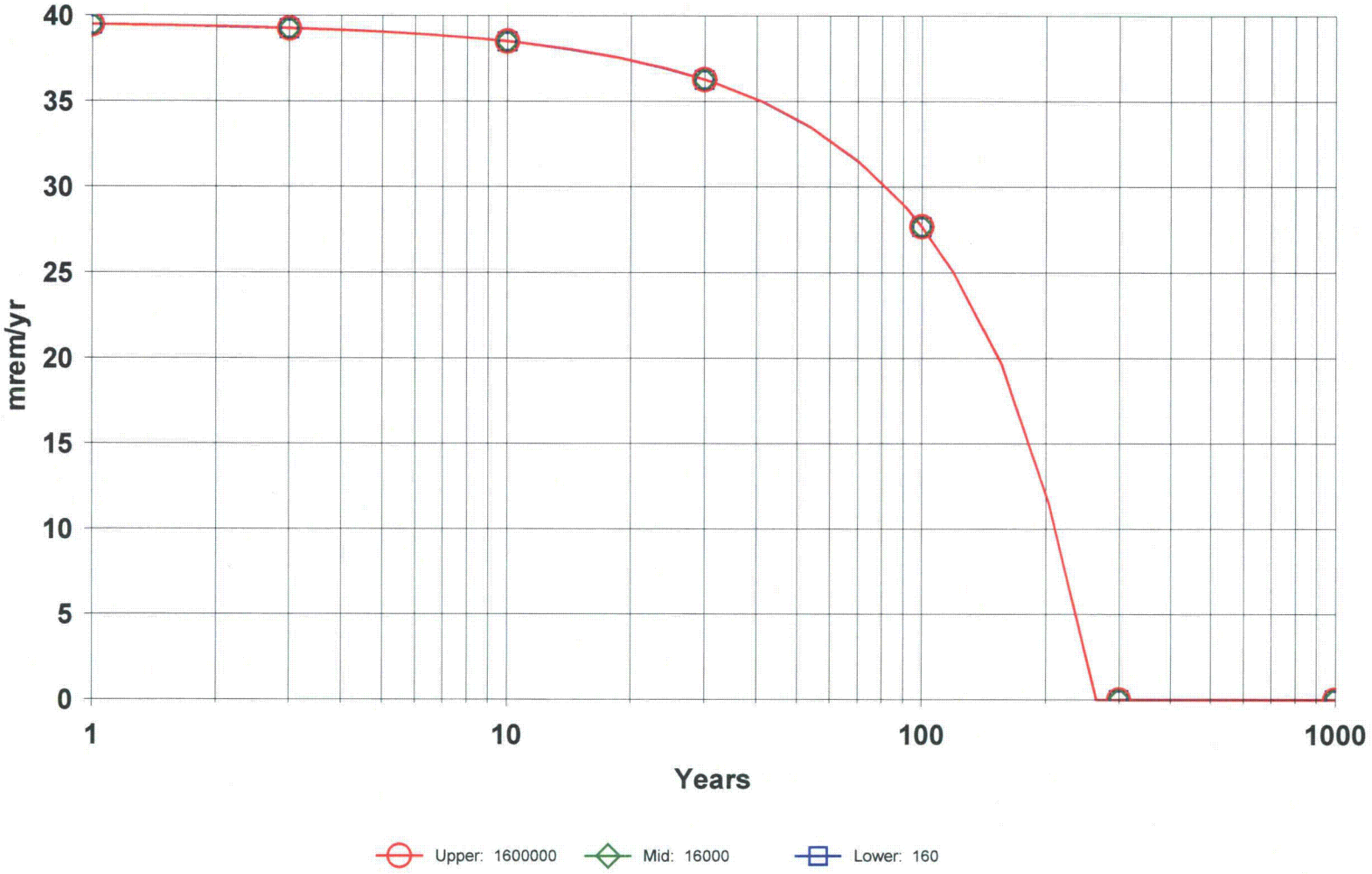
Storage Times

Used the default values for all storage times (vegetables, meats, fodder, etc.).

APPENDIX D-2

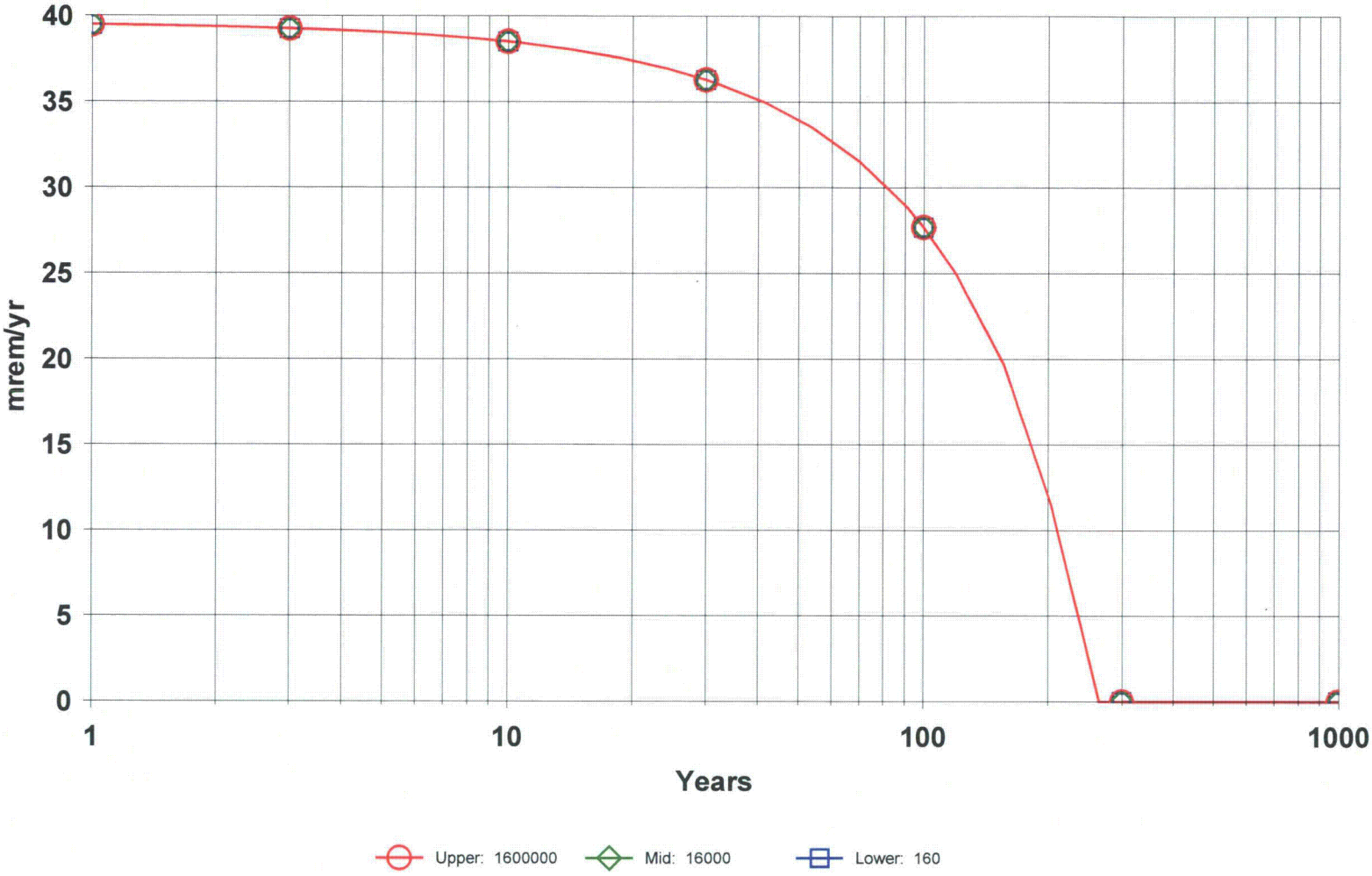
RESRAD INPUT BASIS PARAMETER SENSITIVITY ANALYSIS

DOSE: All Nuclides Summed, All Pathways Summed With SA on Pb-210 Contaminated Zone Distribution Coefficient



C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD 12/10/2008 13:36 GRAPHICS.ASC Includes All Pathways

DOSE: All Nuclides Summed, All Pathways Summed With SA on Pb-210 Saturated Zone Distribution Coefficient



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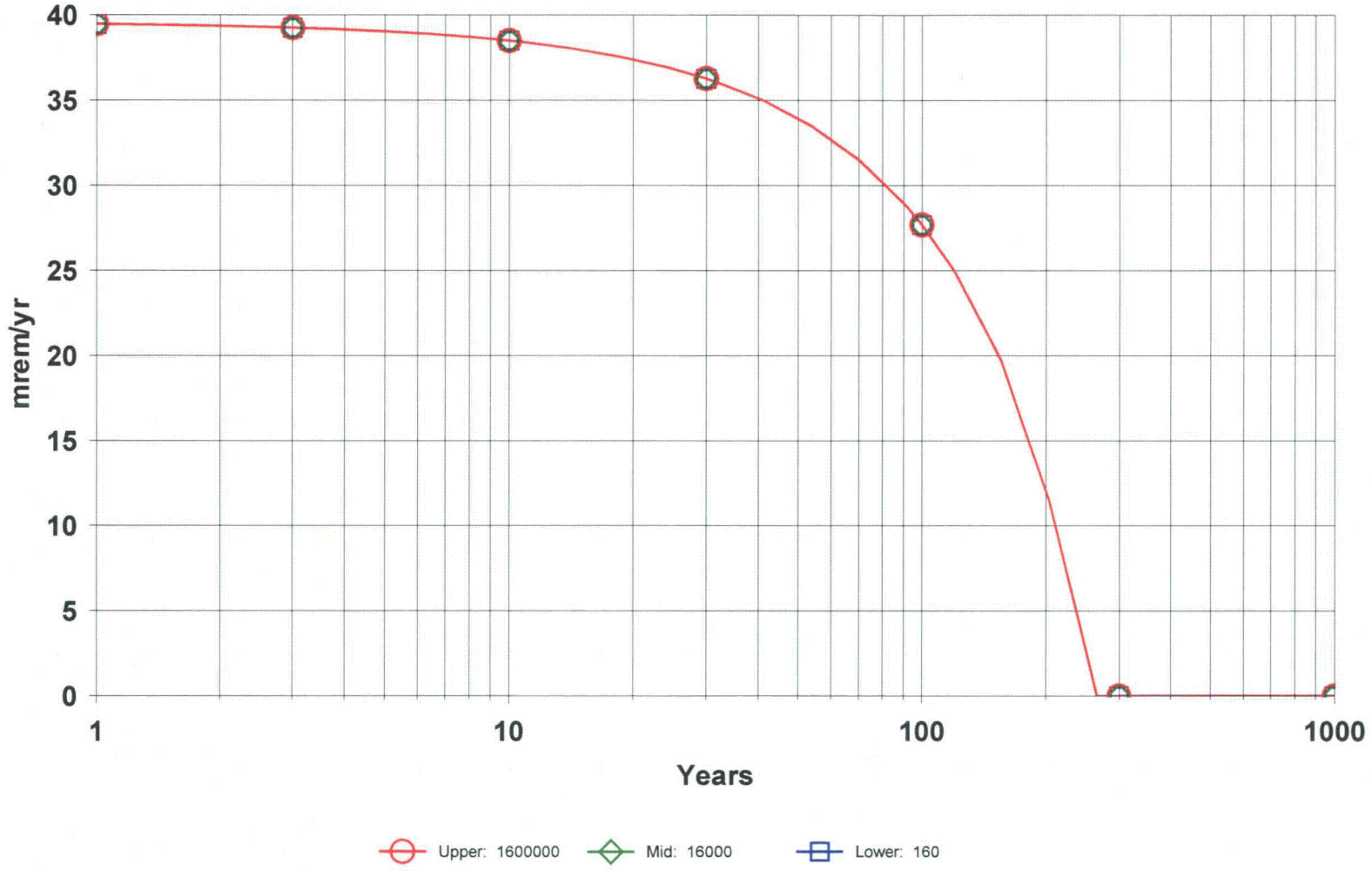
DOSE: All Nuclides Summed, All Pathways Summed With SA on Pb-210 Unsaturated Zone Distribution Coefficient



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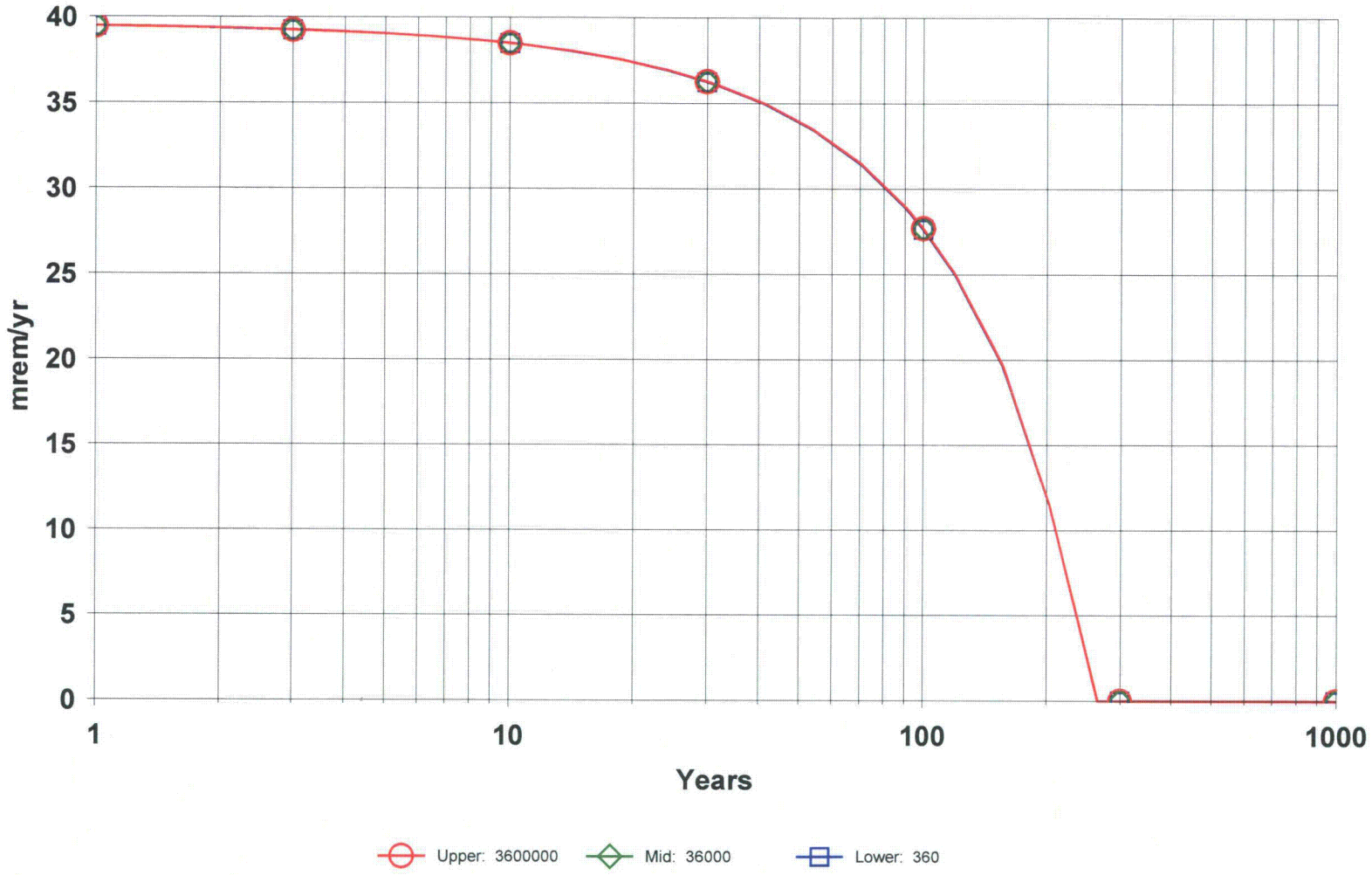
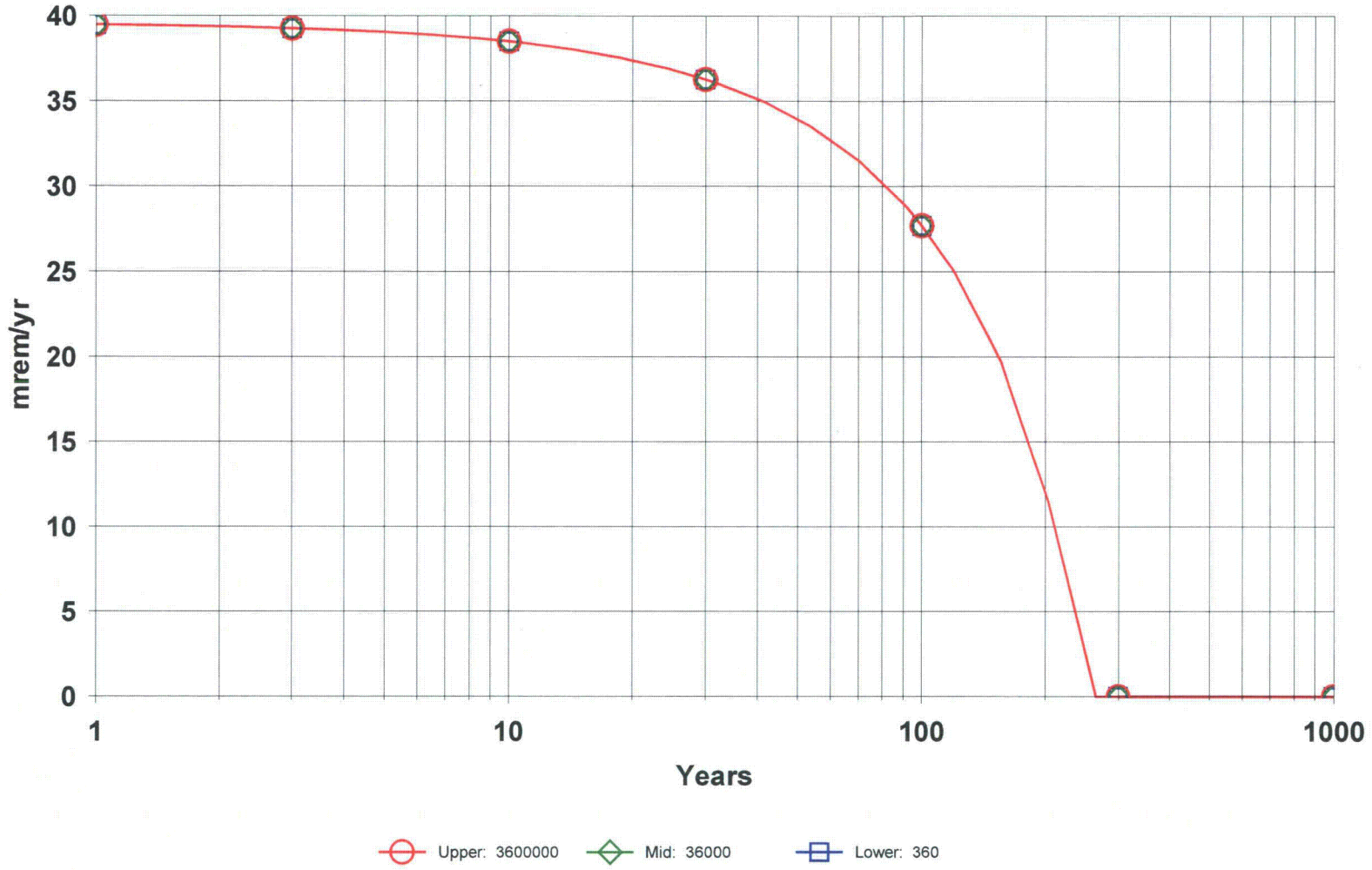
DOSE: All Nuclides Summed, All Pathways Summed With SA on Ra-226 Contaminated Zone Distribution Coefficient



