APPENDIX U

MINEQL+

The MINEQL+ model (Schecher and McAvoy, 2003) was used to determine uranium solubility. MINEQL+ is a menu-driven version of MINTEQA2 which includes the USEPA MINTEQA2 database and additional species, including uranium, which is not included in the MINTEQA2 database. MINEQL+ simplifies data input and generates graphic and other data displays.

Input

Groundwater data from three Guterl wells were used as input for modeling (Table U-1). The wells were chosen to represent conditions that would promote uranium solubility. Well MW-605D had the most elevated groundwater uranium concentration based on the July/August, 2007 sampling. The presence of anions increases uranium solubility; well MW-602D had elevated uranium and relatively elevated anion concentrations. Groundwater at these wells also had oxidizing conditions, indicating uranium presence as the more soluble U^{6+} species. For comparison, groundwater conditions at well MW-2 were modeled. Uranium was detected at this well; however, conditions appear to be nitrate reducing so uranium was assumed to be present as the less soluble U^{4+} species.

Data were converted to molar concentrations for entry into MINEQL+. The uranium concentration was determined by converting the reported activities for the uranium species (^{234}U, ^{238}U, and $^{235/236}U$) to concentrations and adding the three concentrations (Table U-2). Ninety-nine percent of the uranium concentration was composed of ^{238}U. Field redox measurements were converted to pe for MINEQL+ entry by first adding 200 mV to the field redox measurement, under the assumption that field measurements used a silver/silver chloride reference electrode. The alternate conversion, if a calomel reference electrode is used, would be 244 mV. Both conversion factors assume tested water is at $25^{o}C$. Considering the difficulty obtaining an accurate redox measurement, field values are considered to be qualitative so the difference in conversion factors is relatively small.

The converted redox measurement was converted to a pe value, required by the program, using the following formula (Table U-3):

$$pe = Eh(V)*F/2.303RT$$

where:

Eh = converted field redox measurement,

F = Faraday constant (23061 calorie per volt)

R = gas constant (1.987 calorie per degree)

T = groundwater temperature converted from degrees Celsius to degrees Kelvin by adding 273.15.

Other model input included:

- Ionic strength was fixed to maintain concentrations reported by laboratory rather than calculated to maintain ion balance.

- Mineral precipitation allowed when the Gibbs Phase Rule is not violated; in that case, the model would not complete calculations.
- pH was fixed at the value reported for groundwater.
- No adsorption was included due to small distribution value measured for the dolostone bedrock (K_d = 0.22 mL/g).

Results

MINEQL+ model results for different sets of conditions are listed in Table U-4. As indicated, the redox conditions were fixed in some model runs either by specifying dissolved oxygen content or the pe, which was based on the redox (ORP) measured in the field. U^{4+}, U^{6+}, or both were specified. Initially, the measured concentration was modeled. Then the concentration of uranium was increased until mineral precipitation occurred, indicating that maximum solubility had been reached. Maximum solubility was also calculated by multiplying the input uranium concentration by the percent soluble uranium (calculated by MINEQL+). The maximum dissolved uranium concentration was 147 milligrams per liter (mg/L). Therefore, a value of 150 mg/L was used for solubility of uranium for the SESOIL model.

Attached to this appendix are input and output files for MINEQL+ modeling runs. Files for each location are identified by the well name. Input files have "input" as part of the file name. Output files include the following identifiers as part of the file name:

- Output – entire output
- SI – saturation index report indicating minerals that precipitate (saturation index = 0 or positive number
- UIV or UVI report – lists percent of each species or mineral containing U^{4+} or U^{6+}

References:

Schecher, W.D. and McAvoy, D.C. 2003. MINEQL+, A Chemical Equilibrium Modeling System, Version 4.5 for Windows User's Manual. Environmental Research Software.

Table U-1
MINTEQL+ Model Input
Guterl Site

SAMPLE_ID	units	G-MW-2-F	G-MW-602D-F	G-MW-605D-F
Barium	mg/L	108	18.7	48.6
Calcium	mg/L	126000	61400	77500
Chloride	mg/L	400	24	82
Alkalinity, Total (as $CaCO_3$)	mg/L	290	250	350
Iron	ug/L	98.4	<15.4	<15.4
Fluoride	ug/L	0.69	3.7	2.9
Potassium	mg/L	5420	2480	4680
Magnesium	mg/L	34900	33000	36900
Manganese	ug/L	239	3	202
Sodium	mg/L	169000	31000	98300
Nitrate as N	mg/L	0.1	0.62	1.4
Sulfate	mg/L	94	40	92
Uranium	ug/L	19.4	116.8	191.7
pH	std. unit	7.06	6.97	7.01
Dissolved Oxygen	mg/L	0.00	5.37	0.21
Temperature	^oC	6.63	14.7	10.2
Field ORP	mV	-42	149	87.0

SAMPLE_ID	units	G-MW-2-F	G-MW-602D-F	G-MW-605D-F
Barium	M	7.86E-07	1.36E-07	3.54E-07
Calcium	M	3.14E-03	1.53E-03	1.93E-03
Chloride	M	1.13E-02	6.77E-04	2.31E-03
CO3	M	1.17E-01	1.01E-01	1.41E-01
Iron	M	1.76E-06	2.76E-07	nd
Fluoride	M	3.63E-05	1.95E-04	1.53E-04
Potassium	M	1.39E-04	6.34E-05	1.20E-04
Magnesium	M	1.44E-03	1.36E-03	1.52E-03
Manganese	M	4.35E-06	5.82E-08	3.68E-06
Sodium	M	7.35E-03	1.35E-03	4.28E-03
NO_3-	M	nd	4.43E-05	1.00E-04
Sulfate	M	9.79E-04	4.16E-04	9.58E-04
UO_2^{2+}	M	9.26E-08	5.56E-07	9.13E-07
pH	std. unit	7.06	6.97	7.01
Dissolved Oxygen	mg/L	0.01	5.37	0.21
Temperature	^oC	6.63	14.7	10.2
pe	--	2.85	6.11	5.11

Notes:
Used 0.01 mg/L for dissolved oxygen of 0.00
Assumed conversion factor from field ORP to Standard Eh of +200 millivolts; converted to pe for use by MINEQL+

^oC = degrees Celsius
M = moles per liter (unit used by MINEQL+ model)
mg/L = milligrams per liter
nd = not detected
ug/L = micrograms per liter

Table U-2
Uranium Conversion from Activity to Concentration
Guterl Site

Parameter	Uranium 234	Uranium 238	Uranium 235/236	Uranium 234	Uranium 238	Uranium 235/236*	Uranium Sum	Uranium Sum
	pCi/L	pCi/L	pCi/L	µg/L	µg/L	µg/L	µg/L	pCi/L
A02MW2-F	6.1	6.5	0.3	0.000976	19.305	0.1368	19.44	12.9
A04AMW602D-F	39.1	39	2.15	0.006256	115.83	0.9804	116.82	80.25
A04BMW605D-F	68	64	3.6	0.01088	190.08	1.6416	191.73	135.6

Notes:
pCi/L to µg/L conversion:
*Method reference: http://www.hps.org/publicinformation/ate/q6747.html
using half life of 245,000 yrs for U-234
using half life of 7.04e8 yrs for U-235
using half life of 4.46e9 yrs for U-238
For U-235/236, the half life of U-235 is used as U-236 is unlikely to occur at the site.
Half-life reference:
Weast, R.C., ed. 1985. Handbook of Chemistry and Physics, 66th Edition, Table of Isotopes.
SA (dps/g) = $(4.17 \times 10^{23}) / (M) (T_{1/2})$, where $T_{1/2}$ is in seconds

Table U-3
Conversion from Field ORP to PE Values for MINEQL+ Modeling
Guterl Site

Convert Eh (mV) to pe at any temperature

Eh = (2.303RT/F)*pe
pe= Eh(mV)*F/(2.303RT*1000)

Eh(mV)	R (cal/degree)	T o C	T o K	Constant	F (cal/V)	pe
158	1.987	6.63	279.78	2.303	23061	2.85
287	1.987	10.16	283.31	2.303	23061	5.11
349	1.987	14.65	287.8	2.303	23061	6.11

Note: Measured field ORP values "converted" to Eh by adding 200 mV.
Input from field data
From: http://coalgeology.com/wp-content/uploads/2008/04/eh-to-pe.xls

Table U-4
MINEQL+ Model Output
Guterl Site

Sample Location	Uranium Species Modeled	Uranium Modeled *milligrams per liter*	Redox Conditions *(input to model)*	Dissolved Uranium[c] *Percent of Uranium Modeled*	Dissolved Uranium[c] *milligrams per liter*
Most dissolved oxygen occurring with elevated uranium:					
MW-602D	$UO2^{2+}$ (U^{6+}) & U^{4+}	0.117[a]	DO fixed at 5.37 mg/L[b]	100%	0.117
MW-602D	$UO2^{2+}$ (U^{6+})	2.10E+03	not set	1.7%	36
MW-602D	$UO2^{2+}$ (U^{6+})	2.10E+02	not set	45.1%	95
Most anions occuring with elevated uranium:					
MW-605D	$UO2^{2+}$ (U^{6+})	0.192[a]	not set	100%	0.192
MW-605D	$UO2^{2+}$ (U^{6+})	2.10E+02	not set	68.3%	143
MW-605D	$UO2^{2+}$ (U^{6+})	1.47E+02	not set	100%	147
Reducing conditions with uranium present:					
MW-2	U^{4+}	2.10	pe fixed at 2.85[b]	0%	0
MW-2	U^{4+}	2.10E+02	pe fixed at 2.85[b]	0%	0

Notes:

[a] uranium concentration detected in groundwater sample at this location; more elevated concentrations modeled to determine maximum solubility

[b] Based on values measured in field.

[c] Model predicts remainder of uranium precipitates.

DO = dissolved oxygen

Note that wells MW-602D and MW-605D had the most elevated uranium concentrations in groundwater (July/August 2007 sampling).

Modeling assumed a system closed to the atmosphere and pH was fixed at field pH for all model runs.

HELP Model

1. INTRODUCTION

The Hydrologic Evaluation of Landfill Performance (HELP) model was developed at the U.S. Army Engineer Waterways Experiment Station under a cooperative agreement with the U.S. Environmental Protection Agency (EPA) to support RCRA and Superfund programs. HELP is a quasi-two-dimensional hydrologic model of water movement through soils. The primary purpose of the model is to assist in the comparison of design alternatives for landfills. However the model is also applicable to open, partially closed, and fully closed sites, as a tool for both designers and permit writers. The model accepts weather, soil and design data and uses solution techniques that account for the effects of surface storage, snowmelt, runoff, infiltration, evapotranspiration, vegetative growth, soil moisture storage, lateral subsurface drainage, leachate recirculation, unsaturated vertical drainage, and leakage through soil, geomembrane or composite liners.

The HELP model was used to evaluate infiltration at the Guterl site. Initial runs were performed to evaluate infiltration for specific Guterl Site areas and buildings. This was followed by runs to evaluate a generalized site model that was developed to be conservatively applicable to the Guterl site. For the generalized site model, HELP parameters were modified to match the results of the RESRAD model, which is discussed in a separate appendix attached to this document.

Using the HELP default soil texture for silty clay, the annual average infiltration rates range from 0.04 to 0.11 inches inside the buildings and 2.0 to 2.5 inches outside the buildings. Using site specific soil characteristics, the HELP model predicted an annual average infiltration rate of 2.0 inches/year within Buildings 2, 6 and 8 and 0.45 inches/year within Building 3. Outside the building areas, the annual average infiltration rates predicted range from 3.1 to 9.1 inches/year. Using parameters adjusted to coordinate with RESRAD results, an annual average infiltration rate of 14.5 inches/year was predicted. This value is conservative because greater infiltration results in more contaminant transport to groundwater (see SESOIL portion of this appendix). The input parameters and results are discussed in detail below.

2. INPUT PARAMETERS

2.1. Climate Data

2.1.1. Precipitation, Temperature and Solar Radiation

The HELP model uses the WGEN synthetic weather generator developed by the USDA Agricultural Research Service (ARS) to yield daily values of precipitation, temperature and solar radiation. Up to 100 years of daily conditions can be generated for 139 cities. The data generated has approximately the same statistical characteristics as the historic data at the selected city. The statistical characteristics of the resulting daily values can be improved to better represent the site by entering normal mean monthly values. The HELP manual advises that normal mean monthly precipitation values specific to the site be entered if the site is located more than a few miles from the selected city or if the land use or topography varies between the site and city. The manual also advises that normal mean monthly temperature values specific to the site location be entered if the project site is located more than 100 miles from the selected city or if the difference in elevation between the site and the city is more than 500 feet. To improve the solar radiation data generated, the manual advises that the latitude of the site be entered if the site is more than 50 miles north or south of the selected city.

HELP is capable of generating climate data for 139 cities. Of these, Buffalo, NY is the closest to the site at 20 miles away. The climate data generated was further improved by entering the normal mean monthly values from the weather station Lockport 2 NE. These values are shown in Table 1. Since Lockport 2NE is located approximately 3.5 miles from

the site and is at an elevation of 520 feet (site elevation is approximately 600 feet), the climate conditions should be representative of those at the site. To improve the solar radiation data, the site specific latitude (43.16 degrees) was entered. Within the buildings the daily precipitation was set to a fraction of the outside precipitation to account for coverage provided by roofing. It was estimated based on site data that roofing diverts 85 percent of the precipitation falling on Buildings 2, 6 and 8 and 95 percent falling on Building 3.

The RESRAD model also considers infiltration from irrigation. To adjust the generalized site model for this parameter, an irrigation rate of 0.2 meters/year was added to a precipitation rate of 0.94 meters/year yielding an overall "infiltration rate" of 1.14 meters/year.

Table 1 – Lockport 2 NE Normal Mean Monthly Precipitation and Temperature

Month	Normal Mean Monthly Precipitation (mm)	Normal Mean Monthly Temperature (Degrees Celsius)
January	61.5	-4.7
February	58.7	-3.9
March	67.8	1.2
April	80	7.6
May	75.2	13.9
June	85.8	18.8
July	72.4	21.6
August	98.8	20.5
September	92.7	16.6
October	71.9	10.7
November	92.5	4.7
December	84.6	-1.7

2.1.2.Evapotranspiration

In order to model the evapotranspiration at the site, the following parameters were required: evaporative zone depth, maximum leaf area index, start and end dates of the growing season, normal average annual wind speed and normal average quarterly relative humidity.

The evaporative zone depth is the maximum depth from which water may be removed by evapotranspiration. According to the HELP manual the depth of capillary draw to the surface without vegetation or to the root zone may be about 8 to 18 inches in silts and 12 to 60 inches in clays. In addition to the manual guidance, the program also provides region based guidelines. When Buffalo is selected the HELP model provides guidelines of 20 cm (8 in) for bare ground, 50 cm (20 in) for fair vegetative conditions, and 91 cm (36 in) for excellent vegetative conditions. Taking into account the silty clay nature of the soil and assuming a poor standing of grass, a depth of 18 inches was chosen for the areas outside the buildings. For the building areas which are assumed to be bare, a value of 8 inches was used. The model does not allow the evaporative zone depth to extend into barrier layers; therefore, for areas IA03 and IA03 South the evaporative zone depths were reset by the model to the depths of the topmost layers. For the generalized site model an evaporative zone depth of 20 cm was used to achieve an evapotranspiration coefficient similar to the one used for RESRAD.

The maximum leaf area index or LAI is defined as the dimensionless ratio of the leaf area of actively transpiring vegetation to the nominal surface area of the land on which the vegetation is growing. The model guidance provides a value of 0 for bare ground and states that for a poor stand of grass the LAI could approach 1.0. Therefore, the LAI for the areas inside the buildings was set at 0 assuming no vegetation, and the LAI in the areas outside the buildings was set at 1 assuming poor vegetation. For the generalized site model, a maximum leaf area index of 0.50 was used to achieve an evapotranspiration coefficient similar to the one used for RESRAD.

The program provided values for the Julian dates starting and ending the growing season, the annual average wind speed, and the quarterly average relative humidity for Buffalo NY. The growing season was defined as May 6 to October 12. The average wind speed was set at 12.1 mph. The first, second, third and fourth quarter relative humidity values were set at 76 percent, 68 percent, 72 percent and 76 percent respectively.

2.2. Soil and Site Data

2.2.1. General Landfill Information

The general landfill information includes: the project title, landfill area, percent of area where runoff is possible, moisture content initialization and amount of water or snow water on the surface. The project title is only used for identification of the simulation. The landfill area or model area does not have any effect on the infiltration rate reported in inches/year.

2.2.1.1. Percent Area where Runoff is Possible

The percent of area where runoff is possible specifies the portion of the area that is sloped in a manner that would permit drainage off the surface. In the buildings, the area where runoff is possible was set to 0 percent. In this case, all the water entering the building area is assumed to be trapped within and must either evaporate or infiltrate. Site investigations have documented ponded areas outside the buildings; therefore, the area where runoff is possible was set to 90 percent. In these areas, 10 percent of the water entering from precipitation pools and must either evaporate or infiltrate. For the generalized site model, 80 percent runoff was assumed. However, this value was adjusted to 65 percent to coordinate with RESRAD which does not allow irrigation to run off. Lowering the percent area where runoff is possible to 65 percent kept the extra 0.2 meters/year (irrigation rate) from running off.

2.2.1.2. Initial Moisture Storage

The program provides the option to specify the initial moisture storage or the program will assume near steady-state values and run the first year of the simulation to improve the initialization to steady-state. The soil water contents at the end of this year of initialization are taken as the initial values for the simulation period. The program then runs the complete simulation, starting again at the beginning of the first year of weather data. The results for the initialization period are not reported. This option was chosen for the model runs. If the initial moisture storage for each layer is specified, the amount of water or snow water on the surface must also be specified. The initial soil moisture storage must be greater than or equal to the wilting point and less than or equal to the porosity. For barrier soils, the HELP model requires that the initial moisture content be equal to the porosity and the soils remain saturated. Using the HELP default soil texture for silty clay, the initial moisture storage values for the fill layer ranged from 0.38 to 0.45 vol/vol. When using site specific soil characteristics, the initial moisture storage values for the fill layers ranged from 0.14 to 0.27 vol/vol. Since the native soil was modeled as a barrier soil layer, the initial moisture storage values assigned by the HELP model equaled the total porosity

(0.45 vol/vol for default texture, and 0.3 vol/vol for site specific). For the generalized site model, the initial moisture storage values for the fill layer and native layers were 0.20 and 0.12 vol/vol respectively.

2.2.2.Runoff Curve Number

In order to use the HELP model, a value of the Soil Conservation Service (SCS) runoff curve number for Antecedent Moisture Condition II (AMC-II) must be specified. The HELP model has three methods available to define a curve number:

1. User-specified curve number used without modification

2. User-specified curve number modified for surface slope (%) and slope length (ft)

3. Curve number computed by HELP program based on surface slope, slope length, default soil texture, and quantity of vegetative cover

When possible, the HELP program was used to generate the curve number (option 3 above). This option could be used for the areas outside the buildings, Building 2 (which has a dirt floor), and for the generalized site model. The inputs for this computation and the resultant curve numbers are shown in Table 2. Building 3 has a concrete floor and Buildings 6 and 8 have brick floors. Since the HELP model does not have default soil texture options for these conditions, the runoff curve numbers were based on guidance from the US Soil Conservation Services (now the Natural Resources Conservation Service, 1986). According to the guidance paved areas have a runoff curve number of 98 and this value was used in the modeling of Building 3 without modification (option 1 above). However, since the percent area where runoff is possible is set to zero for the buildings, there is no runoff and the runoff curve numbers are irrelevant. In this case, there were no differences in the results for Buildings 2 and Buildings 6 and 8 and they were modeled together.

Table 2 – Curve Numbers Generated by HELP Model

	Building 2	IA02 – Exterior Areas	IA03 – Landfill Area	IA04A	Generalized Site Model
Slope (%)	1	2	8	2	1
Slope length (m)	100	300	120	260	600
Soil Texture	SiC	SiC	SiC	SiC	SiL
Vegetation	Bare	Poor	Poor	Poor	Poor
HELP generated Curve Number	96.7	93.2	93.7	93.2	85.8

2.2.3.Soil Layer Data

2.2.3.1. Layer Type

The HELP model allows four layer types. The four layer types and their associated code numbers that the program recognizes are vertical percolation (1), lateral drainage (2), barrier soil liner (3), and geomembrane liner (4). These are defined as follows:

1. A layer of moderate to high permeability material that drains vertically primarily as unsaturated flow is classified as a vertical percolation layer as long as it is not underlain by a liner with a lateral drainage collection and removal system. The primary purpose of a vertical percolation layer is to provide moisture storage; as such, top soil layers and waste layers are often vertical percolation layers.

2. A layer of moderate to high permeability material that is underlain by a liner with a lateral drainage collection and removal system is classified as a lateral drainage layer. The layer drains vertically primarily as unsaturated flow and laterally as a saturated flow.

3. A layer of low permeability soil designed to limit percolation/leakage is classified as a barrier soil liner. The layer drains only vertically as a saturated flow.

4. A geomembrane (synthetic flexible membrane liner) designed to restrict vertical drainage and limit leakage is classified as a geomembrane liner. Leakage is modeled as vapor diffusion and leakage through small manufacturing defects and installation flaws.

The fill layer at the site was modeled as a vertical percolation layer and the native layer was modeled as a barrier soil liner. For the generalized site model, the fill layer and the native till layer were modeled as vertical percolation layers.

2.2.3.2. Layer Thickness

The native and fill thicknesses were based on average values derived from Site data. The values are shown in Table 3 below.