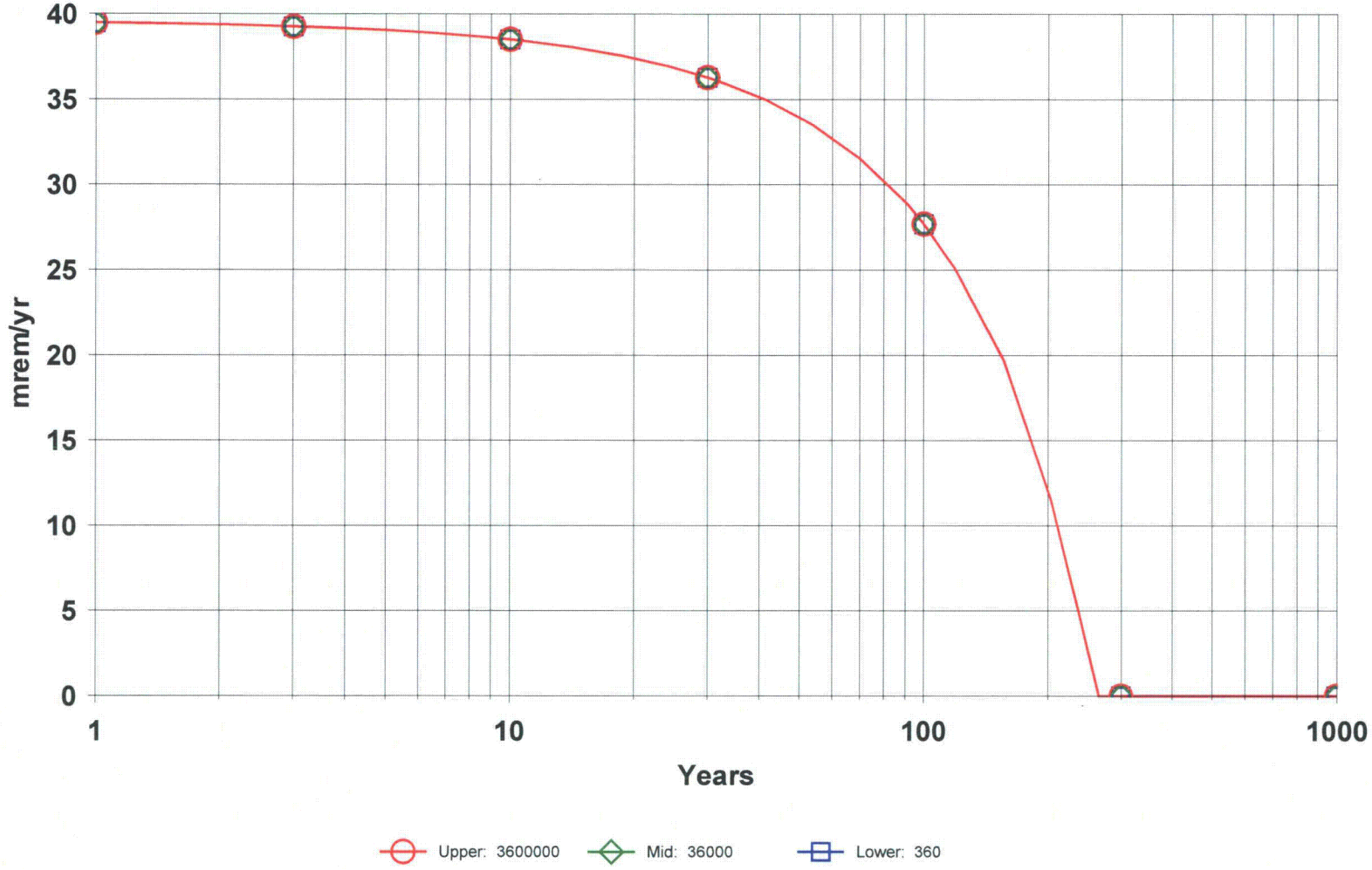
C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD 12/10/2008 13:36 GRAPHICS.ASC Includes All Pathways

DOSE: All Nuclides Summed, All Pathways Summed With SA on Ra-226 Unsaturated Zone Distribution Coefficient



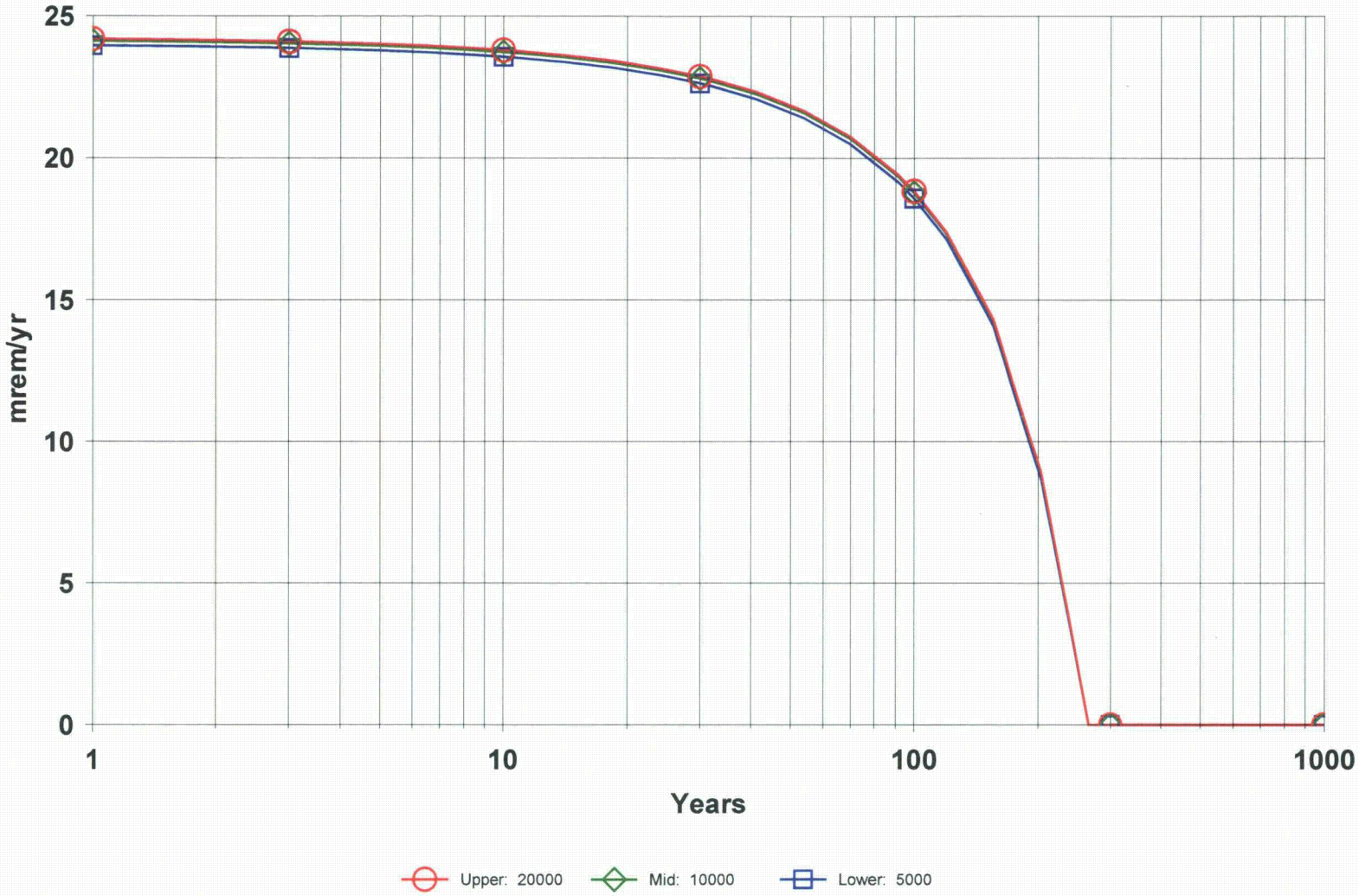
C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD 12/10/2008 13:36 GRAPHICS.ASC Includes All Pathways

DOSE: All Nuclides Summed, All Pathways Summed With SA on Ra-226 Saturated Zone Distribution Coefficient



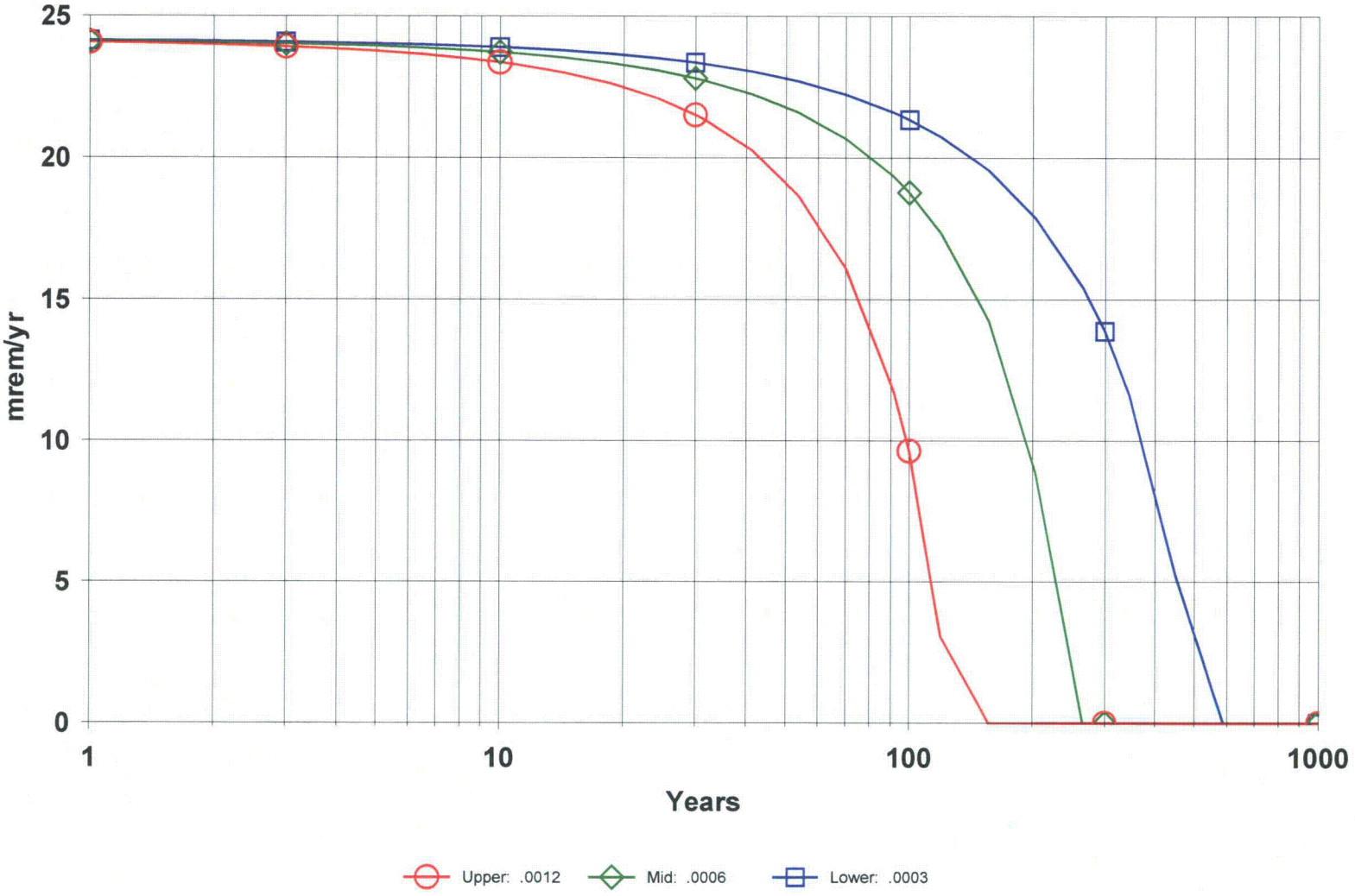
C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD 12/10/2008 15:09 GRAPHICS.ASC Includes All Pathways

DOSE: All Nuclides Summed, External With SA on Area of contaminated zone



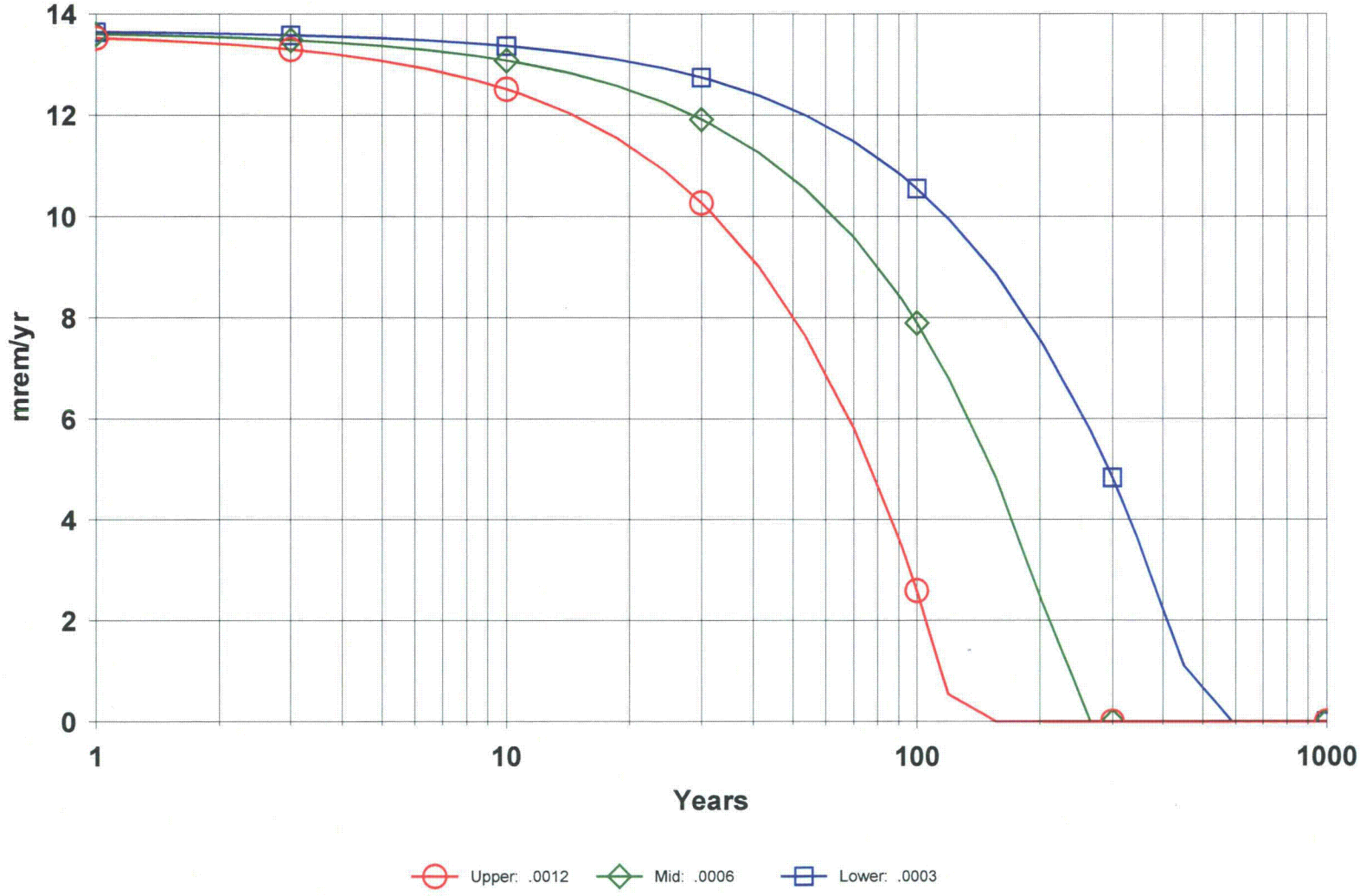
C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD 12/10/2008 15:09 GRAPHICS.ASC Pathways: External

DOSE: All Nuclides Summed, External With SA on Contaminated zone erosion rate



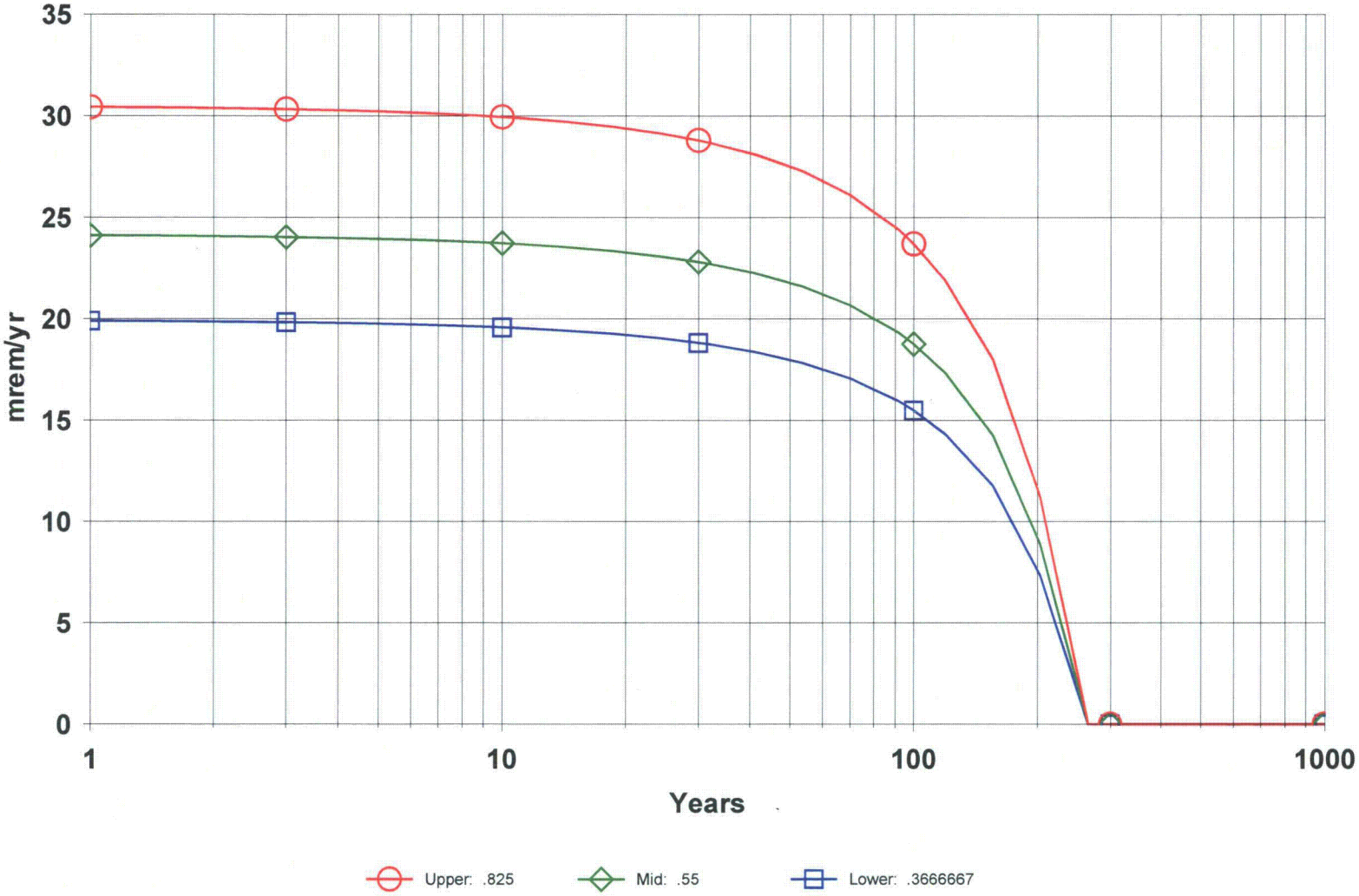
C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD 12/10/2008 15:09 GRAPHICS.ASC Pathways: External

DOSE: All Nuclides Summed, Plant (Water Independent) With SA on Contaminated zone erosion rate



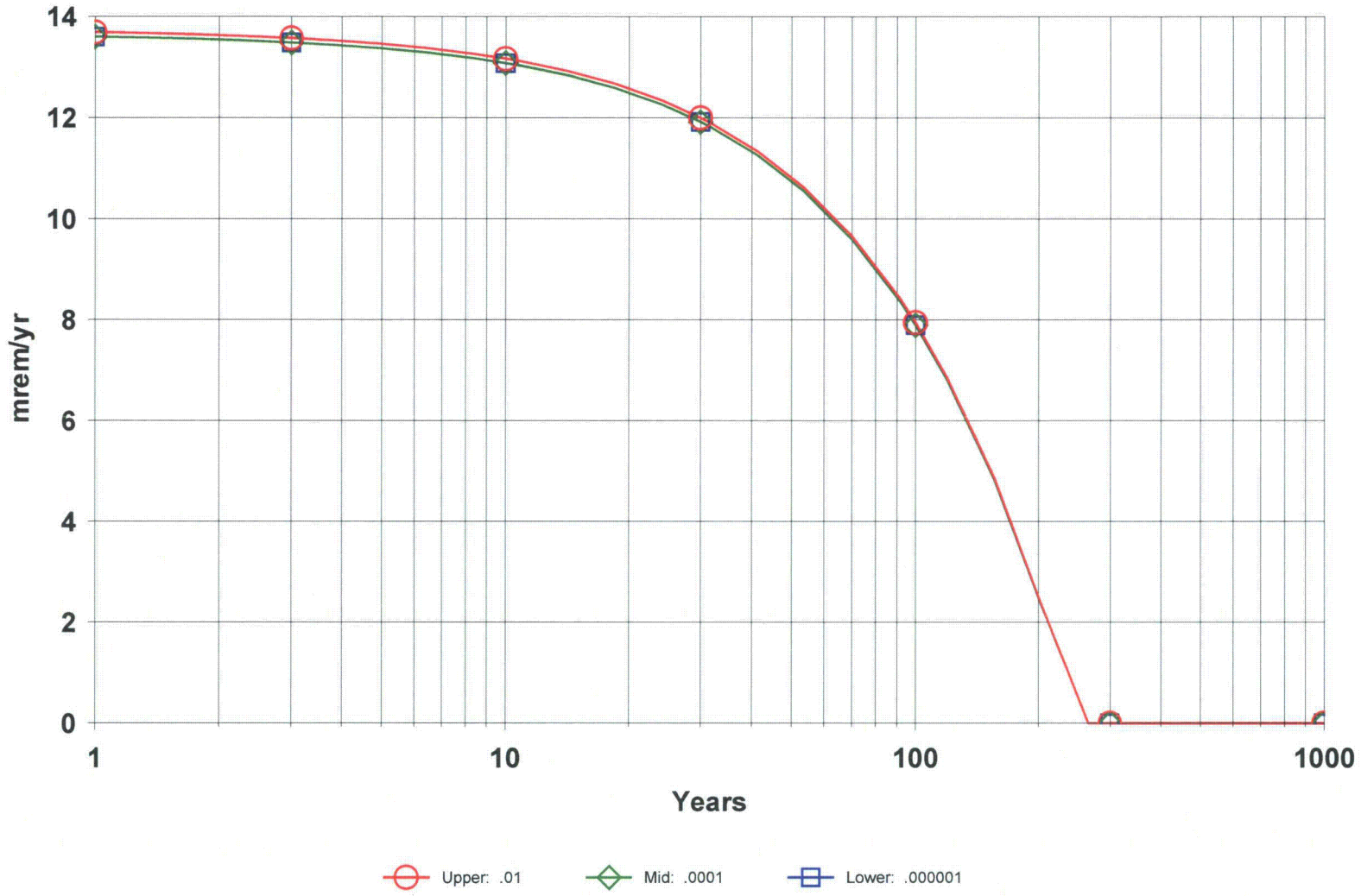
C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD 12/10/2008 15:09 GRAPHICS.ASC Pathways: Plant (Water Independent)