Table 3 – Layer Thicknesses

Model Area	Fill Thickness (cm)	Native Soil Thickness (cm)
Bldgs 2, 3, 6 and 8	30	90
IA02	50	154
IA03 (South)	30	123
IA03	15	290
IA04A (West)	150	15
IA04A (East)	60	5
Generalized Site Model	100	30

2.2.3.3. Soil Texture

The HELP model offers 42 default soil/material textures. If one of these default textures is chosen the program assigns porosity, field capacity, wilting point, and hydraulic conductivity values. The default soil types and the associated characteristics are show in Table 4, which is taken from the HELP manual. Alternatively, these parameters may be specified for a user defined soil texture. The model was run using both a default soil texture and site specific characteristics. For the default soil texture runs, moderately compacted silty clay was chosen to approximate the native and fill materials (SiC, HELP model number 28). When the fill and native soil layers were modeled using site specific soil characteristics, a hydraulic conductivity of 1.0e-6 cm/sec, total porosity of 0.3 vol/vol, field capacity of 0.15 vol/vol, and wilting point of 0.12 vol/vol were entered. For the generalized site model the following site-specific values were used: hydraulic conductivity of 1.0e-5 cm/sec; total porosity of 0.3 vol/vol; field capacity of 0.15 vol/vol; and, wilting point of 0.12 vol/vol

Table 4 -Default Soil and Waste and Geosynthetic Characteristics

HELP No.	USDA	USCS	Total Porosity vol/vol	Field Capacity vol/vol	Wilting Point vol/vol	Saturated Hydraulic Conductivity cm/sec
1	CoS	SP	0.417	0.045	0.018	1.00E-02
2	S	SW	0.437	0.062	0.024	5.80E-03
3	FS	SW	0.457	0.083	0.033	3.10E-03
4	LS	SM	0.437	0.105	0.047	1.70E-03
5	LFS	SM	0.457	0.131	0.058	1.00E-03
6	SL	SM	0.453	0.19	0.085	7.20E-04
7	FSL	SM	0.473	0.222	0.104	5.20E-04
8	L	ML	0.463	0.232	0.116	3.70E-04
9	SiL	ML	0.501	0.284	0.135	1.90E-04
10	SCL	SC	0.398	0.244	0.136	1.20E-04
11	CL	CL	0.464	0.31	0.187	6.40E-05
12	SiCL	CL	0.471	0.342	0.21	4.20E-05
13	SC	SC	0.43	0.321	0.221	3.30E-05
14	SiC	CH	0.479	0.371	0.251	2.50E-05
15	C	CH	0.475	0.378	0.265	1.70E-05
16	Barrier Soil		0.427	0.418	0.367	1.00E-07
17	Bentonite Mat (0.6 cm)		0.75	0.747	0.4	3.00E-09
18	Municipal Waste (900 lb/yd3 or 312 kg/m3)		0.671	0.292	0.077	1.00E-03
19	Municipal Waste (channeling and dead zones)		0.168	0.073	0.019	1.00E-03
20	Drainage Net (0.5 cm)		0.85	0.01	0.005	1.00E+01
21	Gravel		0.397	0.032	0.013	3.00E-01
22	L*	ML	0.419	0.307	0.18	1.90E-05
23	SiL*	ML	0.461	0.36	0.203	9.00E-06
24	SCL*	SC	0.365	0.305	0.202	2.70E-06
25	CL*	CL	0.437	0.373	0.266	3.60E-06
26	SiCL*	CL	0.445	0.393	0.277	1.90E-06
27	SC*	SC	0.4	0.366	0.288	7.80E-07
28	SiC*	CH	0.452	0.411	0.311	1.20E-06
29	C*	CH	0.451	0.419	0.332	6.80E-07
30	Coal-Burning Electric Plant Fly Ash*		0.541	0.187	0.047	5.00E-05
31	Coal-Burning Electric Plant Bottom Ash*		0.578	0.076	0.025	4.10E-03
32	Municipal Incinerator Fly Ash*		0.45	0.116	0.049	1.00E-02
33	Fine Copper Slag*		0.375	0.055	0.02	4.10E-02
34	Drainage Net (0.6 cm)		0.85	0.01	0.005	3.30E+01

* Moderately compacted

2.2.3.4. Rate of Subsurface Inflow

The HELP model allows the user to specify subsurface inflow into the landfill from a groundwater source. The amount of subsurface inflow into each layer is considered to be a steady flow rate. If subsurface inflow is specified for the bottom layer, the program will assume no leakage through the bottom of the landfill. For most landfills and for Guterl, the inflows will be zero and this column is left blank.

3. RESULTS

The HELP model generates daily values of precipitation, runoff, evapotranspiration, and infiltration over a period of 100 years. Since the primary purpose of using the HELP model at the Guterl site was to provide long term infiltration rates through the native soil, the results were reviewed on an annual basis. The model also provides results for the percent of precipitation that the infiltration rates represent. This percentage can be used to evaluate how much water was lost to runoff and evaporation. Two histograms for each area showing the results of the annual infiltration and the percent of precipitation that the infiltration rate represents are shown for the model runs using the default silty clay texture in Figure 1, and using the site specific soil characteristics in Figure 2. Figure 2 also includes histograms showing the results of annual infiltration and the percent of precipitation and irrigation that infiltration represents for the generalized site model. The annual ranges and averages are shown in Table 5. The building areas had the lowest infiltration rates since they are partially covered with roofs. Since the buildings have zero percent runoff, the runoff curve number is no longer relevant; therefore, Building 2 and Buildings 6 and 8 have identical results.

Table 5 – Annual Infiltration Rates

	Default Soil Texture			Site Specific Soil Characteristics		
Investigative Area or Building	Range of Annual Infiltration (inches/year)	Median Annual Infiltration (inches/year)	Average Annual Infiltration (inches/year)	Range of Annual Infiltration (inches/year)	Median Annual Infiltration (inches/year)	Average Annual Infiltration (inches/year)
Buildings 2, 6 & 8	7.8E-5 - 0.39	5.3E-3	0.039±0.074	0.46 - 3.76	1.94	1.96±0.68
Building 3	1.3E-5 - 0.70	2.5E-2	0.11±0.16	0.12 - 1.21	0.36	0.45±0.25
IA02	0.35 - 4.04	2.01	1.99±0.74	5.06 - 9.10	6.88	6.86±0.74
IA03 (South)	0.35 - 3.87	2.17	2.16±0.73	2.19 - 6.10	3.73	3.73±0.62
IA03	1.10 - 4.20	2.52	2.52±0.57	1.80 - 4.63	3.05	3.09±0.55
IA04A (West)	0.47 - 4.17	2.05	2.15±0.82	4.52 - 14.4	8.53	8.65±1.96
IA04A (East)	0.35 - 4.42	2.17	2.14±0.85	5.32 - 13.6	9.04	9.11±1.95
Generalized Site Model	na	na	na	8.67-24.24	14.61	14.46±3.13

na = not applicable

3.1. Default Soil Texture – Silty Clay

The annual average infiltration rates range from 0.04 to 0.11 inches inside the buildings. Buildings 2, 6 and 8 had the lowest infiltration rates. Although the precipitation entering Building 3 is one-third the amount of precipitation entering Buildings 2, 6 and 8, Building 3 had less evaporation and subsequently higher infiltration rates. The annual infiltration rate and the percent of precipitation that infiltrated the native layer results in each area are provided in Figure 3. The annual average infiltration rates range from 2.0 to 2.5 inches outside the buildings. The average infiltration rates for areas IA02, IA03 South, IA04 West and IA04 East are not statistically different (t-test probability greater than 5 percent). The average infiltration rates for area IA03 is statistically greater than the other areas. For the generalized site model, a default soil texture

(SiL) was used for calculating the runoff curve number, as required by the model. However, for infiltration calculations, site specific values were used.

3.2. Site Specific Soil Characteristics

Using site specific soil characteristics, the HELP model predicted an annual average infiltration rate of 2.0 inches/year within Buildings 2, 6 and 8 and 0.45 inches/year within Building 3. Outside the building areas, the annual average infiltration rates predicted range from 3.1 to 9.0 inches/year. Areas IA03 and IA03 South had the two lowest annual averages. The highest average annual infiltration rates were predicted at IA04A East and West. Areas IA04A East and West were not statistically significantly different. As shown in the box plots in Figure 3, IA02, IA03, IA04A, and the generalized site model had distinct distributions of infiltration rates. The generalized site model was specifically adjusted to match infiltration obtained with RESRAD. The infiltration obtained, 14.5 inches/year, was greater than that for other model runs and equivalent to the upper end of the infiltration range for IA04A (West). Since the generalized site model was based on IA04A, this result is not surprising.

3.3. Comparison of Results

The HELP model results using the default soil texture for moderately compacted silty clay are approximately 1 to 4 times lower in most areas than the results obtained using the site specific soil characteristics. A comparison of the results is provided in Figure 4. Buildings 2, 6 and 8 were more sensitive to the soil texture and the infiltration rate was approximately 50 times lower using the default soil than the site specific characteristics. When the default soil texture is used, the results for the areas outside the buildings are more similar to each other than they are when modeled with the site specific soil characteristics. The standard deviations using the default soils are similar to or lower than the standard deviations when the site specific soil characteristics are used. However, the relative standard deviations are lower when the site specific soil characteristics are used. The relative standard deviation is sometimes called the coefficient of variation and is equal to the standard deviation divided by the mean. It is a normalized measure of dispersion and is useful when comparing data sets with significantly different means. The lower relative standard deviations for the site specific soil model runs indicate that the annual infiltrations rates are less dispersed than the annual results using the default soil texture.

Infiltration results for the generalized site model are greater than other scenarios, as expected. The relative standard deviations for the generalized site model were within the range of the relative standard deviations for IA04A West and East.

4. REFERENCES

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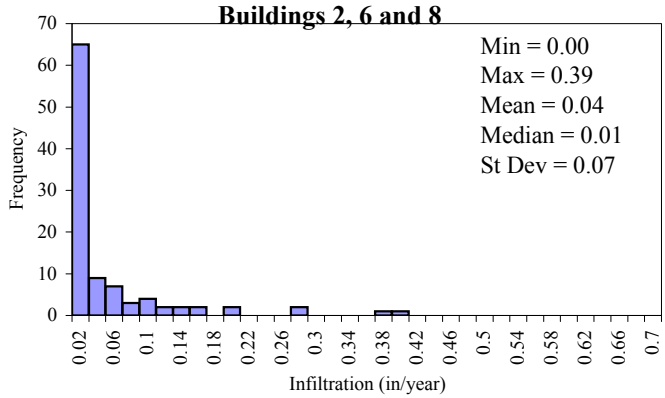
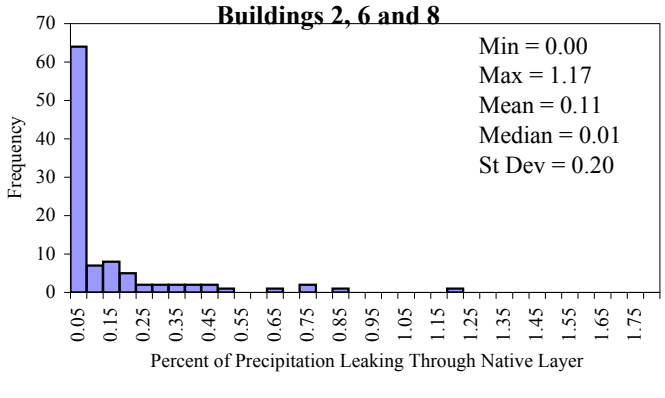
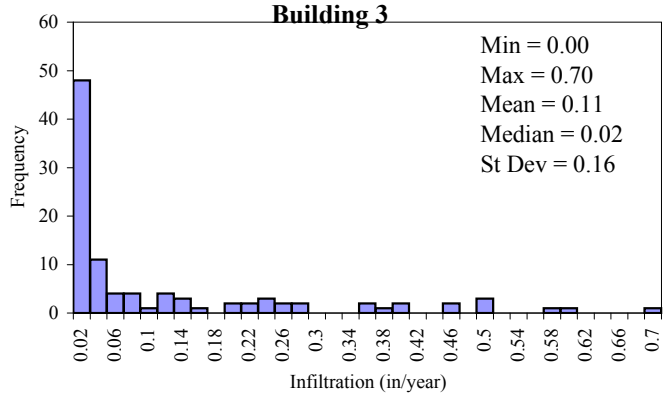
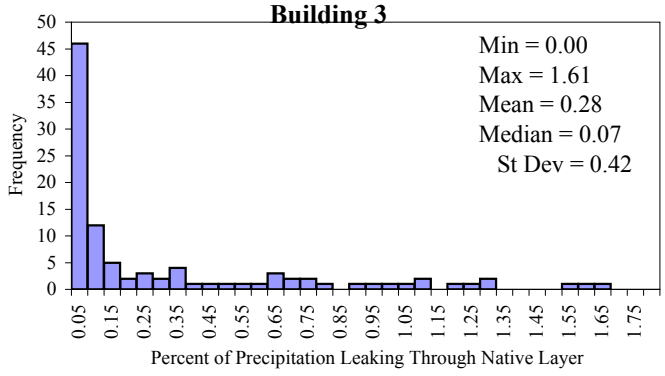
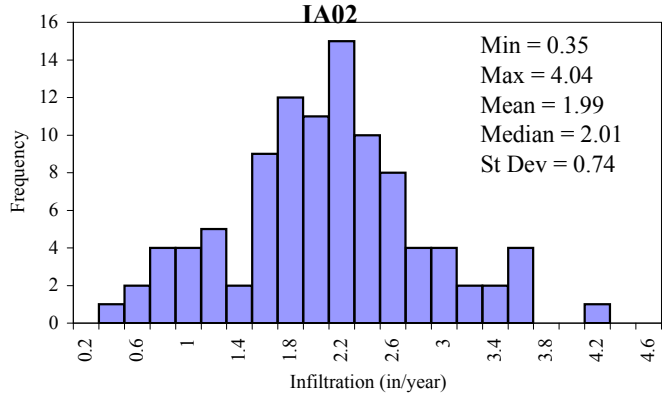
Figure 1
Histograms of Annual Infiltration and Percent Precipitation Using Default Soil Texture Silty Clay

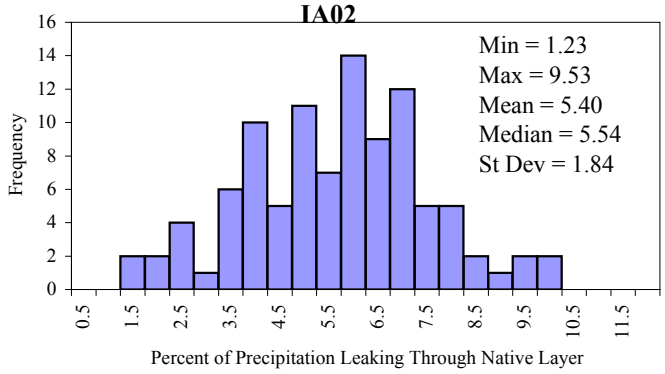


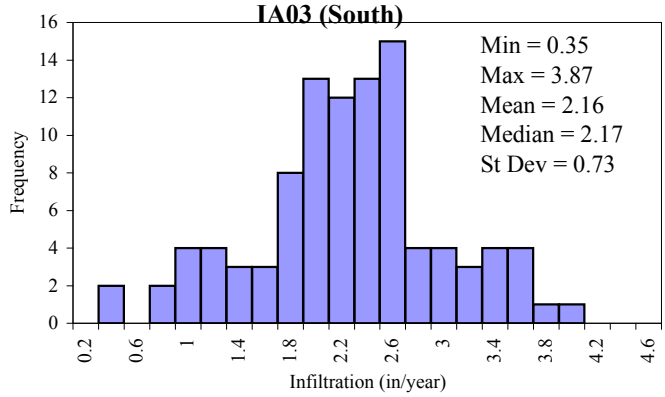












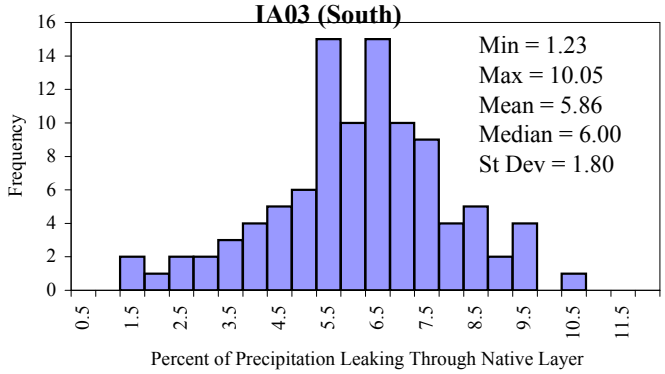
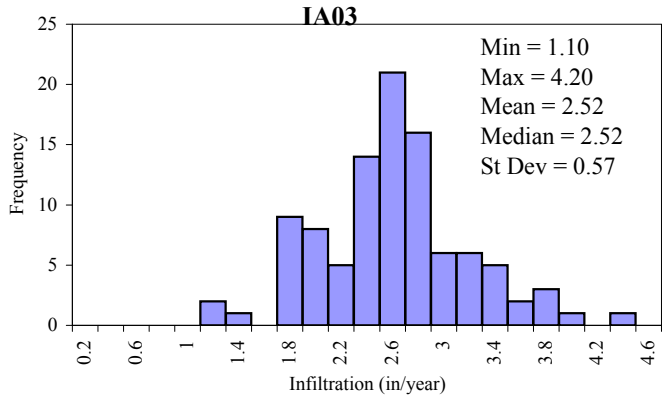
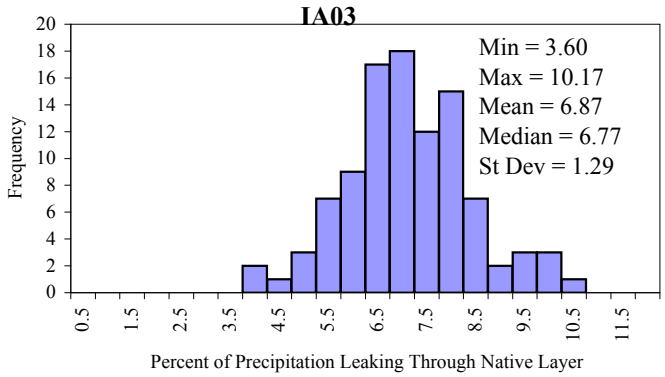
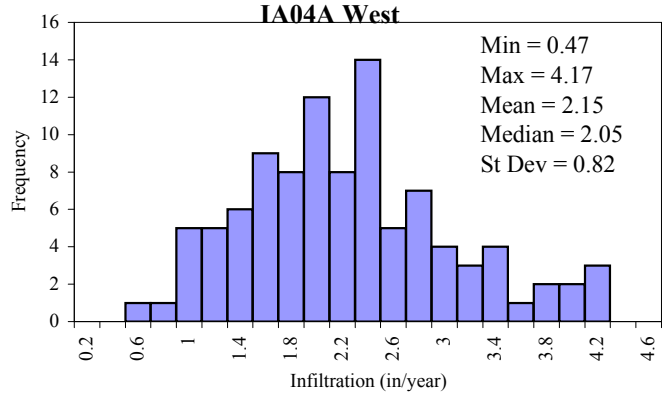
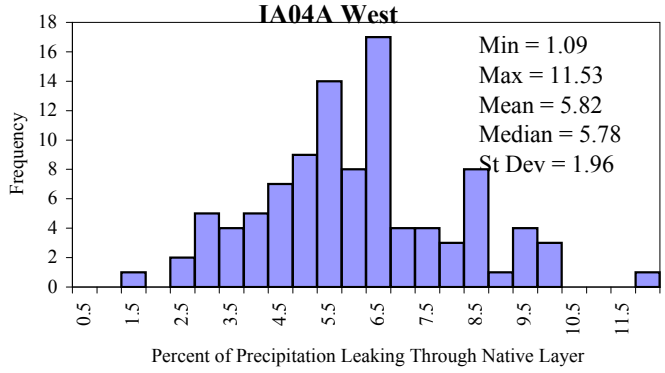


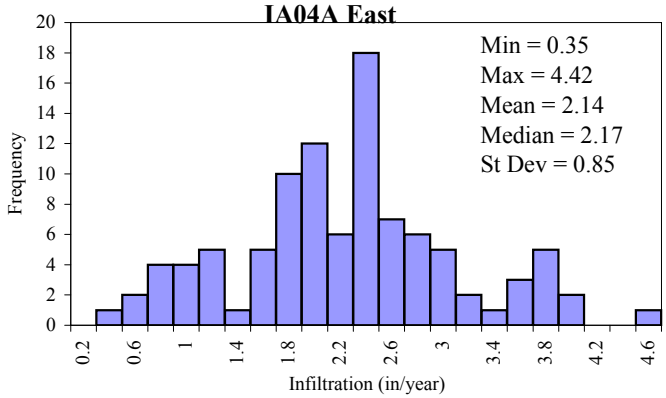
Figure 1
Histograms of Annual Infiltration and Percent Precipitation Using Default Soil Texture Silty Clay











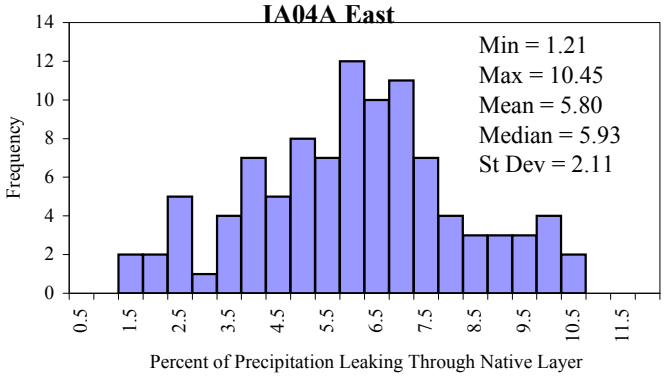
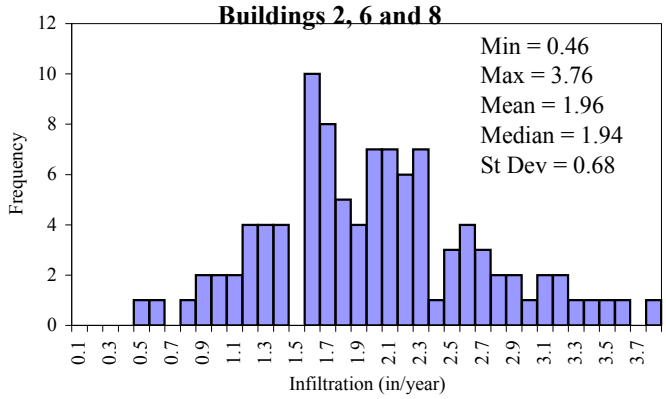
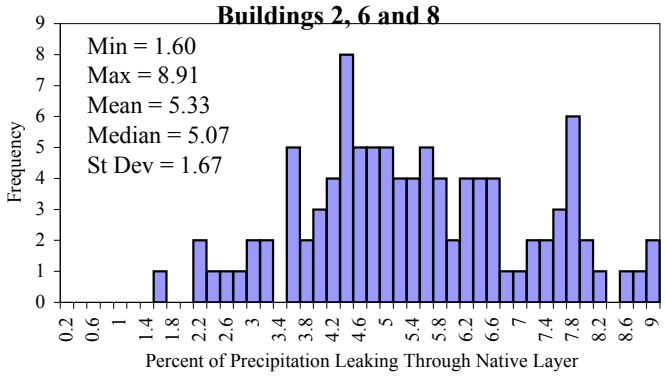
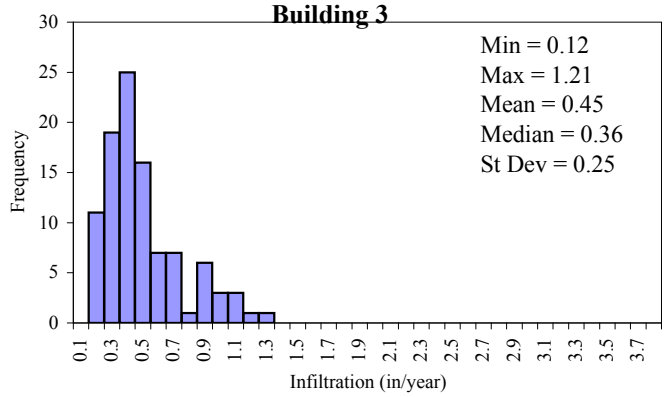
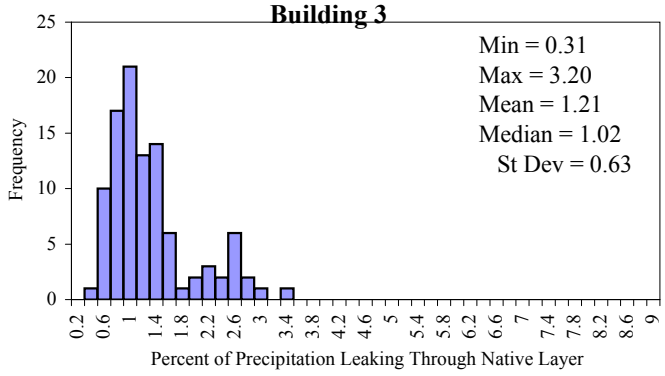