DOSE: All Nuclides Summed, External With SA on External Gamma Shielding factor



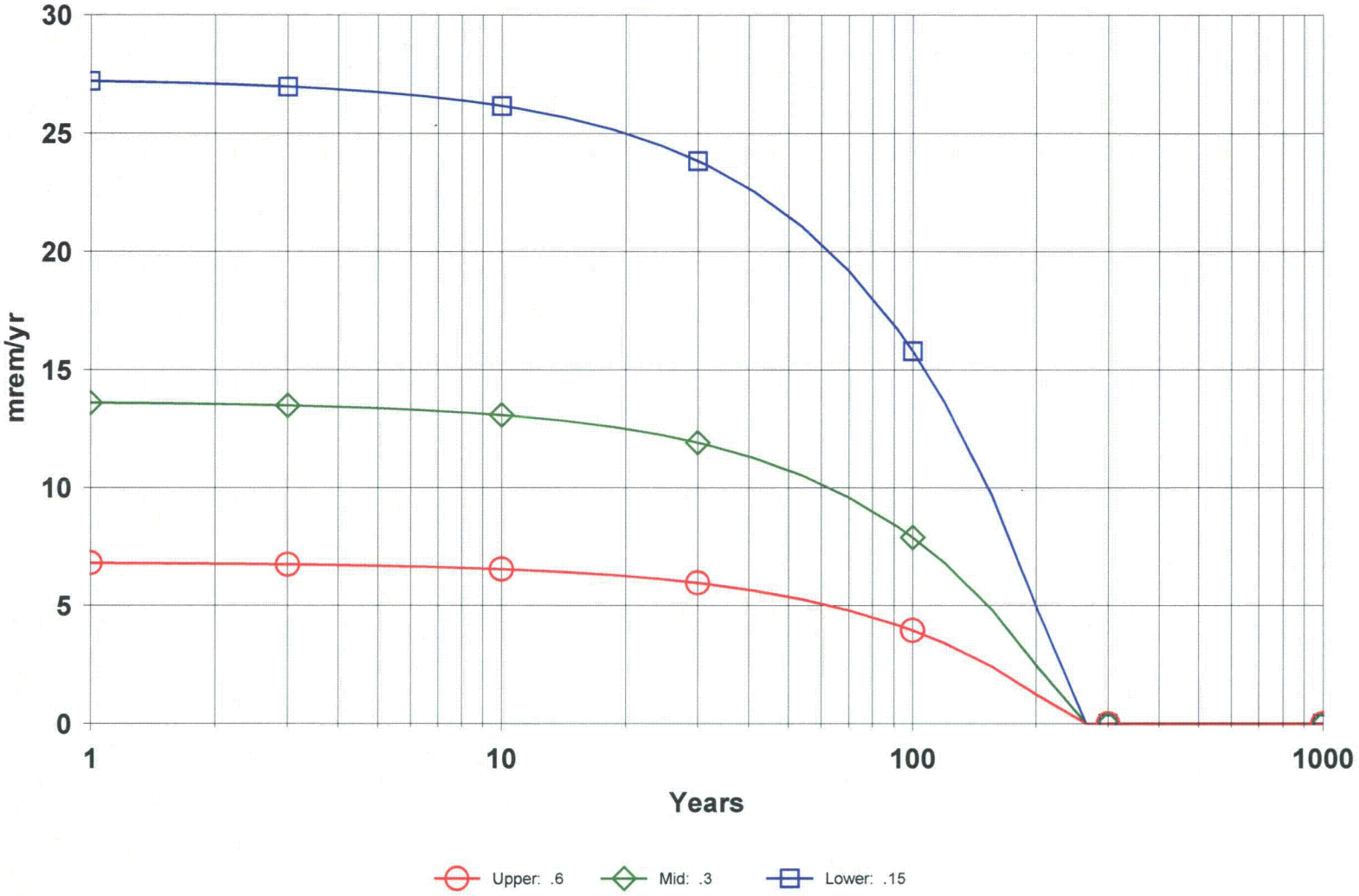
C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD 12/10/2008 15:09 GRAPHICS.ASC Pathways: External

DOSE: All Nuclides Summed, Plant (Water Independent) With SA on Mass loading for foliar deposition



C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD 12/10/2008 15:09 GRAPHICS.ASC Pathways: Plant (Water Independent)

DOSE: All Nuclides Summed, Plant (Water Independent) With SA on Depth of roots



C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD 12/10/2008 15:40 GRAPHICS.ASC Pathways: Plant (Water Independent)

APPENDIX D-3

RESRAD MODEL OUTPUT-RADIUM

Summary [redacted]SRAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Summary : [redacted]SRAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 11

0 Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(1)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(2)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(3)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(4)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(5)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(6)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(7)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(8)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(9)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(10)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(11)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

Summary : [redacted]SRAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD

Site-Specific Parameter Summary

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.000E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.500E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Pb-210	5.000E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Ra-226	5.000E+00	0.000E+00	---	S1(2)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	6.000E-04	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	2.500E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	6.000E-02	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	2.470E+04	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	6.450E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	5.770E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	9.990E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	2.900E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	1.330E+00	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	5.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	2.500E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	1.900E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	6.000E-02	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.470E+04	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	6.450E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	5.490E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	5.330E+01	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	2.500E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	1.900E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	6.000E-02	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	6.450E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	2.470E+04	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.600E+04	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	1.600E+04	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.600E+04	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.097E-07	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	3.600E+04	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	3.600E+04	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	3.600E+04	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.821E-07	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	5.500E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	1.400E+01	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	9.200E+01	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	6.300E+01	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	5.400E+00	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	9.000E-01	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	0.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	0.000E+00	5.000E-01	---	FR9
R018	Contamination fraction of plant food	2.500E-01	-1	---	FPLANT
R018	Contamination fraction of meat	2.500E-01	-1	---	FMEAT
R018	Contamination fraction of milk	0.000E+00	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	3.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	0.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	1	---	---	KYMAX

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	active
4 -- meat ingestion	active
5 -- milk ingestion	active
6 -- aquatic foods	active
7 -- drinking water	active
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

Summary [redacted]ESRAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	10000.00 square meters	Pb-210	5.000E+00
Thickness:	0.15 meters	Ra-226	5.000E+00
Cover Depth:	0.00 meters		

0

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	3.957E+01	3.947E+01	3.926E+01	3.850E+01	3.627E+01	2.770E+01	0.000E+00	0.000E+00
M(t):	1.583E+00	1.579E+00	1.570E+00	1.540E+00	1.451E+00	1.108E+00	0.000E+00	0.000E+00

0Maximum TDOSE(t): 3.957E+01 mrem/yr at t = 0.000E+00 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	1.503E-02	0.0004	2.861E-03	0.0001	0.000E+00	0.0000	7.778E+00	0.1965	3.786E-01	0.0096	0.000E+00	0.0000	9.787E-01	0.0247
Ra-226	2.414E+01	0.6101	1.121E-03	0.0000	0.000E+00	0.0000	5.878E+00	0.1485	2.016E-01	0.0051	0.000E+00	0.0000	1.957E-01	0.0049
Total	2.416E+01	0.6105	3.982E-03	0.0001	0.000E+00	0.0000	1.366E+01	0.3451	5.802E-01	0.0147	0.000E+00	0.0000	1.174E+00	0.0297

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years
Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.153E+00	0.2313
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.042E+01	0.7687
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.957E+01	1.0000

*Sum of all water independent and dependent pathways.

Summary : [redacted]SRAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	1.457E-02	0.0004	2.762E-03	0.0001	0.000E+00	0.0000	7.509E+00	0.1903	3.655E-01	0.0093	0.000E+00	0.0000	9.449E-01	0.0239
Ra-226	2.410E+01	0.6106	1.203E-03	0.0000	0.000E+00	0.0000	6.093E+00	0.1544	2.127E-01	0.0054	0.000E+00	0.0000	2.246E-01	0.0057
Total	2.411E+01	0.6110	3.965E-03	0.0001	0.000E+00	0.0000	1.360E+01	0.3446	5.782E-01	0.0146	0.000E+00	0.0000	1.170E+00	0.0296

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years
Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.837E+00	0.2239
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.063E+01	0.7761
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.947E+01	1.0000

*Sum of all water independent and dependent pathways.

Summary : [redacted]SRAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	1.368E-02	0.0003	2.575E-03	0.0001	0.000E+00	0.0000	7.000E+00	0.1783	3.408E-01	0.0087	0.000E+00	0.0000	8.808E-01	0.0224
Ra-226	2.402E+01	0.6118	1.357E-03	0.0000	0.000E+00	0.0000	6.487E+00	0.1653	2.326E-01	0.0059	0.000E+00	0.0000	2.791E-01	0.0071
Total	2.403E+01	0.6122	3.932E-03	0.0001	0.000E+00	0.0000	1.349E+01	0.3436	5.734E-01	0.0146	0.000E+00	0.0000	1.160E+00	0.0295

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years
Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.238E+00	0.2099
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.102E+01	0.7901
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.926E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	1.098E-02	0.0003	2.012E-03	0.0001	0.000E+00	0.0000	5.471E+00	0.1421	2.663E-01	0.0069	0.000E+00	0.0000	6.885E-01	0.0179
Ra-226	2.372E+01	0.6161	1.803E-03	0.0000	0.000E+00	0.0000	7.612E+00	0.1977	2.900E-01	0.0075	0.000E+00	0.0000	4.374E-01	0.0114
Total	2.373E+01	0.6164	3.816E-03	0.0001	0.000E+00	0.0000	1.308E+01	0.3398	5.563E-01	0.0144	0.000E+00	0.0000	1.126E+00	0.0292

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years
Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.439E+00	0.1673
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.206E+01	0.8327
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.850E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	5.852E-03	0.0002	9.905E-04	0.0000	0.000E+00	0.0000	2.693E+00	0.0742	1.311E-01	0.0036	0.000E+00	0.0000	3.389E-01	0.0093
Ra-226	2.281E+01	0.6288	2.488E-03	0.0001	0.000E+00	0.0000	9.226E+00	0.2544	3.759E-01	0.0104	0.000E+00	0.0000	6.882E-01	0.0190
Total	2.281E+01	0.6290	3.479E-03	0.0001	0.000E+00	0.0000	1.192E+01	0.3286	5.070E-01	0.0140	0.000E+00	0.0000	1.027E+00	0.0283

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years
Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.170E+00	0.0874
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.310E+01	0.9126
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.627E+01	1.0000

*Sum of all water independent and dependent pathways.

Summary : [redacted]ESRAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	6.314E-04	0.0000	7.658E-05	0.0000	0.000E+00	0.0000	2.082E-01	0.0075	1.014E-02	0.0004	0.000E+00	0.0000	2.620E-02	0.0009
Ra-226	1.878E+01	0.6780	2.230E-03	0.0001	0.000E+00	0.0000	7.690E+00	0.2777	3.261E-01	0.0118	0.000E+00	0.0000	6.552E-01	0.0237
Total	1.878E+01	0.6780	2.307E-03	0.0001	0.000E+00	0.0000	7.898E+00	0.2852	3.362E-01	0.0121	0.000E+00	0.0000	6.814E-01	0.0246

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years
Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.453E-01	0.0089
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.745E+01	0.9911
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.770E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years
Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

Summary [redacted]ESRAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years
0 Water Independent Pathways (Inhalation excludes radon)

0 Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years
0 Water Dependent Pathways

0 Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0*Sum of all water independent and dependent pathways.

Summary [redacted]ESRAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Pb-210+D	Pb-210+D	1.000E+00	1.831E+00	1.767E+00	1.648E+00	1.288E+00	6.340E-01	4.905E-02	0.000E+00	0.000E+00
0Ra-226+D	Ra-226+D	1.000E+00	6.050E+00	6.036E+00	6.009E+00	5.911E+00	5.621E+00	4.454E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	3.353E-02	9.002E-02	1.948E-01	5.013E-01	9.994E-01	1.036E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		6.084E+00	6.126E+00	6.203E+00	6.412E+00	6.620E+00	5.490E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.
0

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

0Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Pb-210	1.366E+01	1.414E+01	1.517E+01	1.941E+01	3.943E+01	5.096E+02	*7.634E+13	*7.634E+13
Ra-226	4.109E+00	4.081E+00	4.030E+00	3.899E+00	3.776E+00	4.554E+00	*9.885E+11	*9.885E+11

*At specific activity limit
0

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 0.000E+00 years

0Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Pb-210	5.000E+00	0.000E+00	1.831E+00	1.366E+01	1.831E+00	1.366E+01
Ra-226	5.000E+00	29.80 ± 0.06	6.620E+00	3.776E+00	6.084E+00	4.109E+00

Summary : [redacted]SRAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

0Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Pb-210	Pb-210	1.000E+00	9.153E+00	8.837E+00	8.238E+00	6.439E+00	3.170E+00	2.453E-01	0.000E+00	0.000E+00
Pb-210	Ra-226	1.000E+00	1.677E-01	4.501E-01	9.742E-01	2.506E+00	4.997E+00	5.181E+00	0.000E+00	0.000E+00
Pb-210	ΣDOSE(j)		9.320E+00	9.287E+00	9.212E+00	8.946E+00	8.167E+00	5.427E+00	0.000E+00	0.000E+00
0Ra-226	Ra-226	1.000E+00	3.025E+01	3.018E+01	3.004E+01	2.955E+01	2.810E+01	2.227E+01	0.000E+00	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

0Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Pb-210	Pb-210	1.000E+00	5.000E+00	4.847E+00	4.555E+00	3.664E+00	1.968E+00	2.234E-01	4.458E-04	1.584E-13
Pb-210	Ra-226	1.000E+00	0.000E+00	1.530E-01	4.449E-01	1.333E+00	3.009E+00	4.629E+00	4.452E+00	3.287E+00
Pb-210	ΣS(j):		5.000E+00	5.000E+00	5.000E+00	4.997E+00	4.977E+00	4.852E+00	4.452E+00	3.287E+00
0Ra-226	Ra-226	1.000E+00	5.000E+00	4.998E+00	4.994E+00	4.978E+00	4.935E+00	4.788E+00	4.390E+00	3.242E+00

THF(i) is the thread fraction of the parent nuclide.
0RESCALC.EXE execution time = 18.66 seconds

APPENDIX D-4

RESRAD MODEL OUTPUT-URANIUM

Summary : [redacted]RAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANURANIUMBENCHMARK.RAD

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 11

0 Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-227 (Source: FGR 12)	4.951E-04	4.951E-04	DCF1(1)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(2)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(3)
A-1	Bi-211 (Source: FGR 12)	2.559E-01	2.559E-01	DCF1(4)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(5)
A-1	Fr-223 (Source: FGR 12)	1.980E-01	1.980E-01	DCF1(6)
A-1	Pa-231 (Source: FGR 12)	1.906E-01	1.906E-01	DCF1(7)
A-1	Pa-234 (Source: FGR 12)	1.155E+01	1.155E+01	DCF1(8)
A-1	Pa-234m (Source: FGR 12)	8.967E-02	8.967E-02	DCF1(9)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(10)
A-1	Pb-211 (Source: FGR 12)	3.064E-01	3.064E-01	DCF1(11)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(12)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(13)
A-1	Po-211 (Source: FGR 12)	4.764E-02	4.764E-02	DCF1(14)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(15)
A-1	Po-215 (Source: FGR 12)	1.016E-03	1.016E-03	DCF1(16)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(17)
A-1	Ra-223 (Source: FGR 12)	6.034E-01	6.034E-01	DCF1(18)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(19)
A-1	Rn-219 (Source: FGR 12)	3.083E-01	3.083E-01	DCF1(20)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(21)
A-1	Th-227 (Source: FGR 12)	5.212E-01	5.212E-01	DCF1(22)
A-1	Th-230 (Source: FGR 12)	1.209E-03	1.209E-03	DCF1(23)
A-1	Th-231 (Source: FGR 12)	3.643E-02	3.643E-02	DCF1(24)
A-1	Th-234 (Source: FGR 12)	2.410E-02	2.410E-02	DCF1(25)
A-1	Tl-207 (Source: FGR 12)	1.980E-02	1.980E-02	DCF1(26)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(27)
A-1	U-234 (Source: FGR 12)	4.017E-04	4.017E-04	DCF1(28)
A-1	U-235 (Source: FGR 12)	7.211E-01	7.211E-01	DCF1(29)
A-1	U-238 (Source: FGR 12)	1.031E-04	1.031E-04	DCF1(30)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.724E+00	6.700E+00	DCF2(1)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(2)
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(3)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(4)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(5)
B-1	U-234	1.320E-01	1.320E-01	DCF2(6)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(7)
B-1	U-238	1.180E-01	1.180E-01	DCF2(8)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(9)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.410E-02	DCF3(1)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(2)
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(3)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(4)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(5)
D-1	U-234	2.830E-04	2.830E-04	DCF3(6)

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 11

0 Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-1	U-235+D	2.673E-04	2.660E-04	DCF3(7)
D-1	U-238	2.550E-04	2.550E-04	DCF3(8)
D-1	U-238+D	2.687E-04	2.550E-04	DCF3(9)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(2,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(3,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(3,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(3,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(5,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(5,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(5,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(6,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(6,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(6,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(7,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(7,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(7,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(8,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(8,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(9,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(9,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(2,1)
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(2,2)
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 11

0 Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(4,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(5,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(5,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(6,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(6,2)
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(7,1)
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(7,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(8,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(8,2)
D-5				
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(9,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(9,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

Summary : [redacted]RAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANURANIUMBENCHMARK.RAD

Site-Specific Parameter Summary

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.000E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.500E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): U-234	4.920E+01	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): U-235	2.200E+00	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): U-238	4.860E+01	0.000E+00	---	S1(8)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(8)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	6.000E-04	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	2.500E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	6.000E-02	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	2.470E+04	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	6.450E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	5.770E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	9.990E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	2.900E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	1.330E+00	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	5.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	2.500E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	1.900E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	6.000E-02	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.470E+04	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	6.450E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	5.490E+01	1.000E+01	---	DWIBWT

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	5.330E+01	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	2.500E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	1.900E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	6.000E-02	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	6.450E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	2.470E+04	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.310E-04	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for U-235				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.310E-04	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.310E-04	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for daughter Ac-227				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.268E-04	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Pa-231				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.310E-04	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.552E-05	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for daughter Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.357E-05	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for daughter Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.093E-07	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	5.500E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	1.400E+01	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	9.200E+01	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	6.300E+01	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	5.400E+00	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	9.000E-01	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	0.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	0.000E+00	5.000E-01	---	FR9
R018	Contamination fraction of plant food	2.500E-01	-1	---	FPLANT
R018	Contamination fraction of meat	2.500E-01	-1	---	FMEAT
R018	Contamination fraction of milk	0.000E+00	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	3.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	0.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	active
4 -- meat ingestion	active
5 -- milk ingestion	active
6 -- aquatic foods	active
7 -- drinking water	active
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

Summary : [redacted]RAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANURANIUMBENCHMARK.RAD

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	10000.00 square meters	U-234	4.920E+01
Thickness:	0.15 meters	U-235	2.200E+00
Cover Depth:	0.00 meters	U-238	4.860E+01

0

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	6.867E+00	6.852E+00	6.823E+00	6.718E+00	6.409E+00	5.178E+00	0.000E+00	0.000E+00
M(t):	2.747E-01	2.741E-01	2.729E-01	2.687E-01	2.564E-01	2.071E-01	0.000E+00	0.000E+00

0Maximum TDOSE(t): 6.867E+00 mrem/yr at t = 0.000E+00 years

Summary : [redacted]SRAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANURANIUMBENCHMARK.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	1.003E-02	0.0015	1.627E-01	0.0237	0.000E+00	0.0000	7.559E-01	0.1101	4.355E-02	0.0063	0.000E+00	0.0000	3.804E-01	0.0554
U-235	8.183E-01	0.1192	6.779E-03	0.0010	0.000E+00	0.0000	3.198E-02	0.0047	1.853E-03	0.0003	0.000E+00	0.0000	1.607E-02	0.0023
U-238	3.389E+00	0.4935	1.437E-01	0.0209	0.000E+00	0.0000	7.090E-01	0.1032	4.085E-02	0.0059	0.000E+00	0.0000	3.568E-01	0.0520
Total	4.218E+00	0.6142	3.132E-01	0.0456	0.000E+00	0.0000	1.497E+00	0.2180	8.625E-02	0.0126	0.000E+00	0.0000	7.532E-01	0.1097

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years
Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.353E+00	0.1970
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.750E-01	0.1274
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.639E+00	0.6756
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.867E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : [redacted]RAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANURANIUMBENCHMARK.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	1.003E-02	0.0015	1.620E-01	0.0236	0.000E+00	0.0000	7.528E-01	0.1099	4.337E-02	0.0063	0.000E+00	0.0000	3.788E-01	0.0553
U-235	8.179E-01	0.1194	6.753E-03	0.0010	0.000E+00	0.0000	3.196E-02	0.0047	1.878E-03	0.0003	0.000E+00	0.0000	1.602E-02	0.0023
U-238	3.386E+00	0.4941	1.431E-01	0.0209	0.000E+00	0.0000	7.061E-01	0.1030	4.068E-02	0.0059	0.000E+00	0.0000	3.553E-01	0.0518
Total	4.214E+00	0.6149	3.119E-01	0.0455	0.000E+00	0.0000	1.491E+00	0.2176	8.593E-02	0.0125	0.000E+00	0.0000	7.501E-01	0.1095

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years
Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.347E+00	0.1966
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.745E-01	0.1276
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.631E+00	0.6758
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.852E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	1.003E-02	0.0015	1.607E-01	0.0235	0.000E+00	0.0000	7.466E-01	0.1094	4.301E-02	0.0063	0.000E+00	0.0000	3.757E-01	0.0551
U-235	8.169E-01	0.1197	6.701E-03	0.0010	0.000E+00	0.0000	3.191E-02	0.0047	1.927E-03	0.0003	0.000E+00	0.0000	1.592E-02	0.0023
U-238	3.378E+00	0.4952	1.419E-01	0.0208	0.000E+00	0.0000	7.002E-01	0.1026	4.034E-02	0.0059	0.000E+00	0.0000	3.523E-01	0.0516
Total	4.205E+00	0.6164	3.093E-01	0.0453	0.000E+00	0.0000	1.479E+00	0.2167	8.528E-02	0.0125	0.000E+00	0.0000	7.439E-01	0.1090

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years
Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.336E+00	0.1958
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.734E-01	0.1280
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.613E+00	0.6762
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.823E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	1.006E-02	0.0015	1.560E-01	0.0232	0.000E+00	0.0000	7.247E-01	0.1079	4.175E-02	0.0062	0.000E+00	0.0000	3.647E-01	0.0543
U-235	8.133E-01	0.1211	6.525E-03	0.0010	0.000E+00	0.0000	3.175E-02	0.0047	2.090E-03	0.0003	0.000E+00	0.0000	1.557E-02	0.0023
U-238	3.352E+00	0.4991	1.378E-01	0.0205	0.000E+00	0.0000	6.797E-01	0.1012	3.916E-02	0.0058	0.000E+00	0.0000	3.420E-01	0.0509
Total	4.176E+00	0.6216	3.003E-01	0.0447	0.000E+00	0.0000	1.436E+00	0.2138	8.300E-02	0.0124	0.000E+00	0.0000	7.223E-01	0.1075

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years
Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.297E+00	0.1931
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.693E-01	0.1294
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.551E+00	0.6775
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.718E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	1.037E-02	0.0016	1.426E-01	0.0223	0.000E+00	0.0000	6.626E-01	0.1034	3.817E-02	0.0060	0.000E+00	0.0000	3.335E-01	0.0520
U-235	8.017E-01	0.1251	6.055E-03	0.0009	0.000E+00	0.0000	3.121E-02	0.0049	2.484E-03	0.0004	0.000E+00	0.0000	1.462E-02	0.0023
U-238	3.270E+00	0.5102	1.259E-01	0.0196	0.000E+00	0.0000	6.214E-01	0.0970	3.580E-02	0.0056	0.000E+00	0.0000	3.127E-01	0.0488
Total	4.082E+00	0.6369	2.746E-01	0.0428	0.000E+00	0.0000	1.315E+00	0.2052	7.646E-02	0.0119	0.000E+00	0.0000	6.608E-01	0.1031

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years
Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.187E+00	0.1853
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.561E-01	0.1336
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.366E+00	0.6812
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.409E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	1.327E-02	0.0026	9.640E-02	0.0186	0.000E+00	0.0000	4.484E-01	0.0866	2.581E-02	0.0050	0.000E+00	0.0000	2.254E-01	0.0435
U-235	7.306E-01	0.1411	4.422E-03	0.0009	0.000E+00	0.0000	2.680E-02	0.0052	3.032E-03	0.0006	0.000E+00	0.0000	1.108E-02	0.0021
U-238	2.853E+00	0.5510	8.501E-02	0.0164	0.000E+00	0.0000	4.195E-01	0.0810	2.417E-02	0.0047	0.000E+00	0.0000	2.110E-01	0.0408
Total	3.597E+00	0.6947	1.858E-01	0.0359	0.000E+00	0.0000	8.947E-01	0.1728	5.301E-02	0.0102	0.000E+00	0.0000	4.475E-01	0.0864

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years
Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.093E-01	0.1563
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.759E-01	0.1498
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.593E+00	0.6939
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.178E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years
Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

Summary : [redacted]RAD Default Parameters
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years
Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

Summary : [redacted]RAD Default Parameters
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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-234	U-234	1.000E+00	2.749E-02	2.738E-02	2.715E-02	2.636E-02	2.411E-02	1.633E-02	0.000E+00	0.000E+00
U-234	Th-230	1.000E+00	1.679E-07	4.919E-07	1.130E-06	3.283E-06	8.729E-06	1.963E-05	0.000E+00	0.000E+00
U-234	Ra-226+D	1.000E+00	3.849E-09	2.721E-08	1.440E-07	1.273E-06	1.026E-05	8.958E-05	0.000E+00	0.000E+00
U-234	Pb-210+D	1.000E+00	1.248E-11	1.628E-10	1.711E-09	3.973E-08	7.568E-07	1.203E-05	0.000E+00	0.000E+00
U-234	ΣDSR(j)		2.749E-02	2.738E-02	2.715E-02	2.637E-02	2.413E-02	1.645E-02	0.000E+00	0.000E+00
0U-235+D	U-235+D	1.000E+00	3.977E-01	3.974E-01	3.967E-01	3.943E-01	3.867E-01	3.459E-01	0.000E+00	0.000E+00
U-235+D	Pa-231	1.000E+00	3.385E-05	1.053E-04	2.471E-04	7.252E-04	1.933E-03	4.339E-03	0.000E+00	0.000E+00
U-235+D	Ac-227+D	1.000E+00	3.015E-07	1.936E-06	9.597E-06	7.668E-05	4.991E-04	2.438E-03	0.000E+00	0.000E+00
U-235+D	ΣDSR(j)		3.977E-01	3.975E-01	3.970E-01	3.951E-01	3.891E-01	3.527E-01	0.000E+00	0.000E+00
0U-238	U-238	5.400E-05	1.329E-06	1.324E-06	1.313E-06	1.275E-06	1.165E-06	7.874E-07	0.000E+00	0.000E+00
0U-238+D	U-238+D	9.999E-01	9.546E-02	9.528E-02	9.492E-02	9.364E-02	8.983E-02	7.393E-02	0.000E+00	0.000E+00
U-238+D	U-234	9.999E-01	3.894E-08	1.164E-07	2.694E-07	7.847E-07	2.085E-06	4.652E-06	0.000E+00	0.000E+00
U-238+D	Th-230	9.999E-01	1.620E-13	1.097E-12	5.675E-12	4.897E-11	3.774E-10	2.792E-09	0.000E+00	0.000E+00
U-238+D	Ra-226+D	9.999E-01	2.710E-15	4.115E-14	4.817E-13	1.264E-11	2.958E-10	8.526E-09	0.000E+00	0.000E+00
U-238+D	Pb-210+D	9.999E-01	7.415E-18	1.983E-16	4.454E-15	3.038E-13	1.714E-11	9.614E-10	0.000E+00	0.000E+00
U-238+D	ΣDSR(j)		9.546E-02	9.528E-02	9.492E-02	9.364E-02	8.983E-02	7.393E-02	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.
0

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

0Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-234	9.094E+02	9.131E+02	9.207E+02	9.482E+02	1.036E+03	1.520E+03	*6.247E+09	*6.247E+09
U-235	6.285E+01	6.289E+01	6.298E+01	6.327E+01	6.425E+01	7.089E+01	*2.161E+06	*2.161E+06
U-238	2.619E+02	2.624E+02	2.634E+02	2.670E+02	2.783E+02	3.381E+02	*3.361E+05	*3.361E+05

*At specific activity limit
0

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 0.000E+00 years

0Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
U-234	4.920E+01	0.000E+00	2.749E-02	9.094E+02	2.749E-02	9.094E+02
U-235	2.200E+00	0.000E+00	3.977E-01	6.285E+01	3.977E-01	6.285E+01
U-238	4.860E+01	0.000E+00	9.546E-02	2.619E+02	9.546E-02	2.619E+02

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

0Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-234	U-234	1.000E+00	1.353E+00	1.347E+00	1.336E+00	1.297E+00	1.186E+00	8.033E-01	0.000E+00	0.000E+00
U-234	U-238	9.999E-01	1.892E-06	5.657E-06	1.309E-05	3.813E-05	1.013E-04	2.261E-04	0.000E+00	0.000E+00
U-234	ΣDOSE(j)		1.353E+00	1.347E+00	1.336E+00	1.297E+00	1.186E+00	8.036E-01	0.000E+00	0.000E+00
0Th-230	U-234	1.000E+00	8.259E-06	2.420E-05	5.561E-05	1.615E-04	4.295E-04	9.660E-04	0.000E+00	0.000E+00
Th-230	U-238	9.999E-01	7.872E-12	5.331E-11	2.758E-10	2.380E-09	1.834E-08	1.357E-07	0.000E+00	0.000E+00
Th-230	ΣDOSE(j)		8.259E-06	2.420E-05	5.561E-05	1.615E-04	4.295E-04	9.661E-04	0.000E+00	0.000E+00
0Ra-226	U-234	1.000E+00	1.894E-07	1.339E-06	7.084E-06	6.261E-05	5.047E-04	4.407E-03	0.000E+00	0.000E+00
Ra-226	U-238	9.999E-01	1.317E-13	2.000E-12	2.341E-11	6.143E-10	1.438E-08	4.144E-07	0.000E+00	0.000E+00
Ra-226	ΣDOSE(j)		1.894E-07	1.339E-06	7.084E-06	6.261E-05	5.047E-04	4.408E-03	0.000E+00	0.000E+00
0Pb-210	U-234	1.000E+00	6.142E-10	8.008E-09	8.420E-08	1.955E-06	3.723E-05	5.920E-04	0.000E+00	0.000E+00
Pb-210	U-238	9.999E-01	3.604E-16	9.639E-15	2.165E-13	1.476E-11	8.330E-10	4.672E-08	0.000E+00	0.000E+00
Pb-210	ΣDOSE(j)		6.142E-10	8.008E-09	8.420E-08	1.955E-06	3.723E-05	5.920E-04	0.000E+00	0.000E+00
0U-235	U-235	1.000E+00	8.750E-01	8.742E-01	8.728E-01	8.675E-01	8.507E-01	7.610E-01	0.000E+00	0.000E+00
0Pa-231	U-235	1.000E+00	7.448E-05	2.316E-04	5.437E-04	1.595E-03	4.253E-03	9.546E-03	0.000E+00	0.000E+00
0Ac-227	U-235	1.000E+00	6.632E-07	4.259E-06	2.111E-05	1.687E-04	1.098E-03	5.364E-03	0.000E+00	0.000E+00
0U-238	U-238	5.400E-05	6.461E-05	6.434E-05	6.381E-05	6.194E-05	5.663E-05	3.827E-05	0.000E+00	0.000E+00
U-238	U-238	9.999E-01	4.639E+00	4.631E+00	4.613E+00	4.551E+00	4.366E+00	3.593E+00	0.000E+00	0.000E+00
U-238	ΣDOSE(j)		4.639E+00	4.631E+00	4.613E+00	4.551E+00	4.366E+00	3.593E+00	0.000E+00	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

Summary : [redacted]RAD Default Parameters
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Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

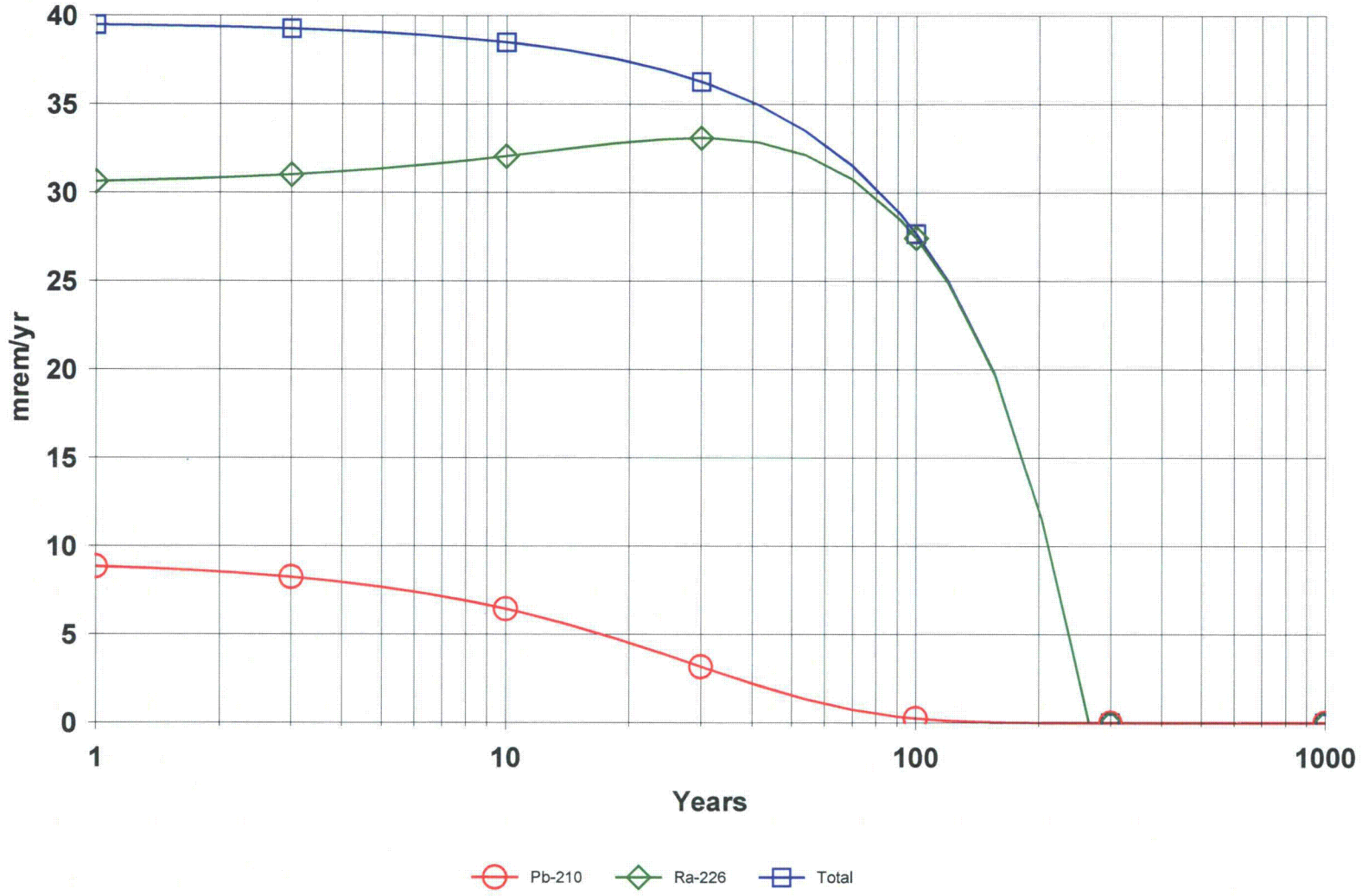
0Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-234	U-234	1.000E+00	4.920E+01	4.919E+01	4.918E+01	4.913E+01	4.900E+01	4.855E+01	4.726E+01	4.304E+01
U-234	U-238	9.999E-01	0.000E+00	1.378E-04	4.132E-04	1.376E-03	4.117E-03	1.360E-02	3.972E-02	1.207E-01
U-234	ΣS(j):		4.920E+01	4.919E+01	4.918E+01	4.914E+01	4.901E+01	4.856E+01	4.730E+01	4.316E+01
0Th-230	U-234	1.000E+00	0.000E+00	4.429E-04	1.328E-03	4.426E-03	1.326E-02	4.397E-02	1.301E-01	4.126E-01
Th-230	U-238	9.999E-01	0.000E+00	6.200E-10	5.579E-09	6.195E-08	5.566E-07	6.145E-06	5.430E-05	5.662E-04
Th-230	ΣS(j):		0.000E+00	4.429E-04	1.328E-03	4.426E-03	1.326E-02	4.398E-02	1.301E-01	4.132E-01
0Ra-226	U-234	1.000E+00	0.000E+00	9.591E-08	8.628E-07	9.572E-06	8.577E-05	9.382E-04	8.079E-03	7.720E-02
Ra-226	U-238	9.999E-01	0.000E+00	8.953E-14	2.416E-12	8.937E-11	2.403E-09	8.778E-08	2.278E-06	7.358E-05
Ra-226	ΣS(j):		0.000E+00	9.591E-08	8.628E-07	9.572E-06	8.577E-05	9.383E-04	8.082E-03	7.728E-02
0Pb-210	U-234	1.000E+00	0.000E+00	9.861E-10	2.621E-08	9.196E-07	2.147E-05	5.214E-04	6.558E-03	7.271E-02
Pb-210	U-238	9.999E-01	0.000E+00	6.914E-16	5.530E-14	6.536E-12	4.704E-10	4.089E-08	1.690E-06	6.717E-05
Pb-210	ΣS(j):		0.000E+00	9.861E-10	2.621E-08	9.196E-07	2.147E-05	5.214E-04	6.560E-03	7.278E-02
0U-235	U-235	1.000E+00	2.200E+00	2.200E+00	2.199E+00	2.197E+00	2.191E+00	2.171E+00	2.115E+00	1.930E+00
0Pa-231	U-235	1.000E+00	0.000E+00	4.654E-05	1.396E-04	4.648E-04	1.391E-03	4.589E-03	1.338E-02	4.041E-02
0Ac-227	U-235	1.000E+00	0.000E+00	7.330E-07	6.457E-06	6.669E-05	4.940E-04	3.196E-03	1.192E-02	3.892E-02
0U-238	U-238	5.400E-05	2.624E-03	2.624E-03	2.623E-03	2.621E-03	2.614E-03	2.590E-03	2.523E-03	2.302E-03
U-238	U-238	9.999E-01	4.860E+01	4.859E+01	4.858E+01	4.853E+01	4.841E+01	4.797E+01	4.673E+01	4.263E+01
U-238	ΣS(j):		4.860E+01	4.859E+01	4.858E+01	4.854E+01	4.841E+01	4.797E+01	4.673E+01	4.263E+01

THF(i) is the thread fraction of the parent nuclide.
0RESCALC.EXE execution time = 1.28 seconds