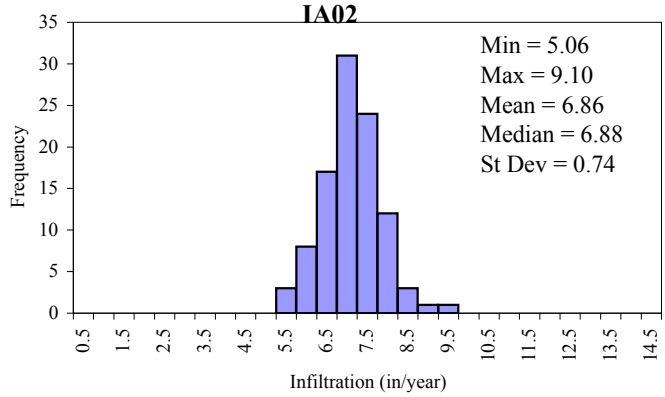
Figure 2
Histograms of Annual Infiltration and Percent Precipitation Using Site Specific Soil Characteristics

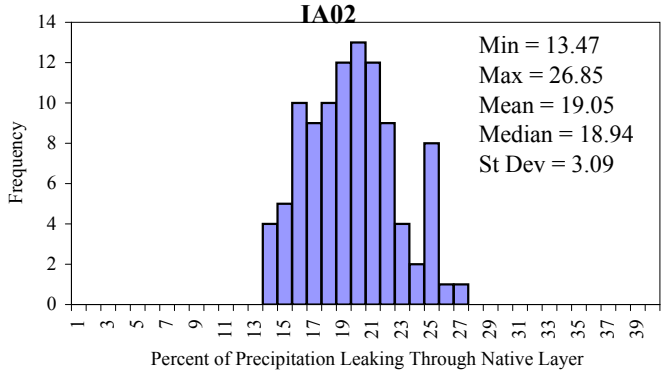


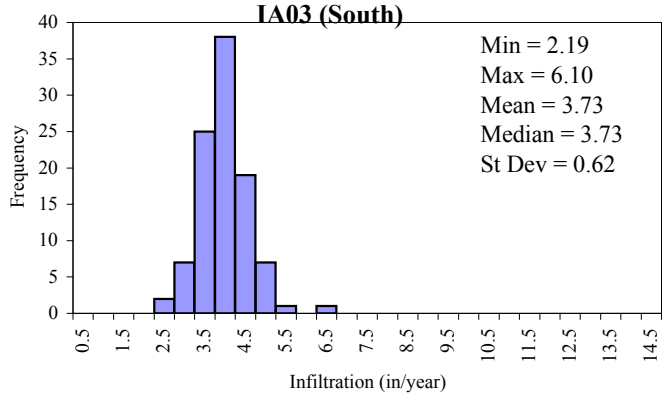












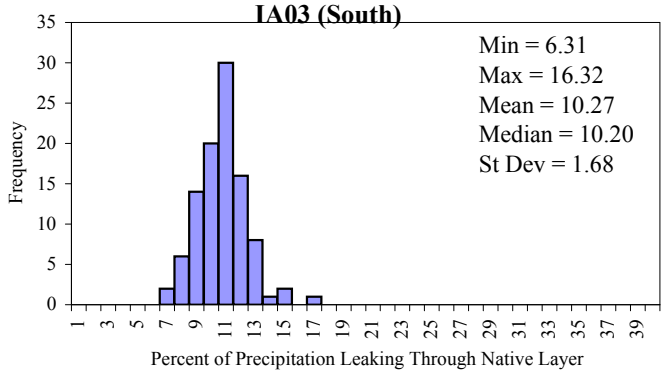
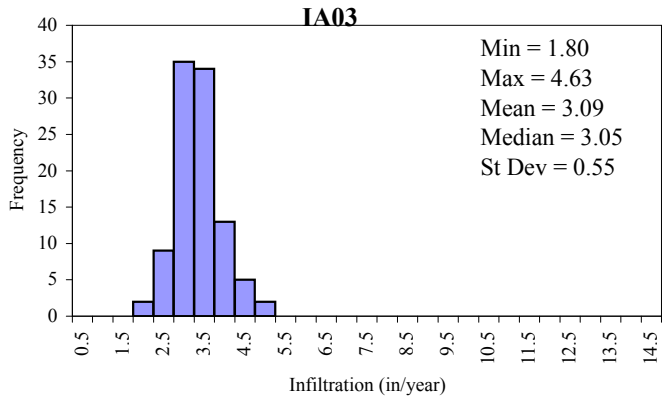
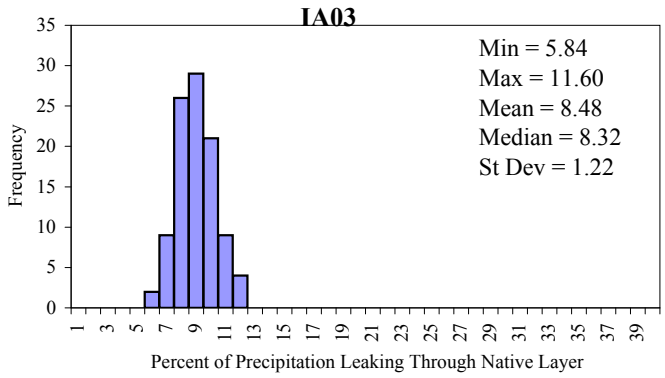
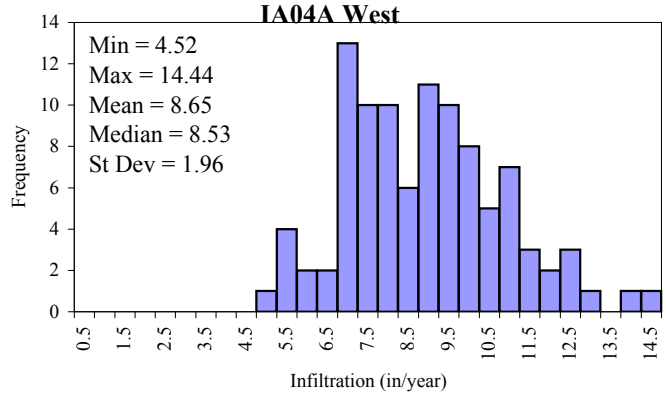
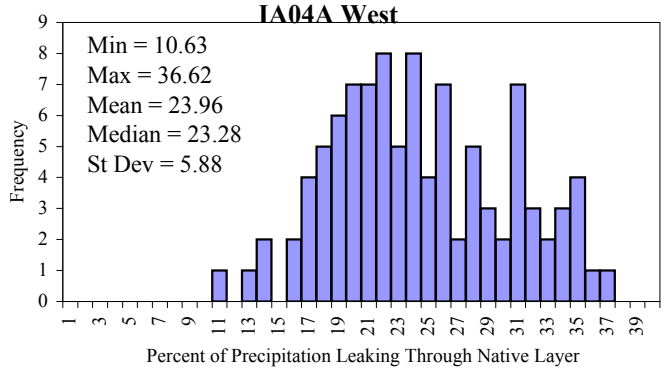


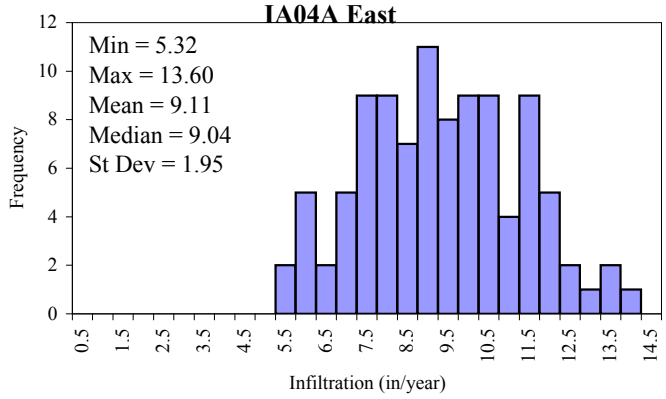
Figure 2
Histograms of Annual Infiltration and Percent Precipitation Using Site Specific Soil Characteristics

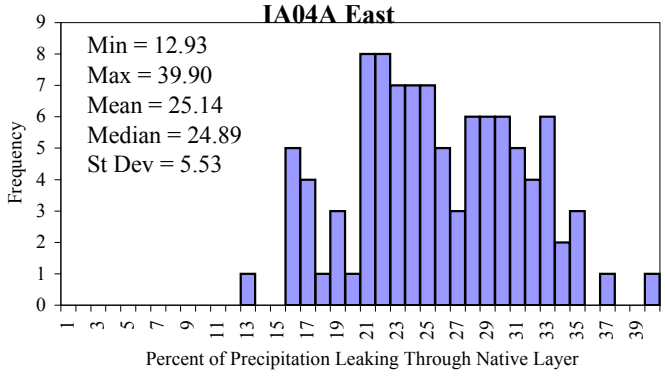


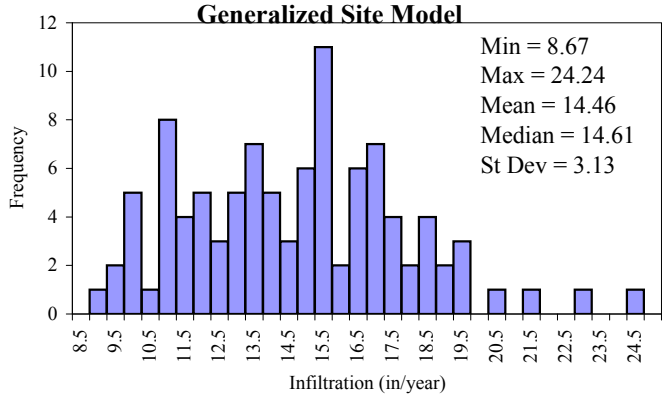


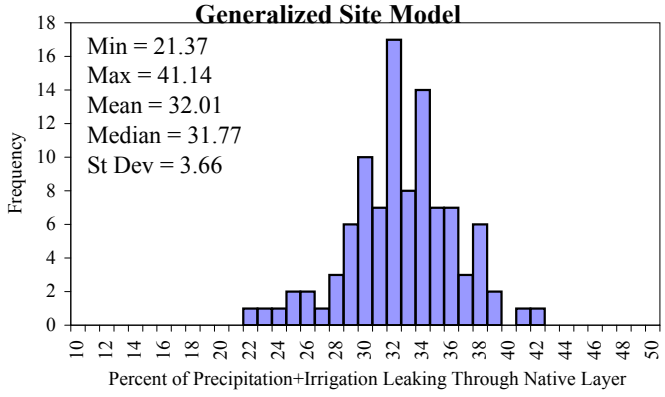












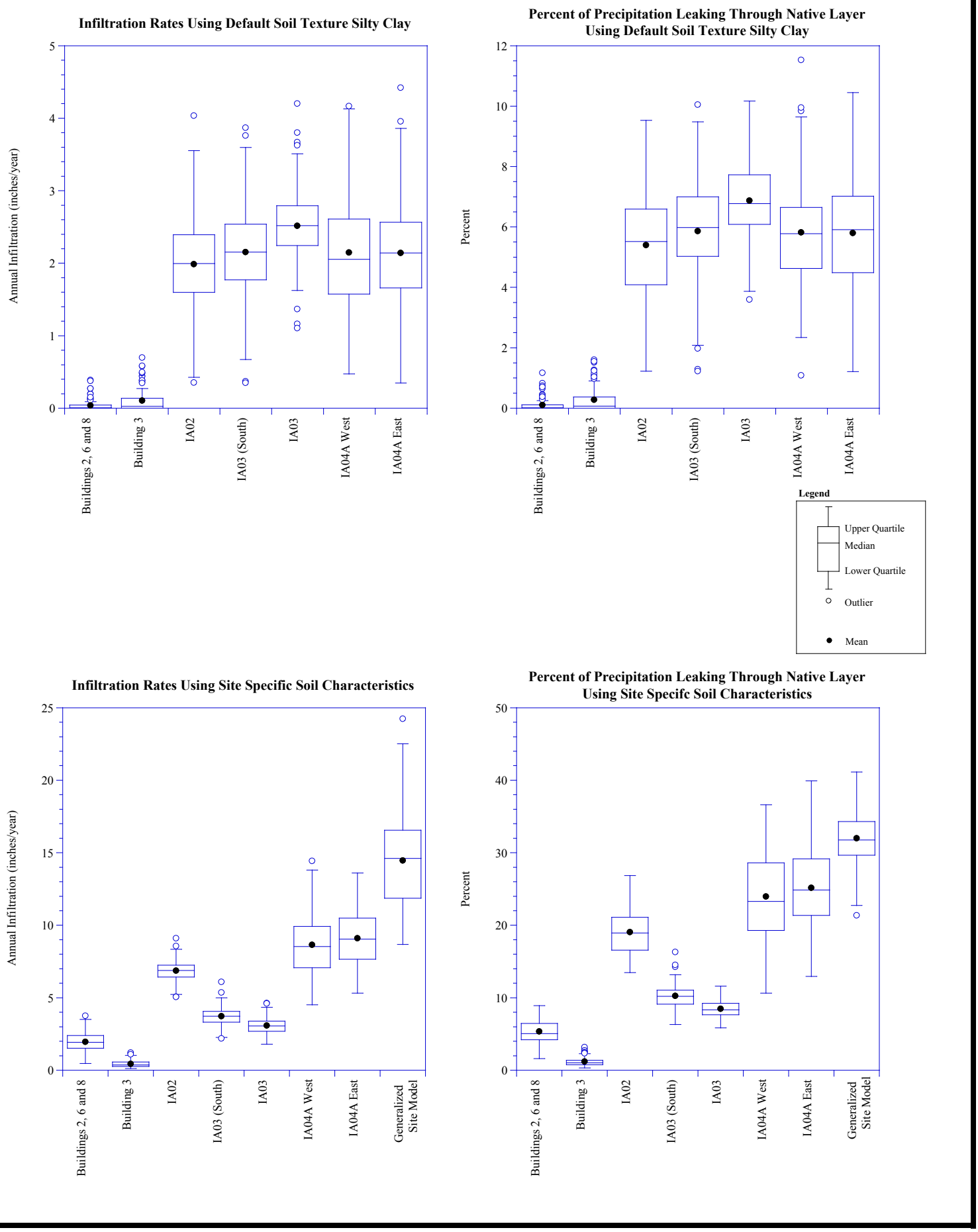
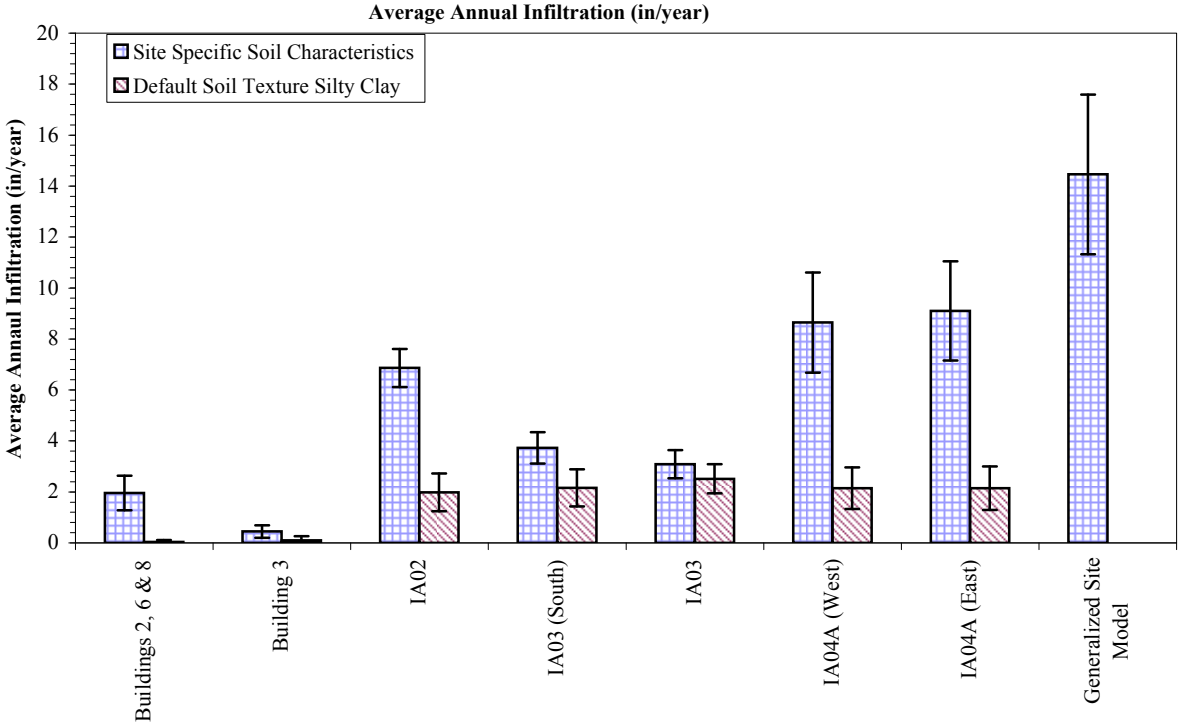


Figure 3
Box Plots of Annual Infiltration and Percent Precipitation

Figure 4
Average Annual Infiltration (in/year)



SESOIL/AT123D

To evaluate transport of uranium in groundwater, the unsaturated (vadose) zone model SESOIL was used. SESOIL (Bonazountas and Wagner 1984) was developed as a screening level model that uses less soil, chemical, and meteorological data than other, more complex models. The model uses actual climate data in the hydrological cycle predictions rather than a constant infiltration rate, which is common in other similar models. The SESOIL model can also accept constant infiltration rates. The model output can include time-varying constituent concentrations at different soil depths and removal of the constituent from the soil column by surface runoff, percolation to groundwater, volatilization, adsorption, and degradation. For this modeling, uranium was distributed between a dissolved, porewater phase and an adsorbed phase based on the assigned solubility and distribution coefficients.

The concentration in leachate, derived from the SESOIL model, is used as input to the saturated zone model, AT123D (Yeh, 1981), to compute a resulting concentration in groundwater beneath the modeled location. The AT123D model is used to predict resulting groundwater concentrations when pore water from the vadose zone mixes with water in the underlying aquifer. AT123D is an analytical groundwater transport model that computes the spatial-temporal concentration distribution of a constituent in the aquifer and predicts the transient spread of a chemical plume through an aquifer using advection, dispersion, adsorption, and decay. Because of the long half-lives for uranium species, only advection, dispersion, and adsorption were utilized.

The SEVIEW© (Schneiker, 2006) program, which links SESOIL and AT123D, was used for modeling. SEVIEW© is a menu-driven, integrated contaminant modeling system that simplifies transport and fate modeling by linking the SESOIL vadose zone model to AT123D.

Input to SESOIL

Input parameters for SESOIL were derived directly or indirectly from Site data and SESOIL guidance. Input and their sources are listed in Tables SESOIL 1, SESOIL 2, and SESOIL 3.

For soil properties, Site data were used along with SESOIL guidance. Bulk density represents the weight of soil materials divided by the soil volume (including pore space) and was compiled from the average reported soil densities for each investigative area. Effective porosity is a measure of the connected pore space in soils that transmit water. Although the effective porosity was estimated as 0.0075 based on geotechnical analysis, a value of 0.20 was used for SESOIL based on the silty clay soil type, model guidance (Bonazountas and Wagner 1984), and model calibration (discussed below). The soil pore disconnected index relates soil permeability to soil moisture content; the value for this parameter is based on values recommended in SESOIL guidance for the soil type and calibration. Vadose zone thickness varies for different areas of the site. A generalized site model was developed that assigned a 1-meter thickness to the upper, contaminated soil layers and a 0.3-m thickness to the underlying uncontaminated vadose zone soil. Table SESOIL 3 lists input values based on the results of borings as well as the generalized site model. Data for hydraulic conductivity and geotechnical evaluation indicate a value of

approximately 1e-6 cm/sec. This value is converted to intrinsic permeability, used by the SESOIL model, by multiplying by 1e-5. The intrinsic permeability was further adjusted during calibration so that recharge would more closely match that generated by the HELP and RESRAD models (see Appendix U-2 and Section 6.3.4 of Volume 1 of this report).