APPENDIX D-5

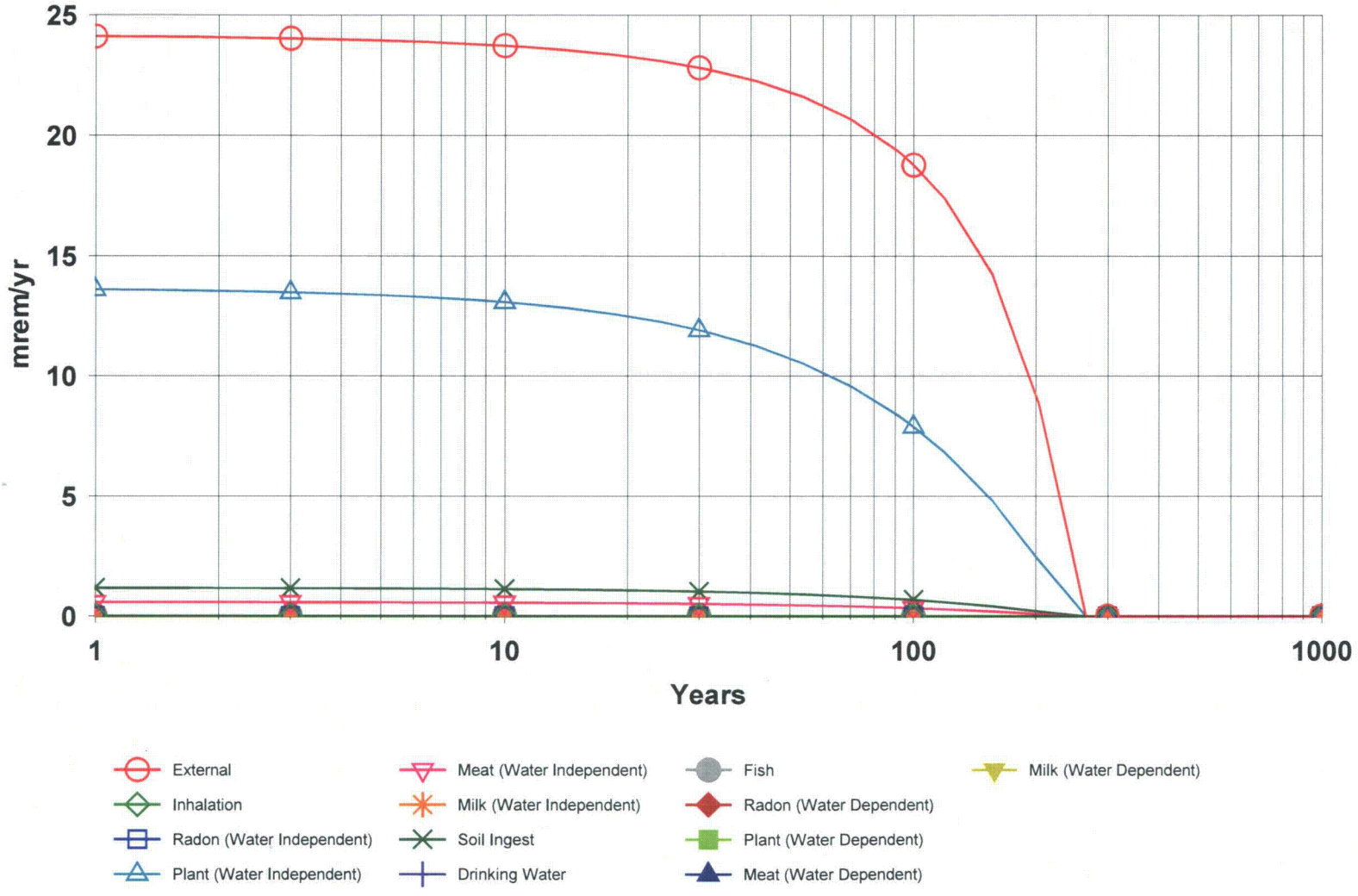
STANDARD GRAPHICS FOR RADIUM AND URANIUM DOSE MODELING

RADIUM DOSE GRAPHICS



C:\RESRAD_FAMILY\RESRAD\USERFILES\LUDEMANRADIUMBENCHMARK.RAD 12/10/2008 15:40 GRAPHICS.ASC Includes All Pathways

DOSE: All Nuclides Summed, Component Pathways



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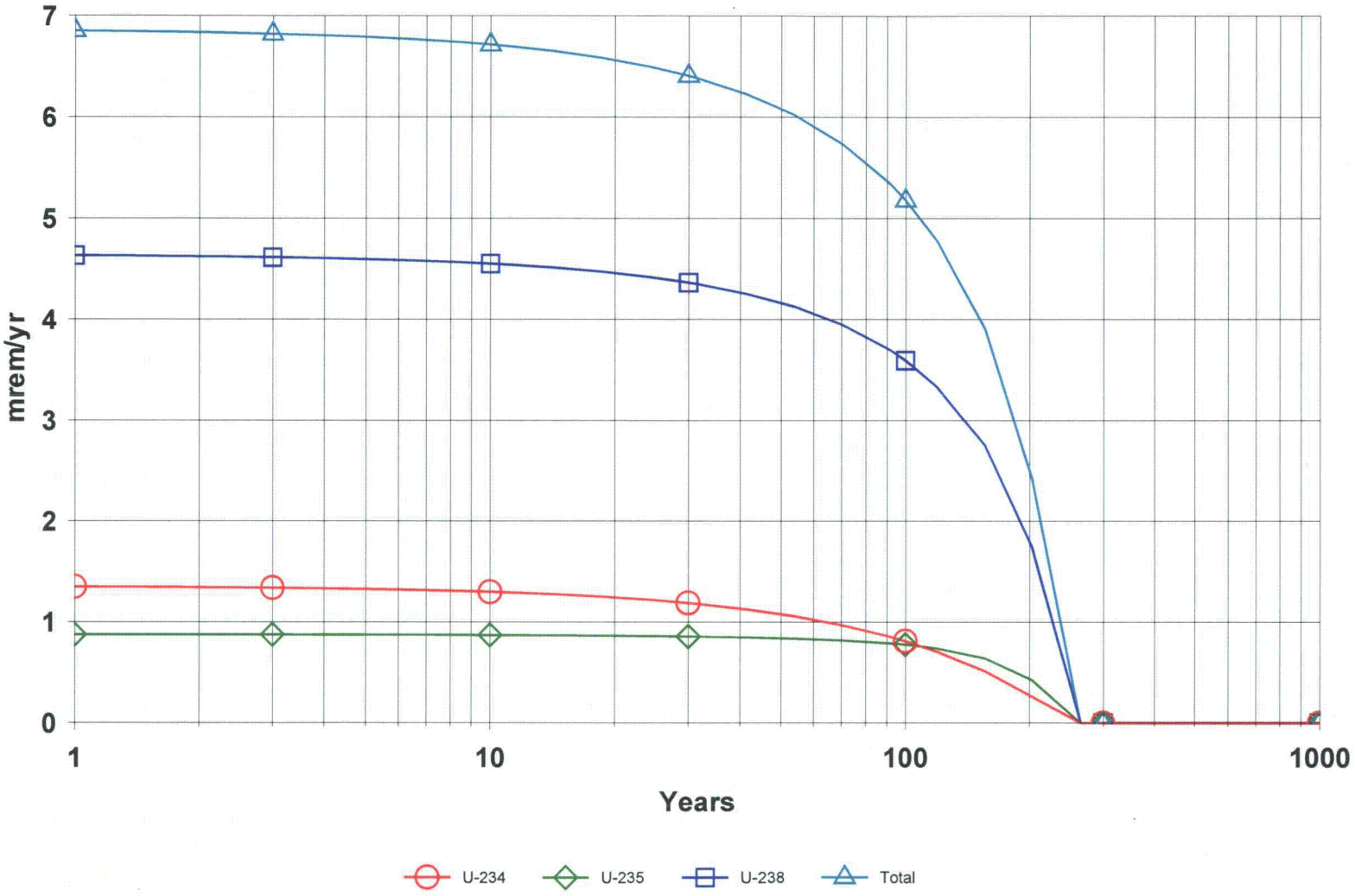
NATURAL URANIUM DOSE GRAPHICS



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APPENDIX E

FINANCIAL ASSURANCE

uraniumone
investing in our energy

Restoration and Reclamation Cost Estimates at the End of Year 1
(no operation has occurred therefore no groundwater restoration or 11.e.2 byproduct disposal is required)

No.	Leuenberger Satellite Plant Cost Item	Cost
1	GROUNDWATER RESTORATION COST	$9,632,214
2a	PLANT EQUIPMENT REMOVAL AND DISPOSAL COST	$108,521
2b	BUILDING DEMOLITION AND DISPOSAL COST	$478,784
3	SOIL REMOVAL & DISPOSAL COST	$101,250
4	TOTAL WELL ABANDONMENT COST	$199,886
5	WELLFIELD EQUIPMENT REMOVAL & DISPOSAL COST	$755,846
6	TOPSOIL REPLACEMENT & REVEGETATION COST	$241,445
7	MISCELLANEOUS RECLAMATION COST	$87,335
8	SURGE POND RESTORATION & DISPOSAL COST	$202,451
	Subtotal Restoration and Reclamation Cost Estimate	$11,807,732
	Administration,Overhead and Contingency (25%)	$2,951,933
	Total	$14,759,666

No.	North Platte Satellite Plant Cost Item	Cost
1	GROUNDWATER RESTORATION COST	$5,918,105
2a	PLANT EQUIPMENT REMOVAL AND DISPOSAL COST	$107,112
2b	BUILDING DEMOLITION AND DISPOSAL COST	$329,949
3	SOIL REMOVAL & DISPOSAL COST	$101,654
4	TOTAL WELL ABANDONMENT COST	$327,164
5	WELLFIELD EQUIPMENT REMOVAL & DISPOSAL COST	$982,859
6	TOPSOIL REPLACEMENT & REVEGETATION COST	$354,260
7	MISCELLANEOUS RECLAMATION COST	$106,800
8	SURGE POND RESTORATION & DISPOSAL COST	$202,451
	Subtotal Restoration and Reclamation Cost Estimate	$8,430,354
	Administration,Overhead and Contingency (25%)	$2,107,588
	Total	$10,537,942

No.	Peterson Satellite Plant Cost Item	Cost
1	GROUNDWATER RESTORATION COST	$14,009,187
2a	PLANT EQUIPMENT REMOVAL AND DISPOSAL COST	$123,780
2b	BUILDING DEMOLITION AND DISPOSAL COST	$330,786
3	SOIL REMOVAL & DISPOSAL COST	$101,654
4	TOTAL WELL ABANDONMENT COST	$541,329
5	WELLFIELD EQUIPMENT REMOVAL & DISPOSAL COST	$1,396,617
6	TOPSOIL REPLACEMENT & REVEGETATION COST	$535,995
7	MISCELLANEOUS RECLAMATION COST	$145,125
8	SURGE POND RESTORATION & DISPOSAL COST	$202,451
	Subtotal Restoration and Reclamation Cost Estimate	$17,386,923
	Administration,Overhead and Contingency (25%)	$4,346,731
	Total	$21,733,654

TOTAL RESTORATION COST $47,031,262

Worksheet 1, No. I –
GROUNDWATER RESTORATION

Cost Item	Leuenberger Satellite Plant				North Platte Plant			Peterson Plant			Notes
	Wellfield 1-80 Sand	Wellfield 2-90 Sand	Wellfield 3	Sub Total	Wellfield 4	Wellfield 5	Sub Total	Wellfield 6	Wellfield 7	Sub Total	
Technical Assumptions											
Wellfield Area (Ft^2)	2,800,000	1,400,000	200,000		3,200,000	2,600,000		2,800,000	6,800,000		
Wellfield Area (Acres)	64.3	32.1	4.6		73.5	59.7		64.3	156.1		
Affected Ore Zone Area (Ft^2)	2,800,000	1,400,000	200,000		3,200,000	2,600,000		2,800,000	6,800,000		
Avg Completed Thickness (Ft)	40	40	20		20	20		20	20		Checked with Geology 20 ft screen
Factor for Flare	1.44	1.44	1.44		1.44	1.44		1.44	1.44		Flare Factor is from License Application Section 6.6
Affected Volume:	161,280,000	80,640,000	5,760,000		92,160,000	74,880,000		80,640,000	195,840,000		
Porosity	0.25	0.25	0.25		0.25	0.25		0.25	0.25		Porosity consistent with IR/CR Porosity
Gallons per Cubic Foot	7.48	7.48	7.48		7.48	7.48		7.48	7.48		
Gallon per Pore Volume	301,593,600	150,796,800	10,771,200		172,339,200	140,025,600		##########	366,220,800		
Number of Wells in Unit(s)	769	149	56		879	714		769	1867		
Production Wells	280	47	20		320	260		280	680		
Injection Wells	429	72	31		490	398		429	1041		
Monitor Wells	60	30	5		69	56		60	146		
Average Well Spacing (Ft)	71	71	71		71	71		71	71		
Average Well Depth (Ft)	400	275	400		275	275		275	275		
I Groundwater Sweep											
A. Plant & Office											
Operating Assumptions:											
Flowrate (gpm)	300	300	300		300	300		300	300		Flow Rate based on License Application
PV's Required	1.00	1.00	1.00		1.00	1.00		1.00	1.00		
Total Gallons for Treatment	301,593,600	150,796,800	10,771,200		172,339,200	140,025,600		##########	366,220,800		
Total Kgals for Treatment	301,594	150,797	10,771		172,339	140,026		150,797	366,221		
Cost Assumptions:											
Power											
Avg Connected Hp	50	50	50		50	50		50	50		(100Hp originally) CR uses 40 Hp confirmed with Rick
Kwh's/Hp	0.75	0.75	0.75		0.75	0.75		0.75	0.75		
$/Kwh	0.05	0.05	0.05		0.05	0.05		0.05	0.05		$.02 plus demand charges per quote
Gallons per Minute	300	300	300		300	300		300	300		
Gallons per Hour	18000	18000	18000		18000	18000		18000	18000		
Cost per Hour	$1.88	$1.88	$1.88		$1.88	$1.88		$1.88	$1.88		
Cost per Kgal ($)	$0.104	$0.104	$0.104		$0.104	$0.104		$0.104	$0.104		
Chemicals											
Barium Chloride ($/Kgals)	$0.041	$0.041	$0.041		$0.041	$0.041		$0.041	$0.041		Costs from operating ISR facility experience (Cogema)
Antiscalent ($/Kgals)	$0.000	$0.000	$0.000		$0.000	$0.000		$0.000	$0.000		Costs from operating ISR facility experience (Cogema)
Elution ($/Kgals)	$0.099	$0.099	$0.099		$0.099	$0.099		$0.099	$0.099		Costs from operating ISR facility experience (Cogema)
Repair & Maintenance ($/Kgals)	$0.061	$0.061	$0.061		$0.061	$0.061		$0.061	$0.061		Costs from operating ISR facility experience (Cogema)
Analysis ($/Kgals)	$0.164	$0.164	$0.164		$0.164	$0.164		$0.164	$0.164		Costs from operating ISR facility experience (Cogema)
Total Cost per Kgal	$0.47	$0.47	$0.47		$0.47	$0.47		$0.47	$0.47		
Total Treatment Cost	$141,498	$70,749	$5,053		$80,856	$65,695		$70,749	$171,819		
Utilities											
Power ($/Month)	1,148				648			648			plant building only, i.e., lights, etc. (12,996 sf at $0.05/sf.) & maint building at Leuenberger (10000 sf)
Propane ($/Month)	800	400	400		400	400		400	400		
Time for Treatment											
Minutes for Treatment	1,005,312	502,656	35,904		574,464	466,752		502,656	1,220,736		
Hours for Treatment	16,755	8,378	598		9,574	7,779		8,378	20,346		
Days for Treatment	698	349	25		399	324		349	848		
Average Days per Month	30.4	30.4	30.4		30.4	30.4		30.4	30.4		
Months for Treatment	23.3	11.6	0.8		13.3	10.8		11.6	28.3		
Years for Treatment	1.94	0.97	0.07		1.11	0.90		0.97	2.35		
Utilities Cost ($)	$45,332	$4,654	$332		$13,936	$4,322		$12,194	$11,303		
TOTAL PLANT & OFFICE COST	**$186,830**	**$75,403**	**$5,386**	**$267,619**	**$94,792**	**$70,017**	**$164,809**	**$82,943**	**$183,122**	**$266,065**	
B. WELLFIELD											
Cost Assumptions:											
Power											
Avg Flow/Pump (gpm)	20	20	20		20	20		20	20		Utilized number from the 2011-2012 CR Surety Update
Avg Hp/Pump	3	3	3		3	3		3	3		Utilized Hp from IR/CR 2011-2012 surety
Avg # of Pumps Required	15	15	15		15	15		15	15		
Avg Connected Hp	45	45	45		45	45		45	45		
Kwh's/Hp	0.75	0.75	0.75		0.75	0.75		0.75	0.75		
$/Kwh	0.05	0.05	0.05		0.05	0.05		0.05	0.05		
Gallons per Minute	300	300	300		300	300		300	300		
Gallons per Hour	18000	18000	18000		18000	18000		18000	18000		
Costs per Hour ($)	$1.69	$1.69	$1.69		$1.69	$1.69		$1.69	$1.69		
Costs per Gallon ($)	$0.0001	$0.0001	$0.0001		$0.0001	$0.0001		$0.0001	$0.0001		
Costs per Kgal ($)	$0.09	$0.09	$0.09		$0.09	$0.09		$0.09	$0.09		
Repair & Maintenance ($/Kgals)	$0.016	$0.016	$0.016		$0.016	$0.016		$0.016	$0.016		
Total Cost per Kgal	$0.110	$0.110	$0.110		$0.110	$0.110		$0.110	$0.110		
TOTAL WELLFIELD COST	$33,100	$16,550	$1,182		$18,914	$15,368		$16,550	$40,193		
TOTAL GROUNDWATER SWEEP COST	**$219,930**	**$91,953**	**$6,568**	**$318,451**	**$113,706**	**$85,385**	**$199,091**	**$99,493**	**$223,314**	**$322,807**	

Worksheet 1, No. II
GROUNDWATER RESTORATION

Cost Item	Leuenberger Satellite Plant				North Platte Plant			Peterson Plant			Notes
	Wellfield 1-80 Sand	Wellfield 2-90 Sand	Wellfield 3	Sub Total	Wellfield 4-70 Sands	Wellfield 5-70 Sands	Sub Total	Wellfield 6-90 Sands	Wellfield 7-90 Sands	Sub Total	
II GW Treatment - RO											
A. PLANT											
Operating Assumptions:											
Flowrate (gpm)	600	600	600		600	600		600	600		600 gpm based on average flow to RO listed in LA
PV's Required	5.00	5.00	5.00		5.00	5.00		5.00	5.00		1 PV from Sweep and 5 from Ro for Total of 6 PV's
Total Gallons for Treatment	1,507,968,000	753,984,000	53,856,000		861,696,000	700,128,000		753,984,000	1,831,104,000		
Total Kgals for Treatment	1,507,968	753,984	53,856		861,696	700,128		753,984	1,831,104		
Feed to RO (gpm)	600	600	600		600	600		600	600		
Permeate Flow (gpm)	450	450	450		450	450		450	450		
Brine Flow (gpm)	150	150	150		150	150		150	150		
Average RO Recovery	75%	75%	75%		75%	75%		75%	75%		
Cost Assumptions:											
Power											
Avg Connected Hp	200	200	200		200	200		200	200		
kWh/Hp	0.75	0.75	0.75		0.75	0.75		0.75	0.75		
$/Kwh	0.05	0.05	0.05		0.05	0.05		0.05	0.05		$.02 plus demand charges per quote
Gallons per Minute	600	600	600		600	600		600	600		
Gallons per Hour	36000	36000	36000		36000	36000		36000	36000		
Cost per Hour ($)	$7.50	$7.50	$7.50		$7.50	$7.50		$7.50	$7.50		
Cost per Gallon ($)	$0.0002	$0.0002	$0.0002		$0.0002	$0.0002		$0.0002	$0.0002		
Cost per Kgal ($)	$0.21	$0.21	$0.21		$0.21	$0.21		$0.21	$0.21		
Chemicals											
Sulfuric Acid ($/Kgals)	$0.076	$0.076	$0.076		$0.076	$0.076		$0.076	$0.076		Costs from operating ISR facility experience (Cogema)
Caustic Soda ($/Kgals)	$0.111	$0.111	$0.111		$0.111	$0.111		$0.111	$0.111		Costs from operating ISR facility experience (Cogema)
Hydrochloric Acid ($Kgals)	$0.009	$0.009	$0.009		$0.009	$0.009		$0.009	$0.009		Costs from operating ISR facility experience (Cogema)
Hydrochloric Sulfide ($Kgals)	$0.304	$0.304	$0.304		$0.304	$0.304		$0.304	$0.304		Costs from operating ISR facility experience (Cogema)
Repair & Maintenance ($Kgals)	$0.279	$0.279	$0.279		$0.279	$0.279		$0.279	$0.279		Costs from operating ISR facility experience (Cogema)
Sampling & Analysis ($/Kgals)	$0.164	$0.164	$0.164		$0.164	$0.164		$0.164	$0.164		Costs from operating ISR facility experience (Cogema)
Total Cost per Kgal ($)	$1.15	$1.15	$1.15		$1.15	$1.15		$1.15	$1.15		
Total Pumping Cost ($)	$1,736,174	$868,087	$62,006		$992,099	$806,081		$868,087	$2,108,211		
Utilities											
Power ($/Month)	1,148	648	648		648	648		648	648		plant building only, i.e., lights, etc. (12,966 SF at $0.05/sf.)
Propane ($/Month)	800	400	400		400	400		400	400		
Time for Treatment											
Months for Treatment	27.7	15.5	15.5		27.7	27.7		15.5	15.5		Years of restoration for 6 pore volumes based on 300 gpm per wellfield for 1.29 years when the 90 sand will be restored. Then an additional 1.02 years at 600 gpm for the 80 sand restoration to be complete.
Utilities Cost ($)	$53,999	$16,223	$16,223		$29,051	$29,051		$16,223	$16,223		
TOTAL PLANT COST	**$1,790,172**	**$884,310**	**$78,229**	**$2,752,712**	**$1,021,150**	**$835,131**	**$1,856,281**	**$884,310**	**$2,124,434**	**$3,008,744**	
B. WELLFIELD											
Cost Assumptions:											
Power											
Avg Flow/Pump (gpm)	5	5	5		5	5		5	5		
Avg Hp/Pump	3	3	3		3	3		3	3		
Avg # of Pumps Required	280	47	20		320	260		280	680		Using Recovery Pumps
Avg Connected Hp	840	141	60		960	780		840	2040		
Kwh's/Hp	0.75	0.75	0.75		0.75	0.75		0.75	0.75		
$/Kwh	0.05	0.05	0.05		0.05	0.05		0.05	0.05		
Gallons per Minute	300	300	300		300	300		300	300		
Gallons per Hour	18000	18000	18000		18000	18000		18000	18000		
Costs per Hour ($)	$31.50	$5.29	$2.25		$36.00	$29.25		$31.50	$76.50		
Costs per Gallon ($)	$0.0018	$0.0003	$0.0001		$0.0020	$0.0016		$0.0018	$0.0043		
Costs per Kgal ($)	$1.75	$0.29	$0.13		$2.00	$1.63		$1.75	$4.25		
Repair & Maintenance ($/Kgals)	$0.016	$0.016	$0.016		$0.016	$0.016		$0.016	$0.016		
Total Cost per Kgal	$1.766	$0.310	$0.141		$2.016	$1.641		$1.766	$4.266		
MIT cost ($150/well)	$115,313	$22,345	$8,344		$131,850	$107,119		$115,313	$280,088		
TOTAL WELLFIELD COST	**$2,663,071**	**$233,547**	**$7,594**	**$241,140**	**$1,737,179**	**$1,148,910**	**$2,886,089**	**$1,331,536**	**$7,811,490**	**$9,143,025**	
TOTAL GW TREATMENT RO COST	**$4,568,556**	**$1,140,202**	**$94,167**	**$5,802,925**	**$2,890,179**	**$2,091,160**	**$4,981,339**	**$2,331,158**	**$10,216,011**	**$12,547,169**	