Chemical data were obtained from literature values specific to ^{238}U with the exception of uranium solubility and the adsorption (distribution) coefficients (K_ds). Uranium solubility was determined using MINEQL+ (Schecher and McAvoy, 2003), discussed previously in Appendix U-1. The K_d values used for modeling were based on laboratory tests of Site soil. Soil descriptions of samples tested and test results are listed in Table SESOIL 4. For most SESOIL modeling, the more conservative value of 39 milliliter per gram (mL/g) for contaminated soil was used because modeling focused on areas with impacted soil. Additional modeling evaluated the effect of an underlying soil layer with the more elevated K_d value of 1356 mL/g measured in uncontaminated Site soil. To obtain movement of uranium to groundwater within the timeframe predicted by RESRAD, the K_d was reduced to 25 mL/gm for all soil layers, both contaminated and uncontaminated, for the generalized site model.

SESOIL extent data are used by the model to define the three-dimensional volume of the modeled soil column. The area of contaminated soil used for modeling specific areas was defined as 40 x 40 square meters as this was the sampling interval. Table SESOIL 3 lists the Investigative Area (IA) in which each of the specific areas modeled is located and Figure 1-2 of the main document shows the locations of the IAs. An area the size of IA04A, 67,000 square meters, was used for the generalized site model. The vadose zone soil was divided into two upper, contaminated layers (considered fill) and two lower, uncontaminated layers (considered native till soil) based on data from borings. For the generalized site, the contaminated zone was one meter thick and the uncontaminated zone was 0.3 m thick. Zone thicknesses were varied for the area-specific models based on data from borings.

As part of the SEVIEW software, climatic data are provided for a number of stations that collect meteorological data, including Lockport 2NE station. This station is located less than 5 miles east of the Site and at a similar elevation (518 ft above sea level). The SEVIEW software integrates the appropriate meteorological data from the climatic data records. The input parameters for the climatic data include for each month: temperature, cloud cover, relative humidity, short wave albedo, evapotranspiration, precipitation, storm length, number of storms, and length of rainy season. Climate data for the Lockport 2NE station are provided as an attachment to this appendix.

SESOIL Sensitivity Evaluation

The initial step in SESOIL modeling was a sensitivity evaluation to determine the sensitivity of different parameters and to calibrate the model output for soil moisture and groundwater recharge. Table SESOIL 5 lists soil parameters evaluated and their impact on groundwater recharge, soil moisture, and other factors. The sensitivity evaluation is presented in the main part

of the document along with figures that illustrate parameter sensitivity. Conclusions of the sensitivity evaluation were:

- Intrinsic permeability: Groundwater recharge increased and less time was required for uranium in pore water to the reach groundwater when intrinsic permeability was increased.
- Effective porosity: Groundwater recharge increased slightly, soil moisture increased, and less time was required to the reach groundwater when the effective porosity was increased. When much smaller effective porosities (0.010 and 0.025) were modeled, the resulting soil moistures were only about 1 to 2.5 percent.
- Soil disconnectedness index: Groundwater recharge decreased slightly and more time was required to reach the water table when soil disconnectedness index was increased from 11 to 12. Values less than 10 resulted in negative groundwater recharge.
- Vadose zone thickness: When the vadose zone is only about 2 feet thick or less and small intrinsic permeabilities, groundwater recharge decreases with decreasing thickness. This is because evapotranspiration may remove groundwater if the capillary zone is near or intersects the ground surface.

Of the four parameters discussed above, changes in intrinsic permeability resulted in the largest changes in the rate of groundwater recharge, which in turn can impact transport of uranium to groundwater.

Model parameters to use were chosen initially based on calibration with soil moisture and recharge rate. The soil moisture averages about 15 percent at the Site based on soil sample analysis. An effective porosity of 0.20 resulted in soil moistures in the range of 15 percent and therefore, was used to model uranium transport.

The Hydrologic Evaluation of Landfill Performance (HELP) model is discussed in a separate section of this appendix. HELP is mainly used as an aid for design of landfill covers. For this application, HELP was used to generate groundwater recharge estimates. SESOIL also calculates groundwater recharge as part of the vadose zone transport modeling. The recharge results from HELP and from the RESRAD models were used to calibrate SESOIL.

The recharge rate determined by HELP and RESRAD modeling of about 0.37 and 0.39 m/yr, respectively was best reproduced in SESOIL using an intrinsic permeability of 5.5×10^{-10} cm^2 and soil disconnectedness index of 10. The effective porosity of 0.20 best replicated measured soil moisture content.

AT123D: SESOIL models the concentrations in pore water at the bottom of the vadose zone. To determine the concentration in groundwater, AT123D is used. The time-series concentrations developed by SESOIL are input to AT123D through the link in the SEVIEW software. Table SESOIL 6 lists other AT123D model parameters and their sources. AT123D was only run when uranium was predicted to reach groundwater in 999 years or less. The values obtained by

AT123D modeling were for a location at the top of the water table and directly centered below the uranium source in soil.

AT123D assumes a homogeneous porous medium. According to New York State Department of Environmental Conservation (2000), the upper 10 to 15 feet of the Lockport Dolostone, which forms the bedrock at the Site, contains numerous horizontal and vertical weathered fractures, vugs and other solution features. Groundwater flow is principally in these vertical and horizontal bedding plane fractures. Therefore, the model assumes that the fracture flow paths act similarly to a homogeneous porous medium. Since the groundwater concentrations are only modeled directly below the source area and not downgradient, this assumption was considered to be acceptable. Additionally, aquifer hydraulic conductivity, effective porosity, and gradient were based on Site data.

The SESOIL/AT123D assumed a source area of 67,000 m^2 for the generalized site model. And source areas of 40 x 40 square meters for specific investigation areas. Changing source area size does not affect predicted concentrations in pore water as long as the concentration input to soil remains the same. However, a larger source area causes groundwater concentrations to increase because a larger volume of soil with the same concentration results in contribution of a larger mass of contaminant to groundwater. Therefore, using a large source area results in a more conservative result (higher concentrations) than using a small area.

SESOIL/AT123D Model Results

Table SESOIL 7 lists results of SESOIL/AT123D modeling. Soil concentrations were adjusted until the resulting groundwater concentration was equal or close to the screening level of 30 micrograms per liter (µg/L). Also listed in the table is the time required for the pore water to reach the water table. For the generalized site model, the time of 55 years for uranium in pore water to reach the water table was obtained by adjusting the K_d to 25 mL/gm for all layers. For specific investigative area model scenarios, the K_d for contaminated soil (39 mL/g) was applied to the entire soil column; a second set of scenarios assigned the uncontaminated K_d (1,356 mL/g) to the underlying native soil (lower two layers). The time for uranium in pore water to reach the water table for these scenarios ranged from about 360 to greater than 999 years, which is the maximum timeframe that can be modeled by SESOIL.

The generalized site model and each area were modeled to determine uranium concentrations (or activities) that could remain in soil and not result in an exceedance of the screening level in underlying groundwater. Contamination was assumed to be confined to the upper two layers (fill zone) because this is the most common case at the Site. For the generalized site model, uranium activities less than 1 pCi/gm were predicted to result in the most elevated groundwater uranium activities observed (164 µg/L). This is in part due to the assumption that all soil uranium is present as soluble oxidized uranium (U^{6+}).

Scenarios were modeled assuming the presence of the highly adsorptive layer resulted in significant retardation of uranium transport. This is reflected in the dilution attenuation factors (DAFs) listed in Table SESOIL 7. DAFs were calculated as the modeled soil concentration divided by the maximum concentration in groundwater. DAFs reflect the difference between the

relatively large flow through the aquifer compared to the small volume of flow through the vadose zone resulting from infiltration. Higher adsorption further slows contaminant transport, resulting in very large DAFs.

Further discussion of the results of the SESOIL/AT123D modeling and their implications are discussed in the main text (Sections 5.5.3.2 and 5.6). Attached to this appendix are tables and figures that contain input and output files for SESOIL/AT123D modeling runs listed in Table SESOIL 7. Files for each location are identified by the run file name and by the following terms:

- "load input" provides a summary of input parameters for the model run.
- "hydro" provides graphs and tables showing the division of precipitation into surface runoff and infiltration (upper figure). The lower figure (and the table) further subdivide infiltration into evapotranspiration, moisture retention (soil moisture), and groundwater runoff, which is the portion that recharges groundwater.
- "mass" provides the partitioning of the uranium mass, the maximum uranium concentration in pore water, and graphs of uranium distribution in the vadose zone with time (mass and concentration) and depth.
- "at123D" provides input parameters for AT123D, a graph of uranium concentrations with time, maximum groundwater concentration at the designated point (center of the mass at the top of the water table), and the year the maximum groundwater concentration is reached.

There is one file labeled "climate report" which provides climate data in table and graph form; these data are identical for all model runs.

References:

Bonazountas, M., and J. Wagner. 1981, 1984. SESOIL: A Seasonal Soil Compartment Model. Draft. Cambridge: Arthur D. Little, Inc.

New York State Department of Environmental Conservation (NYSDEC), 2000. Immediate Investigative Work Assignment Report, Guterl Excised Area, City of Lockport, Niagara County. October.

Schneiker, R. Environmental Software Consultants, Inc. 2006. SEVIEW©: Integrated Contaminant Transport and Fate Modeling System, User's Guide for Microsoft Windows®, Version 6.3.

Yeh, G.T. 1981. AT123D: Analytical Transient One-, Two-, and Three-Dimensional Simulation of Waste Transport in the Aquifer System. Tennessee. ORNL-5602.

SESOIL 1
Soil Input Parameters for SESOIL Modeling
Guterl Site

Parameter	Value	Units	Source
Bulk density of soil	1.31	g/cm^3	Average dry bulk density for soil column derived from site data
Effective porosity	0.20*	fraction	Based on SESOIL guidance for silty clay soil type due to characteristics of the model
Soil pore disconnected index	10*	NA	Based on SEVIEW guidance based on soil type; average for soil column
Vadose zone thickness	130	cm	Site model; see Table U-7
Intrinsic permeability	5.5e-10*	cm^2	Available data, geotechnical evaluation, calibration to increase recharge; converted from hydraulic conductivity of 1e-5 cm/sec

Notes:
cm = centimeter
% = percent
g/cm3 = grams per cubic centimeters
NA = not applicable
* These values adjusted through calibration

SESOIL 2
Chemical Input Parameters for SESOIL Modeling
Guterl Site

Parameter[a]	Value	Units	Source/Notes
Constituent	**Uranium**		
Water solubility	150	mg/L	derived from MINEQL+ (oxidized, elevated anions)
Air diffusion coefficient	0	cm^2/sec	not volatile
Henry's Law constant	0	m^3-atm/mol	not volatile
Molecular weight	238.03	g/mole	
Adsorption coefficient (Kd)	--	--	--
Native soil outside of contaminated area	1356	mL/g	laboratory tests of site material
Native soil underlying contaminated soil	25	mL/g	USACE recommendations and calibration
Contaminated soil/fill	25	mL/g	laboratory tests of site material yielded 39 mL/g; value was adjusted during model calibration
Bedrock	0.22	mL/g	laboratory tests of site material
Water diffusion coefficient	1.10E-06	m^2/hr	Tokunaga and others, 2004.

Notes:
a. Remaining chemical properties set at zero.
Tokunaga and others, 2004, *Hexavalent Uranium Diffusion into Soils from Concentrated Acidic and Alkaline Solutions* in Environmental Science & Technology, vol. 38, no. 11, p. 3056 -3062. Value for neutral to alkaline soils.

SESOIL-3
Application Input Parameters for SESOIL Modeling
Guterl Site

Parameter[a]	Value	Units	Source
Generalized Site Model			
Application area	6.70E+08	cm^2	IA04A area
Upper soil layer thicknesses	100	cm	Contaminated thickness divided into upper two soil layers
Lower soil layer thicknesses	30	cm	Remaining unsaturated soil thickness divided into lower two soil layers
Contaminant concentration(s)	Varies	ug/kg	Varied in modeling; see model results table
Site latitude	43.159	degrees	from http://itouchmap.com/latlong.html and site address
Specific Investigative Areas			
Application area	1.60E+07	cm^2	planer (x-y) extent of contamination; 40x40 m based on sample density
Upper soil layer thicknesses	See below	cm	Contaminated thickness divided into upper two soil layers
Lower soil layer thicknesses	See below	cm	Remaining unsaturated soil thickness divided into lower two soil layers
Investigative Area (for location, see Figure 1-3 of the main part of the document)	Total Fill Zone Thickness (cm)	Total Native Soil Zone Thickness (cm)	Notes
IA02	50	154	Based on soil concentration data and geotech boring depth to refusal
IA03 (South)	30	123	Based on soil concentration data and geotech boring depth to refusal
IA03	15	290	Based on soil concentration data and geotech boring depth to refusal
IA04A (West)	150 (SL31)	15	Based on soil concentration data and geotech boring depth to refusal
IA04A (East)	60	5	Based on soil concentration data and geotech boring depth to refusal

Notes:
Climate data from SEVIEW database
For model, fill and native soil zones are divided into two layers, each 1/2 of thickness indicated above.
Area and layer thicknesses based on generalized model for Guterl Site.

SESOIL 4
Distribution Coefficient Data for SESOIL Modeling
Guterl Site

Client ID	Kd Value (mL/g)	Average Kd Value (mL/g)		Comments
GUTERL-KD-01	1246.99	1355.95	Arith Mean	<-- Reflects natural ML-CL soil.
	1452.26	1353.30	Geom Mean	
	1368.59			
GUTERL-KD-02	18.90	19.32	Arith Mean	<-- Reflects reworked contaminated natural and fill materials
	19.10	19.31	Geom Mean	(ML-GM).
	19.96			
GUTERL-KD-03	97.42	90.90	Arith Mean	<-- Reflects reworked contaminated natural and fill materials
	88.02	90.79	Geom Mean	(ML-GM).
	87.27*			
GUTERL-KD-04	4.94	5.36	Arith Mean	<-- Reflects reworked contaminated natural and fill materials
	5.52	5.35	Geom Mean	(ML-GM).
	5.63			
GUTERL-KD-05	-1.20	0.22	Arith Mean	<-- Reflects natural Lockport Dolomite.
	0.39	0.76	Geom Mean	
	1.48			

Notes:
Guterl-KD-001: 1 - 2 ft b.g., medium brown, silty clay, no coarse grains, wet to saturated, moderate plasticity, natural. (ML-CL)
Near wells MW600S/D
Guterl-KD-002: 0.5 - 1 ft b.g., medium brown, silt, little to trace sub-angular gravel, trace fine sand, dry to moist, no plasticity, appears natural but non-native material apparent as fill. (ML-GM)
Guterl-KD-003: 0.5 - 1 ft b.g., dark to medium grayish brown, silt, little sub-angular gravel, trace to no fine sand, moist, no plasticity, contains gravel-sized coal pieces. (ML-GM)
Guterl-KD-004: 0.5 - 1 ft b.g., medium brown, silt, some to little sub-angular gravel, dry to moist, no plasticity, fill. (ML-GM)
Guterl-KD-005: Composite sample of gravel-size material from the following bedrock cores of low RQD:
603D: Run 1, 5.5-6.0 ft
605D: Run 2, 5.5-6.0 and 9.0-9.5 ft AND Run 3, 9.5-10.0 ft
* This sample appeared to be the most unequlibrated at test end since Kd declined.
Samples collected by and data and comments provided by USACE.

SESOIL 5
Sensitivity of SESOIL Modeling Parameters and Results
Guterl Site

INPUT					OUTPUT				
Vadose Zone Thickness	**Intrinsic Permeability**	**Effective Porosity**	**Bulk Density**	**Soil Disconnect-edness Index**	**Evapotrans-piration**	**Ground-water Recharge**	**Soil Moisture[b]**	**Time for Uranium in Vadose Zone Water to Reach Groundwater[c]**	**SESOIL File Name**
cm	*cm²*	--	*g/cm3*	--	*inches/yr*	*inches/yr*	*percent*	*Years*	--
Unsaturated Zone Thickness = 3.9 ft									
120	1.00E-11	0.01	1.31	12.0	0.89	5.3	0.94 - 0.97	350	**BLDG2D**
120	1.00E-11	0.025	1.31	12.0	1.79	6.5	2.4 - 2.5	266	**BLDG2C**
120	1.00E-11	0.20	1.31	11.0	3.26	-0.07	13.0 - 16.7	821	**B2A1**
120	1.00E-11	0.20	1.31	12.0	1.73	0.06	12.4 - 15.0	1448	B2A2
120	1.00E-11	0.20	1.31	10.0	6.92	-2.99	14.4 - 18.0	808	**B2A3**
120	1.00E-11	0.25	1.31	12.0	2.13	0.09	16.0 - 19.5	1661	BLDG2B
120	1.00E-11	0.25	1.31	12.0	2.13	0.09	16.0 - 19.1	1661	BLG2B
120	1.00E-11	0.25	1.31	12.0	2.49	0.2	17.2 - 20.5	1503	BLG2A
120	1.50E-11	0.20	1.31	12.0	2.03	0.17	12.8 - 15.6	1171	B2A6
120	1.50E-11	0.20	1.31	10.0	7.03	-2.07	14.2 - 17.9	582	**B2A7**
120	2.00E-11	0.20	1.31	12.0	2.27	0.3	13.0 - 15.8	993	**B2A5**
Unsaturated Zone Thickness = 4.3 ft									
130	1.00E-10	0.20	1.31	5.0	30.39	-7.01	13.9 - 16.5	126	**SS01**
130	1.00E-10	0.25	1.31	5.0	30.39	-5.44	17.7 - 20.8	194	**SS03**
130	1.00E-10	0.30	1.31	5.0	30.39	-4.22	21.5 - 25.2	182	**SS04**
130	1.00E-10	0.35	1.31	5.0	30.39	-3.18	25.3 - 29.6	172	**SS05**
130	1.00E-10	0.25	1.31	6.0	30.39	-7.43	18.5 - 21.2	218	**SS06**
130	1.00E-10	0.25	1.31	7.0	30.39	-10.08	21.4	260	**SS07**
130	1.00E-10	0.25	1.31	8.0	30.39	-13.24	19.0 - 21.4	303	**SS08**
130	1.00E-10	0.25	1.31	9.0	19.49	-3.38	17.5 - 21.4	331	**SS09**
130	1.00E-10	0.30	1.31	9.0	22.73	-5.61	20.9 - 25.8	319	**SS10**
130	1.00E-10	0.35	1.31	9.0	25.64	-7.83	24.3 - 30.3	314	**SS11**
130	1.00E-10	0.40	1.31	9.0	28.18	-9.8	27.4 - 34.7	308	**SS12**
130	1.00E-10	0.45	1.31	9.0	29.87	-11.14	30.52 -	296	**SS13**
130	1.00E-10	0.20	1.31	4.0	30.39	-6.45	12.8 - 15.8	204	**SS14**
130	1.00E-10	0.20	1.31	5.0	30.39	-7.01	13.9 - 16.5	212	**SS02**
130	1.00E-10	0.20	1.31	7.0	30.39	-11.62	14.9 - 16.9	217	**SS15**
130	1.00E-10	0.20	1.31	9.0	15.92	-1.06	13.9 - 16.9	360	**SS16**
130	1.00E-10	0.25	1.31	10.0	9.77	3.99	16.7 - 21.2	136	**SS17**
130	1.00E-10	0.25	1.31	11.0	6.59	3.95	16.9 - 20.8	na	SS18
130	1.00E-10	0.25	1.31	12.0	4.46	3.19	20.5	na	SS19
130	1.00E-10	0.25	1.31	9.0	19.49	-3.38	17.5 - 21.4	na	SS20
130	1.00E-10	0.20	1.31	10.0	8.52	3.99	13.3 - 16.8	na	SS21
130	1.00E-10	0.35	1.31	10.0	12.03	3.84	23.3 - 30.0	na	SS22
130	1.00E-10	0.20	1.31	10.0	8.52	3.99	13.3 - 16.8	346	**SS23**
130	1.00E-09	0.20	1.31	10.0	11.11	19.99	12.6 - 14.9	90	**SS24**
130	5.00E-10	0.20	1.31	10.0	10.57	14.3	12.9 - 15.5	na	SS25
130	8.00E-10	0.20	1.31	10.0	10.98	18.19	12.7 -	na	SS26
130	2.00E-10	0.20	1.31	10.0	9.44	7.58	13.2 - 16.3	na	SS27
130	4.00E-10	0.20	1.31	10.0	10.33	12.48	13.0 - 15.7	na	SS28
130	6.00E-10	0.20	1.31	10.0	10.76	15.85	12.9 - 15.4	na	SS29