Worksheet 1, No III --
GROUNDWATER RESTORATION

	Leuenberger Satellite Plant				North Platte Plant			Peterson Plant			
Cost Item	Wellfield 1-80 Sand	Wellfield 2-90 Sand	Wellfield 3	Sub Total	Wellfield 4	Wellfield 5	Sub Total	Wellfield 6	Wellfield 7	Sub Total	**Notes**
III Deep Disposal Well											
Operating Assumptions:											
Total Disposal Requirement											
RO Brine Total Gallons	376,992,000	188,496,000	13,464,000		215,424,000	175,032,000		188,496,000	457,776,000		
RO Brine Total Kgallons	376,992	188,496	13,464		215,424	175,032		188,496	457,776		
Brine Concentration Factor	0.6	0.6	0.6		0.6	0.6		0.6	0.6		Confirmed 60% is good value with Engineer
Total Concentrated Brine (Gals)	226,195,200	113,097,600	8,078,400		129,254,400	105,019,200		113,097,600	274,665,600		
Months of RO Operation	27.7	15.5	15.5		27.7	27.7		15.5	15.5		
Average Monthly Reqm't (Gallons)	13,600,000	12,176,744	869,767		7,771,429	6,314,286		12,176,744	29,572,093		
Average Brine Flow (gpm)	100.0	100.0	100.0		100.0	100.0		100.0	100.0		
Total DDW Disposal (Gallons)	226,195,200	113,097,600	8,078,400		129,254,400	105,019,200		113,097,600	274,665,600		
Total DDW Disposal (Kgallons)	226,195	113,098	8,078		129,254	105,019		113,098	274,666		
Cost Assumptions:											
Avg Connected Hp	100	100	100		100	100		100	100		
Kwh's/Hp	0.75	0.75	0.75		0.75	0.75		0.75	0.75		
$/Kwh	0.05	0.05	0.05		0.05	0.05		0.05	0.05		$.02 plus demand charges per quote
Gallons per Minute	90.0	90.0	90.0		90.0	90.0		90.0	90.0		
Gallons per Hour	5400	5400	5400		5400	5400		5400	5400		
Cost per Hour ($)	$3.75	$3.75	$3.75		$3.75	$3.75		$3.75	$3.75		
Cost per Gallon ($)	$0.0007	$0.0007	$0.0007		$0.0007	$0.0007		$0.0007	$0.0007		
Cost per Kgal ($)	$0.69	$0.69	$0.69		$0.69	$0.69		$0.69	$0.69		
Chemicals											
RO Antiscalent ($/Kgals)	$0.192	$0.192	$0.192		$0.192	$0.192		$0.192	$0.192		Costs from operating ISR facility experience (Cogema)
WDW Antiscalent ($/Kgals)	$0.226	$0.226	$0.226		$0.226	$0.226		$0.226	$0.226		Costs from operating ISR facility experience (Cogema)
Sulfuric Acid ($/Kgals)	$0.280	$0.280	$0.280		$0.280	$0.280		$0.280	$0.280		Costs from operating ISR facility experience (Cogema)
Corrosion Inhibitor	$0.217	$0.217	$0.217		$0.217	$0.217		$0.217	$0.217		Costs from operating ISR facility experience (Cogema)
Algacide	$0.080	$0.080	$0.080		$0.080	$0.080		$0.080	$0.080		Costs from operating ISR facility experience (Cogema)
Other	$0.000	$0.000	$0.000		$0.000	$0.000		$0.000	$0.000		Costs from operating ISR facility experience (Cogema)
Repair & Maint. ($/Kgals)	$0.230	$0.230	$0.230		$0.230	$0.230		$0.230	$0.230		Costs from operating ISR facility experience (Cogema)
Total Cost per Kgal	$1.919	$1.919	$1.919		$1.919	$1.919		$1.919	$1.919		
TOTAL DEEP DISPOSAL WELL COST	**$434,169**	**$217,085**	**$15,506**	**$666,760**	**$248,097**	**$201,579**	**$449,675**	**$217,085**	**$527,205**	**$744,290**	

Worksheet 1, Nos. IV & V –
GROUNDWATER RESTORATION

Cost Item	Labor Cost Factors			Leuenberger Satellite Plant				North Platte Plant			Peterson Plant			Notes
				Wellfield 1-80 Sand	Wellfield 2-90 Sand	Wellfield 3	Sub Total	Wellfield 4	Wellfield 5	Sub Total	Wellfield 6	Wellfield 7	Sub Total	
IV STABILIZATION MONITORING														
Operating Assumptions:														
Time of Stabilization (mos)				12.0	12.0	12.0		12.0	12.0		12.0	12.0		
Frequency of Analysis (mos)				3	3	3		3	3		3	3		
Total Sets of Analysis				4	4	4		4	4		4	4		
Cost Assumptions:														
Power ($/Month)				$1,600	$1,600	$1,600		$1,600	$1,600		$1,600	$1,600		
Total Power Cost				$19,200	$19,200	$19,200		$19,200	$19,200		$19,200	$19,200		
Sampling & Analysis (each set)				$19,800	$9,900	$1,650		$22,770	$18,480		$19,800	$48,180		No. of Monitoring Wells @ $330 per event
Total Sampling & Analysis Cost ($)				$79,200	$39,600	$6,600		$91,080	$73,920		$79,200	$192,720		
Utilities ($/Month)				$400	$400	$400		$400	$400		$400	$400		
Total Utilities Cost ($)				$4,800	$4,800	$4,800		$4,800	$4,800		$4,800	$4,800		
TOTAL STABILIZATION COST				**$103,200**	**$63,600**	**$30,600**		**$115,080**	**$97,920**		**$103,200**	**$216,720**	**$730,320.00**	
V LABOR														
Cost Assumptions:	Cost/Hour	Hours/Year	Cost	No.										
Crew:														
1. Supervisor	29	2080	$60,320	1										
2. Operators	19	2080	$158,080	4										
3. Maintenance	19	2080	$158,080	4										
4. Vehicles	20.21	1000	$101,050	5										WDEQ Guideline No.12, Table D-1
Cost per Year			$477,530											
Time Required - Years				5.25										
TOTAL RESTORATION LABOR COST				**$2,506,679**	**$0**	**0$**				**0$**			**$2,506,678.77**	

Worksheet 1, Nos. VI, VII & Summary –
GROUNDWATER RESTORATION

Cost Item	Leuenberger Satellite Plant				North Platte Plant			Peterson Plant			Notes
	Wellfield 1-80 Sand	Wellfield 2-90 Sand	Wellfield 3	Sub Total	Wellfield 4	Wellfield 5	Sub Total	Wellfield 6	Wellfield 7	Sub Total	
VI RESTORATION CAPITAL REQUIREMENTS											
I Deep Disposal Well(s)	0	0	0		0	0		0	0		
II Plug and Abandon DDW	$140,000	0	0		$140,000	0		$140,000	0		Estimate on 2 disposal wells per Satelli
III Reverse Osmosis Unit	$0	0	0		0	0		0	0		
TOTAL RESTORATION CAPITAL REQUIREMENTS	**$140,000**	$0	$0	**$140,000**	**$140,000**	$0	**$140,000**	**$140,000**	$0	**$140,000**	
VII RESTORATION OF EXCURSION WELLS											
I Overlying Sand Well(s)											
Total Wells in Excursion	0	0	0		0	0		**$0**	0		Assume no excursions
Cost of Clean-Up	$100,000	$100,000	$100,000		$100,000	$100,000		$100,000	$100,000		
Total Overlying Sand Cleanup	$0	$0	$0		$0	$0		$0	$0		
II Ore Zone Wells											
Total Wells in Excursion	0	0	0		0	0		0	0		
Cost of Clean-Up	$100,000	$100,000	$100,000		$100,000	$100,000		$100,000	$100,000		
Total Ore Zone Cleanup	$0	$0	$0		$0	$0		$0	$0		
III Underlying Sand Wells											
Total Wells in Excursion	0	0	0		0	0		0	0		
Cost of Clean-Up	$100,000	$100,000	$100,000		$100,000	$100,000		$100,000	$100,000		
Total Underlying Sand Well Cleanup	$0	$0	$0		$0	$0		$0	$0		
TOTAL WELLFIELD COST											
TOTAL EXCURSION CLEANUP COST	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	
SUMMARY:											
I GROUNDWATER SWEEP	$219,930	$91,953	$6,568		$113,706	$85,385		$99,493	$223,314		
II REVERSE OSMOSIS	$4,568,556	$1,140,202	$94,167		$2,890,179	$2,091,160		$2,331,158	$10,216,011		
III WASTE DISPOSAL WELL	$434,169	$217,085	$15,506		$248,097	$201,579		$217,085	$527,205		
IV STABILIZATION	$103,200	$63,600	$30,600		$115,080	$97,920		$103,200	$216,720		
SUB TOTAL	**$5,325,855**	**$1,512,839**	**$146,841**		**$3,367,062**	**$2,476,044**		**$2,750,936**	**$11,183,251**		
V LABOR	$2,506,679	$0	$0		$0	$0		$0	$0		Included in OPEX costs
VI CAPITAL	$140,000	$0	$0		$75,000	$0		$75,000	$0		
VII EXCURSION CLEANUP	$0	$0	$0		$0	$0		$0	$0		
TOTAL GROUNDWATER RESTORATION COST	**$7,972,534**	**$1,512,839**	**$146,841**	**$9,632,214**	**$3,442,062**	**$2,476,044**	**$5,918,105**	**$2,825,936**	**$11,183,251**	**$14,009,187**	

Worksheet 2 a
SATELLITE PLANT EQUIPMENT REMOVAL AND DISPOSAL

	Leuenberger Satellite Plant						North Platte Satellite Plant					Petterson Satellite Plant					
Cost Item	Satellite Process Building	Maintenance Building	Resin	External Tanks	Header Houses	Sub Total	Satellite Process Building	Resin	External Tanks	Header Houses	Sub Total	Satellite Process Building	Resin	External Tanks	Header Houses	Sub Total	Notes
Volume (Yds^3)	100	25	110	20	55		100	110	20	73		100	110	20	120		Volume estimate uses 2.5 cubic yards per header house
Quantity per Truck Load (Yds^3)	20	20	20	20	20		20	20	20	20		20	20	20	20		
Number of Truck Loads	5.0	1.25	5.5	1	2.8		5.0	5.5	1	3.6		5.0	5.5	1	6.0		
I Decontamination Cost																	
Decontamination Cost ($/Load)	$900	$900	$900	$900	$900		$900	$900	$900	$900		$900	$900	$900	$900		Used WC number of $435 rather than $900 used for MR
Percent Requiring Decontamination	100%	25%	0%	50%	100%		100%	0%	50%	100%		100%	0%	50%	100%		
Total Cost	$4,500	$281	$0	$450	$2,475		$4,500	$0	$450	$3,263		$4,500	$0	$450	$5,400		
II Dismantle and Loading Cost																	
Cost per Truck Load ($)	$850	$850	$850	$850	$850		$850	$850	$850	$850		$850	$850	$850	$850		
Total Cost	$4,250	$1,063	$4,675	$850	$2,338		$4,250	$4,675	$850	$3,081		$4,250	$4,675	$850	$5,100		
III Oversize Charges																	
Percent Requiring Permits	40%	50%	0%	50%	40%		40%	0%	50%	40%		40%	0%	50%	40%		
Cost per Truck Load ($)	$500	$500	$500	$500	$500		$500	$500	$500	$500		$500	$500	$500	$500		$500 used for MR and CR
Total Cost	$1,000	$313	$0	$250	$550		$1,000	$0	$250	$725		$1,000	$0	$250	$1,200		
IV Transportation & Disposal																	
A. Landfill																	
Percent to be Shipped	80%	100%	0%	100%	80%		80%	0%	100%	80%		80%	0%	100%	80%		
Distance (Miles)	50	50	50	50	50		50	50	50	50		50	50	50	50		
Transport Cost ($/Ton-Mile)	$0.22	$0.22	$0.22	$0.22	$0.22		$0.22	$0.22	$0.22	$0.22		$0.22	$0.22	$0.22	$0.22		Based on an estimate from trucking company in 2010 adjusted for inflation.
Transportation Cost	$950	$297	$0	$238	$523		$950	$0	$238	$689		$950	$0	$238	$1,140		
Disposal Fee per Cubic Yard	$106	$106	$106	$106	$106		$106	$106	$106	$106		$106	$106	$106	$106		Cost based on WDEQ Guideline 12
Disposal Cost ($)	$8,480	$2,650	$0	$2,120	$4,664		$8,480	$0	$2,120	$6,148		$8,480	$0	$2,120	$10,176		
Total Cost	$9,430	$2,947	$0	$2,358	$5,187		$9,430	$0	$2,358	$6,837		$9,430	$0	$2,358	$11,316		
B. Licensed Site																	
Percent to be Shipped	20%	0%	100%	0%	20%		20%	100%	0%	20%		20%	100%	0%	20%		
Distance (Miles)	160	160	160	160	160		160	160	160	160		160	160	160	160		
Transport Cost ($/Ton-Mile)	$0.22	$0.22	$0.22	$0.22	$0.22		$0.22	$0.22	$0.22	$0.22		$0.22	$0.22	$0.22	$0.22		
Transport Cost	$3,456	$0	$19,008	$0	$1,901		$3,456	$19,008	$0	$2,506		$3,456	$19,008	$0	$4,147		
Disposal Cost ($/Ton)	$300	$300	$300	$300	$300		$300	$300	$300	$300		$300	$300	$300	$300		
Quantity per Truck Load (Yds^3)	20	20	20	20	20		20	20	20	20		20	20	20	20		
Quantity per Truck Load (Tons)	21.6	21.6	21.6	21.6	21.6		21.6	21.6	21.6	21.6		21.6	21.6	21.6	21.6		Based on avg 80lbs per cf
Disposal Cost	$6,480	$0	$35,640	$0	$3,564		$6,480	$35,640	$0	$4,698		$6,480	$35,640	$0	$7,776		
Total Cost	$15,910	$2,947	$35,640	$2,358	$8,751		$15,910	$35,640	$2,358	$11,535		$15,910	$35,640	$2,358	$19,092		
Total Cost	$25,341	$5,894	$35,640	$4,715	$13,937		$25,341	$35,640	$4,715	$18,372		$25,341	$35,640	$4,715	$30,409		
TOTAL COST	**$35,091**	**$7,550**	**$40,315**	**$6,265**	**$19,300**	**$108,521**	**$35,091**	**$40,315**	**$6,265**	**$25,441**	**$107,112**	**$35,091**	**$40,315**	**$6,265**	**$42,109**	**$123,780**	

Worksheet 2 b
SATELLITE PLANT BUILDING DEMOLITION AND DISPOSAL

Cost Item	Leuenberger Satellite Plant				North Platte Satellite Plant			Petterson Satellite Plant			Notes
	Satellite Process Building	Maintenance Building	Header Houses	Sub Total	Satellite Process Building	Header Houses	Sub Total	Satellite Process Building	Header Houses	Sub Total	
STRUCTURE DEMOLITION & DISPOSAL											
Structural Character											
Demolition Volume (Ft^3)	337,116	180,000	1485		337,116	1958		337,116	3240		Satellite plant building is 12,966 sf
Unit Cost of Demolition ($/ Ft^3)	$0.300	$0.300	$0.300		$0.300	$0.300		$0.300	$0.300		
Total Demolition Cost	$101,135	$54,000	$446		$101,135	$587		$101,135	$972		
Weight of Disposal Material in Tons	152	81	1		152	1		152	1		
Factor for Gutting	1	0.8	1		1	1		1	1		
Cost for Gutting ($)	$101,135	$43,200	$446		$101,135	$587		$101,135	$972		
Quantity per Truck Load (Ton)	21.6	21.6	21.6		21.6	21.6		21.6	21.6		
Number of Truckloads	7.0	3.8	0.0		7.0	0.0		7.0	0.1		
Distance to Landfill	50	50	50		50	50		50	50		
Unit Cost (Ton-Mile)	$0.22	$0.22	$0.22		$0.22	$0.22		$0.22	$0.22		
Transportation Cost	$1,668.72	$891.00	$7.35		$1,668.72	$9.69		$1,668.72	$16.04		
Disposal Cost ($/ton)	$106.00	$106.00	$106.00		$106.00	$106.00		$106.00	$106.00		
Disposal Cost ($)	$16,080.43	$8,586.00	$70.83		$16,080.43	$93.37		$16,080.43	$154.55		
TOTAL STRUCTURE DEMO & DISPOSAL	**$220,019**	**$106,677**	**$969**	**$327,665**	**$220,019**	**$1,278**	**$221,296**	**$220,019**	**$2,115**	**$222,133**	
CONCRETE DECONTAMINATION, DEMO & DISPOSAL											
Area	12966	8000	0		12966	0		12966	0		
Average Thickness (Ft)	0.75	0.75	0.75		0.75	0.75		0.75	0.75		
Volume (Ft^3)	9724.5	6000	0.0		9724.5	0.0		9724.5	0		
Weight of Disposal Concrete Assuming 145lbs/cubic foot	1,410,053	870,000	0		1,410,053	0		1,410,053	0		
Weight of Disposal in Tons	705	435	0		705	0		705	0		
Percent Requiring Decontamination	100%	0%	10%		100%	10%		100%	10%		
Volume Decontaminated (Ft^2)	9,725	0	0		9,725	0		9,725	0		
Decontamination ($/$Ft^2$)	$0.4500	$0.4500	$0.4500		$0.4500	$0.4500		$0.4500	$0.4500		
Decontamination Cost	$4,376	$0	$0		$4,376	$0		$4,376	$0		
Demolition ($/$Ft^2$)	$5.10	$5.10	$5.10		$5.10	$5.10		$5.10	$5.10		
Demolition Cost	$66,127	$40,800	$0		$66,127	$0		$66,127	$0		
Transportation & Disposal											
A. Onsite Disposal											
Percent to be Disposed Onsite	85%	100%	100%		85%	100%		85%	100%		
Transportation Cost	$0	$0	$0		$0	$0		$0	$0		
Disposal Cost per Cubic Yard ($)	$7.50	$7.50	$7.50		$7.50	$7.50		$7.50	$7.50		On-site disposal
Disposal Cost ($)	$2,701	$1,667	$0		$2,701	$0		$2,701	$0		
B. Licensed Site											
Percent to be Shipped	15%	0%	0%		15%	0%		15%	0%		
Distance (Miles)	160	160	160		160	160		160	160		
Unit Cost (Ton-Mile)	$0.22	$0.22	$0.22		$0.22	$0.22		$0.22	$0.22		
Transportation Cost ($)	$3,723	$0	$0		$3,723	$0		$3,723	$0		
Disposal Cost ($/Ton)	$300	$300	$300		$300	$300		$300	$300		
Disposal Cost ($)	$31,726	$0	$0		$31,726	$0		$31,726	$0		
TOTAL TRANSPORT & DISPOSAL COST	**$108,653**	**$42,467**	**$0**	**$151,119**	**$108,653**	**$0**	**$108,653**	**$108,653**	**$0**	**$108,653**	
TOTAL BUILDING DEMO & DISPOSAL COST	**$328,671**	**$149,144**	**$969**	**$478,784**	**$328,671**	**$1,278**	**$329,949**	**$328,671**	**$2,115**	**$330,786**	

Worksheet 3
SOIL REMOVAL & DISPOSAL

Cost Item	Leuenberger Satellite Plant				North Platte Satellite Plant			Peterson Satellite Plant			Notes
	Satellite Plant	Maintenance Building	Header Houses	Sub Total	Satellite Plant	Header Houses	Sub Total	Satellite Plant	Header Houses	Sub Total	
SOIL EXCAVATION, TRANSPORT & DISPOSAL											
Removal Under Building Footprints											
Excavation, Front End Loader	$55	$0	$0		$55	$0		$55	$0		$81.81/hr per WDEQ Guideline12 and 150 cy/hr
Quantity to be Shipped (Ft^3)	810	0	0		810	0		810	0		Assume removal of 3" of Contaminated Soil under Primary Areas over 25% of building area, Disposal at a Licensed facility (ft3)
Weight in Tons	40.5	0	0		40.51875	0		40.51875	0		
Distance (Miles)	160	160	160		160	160		160	160		
Transportation Unit Cost (Ton/Mile)	$0.220	$0.220	$0.220		$0.220	$0.220		$0.220	$0.220		
Transportation Cost	$1,426	$0	$0		$1,426	$0		$1,426	$0		
Disposal Fee ($/Ton)	$2,500	$2,500	$2,500		$2,500	$2,500		$2,500	$2,500		
Disposal Cost ($)	$101,250	$0	$0	$101,250	$101,297	$0	$101,297	$101,297	$0	$101,297	
Removal NPDES Pts.											
Quantity to be Shipped (Ft^3)	0	0	0		0	0		0	0		Zero discharge facility
Weight in Tons	0	0	0		0	0		0	0		
Distance (Miles)	160	160	160		160	160		160	160		
Transportation Cost Ton/Mile ($)	$0.220	$0.220	$0.220		$0.220	$0.220		$0.220	$0.220		
Transportation Cost	$0	$0	$0		$0	$0		$0	$0		
Disposal Fee ($/Ton)	$300	$300	$300		$300	$300		$300	$300		
Disposal Cost ($)	$0	$0	$0		$0	$0		$0	$0		
Total NPDES Removal Cost	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
TOTAL SOILS EXC., TRANSPORT & DISPOSAL	**$101,250**	**$0**	**$0**	**$101,250**	**$101,297**	**$0**	**$101,297**	**$101,297**	**$0**	**$101,297**	
RADIATION SURVEY											
Area Required (Acres)	0.00	0.00	0.00		0.30	0.00		0.30	0.00		
Survey Cost ($/Acre)	$1,200	$1,200	$1,200		$1,200	$1,200		$1,200	$1,200		$1200 based on cost for Tetratech gamma survey
Number of Structures	0	0	0		0	0		0	0		
Cost per Structure ($)	$225	$225	$225		$225	$225		$225	$225		
TOTAL RAD SURVEY COST	**$0**	**$0**	**$0**	**$0**	**$357**	**$0**	**$357**	**$357**	**$0**	**$357**	
TOTAL SOIL REMOVAL & DISPOSAL COST	**$101,250**	**$0**	**$0**	**$101,250**	**$101,654**	**$0**	**$101,654**	**$101,654**	**$0**	**$101,654**	

Worksheet 5, No. I --
WELLFIELD EQUIPMENT REMOVAL & DISPOSAL

	Leuenberger Satellite Plant				North Platte Plant			Peterson Plant			
Cost Item	Wellfield 1-80 Sand	Wellfield 2-90 Sand	Wellfield 3	Sub Total	Wellfield 4	Wellfield 5	Sub Total	Wellfield 6	Wellfield 7	Sub Total	**Notes**
I Wellfield Piping											
A. Removal											
Total Number of Wells	769	149	56		879	714		769	1,867		Includes total injection and recovery wells
Feeder lines from HH to Injection wells 1" HDPE (Ft)	448,000	128,000	32,000		512,000	416,000		448,000	1,088,000		From Preliminary Design- MR Wellfield 1 & Wellfield 2 takeoffs Based on engineers estimate of 32,000 ft. per HH
Pregnant solution feeder lines from production wells to HH 1" HDPE (Ft)	224,000	64,000	16,000		256,000	208,000		224,000	544,000		Based on engineers estimate of 16,000 ft per HH
Total Quantity of 1" HDPE Piping (Ft)	672,000	192,000	48,000		768,000	624,000		672,000	1,632,000		
Plastic Volume (Ft^3)	2,203.79	629.65	157.41		2,518.62	2,046.38		2,203.79	5,352.06		ISCO specs.for 1" HDPE DR 11
Chipped Volume Assuming 30% Void Space (Ft^3)	2,864.93	818.55	204.64		3,274.20	2,660.29		2,864.93	6,957.68		
Disposal Weight (tons)	114.60	32.74	8.19		130.97	106.41		114.60	278.31		Year 1 buildout only to include Wellfield 1
Quantity per Truck Load (Tons)	21.6	21.6	22.6		24.6	25.6		26.6	27.6		Based on 20 cy per truckload and 80lbs per cf
Total Number of Truck Loads	6	2	1		6	5		5	11		
Total Length of Feeder line Trench (ft)	70,000	20,000	5,000		80,000	65,000		70,000	170,000		Use 5000 ft per HH based on engineer estimate for WC wellfield 7-1
Pipeline Removal Unit Cost ($/ft of trench)	$2.25	$2.25	$2.25		$2.25	$2.25		$2.25	$2.25		Quote - Jordan Construction
Total Cost for Trunkline Removal ($)	$157,500	$45,000	$11,250		$180,000	$146,250		$157,500	$382,500		
Total Cost - Removal	$157,500	$45,000	$11,250	**$213,750**	$180,000	$146,250	**$326,250**	$157,500	$382,500	**$540,000**	
B. Survey & Decontamination											
Percent Requiring Decontamination	0	0	0		0	0		0	0		No survey or decon needed. Total volume to low level disposal
Loads for Decontamination	0	0	0		0	0		0	0		
Cost for Decontamination ($/Load)	$600	$600	$600		$600	$600		$600	$600		
Cost for Decontamination ($)	$0	$0	$0	**$0**	$0	$0	**$0**	$0	$0	**$0**	
C. Transport & Disposal											
1.) Landfill											
a. Transportation											
Percent to be Shipped	0%	0%	100%		300%	400%		500%	600%		
Loads to be Shipped	0	0	1		18	20		25	66		
Distance (Miles)	50	50	50		50	50		50	50		
Transportation Cost (Ton/Mile) ($)	$0.22	$0.15	$0.15		$0.15	$0.15		$0.15	$0.15		
Transportation Cost ($)	$0	$0	$8	**$8**	$135	$150	**$285**	$188	$495	**$683**	
b. Disposal											
Disposal Fee per Yd^3	$58	$58	$58		$58	$58		$58	$58		
Yds^3 per Load	20	20	20		20	20		20	20		
Disposal Cost ($)	$0	$0	$1,160		$20,880	$23,200		$29,000	$76,560		
Total Cost - Landfill	$0	$0	$1,168	**$1,168**	$21,015	$23,350	**$44,365**	$29,188	$77,055	**$106,243**	
2.) Licensed Site											
a. Transportation											
Percent to be Shipped	100%	100%	200%		400%	500%		600%	700%		
Loads to be Shipped	2	2	2		24	25		30	77		
Tons to be Shipped	114.60	32.74	8.19		130.97	106.41		114.60	278.31		
Distance (Miles)	160	160	160		160	160		160	160		
Transportation Ton/Mile ($)	$0.220	$0.220	$0.220		$0.220	$0.220		$0.220	$0.220		
Transportation Cost ($)	$4,034	$1,153	$288		$4,610	$3,746		$4,034	$9,796		
b. Disposal											
Disposal Fee per ton	$300	$300	$301		$303	$304		$305	$306		
Disposal Cost ($)	$34,379	$9,823	$2,464		$39,683	$32,349		$34,952	$85,162		
Total Cost - Licensed Site	38,413	10,975	2,752		44,293	36,095		38,986	94,958		
Total Cost - Transport & Disposal	38,413	10,975	3,919		65,308	59,445		68,173	172,013		
Total Cost - WF Piping Removal & Disposal	**$195,913**	**$55,975**	**$15,169**	**$267,058**	**$245,308**	**$205,695**	**$451,003**	**$225,673**	**$554,513**	**$780,187**	

Worksheet 4 –
Well Abandonment

Cost Item	Leuenberger Satellite Plant				North Platte Plant			Peterson Plant			Notes
	Wellfield 1-80 Sand	Wellfield 2-90 Sand	Wellfield 3	Sub Total	Wellfield 4	Wellfield 5	Sub Total	Wellfield 6	Wellfield 7	Sub Total	
Number of Wells	769	149	56		879	714		769	1867		Includes injection, recovery and monitor wells.
Average Depth (ft)	400	275	400		275	275		275	275		
Average Diameter (inch)	5	5	5		5	5		5	5		
Area of Annulus (ft^2)	0.1364	0.1364	0.1364		0.1364	0.1364		0.1364	0.1364		
Materials											
Bentonite Chips Required (Ft^3/Well)	11.4	11.4	11.4		11.4	11.4		11.4	11.4		250 feet of clay above water
Bags of Chips Required/Well	15	15	15		15	15		15	15		
Cost per Bag ($)	$5.10	$5.10	$5.10		$5.10	$5.10		$5.10	$5.10		Quote from Casper Well services (August 2011)
Cost/Well Bentonite Chips ($)	$77	$77	$77		$77	$77		$77	$77		
Gravel Fill Required (Ft^3/Well)	15.70	15.70	15.70		15.70	15.70		15.70	15.70		Avg depth less 250 feet filled w/ gravel
Cost of Gravel/Yd^3 ($)	$20	$20	$21		$23	$24		$25	$26		
Cost/Well Gravel Fill ($)	$11.63	$11.63	$11.63		$11.63	$11.63		$11.63	$11.63		MR and CR use $11.63
Cement Cone/Markers Req'd/Well	1	1	1		1	1		1	1		
Cost of Cement Cones Markers ($)	$7.50	$7.50	$7.50		$7.50	$7.50		$7.50	$7.50		Cost per Guideline 12, Appendix L
Total Materials Cost per Well	$96	$96	$96		$96	$96		$96	$96		
Labor											
Hours Required per Well	1	1	1		1	1		1	1		
Labor Cost per Hour	$54.12	$54.12	$54.12		$54.12	$54.12		$54.12	$54.12		From 2011 Heavy Highway Prevailing Wages WDEQ Guideline 12, I
Total Labor Cost per Well ($)	$54.12	$54.12	$54.12		$54.12	$54.12		$54.12	$54.12		
Equipment Rental											
Hours Required per Well	1	1	1		1	1		1	1		
Backhoe w/Operator Cost/Hr ($)	$55.61	$55.61	$55.61		$55.61	$55.61		$55.61	$55.61		Cost from WDEQ Guideline 12, Table D-1
Total Equipment Cost per Well ($)	$55.61	$55.61	$55.61		$55.61	$55.61		$55.61	$55.61		Wages from 2011 Heavy Highway wages WDEQ 12, I
Total Cost per Well ($)	$205	$205	$205		$205	$205		$205	$205		
TOTAL WELL ABANDONMENT COST ($)	**$157,871**	**$30,592**	**$11,423**	**$199,886**	**$180,511**	**$146,653**	**$327,164**	**$157,871**	**$383,458**	**$541,329**	

Worksheet 5, No. II
WELLFIELD EQUIPMENT REMOVAL & DISPOSAL

Cost Item	Leuenberger Satellite Plant				North Platte Plant			Peterson Plant			Notes
	Wellfield 1-80 Sand	Wellfield 2-90 Sand	Wellfield 3	Sub Total	Wellfield 4	Wellfield 5	Sub Total	Wellfield 6	Wellfield 7	Sub Total	
II Production Well Pumps											
A. Pump and Tubing Removal											
Number of Production Wells	280	47	20		320	260		280	680		
Cost of Removal ($/well)	$200	$201	$201		$201	$201		$201	$201		
Cost of Removal ($)	$56,000	$9,447	$4,020		$64,320	$52,260		$56,280	$136,680		
Number of Pumps per Truck Load	180	180	180		180	180		180	180		
Number of Truck Loads (Pumps)	1.56	0.26	0.11		1.78	1.44		1.56	3.78		
Weight of Pumps	21.56	20.26	20.11		21.78	21.44		21.56	23.78		Assume 20 T per truck
B. Survey & Decontamination (Pumps)											
Percent Requiring Decontamination	50%	50%	50%		50%	50%		50%	50%		
Loads for Decontamination	0.78	0.13	0.06		0.89	0.72		0.78	1.89		
Cost for Decontamination ($/Load)	$600	$600	$600		$600	$600		$600	$600		
Cost for Decontamination ($)	$467	$78	$33		$533	$433		$467	$1,133		
C. Tubing Volume Reduction & Loading											
Length per Well (Ft)	400	275	400		275	275		275	275		
Total Quantity (Ft^3)	367.3	42.4	26.2		288.6	234.5		252.5	613.3		Thickness Based on ISCO DR 11 1" HDPE PSI 160 (R1=.05479', R2=.04425')
Chipped Volume Assuming 30% Void Space (Ft^3)	477.5	55.1	34.1		375.2	304.8		328.3	797.2		
Cost of Removal ($/Ft)	$0.03	$0.03	$0.03		$0.03	$0.03		$0.03	$0.03		
Cost of Removal ($)	$3,360.00	$387.75	$240.00		$2,640.00	$2,145.00		$2,310.00	$5,610.00		
Quantity per Truck Load (Ft^3)	540	540	540		540	540		540	540		
Number of Truck Loads	1	1	1		1	1		1	2		
D. Transport & Disposal											
1.) Landfill											
a. Transportation											
Percent to be Shipped (Pumps)	50%	50%	50%		50%	50%		50%	50%		
Loads to be Shipped	0.8	0.1	0.1		0.9	0.7		0.8	1.9		
Distance (Miles)	50	50	50		50	50		50	50		
Transportation Ton/Mile ($)	$0.22	$0.22	$0.22		$0.22	$0.22		$0.22	$0.22		
Transportation Cost ($)	$185	$31	$13		$211	$172		$185	$449		
b. Disposal											
Disposal Fee per Yd^3	$58	$58	$58		$58	$58		$58	$58		
Yds^3 per Load	20	20	20		20	20		20	20		
Disposal Cost ($)	$902	$151	$64		$1,031	$838		$902	$2,191		
Total Cost - Landfill	$1,087	$182	$78		$1,242	$1,009		$1,087	$2,640		
2.) Licensed Site											
a. Transportation											
Percent to be Shipped (Pumps)	50%	50%	50%		50%	50%		50%	50%		
Percent to be Shipped (Tubing)	100%	100%	100%		100%	100%		100%	100%		
Loads to be Shipped	2.00	2.00	2.00		2.00	2.00		2.00	4.00		
Distance (Miles)	50	50	50		50	50		50	50		
Transportation Ton/Mile ($)	$0.22	$0.22	$0.22		$0.22	$0.22		$0.22	$0.22		
Transportation Cost ($)	$475	$475	$475		$475	$475		$475	$950		
b. Disposal											
Disposal Cost per Ft^3	$300	$300	$300		$300	$300		$300	$300		
Disposal Fee per Yd^3	20	20	20		20	20		20	20		
Quantity Per Truck Load (Yds^3)	$12,000	$12,000	$12,000		$12,000	$12,000		$12,000	$24,000		
Disposal Cost ($)	$12,475	$12,475	$12,475		$12,475	$12,475		$12,475	$24,950		
Total Cost - Licensed Site	$12,950	$12,950	$12,950		$12,950	$12,950		$12,950	$25,901		
Total Cost - Transport & Disposal	$14,037	$13,133	$13,028		$14,193	$13,960		$14,037	$28,541		
Total Cost - Pump Removal & Disposal	**$73,864**	**$23,046**	**$17,321**	**$114,231**	**$81,686**	**$68,798**	**$150,484**	**$73,094**	**$171,964**	**$245,058**	

Worksheet 5, No. III
WELLFIELD EQUIPMENT REMOVAL & DISPOSAL

Cost Item	Leuenberger Satellite Plant				North Platte Plant			Peterson Plant			Notes
	Wellfield 1-80 Sand	Wellfield 2-90 Sand	Wellfield 3	Sub Total	Wellfield 4	Wellfield 5	Sub Total	Wellfield 6	Wellfield 7	Sub Total	
III Buried Trunkline											
A. Removal											
Trunk lines from Satellite Plant to HH 8" HDPE Pipe (Ft)	50,000	50,000	50,000		50,000	50,000		50,000	50,000		Based on engineer estimate of 50,000 ft per wellfield.
Pregnant solution trunk lines from HH to Satellite Plant 8" HDPE Pipe (Ft)	0	0	0		0	0		0	0		
Total Quantity of HDPE Piping (Ft)	50,000	50,000	50,000		50,000	50,000		50,000	50,000		assume avg 8-in dia.
Plastic Volume (Ft^3)	33,729	33,729	33,729		33,729	33,729		33,729	33,729		Thickness Based on ISCO DR 11 8" PSI 160 (R1=.7188', R2=.5494')
Chipped Volume Assuming 30% Void Space (Ft^3)	43,847	43,847	43,847		43,847	43,847		43,847	43,847		
Disposal Tons	327	327	327		327	327		327	327		13.089lb/ft per ISCO
Quantity per Truck Load (Tons)	21.6	21.6	22.6		24.6	25.6		26.6	27.6		
Total Number of Truck Loads	16	16	15		14	13		13	12		
Total Length of Trunkline Trench (ft)	4,000	2,000	4,300		6,000	15,000		8,000	8,000		
Pipeline Removal Unit Cost ($/ft of trench)	$4.00	$4.00	$5.00		$7.00	$8.00		$9.00	$10.00		
Total Cost for Trunkline Removal ($)	$16,000	$8,000	$21,500	**$45,500**	$42,000	$120,000	**$162,000**	$72,000	$80,000	**$152,000**	
B. Survey & Decontamination											
Percent Requiring Decontamination	0	0	0		0	0		0	0		No survey or decon needed. Total volume to low level disposal
Loads for Decontamination	0	0	0		0	0		0	0		
Cost for Decontamination ($/Load)	$600	$600	$600		$600	$600		$600	$600		
Cost for Survey & Decontamination ($)	$0	$0	$0	**$0**	$0	$0	**$0**	$0	$0	**$0**	
C. Transportation & Disposal											
1.) Landfill											
a. Transportation											
Percent to be Shipped	0%	0%	0%		0%	0%		0%	0%		
Loads to be Shipped	0	0	0		0	0		0	0		
Distance (Miles)	50	50	50		50	50		50	50		
Transportation Cost (Ton/Mile) ($)	$0.22	$0.22	$0.22		$0.22	$0.22		$0.22	$0.22		
Transportation Cost ($)	$0	$0	$0		$0	$0		$0	$0		
b. Disposal											
Disposal Fee per Yd^3	$58	$58	$58		$58	$58		$58	$58		
Yds^3 per Load	20	20	20		20	20		20	20		
Disposal Cost ($)	$0	$0	$0		$0	$0		$0	$0		
Total Cost - Landfill	$0	$0	$0		$0	$0		$0	$0		
2.) Licensed Site											
a. Transportation											
Percent to be Shipped	100%	100%	100%		100%	100%		100%	100%		
Loads to be Shipped	16	16	15		14	13		13	12		
Tons to be Shipped	327.23	327.23	327.23		327.23	327.23		327.23	327.23		
Distance (Miles)	160	160	160		160	160		160	160		
Transportation Ton/Mile ($)	$0.220	$0.220	$0.220		$0.220	$0.220		$0.220	$0.220		
Transportation Cost ($)	$11,518	$11,518	$11,518		$11,518	$11,518		$11,518	$11,518		
b. Disposal											
Disposal Fee per ton	$300	$300	$300		$300	$300		$300	$300		
Disposal Cost ($)	$98,168	$98,168	$98,168		$98,168	$98,168		$98,168	$98,168		
Total Cost - Licensed Site	$109,686	$109,686	$109,686	**$329,057**	$109,686	$109,686	**$219,372**	$109,686	$109,686	**$219,372**	
Total Cost Transportation & Disposal	**$109,686**	**$109,686**	**$109,686**	**$329,057**	**$109,686**	**$109,686**	**$219,372**	**$109,686**	**$109,686**	**$219,372**	
Total Cost - Buried Trunkline Removal & Disposal	**$125,686**	**$117,686**	**$131,186**	**$374,557**	**$151,686**	**$229,686**	**$381,372**	**$181,686**	**$189,686**	**$371,372**	
TOTAL WELLFIELD EQUIPMENT REMOVAL & DISPOSAL COST	**$395,463**	**$196,707**	**$163,677**	**$755,846**	**$478,680**	**$504,179**	**$982,859**	**$480,453**	**$916,163**	**$1,396,617**	