SESOIL 5
Sensitivity of SESOIL Modeling Parameters and Results
Guterl Site

INPUT					OUTPUT				
Vadose Zone Thickness	**Intrinsic Permeability**	**Effective Porosity**	**Bulk Density**	**Soil Disconnect-edness Index**	**Evapotrans-piration**	**Ground-water Recharge**	**Soil Moisture[b]**	**Time for Uranium in Vadose Zone Water to Reach Groundwater[c]**	**SESOIL File Name**
cm	*cm²*	--	*g/cm3*	--	*inches/yr*	*inches/yr*	*percent*	*Years*	--
130	5.50E-10	0.20	1.31	10.0	10.68	15.1	12.9 - 15.4	na	SS30
130	5.50E-10	0.20	1.31	10.0	10.68	15.1	12.9 - 15.4	115	**SS31**
130	5.50E-10	0.20	1.31	10.0	10.68	15.1	12.9 - 15.4	85	**SS32**
130	5.50E-10	0.20	1.31	10.0	10.68	15.1	12.9 - 15.4	85	**SS33**
130	5.50E-10	0.20	1.31	10.0	10.68	15.1	12.9 - 15.4	85	**SS34**
130	5.50E-10	0.20	1.31	10.0	10.68	15.1	12.9 - 15.4	55	**SS35**
130	5.50E-10	0.20	1.31	10.0	10.68	15.1	12.9 - 15.4	55	**SS36**
130	5.50E-10	0.20	1.31	10.0	10.68	15.1	12.9 - 15.4	55	**SS37**
Unsaturated Zone Thickness = 6.7 ft									
204	1.00E-11	0.15	1.31	12.0	1.26	0.05	9.0 - 10.6	3971	IA02P
204	1.00E-11	0.25	1.29	10.0	6.30	-0.57	16.7 - 22.4	1477	IA02G
204	1.00E-11	0.25	1.29	11.0	3.78	0.21	16.4 - 21.0	1609	IA02F
204	1.00E-11	0.25	1.29	12.0	2.15	0.11	16.0 - 19.1	2413	IA02B
204	1.00E-11	0.25	1.31	11.0	2.15	0.11	16.0 - 19.1	2451	IA02K
204	1.20E-11	0.20	1.31	10.0	5.49	-0.15	13.2-17.6	828	**IA02X**
204	2.00E-11	0.20	1.31	10.0	6.03	0.5	13.2-17.5	662	**IA02Y**
204	4.00E-11	0.20	1.31	10.0	6.87	1.76	13.1-17.2	487	**IA02Z**
204	5.00E-11	0.15	1.31	12.0	2.58	1.08	10.1 - 12.0	1487	IA02O
204	5.00E-11	0.20	1.31	10.0	7.17	2.3	13.1-17.1	440	**IA02AA**
204	5.00E-11	0.25	1.31	10.0	8.21	2.44	16.4 - 21.6	661	**IA02M**
204	5.00E-11	0.25	1.31	11.0	5.61	2.02	16.8 - 21.1	880	**IA02L**
204	5.00E-11	0.25	1.31	12.0	3.67	1.39	17.1 - 20.6	1211	IA02J
204	1.00E-10	0.15	1.31	12.0	3.27	2.82	10.4 - 12.1	870	**IA02R**
204	1.00E-10	0.25	1.29	11.0	6.56	3.99	16.9 - 20.8	541	**IA02H**
204	1.00E-10	0.25	1.29	12.0	4.47	3.18	17.4 - 20.5	717	**IA02E**
204	1.00E-10	0.25	1.31	12.0	3.27	2.82	10.4 - 12.1	870	**IA02N**
204	1.00E-10 / 1.00e-11[a]	0.15	1.31	12.0	1.34	0.07	9.1 - 10.7	2284	IA02Q
204	1.00E-10 / 1.00e-11[a]	0.25	1.31	12.0	2.35	0.18	16.2 - 19.5	1373	IA02I
Other Unsaturated Zone Thicknesses									
30	1.00E-11	0.25	1.31	12.0	2.89	-1.29	17.6 - 20.7	2106	IA02S
65	1.00E-11	0.25	1.31	12.0	2.20	-0.5	16.1 - 19.9	1159	IA04EA
65	1.00E-10	0.25	1.31	12.0	3.27	2.81	10.4 - 12.1	184	**IA02V**
65	1.00E-10	0.25	1.31	12.0	3.27	2.81	10.4 - 12.1	247	**IA02W**
77	1.00E-11	0.25	1.31	12.0	2.17	0.01	16.0 - 19.8	1241	BLDG3B
152	5.00E-11	0.25	1.31	10.5	6.89	2.15	16.7 - 21.4	242	**IA04_31D**
154	1.00E-11	0.25	1.31	12.0	2.14	0.11	16.0 - 19.3	1885	IA03SA
154	1.00E-10	0.25	1.31	12.0	3.26	2.82	10.4 - 12.1	671	**IA02T**
165	1.00E-11	0.25	1.31	12.0	2.14	0.11	16.0 - 19.3	2190	IA04WA

SESOIL 5
Sensitivity of SESOIL Modeling Parameters and Results
Guterl Site

INPUT					OUTPUT				
Vadose Zone Thickness	**Intrinsic Permeability**	**Effective Porosity**	**Bulk Density**	**Soil Disconnect-edness Index**	**Evapotrans-piration**	**Ground-water Recharge**	**Soil Moisture[b]**	**Time for Uranium in Vadose Zone Water to Reach Groundwater[c]**	**SESOIL File Name**
cm	*cm²*	--	*g/cm3*	--	*inches/yr*	*inches/yr*	*percent*	*Years*	--
240	1.00E-10	0.25	1.31	12.0	3.26	2.81	10.4 - 12.1	913	**IA02U**
305	1.00E-11	0.25	1.31	12.0	2.17	0.11	16.2 - 18.7	3538	IA03A
"Worst Case" Scenarios									
152	5.00E-11	0.25	1.31	10.5	6.9	2.15	16.7 - 21.4	242	**IA04_31D**

Notes:

[a] = Indicates intrinsic permeability for upper two zones is different from intrinsic permeability for lower two zones.

[b] For comparison, typical soil moisture about 15 percent.

[c] na indicates model run for 10 years, which was insufficient for uranium to reach groundwater.

Bold indicates model runs resulting in uranium reaching groundwater in less than 1000 years (see Table 10).

SESOIL 6
AT123D Input Parameters for Groundwater Modeling
Guterl Site

Parameter	Value	Units	Source
Bulk density of soil	2.61E+03	kg/m^3	LaFarge quarry data
Hydraulic conductivity	1.76E-01	m/hr	Based on geomean of site data (1.54e3 m/yr)
Hydraulic gradient	0.007	m/m	Calculated from water level map
Effective porosity	0.03	m/hr	Based on average site-specific information; geologist/hydrologist consulted
Aquifer depth	9	m	Fracture frequency decreases between 15 and 30 ft bgs
Longitudinal dispersivity	9.8	m	Based on formula: Longitudinal dispersivity = 0.83×([(Log10(L)]**2.414) (units of feet), assumed plume length (L) of 600 m.
Horizontal transverse dispersivity	0.98	m	Assumes transverse dispersivity is 10 percent of longitudinal dispersivity.
Vertical transverse dispersivity	0.98	m	Assumes transverse dispersivity is 10 percent of longitudinal dispersivity.

Notes:
Model assumes bedrock properties approximate a homogeneous porous medium.
hr = hours
kg = kilograms
m = meters

SESOIL 7
Summary of SESOIL/AT123D Modeling Results
Guterl Site

Location	Layer 1 & 2 Thickness Each[a]	Layer 3 & 4 Thickness Each[a]	Soil Uranium Concentration		Maximum Uranium Pore Water Concentration	Time for Uranium in Vadose Zone Water to Reach Groundwater	Maximum Uranium Groundwater Concentration[b]	Time to Reach Maximum Uranium Groundwater Concentration	Dilution Attenuation Factor	SESOIL/ AT123D Run File Name
	ft	*ft*	*pCi/gm*	*mg/kg*	*mg/L*	*Years*	*mg/L*	*Years*	--	
Generalized Site Model										
Sitewide	3.3	1.0	0.17	0.5	0.055	55	0.030	66	17	SS37
Sitewide	3.3	1.0	0.92	2.7	0.299	55	0.164	66	17	SS38
Models for Specific Investigative Areas										
IA02	0.8	2.5	**12**	**36**	1.26	729	0.031	822	1146	IA02AS
IA02	0.8	2.5	10000	29700	na	5500	na	na	very large	**IA02AV**
IA03 South	0.5	2.0	**20**	**59**	1.73	597	0.030	684	1980	IA03SE
IA03 South	0.5	2.0	18000	53460	1.73	6021	na	na	very large	**IA03SJ**
IA03	0.2	4.8	34000	100980	na	1077	na	na	very large	IA03E
IA04 West	2.5	0.2	**5**	**15**	1.58	460	0.029	571	512	IA04WE
IA04 West	2.5	0.2	3600	10692	na	1179	na	na	very large	**IA04WF**
IA04 East	1.0	0.1	**1**	**3**	2.6	353	0.029	359	102	IA04EE
IA04 East	1.0	0.1	9000	26730	na	1114	na	na	very large	**IA04EL**

Notes:

[a] Model consisted of two upper vadose zone layers with uranium contamination indicated and two lower uncontaminated vadose zone layers.

[b] Soil concentrations based on ^{238}U activities measured in 2007. **Bold** values are less than measured activities/concentrations.

[c] Maximum concentration is at the water table in the center of the source area.

Distribution coefficient (K_d) of 39 milliliters per gram (mL/g) for vadose soil and K_d of 0.22 mL/g for saturated zone used for all runs except sitewide model which used Kd of 25 mL/g for vadose soil.

Bold SESOIL file name indicates layers 3 and 4 were assigned a K_d value of approximately 1356 mL/g.

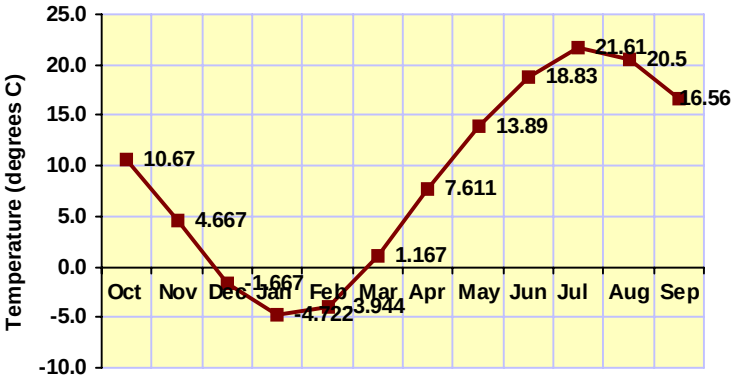
na = not applicable; contaminated pore water did not reach groundwater in 999 years.

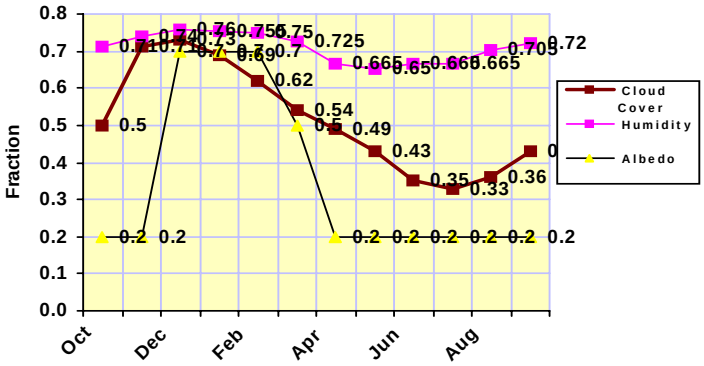
Dilution Attenuation Factor calculated as the ratio of soil concentration to maximum groundwater concentration.

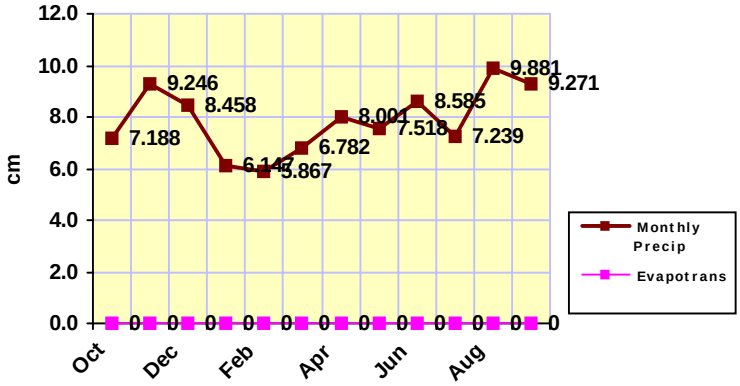
Climate Report

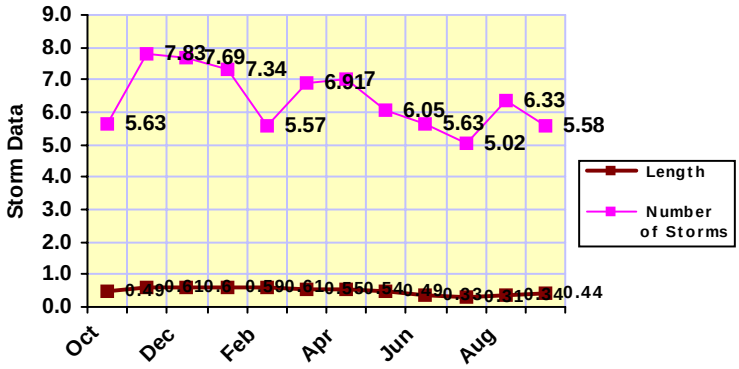
Location Description: LOCKPORT 2 NE
Climatic Input File: C:\SEVIEW63\LOCKPORT.CLM

Month	Temperature		Precipitation		Evapotranspiration Rate		Storms		Cloud Cover	Albedo	Humidity
Units	^{o}C	^{o}F	cm	Inches	cm	Inches	# per Month	Length Days	Fraction	Fraction	Fraction
October	10.67	51.21	7.188	2.83	0.00	0.00	5.63	0.490	0.500	0.200	0.710
November	4.667	40.40	9.246	3.64	0.00	0.00	7.83	0.610	0.710	0.200	0.740
December	-1.667	29.00	8.458	3.33	0.00	0.00	7.69	0.600	0.730	0.700	0.760
January	-4.722	23.50	6.147	2.42	0.00	0.00	7.34	0.590	0.690	0.700	0.755
February	-3.944	24.90	5.867	2.31	0.00	0.00	5.57	0.610	0.620	0.700	0.750
March	1.167	34.10	6.782	2.67	0.00	0.00	6.91	0.550	0.540	0.500	0.725
April	7.611	45.70	8.001	3.15	0.00	0.00	7.00	0.540	0.490	0.200	0.665
May	13.89	57.00	7.518	2.96	0.00	0.00	6.05	0.490	0.430	0.200	0.650
June	18.83	65.89	8.585	3.38	0.00	0.00	5.63	0.330	0.350	0.200	0.665
July	21.61	70.90	7.239	2.85	0.00	0.00	5.02	0.310	0.330	0.200	0.665
August	20.50	68.90	9.881	3.89	0.00	0.00	6.33	0.340	0.360	0.200	0.705
September	16.56	61.81	9.271	3.65	0.00	0.00	5.58	0.440	0.430	0.200	0.720
Total			94.18	37.08	0.00	0.00					





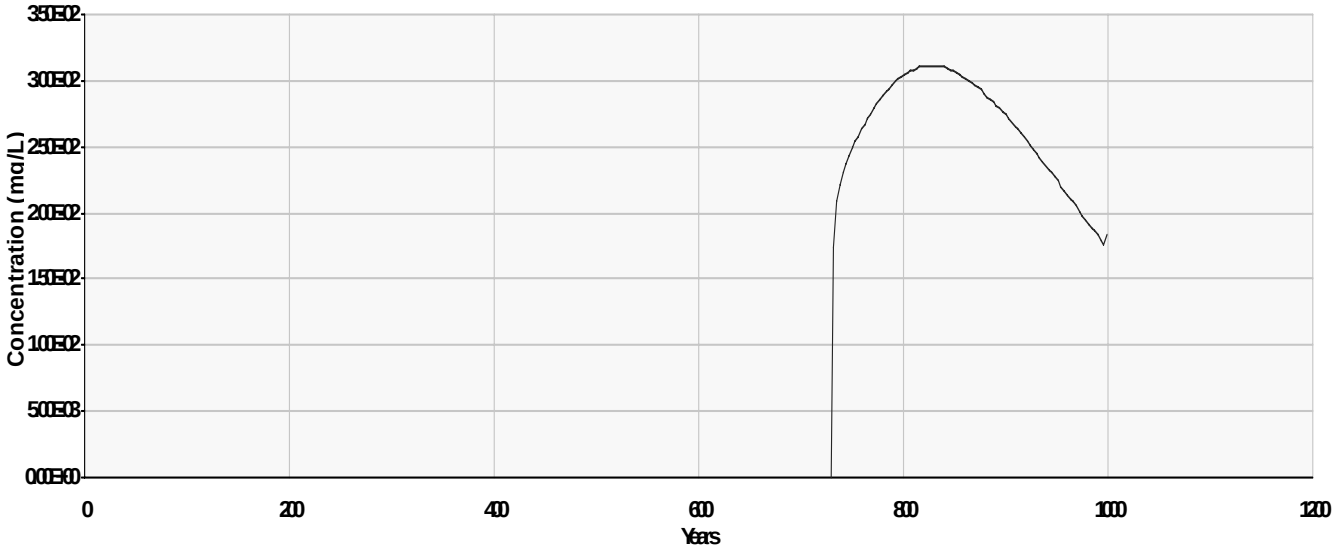




AT123D Point of Compliance Report

Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1200

Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1200



Maximum Concentration: 3.110E-02 mg/L
Year of Maximum Concentration: 822.00

Output Coordinates

X:	0.00000 m	0.0000 ft	**Output Time Step:**	0.2500 years	3.0016 months
Y:	0.00000 m	0.0000 ft	**Initial Load (mg/kg):**	0.0000E+00	
Z:	0.00000 m	0.0000 ft	**Initial Load (kg):**	0.7300E+03	

Input Parameters

Porosity:	0.25000		**Soil Organic Carbon Content (percent):**	0.00000
Hydraulic Gradient:	0.00700		**Carbon Adsorption Coeff. (ug/g)/(ug/ml):**	0.0000E+00
Hydraulic Conductivity:	1.500E-01	m/hr	4.166E-03	cm/sec
Soil Bulk Density:	2.610E+03	kg/m3	2.610E+00	g/cm3
Aquifer Width:	Infinite	m	Infinite	ft
Aquifer Depth:	9.000E+00	m	2.952E+01	ft
Kd:	2.200E-04	m3/kg	2.200E-01	(ug/g)(ug/ml)
Molecular Diffusion:	1.100E-06	m2/hr	3.055E-06	cm2/sec
Decay Coefficient:	0.000E+00	1/hr	0.000E+00	1/day

Retardation Factor:			3.297E+00	
Retarded Darcy Velocity:			1.274E-03	m2/hr 3.538E-03 cm2/sec
Retarded Longitudinal Disp. Coefficient:			1.147E-02	m2/hr 3.186E-02 cm2/sec
Retarded Lateral Dispersion Coefficient:			1.148E-03	m2/hr 3.188E-03 cm2/sec
Retarded Vertical Dispersion Coefficient:			1.148E-03	m2/hr 3.188E-03 cm2/sec

Dispersivities	**Meters**	**Feet**
Longitudinal:	9.000E+00	2.952E+01
Lateral:	9.000E-01	2.952E+00
Vertical:	9.000E-01	2.952E+00

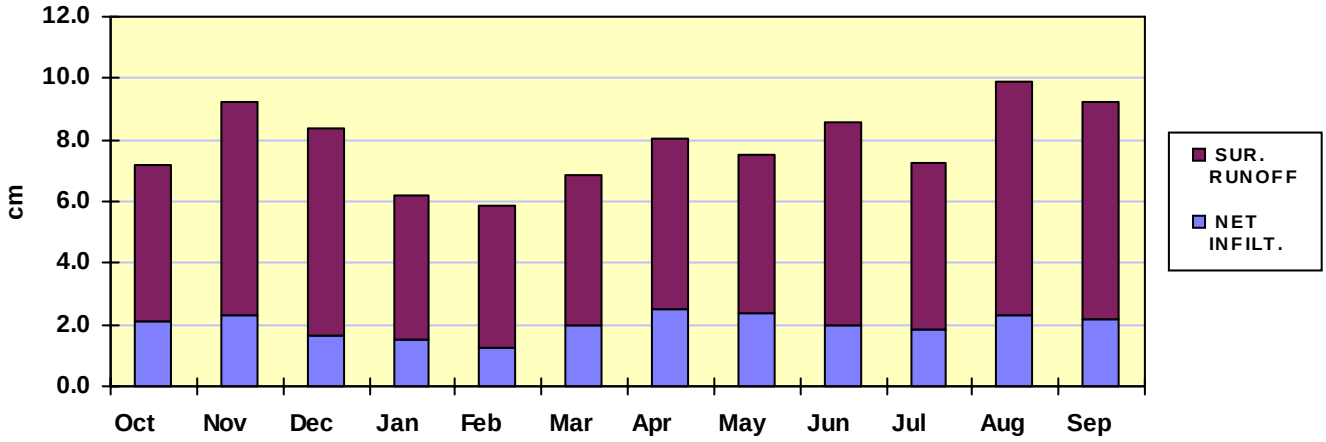
Load	Begin (m)	End (m)	Begin (ft)	End (ft)
X:	-2.000E+01	2.000E+01	-6.561E+01	6.561E+01
Y:	-2.000E+01	2.000E+01	-6.561E+01	6.561E+01
Z:	0.000E+00	0.000E+00	0.000E+00	0.000E+00

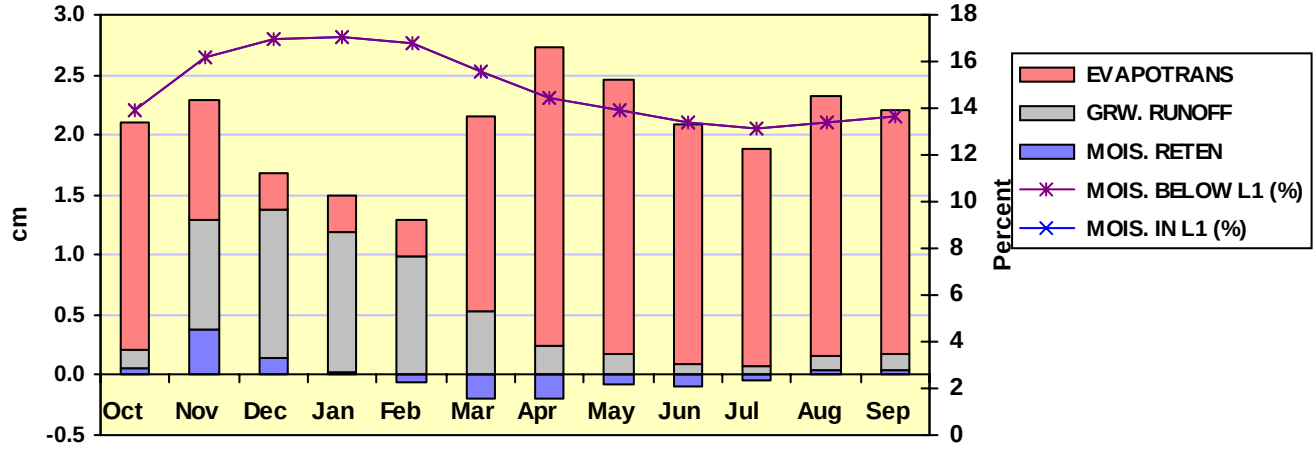
C:\SEVIEW63\IA02AS.ATI
C:\SEVIEW63\IA02AS.ATO