Closure Cost Estimate
Ludeman ISR Project
Uranium One, Americas

Worksheet 6, No. I
TOPSOIL REPLACEMENT & REVEGETATION

	Satellite Plant				
Cost Item	Leuenberger	North Platte	Peterson	Sub Total	**Notes**
I Satellite Plant Building & Maint Bldg (Leuenberger only)					
A. Topsoil Handling & Grading					
Affected Area (Acres)	1.9	1.2	1.2		Assume disturbed area is 4 times area of bldg
Average Affected Thickness (Ins)	12	12	12		
Topsoil Volume (Yds^3)	3,106	1,921	1,921		
Unit Cost	$0.90	$0.90	$0.90		Cost per WDEQ Guideline 12, Appendix B
Sub Total - Topsoil	$2,795	$1,729	$1,729		
B. Radiation Survey & Soil Analysis					
Unit Cost ($/Ac)	$1,200	$1,200	$1,200		$1200 based on cost for Tetratech gamma survey
Sub Total - Survey & Analysis	$2,310	$1,429	$1,429		
C. Revegetation					
Fertilizer ($/Ac)	$0.00	$0.00	$0.00		
Seeding Prep & Seeding ($/Ac)	$280.00	$280.00	$280.00		Used for MR and IR/CR
Mulching & Crimping ($/Ac)	$0.00	$0.00	$0.00		
Sub Total Cost/Acre	$280.00	$280.00	$280.00		
Sub Total Revegetation	$539	$333	$333		
TOTAL PLANT AND OFFICE BUILDING TOPSOIL REPLACEMENT & REVEG COST	**$5,645**	**$3,491**	**$3,491**	**$12,627**	

Worksheet 6, Nos. II & III
TOPSOIL REPLACEMENT & REVEGETATION

Cost Item	Leuenberger Satellite Plant				North Platte Plant			Peterson Plant			Notes
	Wellfield 1-80 Sand	Wellfield 2-90 Sand	Wellfield 3	Sub Total	Wellfield 4	Wellfield 5	Sub Total	Wellfield 6	Wellfield 7	Sub Total	
II Wellfields											
A. Topsoil Handling & Grading											
Affected Area (Acres)	25	8	3		30	28		27	61		Equals trench length times 15 feet wide
Average Affected Thickness (Inch)	12	12	12		12	12		12	12		
Topsoil Volume (Yds^3)	41,111	12,222	5,167		47,778	44,444		43,333	98,889		
Unit Cost - Haul/Place/Grading ($/cy)	$0.90	$0.90	$0.90		$0.90	$0.90		$0.90	$0.90		Cost per WDEQ Guideline 12, Appendix B
Sub Total - Topsoil	$37,000	$11,000	$4,650		$43,000	$40,000		$39,000	$89,000		
B. Radiation Survey & Soil Analysis											
Unit Cost ($/Ac)	$1,200	$1,200	$1,200		$1,200	$1,200		$1,200	$1,200		$1200 based on cost for Tetratech gamma survey
Sub Total - Survey & Analysis	$30,579	$9,091	$3,843		$35,537	$33,058		$32,231	$73,554		
C. Spill Cleanup											
Affected Area (Acres)	0	0	0		0	0		0	0		
Affected Area (Ft^2)	0	0	0		0	0		0	0		
Affected Area Thickness (Ft)	0.5	0.5	0.5		0.5	0.5		0.5	0.5		
Affected Volume (Ft^3)	0	0	0		0	0		0	0		
Quantity per Truckload (Ft^3)	540	540	540		540	540		540	540		
Quantity to be Shipped (Loads)	0	0	0		0	0		0	0		
Distance (Miles)	160	160	160		160	160		160	160		
Transportation Cost (Ton/Mile) ($)	$0.22	$0.22	$0.22		$0.22	$0.22		$0.22	$0.22		
Transportation Cost ($)	$0	$0	$0		$0	$0		$0	$0		
Handling Cost ($/Load)	$400	$400	$400		$400	$400		$400	$400		
Handling Cost ($)	$0	$0	$0		$0	$0		$0	$0		
Disposal Fee ($/Ton)	$300	$300	$300		$300	$300		$300	$300		
Disposal Cost ($)	$0	$0	$0		$0	$0		$0	$0		
Sub Total - Spill Cleanup	$0	$0	$0		$0	$0		$0	$0		
D. Revegetation											
Fertilizer ($/Ac)	$0.00	$0.00	$0.00		$0.00	$0.00		$0.00	$0.00		
Seeding Prep & Seeding ($/Ac)	$280.00	$280.00	$280.00		$280.00	$280.00		$280.00	$280.00		Used for MR and IR/CR
Mulching & Crimping ($/Ac)	$0.00	$0.00	$0.00		$0.00	$0.00		$0.00	$0.00		
Sub Total Cost/Acre	$280.00	$280.00	$280.00		$280.00	$280.00		$280.00	$280.00		
Sub Total Revegetation	$7,135	$2,121	$897		$8,292	$7,713		$7,521	$17,163		
Sub Total - Wellfields	$74,713	$22,212	$9,390		$86,829	$80,771		$78,752	$179,716		
TOTAL WELLFIELDS COST	**$74,713**	**$22,212**	**$9,390**	**$106,315**	**$86,829**	**$80,771**	**$167,601**	**$78,752**	**$179,716**	**$258,468**	
III Roads											
A. Topsoil Handling & Grading											
Affected Area (Acres)	0.91	0.91	0.91		0.91	0.91		0.91	0.91		3305 feet by 12 feet wide- 2 track access
Average Affected Thickness (Ins)	12	12	12		12	12		12	12		
Topsoil Volume (Yds^3)	1,469	1,469	1,469		1,469	1,469		1,469	1,469		
Unit Cost - Haul/Place/Grading ($/cy)	$0.90	$0.90	$0.90		$0.90	$0.90		$0.90	$0.90		Cost per WDEQ Guideline 12, Appendix B
Sub Total - Topsoil	$1,322	$1,322	$1,322		$1,322	$1,322		$1,322	$1,322		
B. Radiation Survey & Soil Analysis											
Unit Cost ($/Ac)	$800	$800	$800		$800	$800		$800	$800		
Sub Total - Survey & Analysis	$728	$728	$728		$728	$728		$728	$728		
C. Revegetation											
Fertilizer ($/Ac)	$0	$0	$0		$0	$0		$0	$0		
Seeding Prep & Seeding ($/Ac)	$280	$280	$280		$280	$280		$280	$280		Used for MR and IR/CR
Mulching & Crimping ($/Ac)	$0	$0	$0		$0	$0		$0	$0		
Sub Total Cost/Acre	$280	$280	$280		$280	$280		$280	$280		
Sub Total Revegetation	$255	$255	$255		$255	$255		$255	$255		
Sub Total - Roads	$2,305	$2,305	$2,305		$2,305	$2,305		$2,305	$2,305		
TOTAL ROADS COST	**$2,305.31**	**$2,305.31**	**$2,305.31**	**$6,916**	**$2,305.31**	**$2,305.31**	**$4,611**	**$2,305.31**	**$2,305.31**	**$4,611**	

Worksheet 6, Nos IV & V
TOPSOIL REPLACEMENT & REVEGETATION

Cost Item	Leuenberger Satellite Plant				North Platte Plant			Peterson Plant			Notes
	Wellfield 1-80 Sand	Wellfield 2-90 Sand	Wellfield 3	Sub Total	Wellfield 4	Wellfield 5	Sub Total	Wellfield 6	Wellfield 7	Sub Total	
IV Other											
A. Topsoil Handling & Grading											
Affected Area (Acres)	4	4	1		4	4		4	4		
Average Affected Thickness (Ins)	6	6	6		6	6		6	6		
Topsoil Volume (Yds^3)	3,227	3,227	807		3,227	3,227		3,227	3,227		
Unit Cost - Haul/Place/Grading ($/Ac)	$0.90	$0.90	$0.90		$0.90	$0.90		$0.90	$0.90		
Sub Total - Topsoil	$2,904	$2,904	$726		$2,904	$2,904		$2,904	$2,904		
B. Radiation Survey & Soil Analysis											
Unit Cost ($/Ac)	$800	$800	$800		$800	$800		$800	$800		
Sub Total - Survey & Analysis	$3,200	$3,200	$800		$3,200	$3,200		$3,200	$3,200		
C. Revegetation											
Fertilizer ($/Ac)	$0.00	$0.00	$0.00		$0.00	$0.00		$0.00	$0.00		
Seeding Prep & Seeding ($/Ac)	$280.00	$280.00	$280.00		$280.00	$280.00		$280.00	$280.00		Used price from WC and MR surety estimates
Mulching & Crimping ($/Ac)	$0.00	$0.00	$0.00		$0.00	$0.00		$0.00	$0.00		
Sub Total Cost/Acre	$280.00	$280.00	$280.00		$280.00	$280.00		$280.00	$280.00		
Sub Total Revegetation	$1,120	$1,120	$280		$1,120	$1,120		$1,120	$1,120		
Sub Total - Other	$7,224	$7,224	$1,806		$7,224	$7,224		$7,224	$7,224		
TOTAL OTHER COST	**$7,224**	**$7,224**	**$1,806**	**$16,254**	**$7,224**	**$7,224**	**$14,448**	**$7,224**	**$7,224**	**$14,448**	
V Remedial Action											
A. Topsoil Handling & Grading											
Affected Area (Acres)	25	8	3		30	28		27	61		
Average Affected Thickness (Ins)	12	12	12		12	12		12	12		
Topsoil Volume (Yds^3)	41,111	12,222	5,167		47,778	44,444		43,333	98,889		
Unit Cost - Haul/Place/Grading ($/cy)	$0.90	$0.90	$0.90		$0.90	$0.90		$0.90	$0.90		Cost per WDEQ Guideline 12, Appendix B
Sub Total - Topsoil	$37,000	$11,000	$4,650		$43,000	$40,000		$39,000	$89,000		
B. Radiation Survey & Soil Analysis											
Unit Cost ($/Ac)	$1,200	$1,200	$1,200		$1,200	$1,200		$1,200	$1,200		$1200 based on cost for Tetratech gamma survey
Sub Total - Survey & Analysis	$30,579	$9,091	$3,843		$35,537	$33,058		$32,231	$73,554		
C. Revegetation											
Fertilizer ($/Ac)											
Seeding Prep & Seeding ($/Ac)	$280.00	$280.00	$280.00		$280.00	$280.00		$280.00	$280.00		Cost from WC and MR surety estimates 2011
Mulching & Crimping ($/Ac)											
Sub Total Cost/Acre	$280.00	$280.00	$280.00		$280.00	$280.00		$280.00	$280.00		
Sub Total Revegetation	$7,135	$2,121	$897		$8,292	$7,713		$7,521	$17,163		
TOTAL REMEDIAL ACTION	**$74,713**	**$22,212**	**$9,390**	**$106,315**	**$86,829**	**$80,771**	**$167,601**	**$78,752**	**$179,716**	**$258,468**	
TOTAL TOPSOIL REPLACEMENT & REVEGETATION COST (Total of 6I through 6V)	**$164,601**	**$53,954**	**$22,891**	**$241,445**	**$183,188**	**$171,072**	**$354,260**	**$167,033**	**$368,962**	**$535,995**	

Closure Cost Estimate
Ludeman ISR Project
Uranium One, Americas

Worksheet 7, Nos I - VII
MISCELLANEOUS RECLAMATION

	Cost Item	Leuenberger Satellite Plant				North Platte Plant			Peterson Plant			Notes
		Wellfield 1-80 Sand	Wellfield 2-90 Sand	Wellfield 3	Sub Total	Wellfield 4	Wellfield 5	Sub Total	Wellfield 6	Wellfield 7	Sub Total	
I	**Fence Removal & Disposal**											
	Quantity (Ft)	11,637	10,086	0		14,400	16,800		12,000	24,750		Scaled off on map
	Cost of Removal/Disposal ($/Ft)	$1.50	$1.50	$1.50		$1.50	$1.50		$1.50	$1.50		
	Cost of Removal/Disposal ($)	$17,456	$15,129	$0	**$32,585**	$21,600	$25,200	**$46,800**	$18,000	$37,125	**$55,125**	
II	**Powerline Removal & Disposal**											
	Quantity (Ft)	7,500	7,500	7,500		7,500	7,500		7,500	7,500		Power to Wells, header houses. Other power already in place by CBM companies
	Cost of Removal/Disposal ($/Ft)	$0.50	$0.50	$1.50		$3.50	$4.50		$5.50	$6.50		
	Cost of Removal/Disposal ($)	$3,750	$3,750	$11,250	**$18,750**	$26,250	$33,750	**$60,000**	$41,250	$48,750	**$90,000**	
III	**Powerpole Removal & Disposal**											
	Quantity	25	25	25		25	25		25	25		Overhead powerpoles and lines will remain in place for future gas production
	Cost of Removal/Disposal ($/Each)	0	0	0		0	0		0	0		
	Cost of Removal/Disposal ($)	$0.00	$0.00	$0.00	**$0**	$0.00	$0.00	**$0**	$0.00	$0.00	**$0**	
IV	**Transformer Removal & Disposal**											
	Quantity	4	4	0		0	0		0	0		
	Cost of Removal/Disposal ($/Each)	4500	4500	4500		4500	4500		4500	4500		Tri-County Electric will remove at no cost, WDEQ Guideline No.12, App. H
	Cost of Removal/Disposal ($)	18000	18000	0	**$36,000**	0	0	**$0**	0	0	**$0**	
V	**Culvert Removal & Disposal**											
	Quantity (Ft)	0	0	0		0	0		0	0		None
	Cost of Removal/Disposal ($/Ft)	$4.56	$4.56	$4.56		$4.56	$4.56		$4.56	$4.56		($91.24/20') WDEQ Guideline No.12, App. J
	Cost of Removal/Disposal ($)	$0.00	$0.00	$0.00	**$0**	$0.00	$0.00	**$0**	$0.00	$0.00	**$0**	
VI	**Guardrail Removal**											
	Quantity (Ft)	0	0	0		0	0		0	0		None
	Cost of Removal/Disposal ($/Ft)	$6.50	$6.50	$6.50		$6.50	$6.50		$6.50	$6.50		
	Cost of Removal/Disposal ($)	$0	0	0	**$0**	0	0	**$0**	0	0	**$0**	
VII	**Low Water Stream Crossing**											
	Quantity	0	0	0		0	0		0	0		None
	Cost of Removal/Disposal ($/Each)	$8,000	$8,000	$8,000		$8,000	$8,000		$8,000	$8,000		
	Cost of Removal/Disposal ($)	$0	$0	$0	**$0**	$0	$0	**$0**	$0	$0	**$0**	
	TOTAL MISCELLANEOUS COST	**$39,206**	**$36,879**	**$11,250**	**$87,335**	**$47,850**	**$58,950**	**$106,800**	**$59,250**	**$85,875**	**$145,125**	

Worksheet 8, Nos I - VIII
POND RECLAMATION COST

	Cost Item	Leuenberger Satellite Plant		North Platte Plant		Petersen Plant		NOTES
		Surge Pond 1	Surge Pond 2	Surge Pond 1	Surge Pond 2	Surge Pond 1	Surge Pond 2	
I	POND SLUDGE:							
	Average Sludge Depth (Ft)	0.15625	0	0.15625	0	0.15625	0	WC uses a sludge volume of 0.15625
	Average Area of Sludge (Ft^2)	32,670	32,670	32,670	32,670	32,670	32,670	Pond size from MR 0.75 acres per pond
	Volume of Sludge (Ft^3)	5,104.69	0.00	5,104.69	0.00	5,104.69	0.00	
	Volume of Sludge (Yds^3)	189	0	189	0	189	0	
	Volume of Sludge Per Truck Load (Yds^3)	20	20	20	20	20	20	
	# of Truck Loads of Sludge	9	0	9	0	9	0	
	Sludge Handling Cost Per Load ($)	$240	$240	$240	$240	$240	$240	
	Total Sludge Handling Cost ($)	$2,269	$0	$2,269	$0	$2,269	$0	
	Transportation & Disposal							
	Percent To Be Shipped to Licensed Site	100%	100%	100%	100%	100%	100%	
	Transportation Cost per Truckload	$2,100.00	$2,100.00	$2,100.00	$2,100.00	$2,100.00	$2,100.00	
	Transportation Cost ($)	$19,851.56	$0.00	$19,851.56	$0.00	$19,851.56	$0.00	
	Disposal Cost Per Cubic Foot ($)	$11.00	$11.00	$11.00	$11.00	$11.00	$11.00	Used WC 2011 surety disposal cost for liner
	Quantity Per Truck Load (Yds^3)	20.0	20.0	20.0	20.0	20.0	20.0	
	Quantity Per Truck Load (Ft^3)	540	540	540	540	540	540	
	Disposal Cost ($)	$56,151.56	$0.00	$56,151.56	$0.00	$56,151.56	$0.00	
	Total Transportation & Disposal ($)	$76,003.13	$0.00	$76,003.13	$0.00	$76,003.13	$0.00	
	TOTAL SLUDGE COST ($)	$78,271.88	$0.00	$78,271.88	$0.00	$78,271.88	$0.00	
II	POND LINER:							
	Total Pond Area (Acres)	1.60	1.60	1.60	1.60	1.60	1.60	MR uses acreage of 1.6 for liner area
	Total Pond Area (Ft^2)	69696	69,696	69696	69,696	69,696	69696	
	Factor For Sloping Sides	20%	20%	20%	20%	20%	20%	Used WC numbers for factor no number in MR
	Total Liner Area (Ft^2)	83635	83635	83635	83635	83635	83635	
	Liner Thickness (Mil)	30	30	30	30	30	30	
	Liner Thickness (Inches)	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	
	Liner Thickness (Ft)	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	
	"Swell" Factor	25%	25%	25%	25%	25%	25%	Used WC number none in MR
	Liner Volume (Ft^3)	261	261	261	261	261	261	
	Truck Loads of Liner	0.5	0.5	0.5	0.5	0.5	0.5	
	Liner Handling Cost ($)							
	Labor Crew Cost per Hour ($)	160.18	$160.18	160.18	$160.18	$160.18	160.18	
	Hours per Load	2	$2	2	$2	$2	2	
	Liner Handling Cost Per Load ($)	$320	$320	320	$320	$320	$320	
	Total Liner Handling Cost ($)	$160	$160	$160	$160	$160	$160	
	Transportation & Disposal							
	Percent To Be Shipped to Licensed Site	100%	100%	100%	100%	100%	100%	
	Transportation Cost per Truckload	$2,100	$2,100	$2,100	$2,100	$2,100	$2,100	
	Transportation Cost ($)	$1,050	$1,050	$1,050	$1,050	$1,050	$1,050	
	Disposal Cost Per Cubic Foot ($)	$11	$11	$11	$11	$11	$11	
	Quantity Per Truck Load (Ft^3)	540	540	540	540	540	540	
	Disposal Cost ($)	2970	2970	2970	2970	2970	2970	
	Total Transportation & Disposal ($)	$4,020	$4,020	$4,020	$4,020	$4,020	$4,020	
	TOTAL LINER COST ($)	$4,180	$4,180	$4,180	$4,180	$4,180	$4,180	
III	POND BACKFILL:							
	Backfill required (Yds^3)	24,039	24,039	24,039	24,039	24,039	24,039	
	Backfill Cost ($/Yd^3$)	$0.90	$0.90	$0.90	$0.90	$0.90	$0.90	Cost per WDEQ Guideline 12, Appendix B
	TOTAL BACKFILL COST ($)	$21,635	$21,635	21635	21635	$21,635	21635	
IV	RADIATION SURVEY							
	Areal required (acres)	1.60	1.60	1.60	1.60	1.60	1.60	
	Survey Cost ($/acre)	$1,200	$1,200	$1,200	$1,200	$1,200	$1,200	$1200 based on cost for Tetratech gamma survey
	TOTAL SURVEY COST ($)	$1,920	$1,920	$1,920	$1,920	$1,920	$1,920	
V	LEAK DETECTION SYSTEM REMOVAL							
	Volume of Gravel and Piping (Ft^3) (Assume 3")	2,187	2,187	2,187	2,187	2,187	2,187	Based on ration of 6 ponds at Ludeman compaired to 12 ponds and 26,250 ft^3 for WC
	Quantity per Truckload (Ft^3)	540	540	540	540	540	540	
	Quantity to be Shipped to Licensed Site (Loads)	4.05	4.05	4.05	4.05	4.05	4.05	
	Transportation Cost per Truckload	$2,100	$2,100	$2,100	$2,100	$2,100	$2,100	Based on estimate for 2011 WC surety
	Transportation Cost ($)	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	
	Handling Cost per load	1,297	1,297	1,297	1,297	1,297	1,297	Based on WC 2011 estimate
	Disposal Fee per Cubic Foot ($)	$11	$11	$11	$11	$11	$11	
	Disposal Cost ($)	24,057	24,057	24,057	24,057	24,057	24,057	
	TOTAL LEAK DETECTION SYSTEM REMOVAL	$34,354.46	$34,354.46	34354.458	34354.458	$34,354.46	34354.458	
	TOTAL POND RECLAMATION COST	$140,361.33	$62,089.46	$140,361.33	$62,089.46	$140,361.33	$62,089.46	
		Leuenberger	$202,451	North Platte	$202,451	Peterson	$202,451	

TOTAL SLUDGE COST ($)	$234,816
TOTAL LINER COST ($)	$25,080
TOTAL BACKFILL COST ($)	$129,810
TOTAL RADIATION SURVEY COST ($)	$11,520
LEAK DETECTION SYSTEM REMOVAL	$206,127