SESOIL Hydrologic Cycle Report

Scenario Description: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1200

SESOIL Output File: C:\SEVIEW63\IA02AS.OUT





	Surface Water Runoff		Net Infiltration		Evapotranspiration		Soil Moisture Retention		Groundwater Runoff (Recharge)		Soil Moisture	
											Layer 1	Below Layer 1
Units	cm	Inches	cm	Inches	cm	Inches	cm	Inches	cm	Inches	Percent	Percent
October	5.06	1.99	2.11	0.83	1.90	0.75	0.05	0.02	0.16	0.06	13.94	13.94
November	6.92	2.72	2.30	0.91	1.00	0.39	0.38	0.15	0.92	0.36	16.18	16.18
December	6.72	2.65	1.68	0.66	0.30	0.12	0.14	0.06	1.24	0.49	16.98	16.98
January	4.68	1.84	1.50	0.59	0.30	0.12	0.02	0.01	1.18	0.46	17.08	17.08
February	4.66	1.83	1.24	0.49	0.30	0.12	-0.05	-0.02	0.99	0.39	16.76	16.76
March	4.87	1.92	1.96	0.77	1.63	0.64	-0.20	-0.08	0.53	0.21	15.58	15.58
April	5.51	2.17	2.53	1.00	2.49	0.98	-0.20	-0.08	0.24	0.09	14.40	14.40
May	5.16	2.03	2.39	0.94	2.28	0.90	-0.08	-0.03	0.18	0.07	13.94	13.94
June	6.59	2.59	1.99	0.78	1.99	0.78	-0.10	-0.04	0.10	0.04	13.38	13.38
July	5.45	2.15	1.84	0.72	1.81	0.71	-0.04	-0.02	0.07	0.03	13.14	13.14
August	7.55	2.97	2.32	0.91	2.16	0.85	0.05	0.02	0.11	0.04	13.42	13.42
September	7.04	2.77	2.20	0.87	2.03	0.80	0.04	0.02	0.14	0.06	13.64	13.64
Total	70.20	27.64	24.05	9.47	18.20	7.17	0.00	0.00	5.85	2.30		

SESOIL Profile and Load Report

Layer No.	Number of Sub-Layers	Thickness		Intrinsic Permeability	Organic Carbon Content	Adsorption Coefficient	Cation Exchange Capacity	Freundlich Exponent	Solid Phase Degradation Rate	Liquid Phase Degradation Rate	Soil pH
		cm	feet	cm^2	percent	µg/g / µg/mL	mEq / 100 g soil	unitless	1/day	1/day	pH
1	10	25.0	0.82	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
2	10	25.0	0.82	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
3	10	77.0	2.53	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
4	10	77.0	2.53	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00

Soil Parameters

Bulk Density (g/cm^3)	1.31
Effective Porosity (fraction)	0.20
Soil Pore Disconnectedness	10.00

Application Parameters

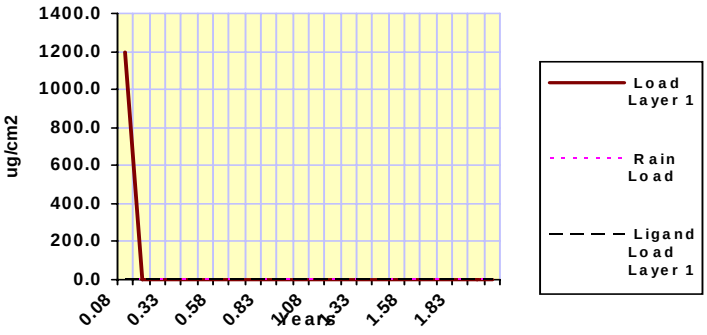
Area	cm^2	1.60E+7
	ft^2	1.72E+4
Latitude	degrees	43.2
Spill Index		1

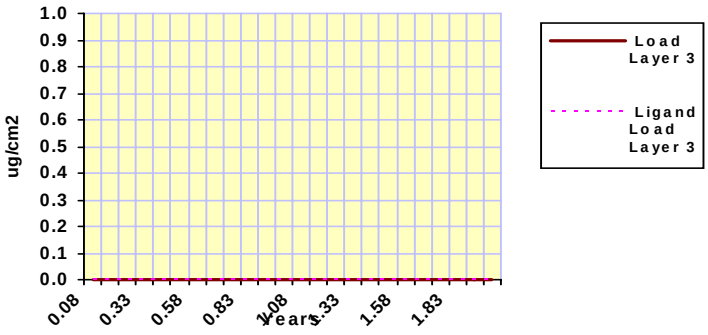
Chemical Parameters

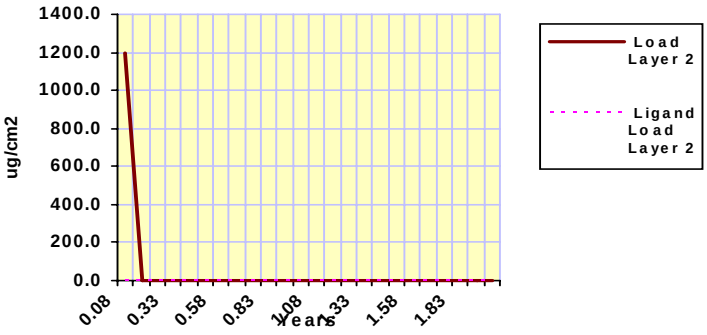
Water Solubility	(µg/mL)	150.0	**Moles Ligand / Moles Chemical**	0.00
Henry's Law	(M^3-atm/mol)	.000	**Ligand Molecular Weight** (g/mol)	0.00
K_{oc}	(µg/g)/(µg/mL)	0.00	**Base Hydrolysis Rate** (L/mol/day)	0.00
Valance	(g/mole)	0.00	**Ligand Dissociation Constant**	0.00
Air Diffusion Coefficient	(cm^2/sec)	.000	**Neutral Hydrolysis Rate** (L/mol/day)	0.00
Water Diffusion Coefficient	(cm^2/sec)	1.10E-6	**Acid Hydrolysis Rate** (L/mol/day)	0.00
Molecular Weight	(g/mol)	238.00		

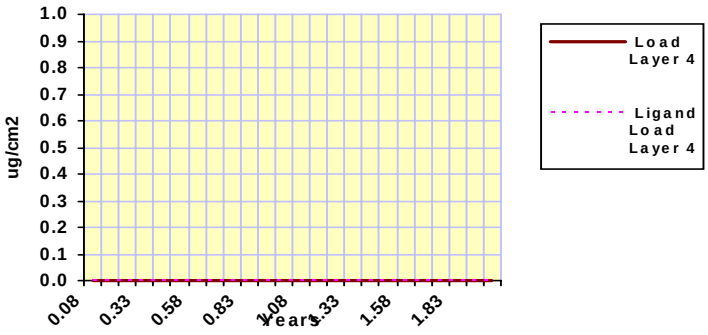
Output File: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1200
C:\SEVIEW63\IA02AS.OUT
Chemical File: Uranium
C:\SEVIEW63\URANIUM.CHM
Soil File: Lockport soil, Perm = 5.0E-6 cm/sec, D=10, n=0.2
C:\SEVIEW63\LOCKPOR6.SOI
Application File: IA02 Application Parameters
C:\SEVIEW63\IA02B.APL

Sublayer Loads	1	2	3	4	5	6	7	8	9	10
Layer 1 (ug/g)										
Layer 2 (ug/g)										
Layer 3 (ug/g)										
Layer 4 (ug/g)										









SESOIL Pollutant Cycle Report

Scenario Description: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1200

SESOIL Output File: C:\SEVIEW63\IA02AS.OUT

SESOIL Process	Pollutant Mass (µg)	Percent of Total
Volatilized	0.000E+00	0.00
In Soil Air	0.000E+00	0.00
Sur. Runoff	0.000E+00	0.00
In Washld	0.000E+00	0.00
Ads On Soil	8.365E+09	21.79
Hydrol Soil	0.000E+00	0.00
Degrad Soil	0.000E+00	0.00
Pure Phase	0.000E+00	0.00
Complexed	0.000E+00	0.00
Immobile CEC	0.000E+00	0.00
Hydrol CEC	0.000E+00	0.00
In Soil Moi	2.234E+07	0.06
Hydrol Mois	0.000E+00	0.00
Degrad Mois	0.000E+00	0.00
Other Trans	0.000E+00	0.00
Other Sinks	0.000E+00	0.00
Gwr. Runoff	2.698E+10	70.27
Total Output	3.537E+10	92.12
Total Input	3.840E+10	
Input - Output	3.026E+09	

Maximum leachate concentration: 1.264E+00 **mg/l**

Climate File: LOCKPORT 2 NE
C:\SEVIEW63\LOCKPORT.CLM

Chemical File: Uranium
C:\SEVIEW63\URANIUM.CHM

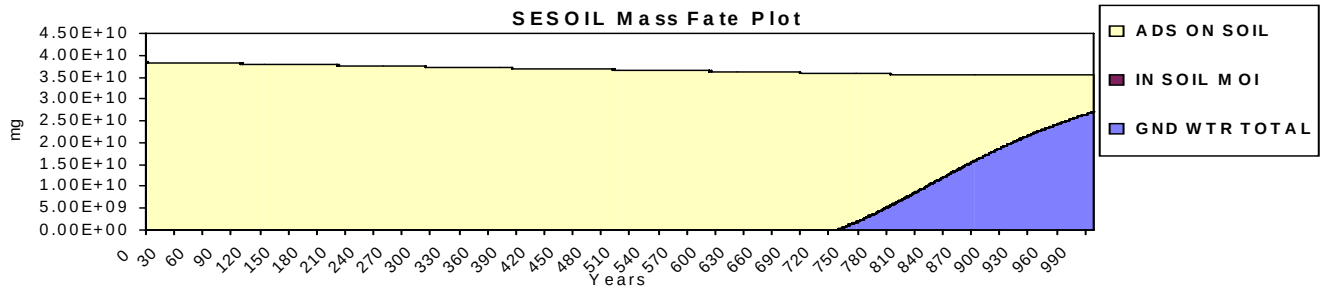
Soil File: Lockport soil, Perm = 5.0E-6 cm/sec, D=10, n=0.2
C:\SEVIEW63\LOCKPOR6.SOI

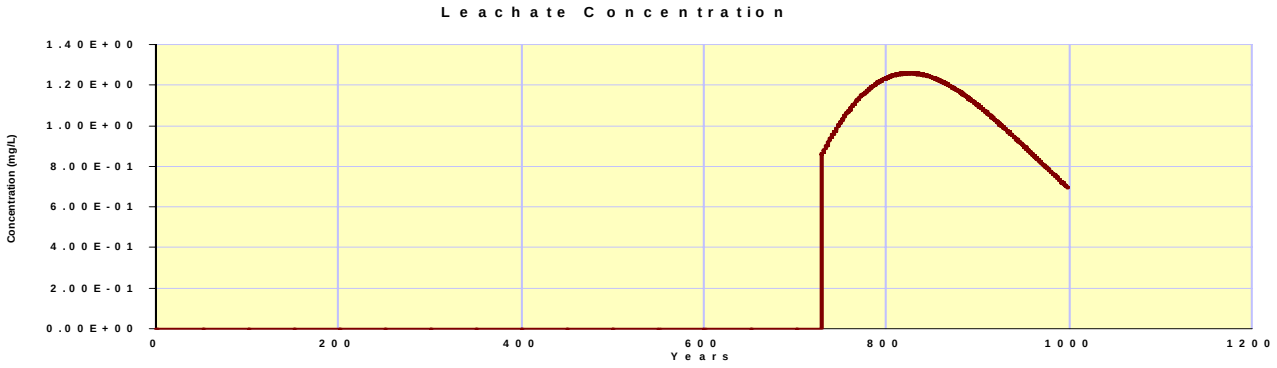
Application File: IA02 Application Parameters
C:\SEVIEW63\IA02B.APL

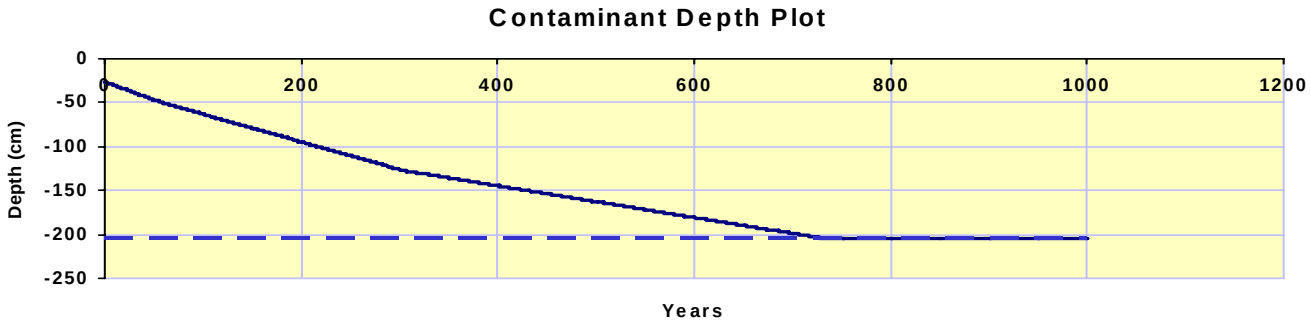
Starting Depth: 26.28 **cm**

Ending Depth: 204.00 **cm**

Total Depth: 204.00 **cm**



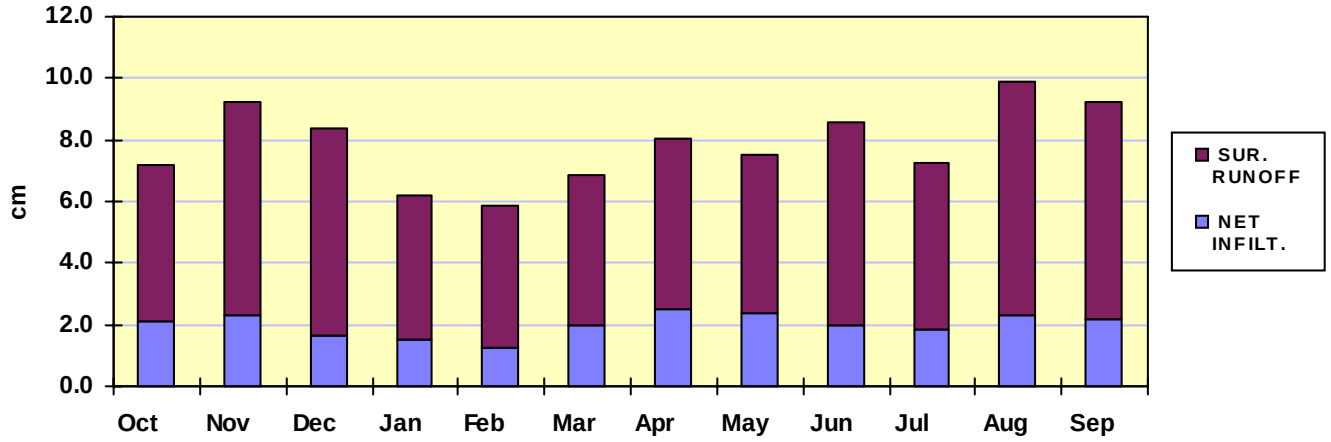


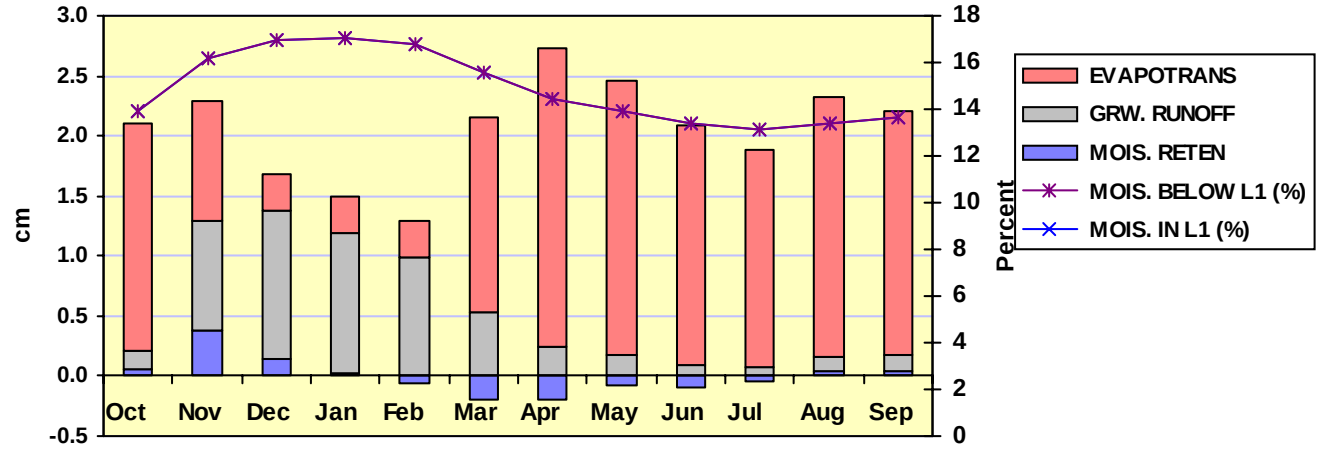


SESOIL Hydrologic Cycle Report

Scenario Description:

SESOIL Output File: C:\SEVIEW63\IA02AV.OUT





	Surface Water Runoff		Net Infiltration		Evapotranspiration		Soil Moisture Retention		Groundwater Runoff (Recharge)		Soil Moisture	
											Layer 1	Below Layer 1
Units	cm	Inches	cm	Inches	cm	Inches	cm	Inches	cm	Inches	Percent	Percent
October	5.06	1.99	2.11	0.83	1.90	0.75	0.05	0.02	0.16	0.06	13.94	13.94
November	6.92	2.72	2.30	0.91	1.00	0.39	0.38	0.15	0.92	0.36	16.18	16.18
December	6.72	2.65	1.68	0.66	0.30	0.12	0.14	0.06	1.24	0.49	16.98	16.98
January	4.68	1.84	1.50	0.59	0.30	0.12	0.02	0.01	1.18	0.46	17.08	17.08
February	4.66	1.83	1.24	0.49	0.30	0.12	-0.05	-0.02	0.99	0.39	16.76	16.76
March	4.87	1.92	1.96	0.77	1.63	0.64	-0.20	-0.08	0.53	0.21	15.58	15.58
April	5.51	2.17	2.53	1.00	2.49	0.98	-0.20	-0.08	0.24	0.09	14.40	14.40
May	5.16	2.03	2.39	0.94	2.28	0.90	-0.08	-0.03	0.18	0.07	13.94	13.94
June	6.59	2.59	1.99	0.78	1.99	0.78	-0.10	-0.04	0.10	0.04	13.38	13.38
July	5.45	2.15	1.84	0.72	1.81	0.71	-0.04	-0.02	0.07	0.03	13.14	13.14
August	7.55	2.97	2.32	0.91	2.16	0.85	0.05	0.02	0.11	0.04	13.42	13.42
September	7.04	2.77	2.20	0.87	2.03	0.80	0.04	0.02	0.14	0.06	13.64	13.64
Total	70.20	27.64	24.05	9.47	18.20	7.17	0.00	0.00	5.85	2.30		

SESOIL Profile and Load Report

Layer No.	Number of Sub-Layers	Thickness		Intrinsic Permeability	Organic Carbon Content	Adsorption Coefficient	Cation Exchange Capacity	Freundlich Exponent	Solid Phase Degradation Rate	Liquid Phase Degradation Rate	Soil pH
		cm	feet	cm^2	percent	µg/g / µg/mL	mEq / 100 g soil	unitless	1/day	1/day	pH
1	10	25.0	0.82	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
2	10	25.0	0.82	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
3	10	77.0	2.53	5.00E-11	0.00	1365.00	0.00	1.00	0.00E+00	0.00E+00	7.00
4	10	77.0	2.53	5.00E-11	0.00	1365.00	0.00	1.00	0.00E+00	0.00E+00	7.00

Soil Parameters

Bulk Density (g/cm^3)	1.31
Effective Porosity (fraction)	0.20
Soil Pore Disconnectedness	10.00

Application Parameters

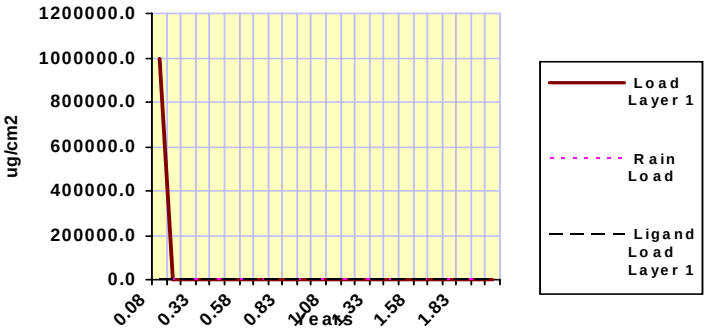
Area	cm^2	1.60E+7
	ft^2	1.72E+4
Latitude	degrees	43.2
Spill Index		1

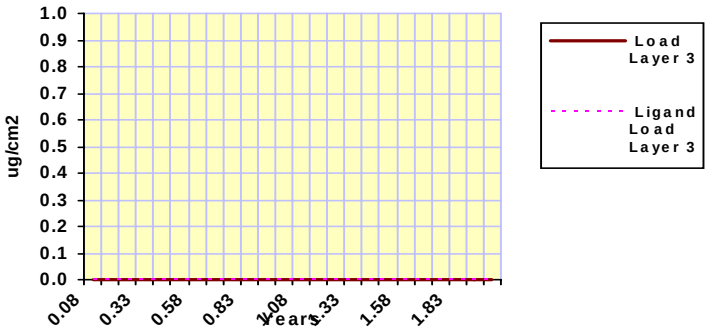
Chemical Parameters

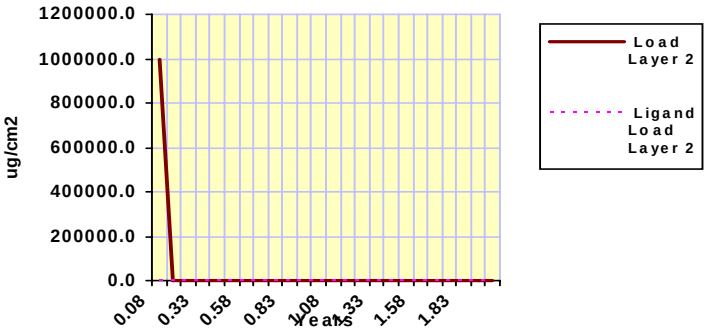
Water Solubility	(µg/mL)	150.0	**Moles Ligand / Moles Chemical**	0.00
Henry's Law	(M^3-atm/mol)	.000	**Ligand Molecular Weight** (g/mol)	0.00
K_{oc}	(µg/g)/(µg/mL)	0.00	**Base Hydrolysis Rate** (L/mol/day)	0.00
Valance	(g/mole)	0.00	**Ligand Dissociation Constant**	0.00
Air Diffusion Coefficient	(cm^2/sec)	.000	**Neutral Hydrolysis Rate** (L/mol/day)	0.00
Water Diffusion Coefficient	(cm^2/sec)	1.10E-6	**Acid Hydrolysis Rate** (L/mol/day)	0.00
Molecular Weight	(g/mol)	238.00		

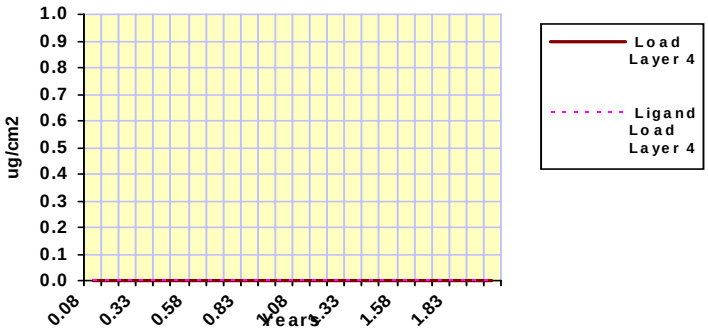
Output File:
C:\SEVIEW63\IA02AV.OUT
Chemical File: Uranium
C:\SEVIEW63\URANIUM.CHM
Soil File: Lockport soil, Perm = 5.0E-6 cm/sec, D=10, n=0.2
C:\SEVIEW63\LOCKPOR6.SOI
Application File: IA02 Application Parameters
C:\SEVIEW63\IA02KDA.APL

Sublayer Loads	1	2	3	4	5	6	7	8	9	10
Layer 1 (ug/g)										
Layer 2 (ug/g)										
Layer 3 (ug/g)										
Layer 4 (ug/g)										









SESOIL Pollutant Cycle Report

Scenario Description:

SESOIL Output File: C:\SEVIEW63\IA02AV.OUT

SESOIL Process	Pollutant Mass (µg)	Percent of Total
Volatilized	0.000E+00	0.00
In Soil Air	0.000E+00	0.00
Sur. Runoff	0.000E+00	0.00
In Washld	0.000E+00	0.00
Ads On Soil	3.058E+13	95.58
Hydrol Soil	0.000E+00	0.00
Degrad Soil	0.000E+00	0.00
Pure Phase	0.000E+00	0.00
Complexed	0.000E+00	0.00
Immobile CEC	0.000E+00	0.00
Hydrol CEC	0.000E+00	0.00
In Soil Moi	2.333E+09	0.01
Hydrol Mois	0.000E+00	0.00
Degrad Mois	0.000E+00	0.00
Other Trans	0.000E+00	0.00
Other Sinks	0.000E+00	0.00
Gwr. Runoff	0.000E+00	0.00
Total Output	3.058E+13	95.58
Total Input	3.200E+13	
Input - Output	1.413E+12	

Maximum leachate concentration: 0.000E+00 **mg/l**

Climate File: LOCKPORT 2 NE
C:\SEVIEW63\LOCKPORT.CLM

Chemical File: Uranium
C:\SEVIEW63\URANIUM.CHM

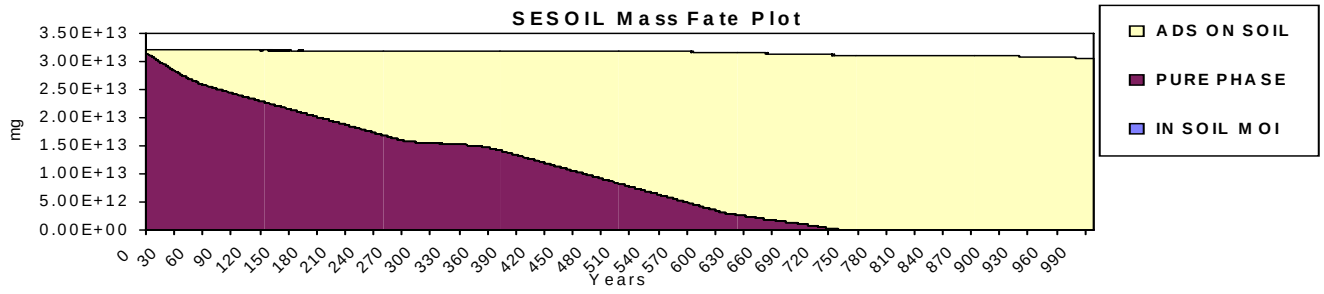
Soil File: Lockport soil, Perm = 5.0E-6 cm/sec, D=10, n=0.2
C:\SEVIEW63\LOCKPOR6.SOI

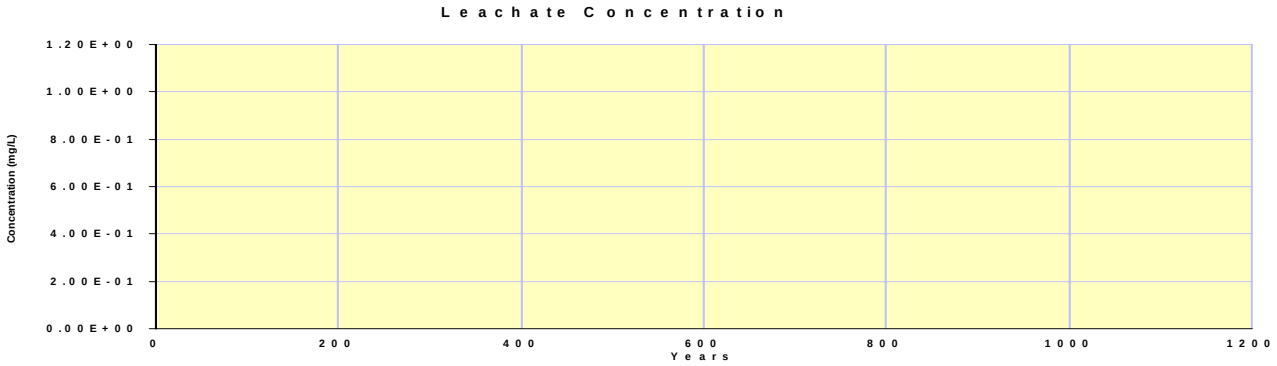
Application File: IA02 Application Parameters
C:\SEVIEW63\IA02KDA.APL

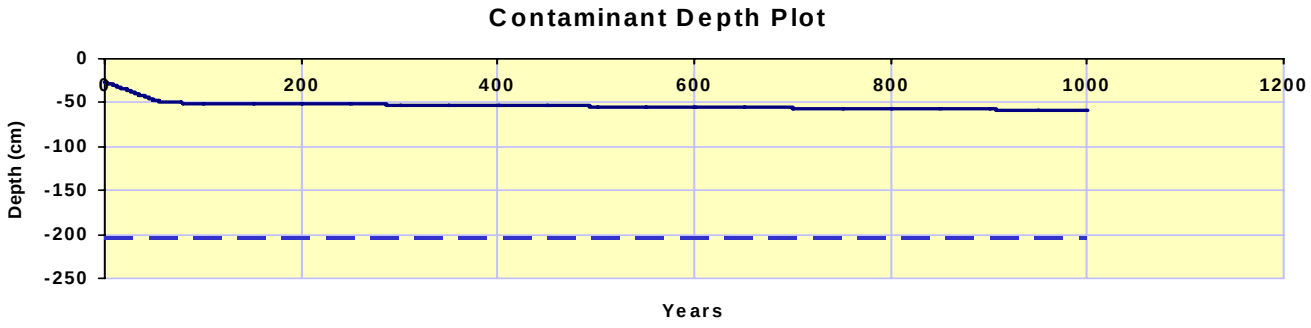
Starting Depth: 26.28 **cm**

Ending Depth: 58.61 **cm**

Total Depth: 204.00 **cm**



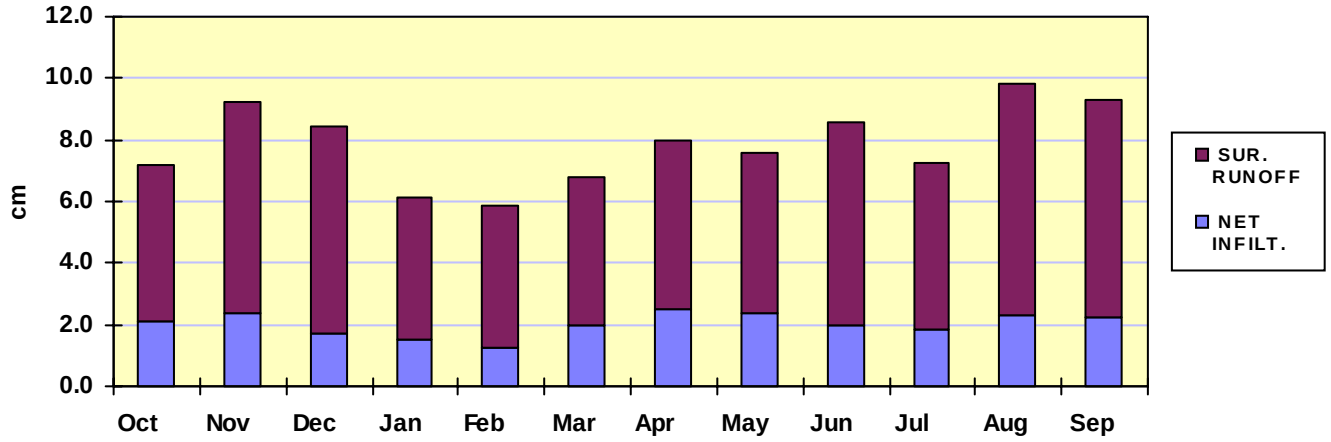


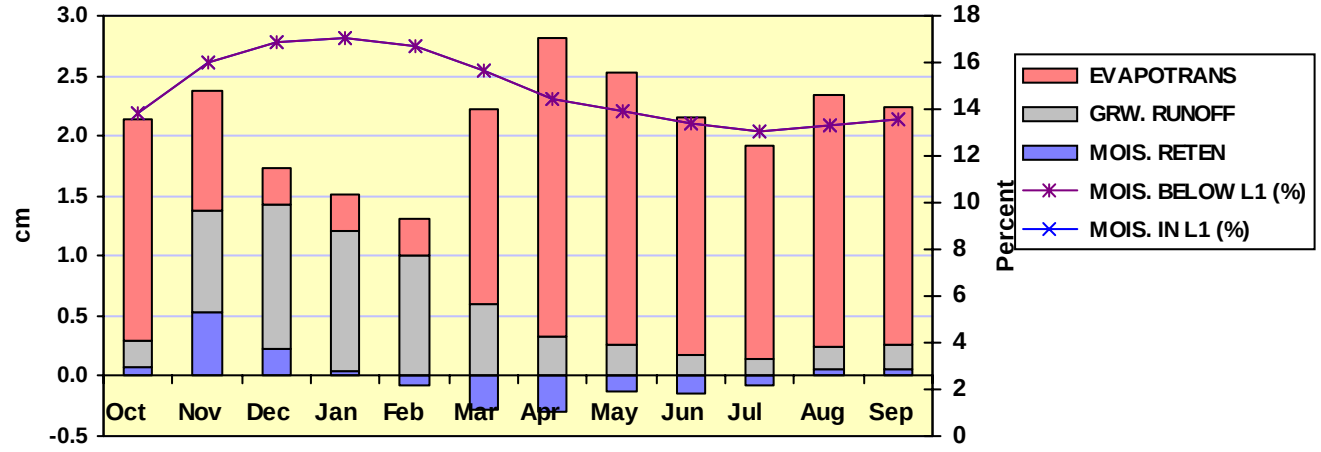


SESOIL Hydrologic Cycle Report

Scenario Description: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1000000

SESOIL Output File: C:\SEVIEW63\IA03E.OUT





	Surface Water Runoff		Net Infiltration		Evapotranspiration		Soil Moisture Retention		Groundwater Runoff (Recharge)		Soil Moisture	
											Layer 1	Below Layer 1
Units	cm	Inches	cm	Inches	cm	Inches	cm	Inches	cm	Inches	Percent	Percent
October	5.03	1.98	2.13	0.84	1.83	0.72	0.08	0.03	0.22	0.09	13.86	13.86
November	6.85	2.70	2.38	0.94	1.00	0.39	0.53	0.21	0.85	0.33	15.96	15.96
December	6.69	2.63	1.73	0.68	0.30	0.12	0.23	0.09	1.20	0.47	16.86	16.86
January	4.59	1.81	1.51	0.59	0.30	0.12	0.04	0.02	1.17	0.46	17.00	17.00
February	4.62	1.82	1.25	0.49	0.30	0.12	-0.07	-0.03	1.01	0.40	16.72	16.72
March	4.86	1.91	1.95	0.77	1.63	0.64	-0.28	-0.11	0.60	0.24	15.62	15.62
April	5.48	2.16	2.52	0.99	2.49	0.98	-0.30	-0.12	0.32	0.13	14.44	14.44
May	5.17	2.04	2.40	0.94	2.27	0.89	-0.13	-0.05	0.26	0.10	13.94	13.94
June	6.58	2.59	2.00	0.79	1.97	0.78	-0.15	-0.06	0.18	0.07	13.36	13.36
July	5.42	2.13	1.85	0.73	1.77	0.70	-0.07	-0.03	0.15	0.06	13.08	13.08
August	7.47	2.94	2.33	0.92	2.09	0.82	0.06	0.02	0.18	0.07	13.32	13.32
September	7.04	2.77	2.23	0.88	1.97	0.78	0.06	0.02	0.20	0.08	13.56	13.56
Total	69.82	27.49	24.28	9.56	17.93	7.06	0.00	0.00	6.35	2.50		

SESOIL Profile and Load Report

Layer No.	Number of Sub-Layers	Thickness		Intrinsic Permeability	Organic Carbon Content	Adsorption Coefficient	Cation Exchange Capacity	Freundlich Exponent	Solid Phase Degradation Rate	Liquid Phase Degradation Rate	Soil pH
		cm	feet	cm^2	percent	µg/g / µg/mL	mEq / 100 g soil	unitless	1/day	1/day	pH
1	10	7.5	0.25	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
2	10	7.5	0.25	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
3	10	145.0	4.76	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
4	10	145.0	4.76	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00

Soil Parameters

Bulk Density (g/cm^3)	1.31
Effective Porosity (fraction)	0.20
Soil Pore Disconnectedness	10.00

Application Parameters

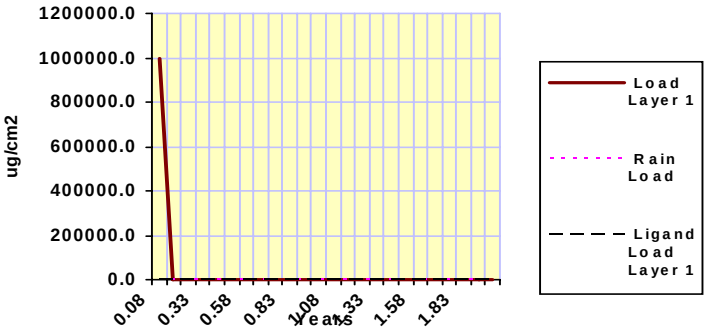
Area	cm^2	1.60E+7
	ft^2	1.72E+4
Latitude	degrees	43.2
Spill Index		1

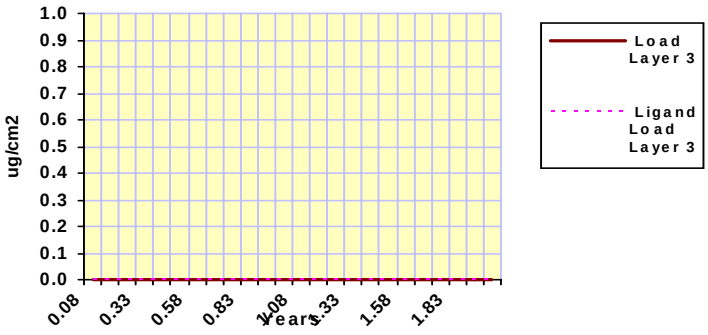
Chemical Parameters

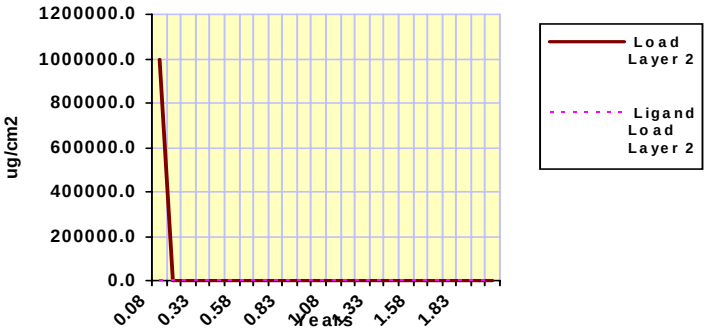
Water Solubility	(µg/mL)	150.0	**Moles Ligand / Moles Chemical**	0.00
Henry's Law	(M^3-atm/mol)	.000	**Ligand Molecular Weight** (g/mol)	0.00
K_{oc}	(µg/g)/(µg/mL)	0.00	**Base Hydrolysis Rate** (L/mol/day)	0.00
Valance	(g/mole)	0.00	**Ligand Dissociation Constant**	0.00
Air Diffusion Coefficient	(cm^2/sec)	.000	**Neutral Hydrolysis Rate** (L/mol/day)	0.00
Water Diffusion Coefficient	(cm^2/sec)	1.10E-6	**Acid Hydrolysis Rate** (L/mol/day)	0.00
Molecular Weight	(g/mol)	238.00		

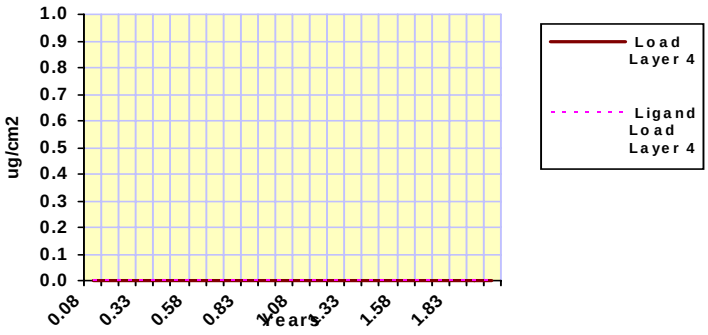
Output File: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1000000
C:\SEVIEW63\IA03E.OUT
Chemical File: Uranium
C:\SEVIEW63\URANIUM.CHM
Soil File: Lockport soil, Perm = 5.00E-6 cm/sec, D=10, n=0.
C:\SEVIEW63\LOCKPOR4.SOI
Application File: IA03 Application Parameters
C:\SEVIEW63\IA03.APL

Sublayer Loads	1	2	3	4	5	6	7	8	9	10
Layer 1 (ug/g)										
Layer 2 (ug/g)										
Layer 3 (ug/g)										
Layer 4 (ug/g)										









SESOIL Pollutant Cycle Report

Scenario Description: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1000000

SESOIL Output File: C:\SEVIEW63\IA03E.OUT

SESOIL Process	Pollutant Mass (µg)	Percent of Total
Volatilized	0.000E+00	0.00
In Soil Air	0.000E+00	0.00
Sur. Runoff	0.000E+00	0.00
In Washld	0.000E+00	0.00
Ads On Soil	2.220E+13	69.39
Hydrol Soil	0.000E+00	0.00
Degrad Soil	0.000E+00	0.00
Pure Phase	9.650E+12	30.16
Complexed	0.000E+00	0.00
Immobile CEC	0.000E+00	0.00
Hydrol CEC	0.000E+00	0.00
In Soil Moi	5.894E+10	0.18
Hydrol Mois	0.000E+00	0.00
Degrad Mois	0.000E+00	0.00
Other Trans	0.000E+00	0.00
Other Sinks	0.000E+00	0.00
Gwr. Runoff	0.000E+00	0.00
Total Output	3.191E+13	99.73
Total Input	3.200E+13	
Input - Output	8.558E+10	

Maximum leachate concentration: 0.000E+00 **mg/l**

Climate File: LOCKPORT 2 NE
C:\SEVIEW63\LOCKPORT.CLM

Chemical File: Uranium
C:\SEVIEW63\URANIUM.CHM

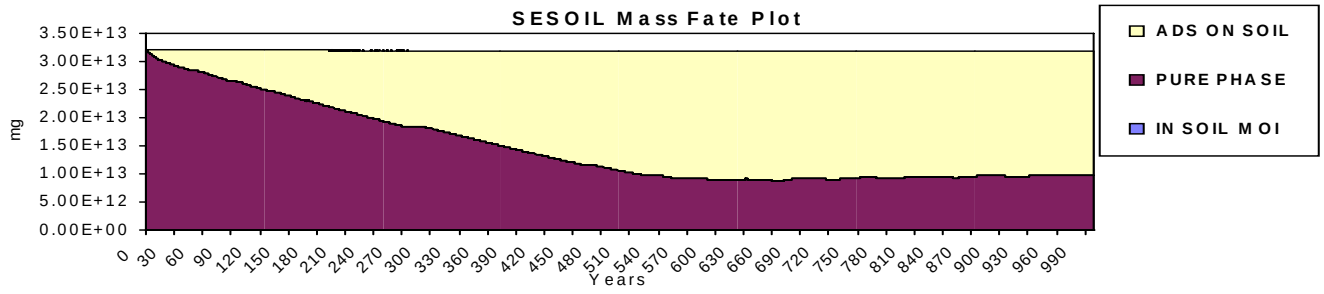
Soil File: Lockport soil, Perm = 5.00E-6 cm/sec, D=10, n=0.
C:\SEVIEW63\LOCKPOR4.SOI

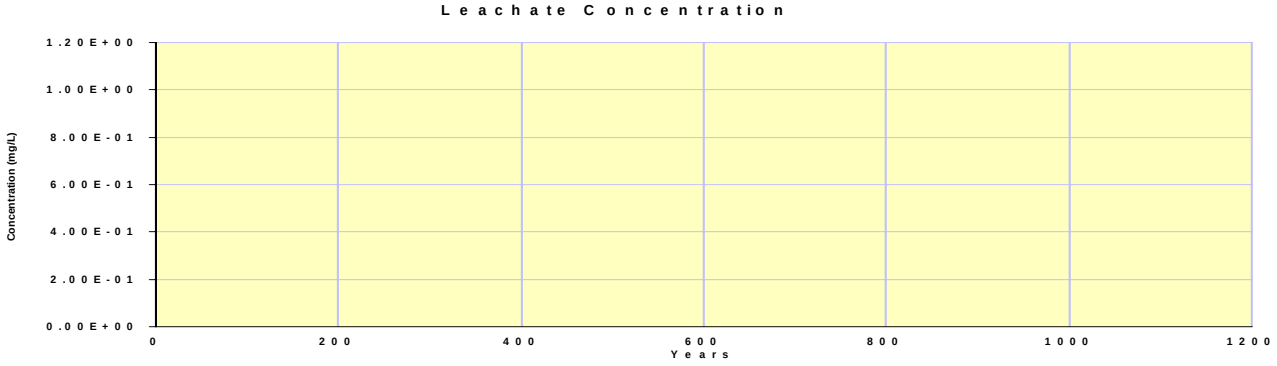
Application File: IA03 Application Parameters
C:\SEVIEW63\IA03.APL

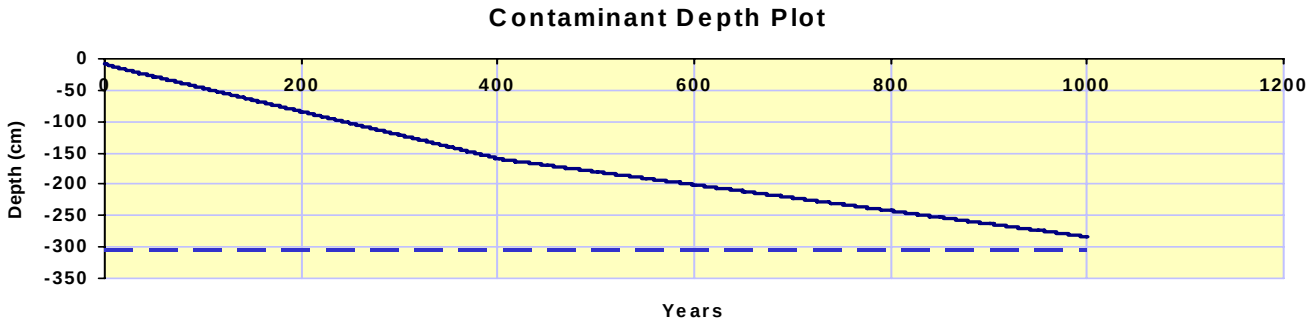
Starting Depth: 7.92 **cm**

Ending Depth: 283.50 **cm**

Total Depth: 305.00 **cm**



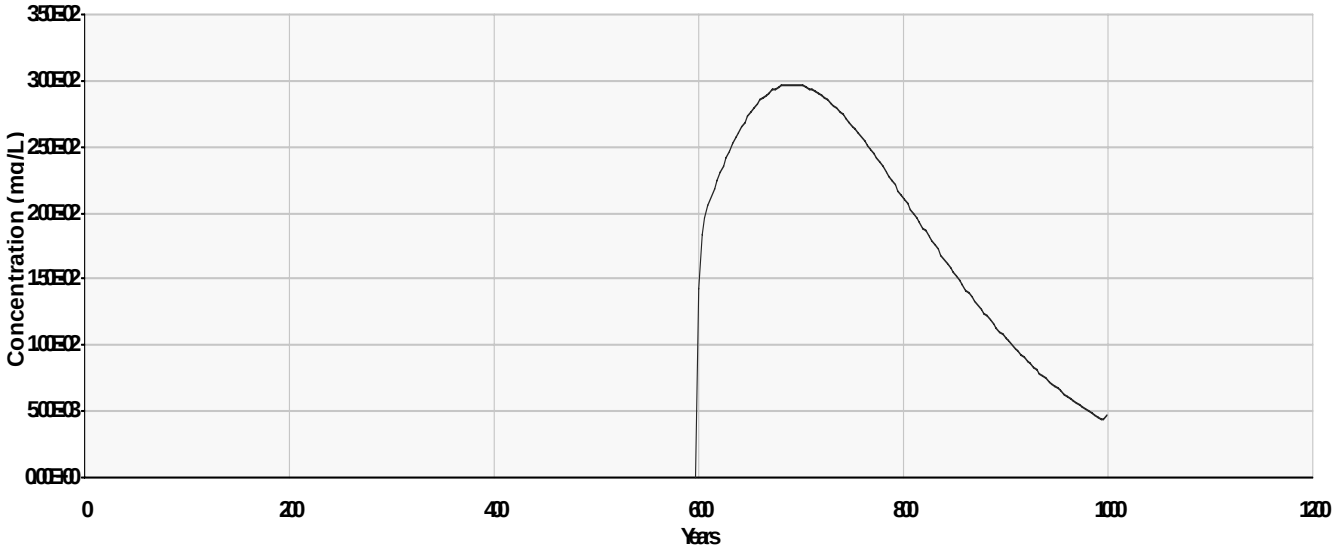




AT123D Point of Compliance Report

Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1200

Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1200



Maximum Concentration: 2.970E-02 mg/L
Year of Maximum Concentration: 684.00

Output Coordinates

X:	0.00000 m	0.0000 ft	**Output Time Step:**	0.2500 years	3.0016 months
Y:	0.00000 m	0.0000 ft	**Initial Load (mg/kg):**	0.0000E+00	
Z:	0.00000 m	0.0000 ft	**Initial Load (kg):**	0.7300E+03	

Input Parameters

Porosity:	0.03000		**Soil Organic Carbon Content (percent):**	0.00000
Hydraulic Gradient:	0.00700		**Carbon Adsorption Coeff. (ug/g)/(ug/ml):**	0.0000E+00
Hydraulic Conductivity:	1.500E-01	m/hr	4.166E-03	cm/sec
Soil Bulk Density:	2.610E+03	kg/m3	2.610E+00	g/cm3
Aquifer Width:	Infinite	m	Infinite	ft
Aquifer Depth:	9.000E+00	m	2.952E+01	ft
Kd:	2.200E-04	m3/kg	2.200E-01	(ug/g)(ug/ml)
Molecular Diffusion:	1.100E-06	m2/hr	3.055E-06	cm2/sec
Decay Coefficient:	0.000E+00	1/hr	0.000E+00	1/day

Retardation Factor:			2.014E+01	
Retarded Darcy Velocity:			1.738E-03	m2/hr	4.827E-03	cm2/sec
Retarded Longitudinal Disp. Coefficient:			1.564E-02	m2/hr	4.344E-02	cm2/sec
Retarded Lateral Dispersion Coefficient:			1.566E-03	m2/hr	4.350E-03	cm2/sec
Retarded Vertical Dispersion Coefficient:			1.566E-03	m2/hr	4.350E-03	cm2/sec

Dispersivities	**Meters**	**Feet**
Longitudinal:	9.000E+00	2.952E+01
Lateral:	9.000E-01	2.952E+00
Vertical:	9.000E-01	2.952E+00

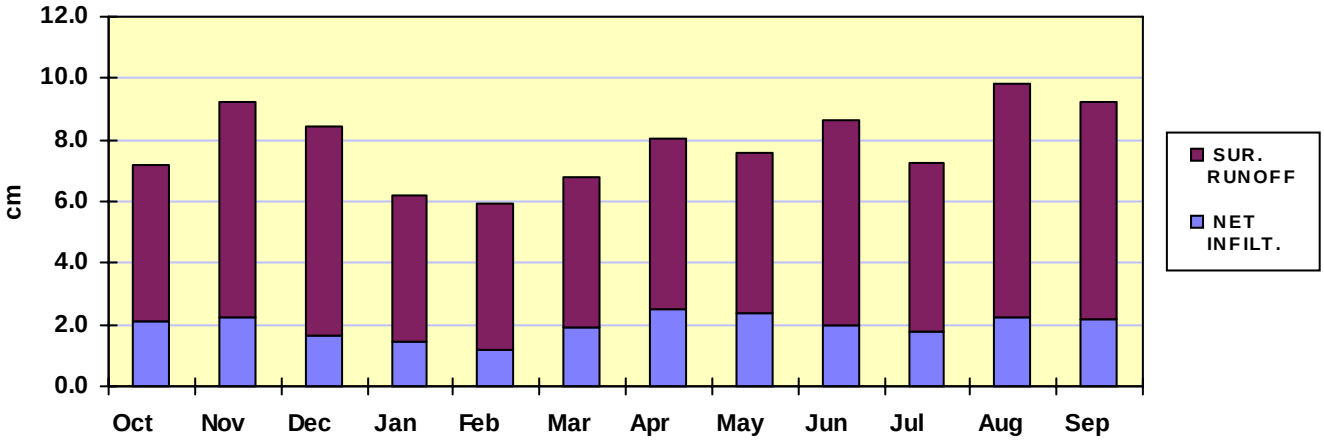
Load	Begin (m)	End (m)	Begin (ft)	End (ft)
X:	-2.000E+01	2.000E+01	-6.561E+01	6.561E+01
Y:	-2.000E+01	2.000E+01	-6.561E+01	6.561E+01
Z:	0.000E+00	0.000E+00	0.000E+00	0.000E+00

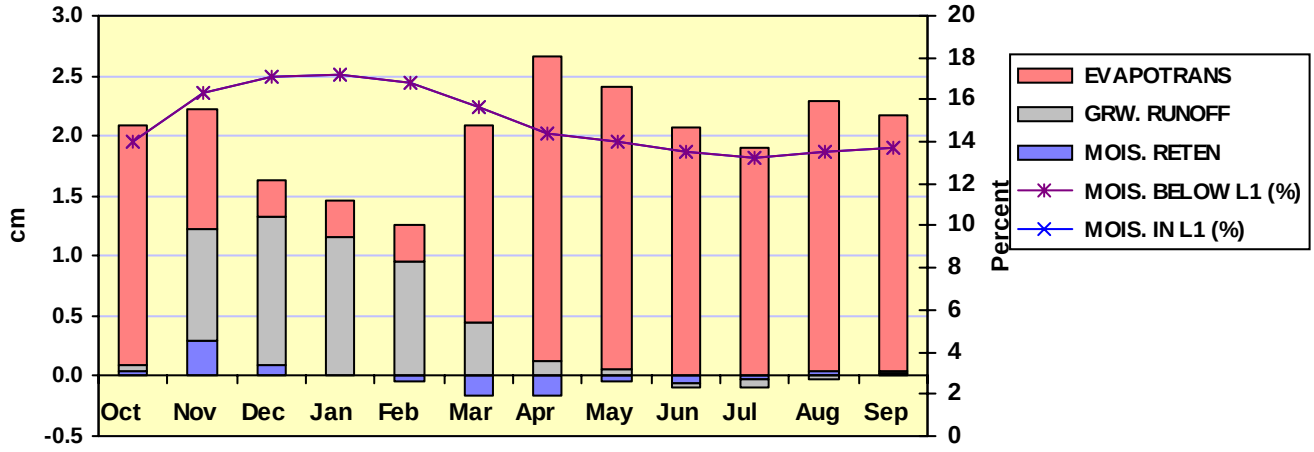
C:\SEVIEW63\IAO3SE.ATI
C:\SEVIEW63\IAO3SE.ATO

SESOIL Hydrologic Cycle Report

Scenario Description: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1200

SESOIL Output File: C:\SEVIEW63\IAO3SE.OUT





	Surface Water Runoff		Net Infiltration		Evapotranspiration		Soil Moisture Retention		Groundwater Runoff (Recharge)		Soil Moisture	
											Layer 1	Below Layer 1
Units	cm	Inches	cm	Inches	cm	Inches	cm	Inches	cm	Inches	Percent	Percent
October	5.09	2.00	2.09	0.82	2.00	0.79	0.04	0.02	0.05	0.02	14.04	14.04
November	6.99	2.75	2.22	0.87	1.00	0.39	0.30	0.12	0.92	0.36	16.36	16.36
December	6.83	2.69	1.64	0.65	0.30	0.12	0.10	0.04	1.24	0.49	17.10	17.10
January	4.71	1.85	1.46	0.57	0.30	0.12	0.01	0.00	1.15	0.45	17.16	17.16
February	4.70	1.85	1.22	0.48	0.30	0.12	-0.04	-0.02	0.95	0.37	16.84	16.84
March	4.87	1.92	1.93	0.76	1.65	0.65	-0.16	-0.06	0.44	0.17	15.62	15.62
April	5.51	2.17	2.51	0.99	2.54	1.00	-0.15	-0.06	0.13	0.05	14.42	14.42
May	5.19	2.04	2.36	0.93	2.36	0.93	-0.05	-0.02	0.06	0.02	14.02	14.02
June	6.67	2.63	1.98	0.78	2.08	0.82	-0.07	-0.03	-0.03	-0.01	13.50	13.50
July	5.46	2.15	1.80	0.71	1.90	0.75	-0.03	-0.01	-0.07	-0.03	13.28	13.28
August	7.54	2.97	2.27	0.89	2.26	0.89	0.03	0.01	-0.02	-0.01	13.54	13.54
September	7.09	2.79	2.17	0.85	2.13	0.84	0.03	0.01	0.01	0.00	13.76	13.76
Total	70.66	27.82	23.63	9.30	18.81	7.41	0.00	0.00	4.82	1.90		

SESOIL Profile and Load Report

Layer No.	Number of Sub-Layers	Thickness		Intrinsic Permeability	Organic Carbon Content	Adsorption Coefficient	Cation Exchange Capacity	Freundlich Exponent	Solid Phase Degradation Rate	Liquid Phase Degradation Rate	Soil pH
		cm	feet	cm^2	percent	µg/g / µg/mL	mEq / 100 g soil	unitless	1/day	1/day	pH
1	10	15.0	0.49	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
2	10	15.0	0.49	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
3	10	62.0	2.03	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
4	10	62.0	2.03	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00

Soil Parameters

Bulk Density (g/cm^3)	1.31
Effective Porosity (fraction)	0.20
Soil Pore Disconnectedness	10.00

Application Parameters

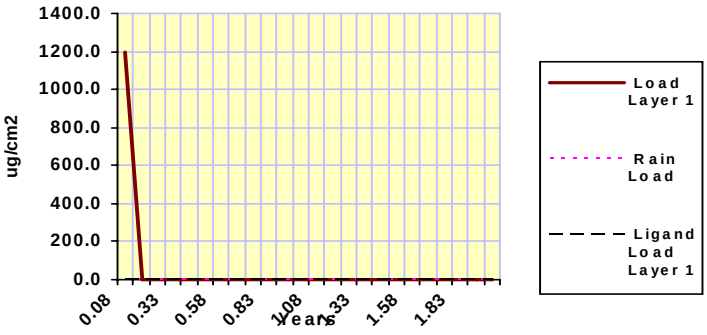
Area	cm^2	1.60E+7
	ft^2	1.72E+4
Latitude	degrees	43.2
Spill Index		1

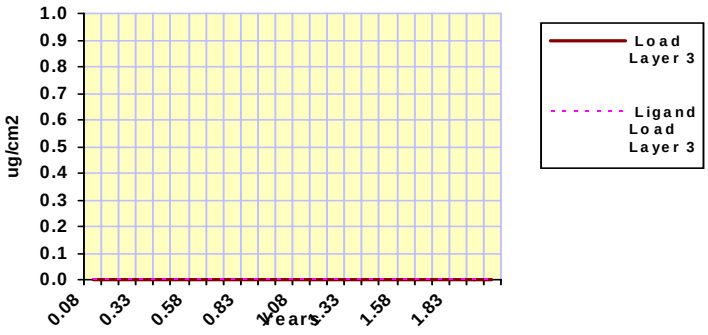
Chemical Parameters

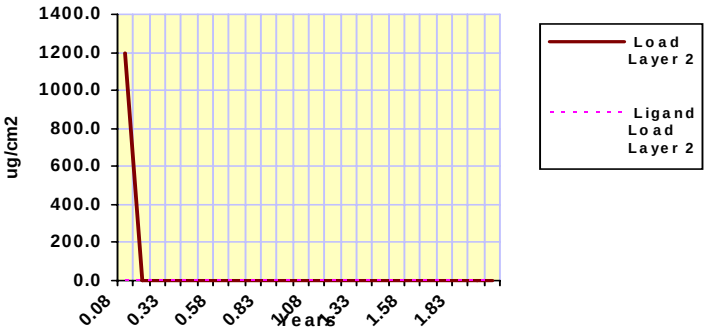
Water Solubility	(µg/mL)	150.0	**Moles Ligand / Moles Chemical**	0.00
Henry's Law	(M^3-atm/mol)	.000	**Ligand Molecular Weight** (g/mol)	0.00
K_{oc}	(µg/g)/(µg/mL)	0.00	**Base Hydrolysis Rate** (L/mol/day)	0.00
Valance	(g/mole)	0.00	**Ligand Dissociation Constant**	0.00
Air Diffusion Coefficient	(cm^2/sec)	.000	**Neutral Hydrolysis Rate** (L/mol/day)	0.00
Water Diffusion Coefficient	(cm^2/sec)	1.10E-6	**Acid Hydrolysis Rate** (L/mol/day)	0.00
Molecular Weight	(g/mol)	238.00		

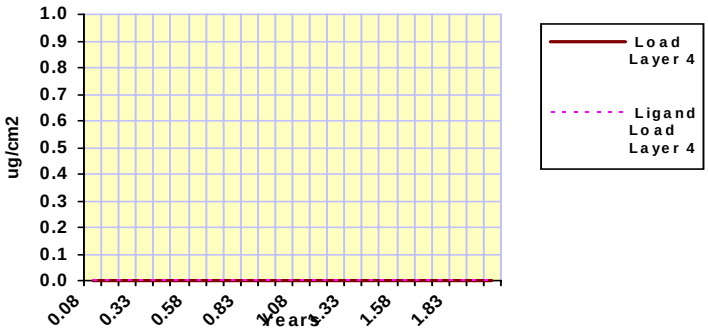
Output File: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1200
C:\SEVIEW63\IAO3SE.OUT
Chemical File: Uranium
C:\SEVIEW63\URANIUM.CHM
Soil File: Lockport soil, Perm = 5.00E-6 cm/sec, D=10, n=0.
C:\SEVIEW63\LOCKPOR4.SOI
Application File: IA03S Application Parameters
C:\SEVIEW63\IA03S.APL

Sublayer Loads	1	2	3	4	5	6	7	8	9	10
Layer 1 (ug/g)										
Layer 2 (ug/g)										
Layer 3 (ug/g)										
Layer 4 (ug/g)										









SESOIL Pollutant Cycle Report

Scenario Description: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1200

SESOIL Output File: C:\SEVIEW63\IAO3SE.OUT

SESOIL Process	Pollutant Mass (µg)	Percent of Total
Volatilized	0.000E+00	0.00
In Soil Air	0.000E+00	0.00
Sur. Runoff	0.000E+00	0.00
In Washld	0.000E+00	0.00
Ads On Soil	1.690E+09	4.40
Hydrol Soil	0.000E+00	0.00
Degrad Soil	0.000E+00	0.00
Pure Phase	0.000E+00	0.00
Complexed	0.000E+00	0.00
Immobile CEC	0.000E+00	0.00
Hydrol CEC	0.000E+00	0.00
In Soil Moi	4.554E+06	0.01
Hydrol Mois	0.000E+00	0.00
Degrad Mois	0.000E+00	0.00
Other Trans	0.000E+00	0.00
Other Sinks	0.000E+00	0.00
Gwr. Runoff	3.432E+10	89.40
Total Output	3.602E+10	93.81
Total Input	3.840E+10	
Input - Output	2.376E+09	

Maximum leachate concentration: 1.733E+00 **mg/l**

Climate File: LOCKPORT 2 NE
C:\SEVIEW63\LOCKPORT.CLM

Chemical File: Uranium
C:\SEVIEW63\URANIUM.CHM

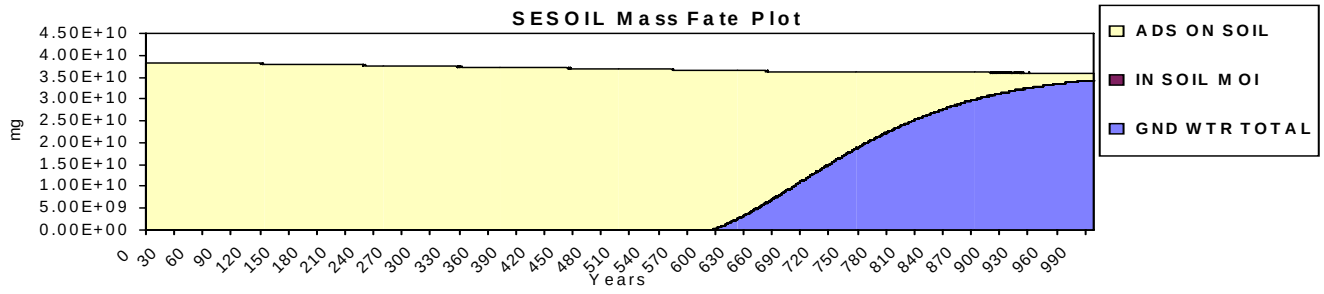
Soil File: Lockport soil, Perm = 5.00E-6 cm/sec, D=10, n=0.
C:\SEVIEW63\LOCKPOR4.SOI

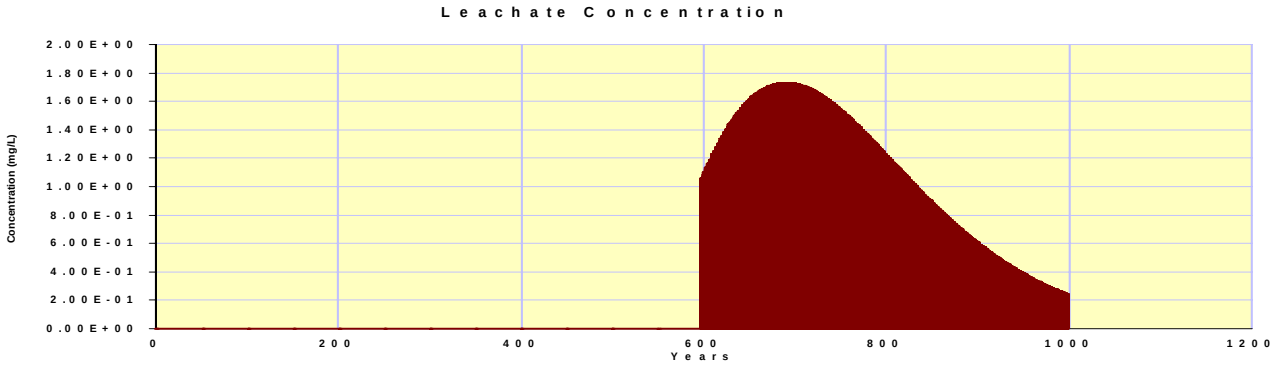
Application File: IA03S Application Parameters
C:\SEVIEW63\IA03S.APL

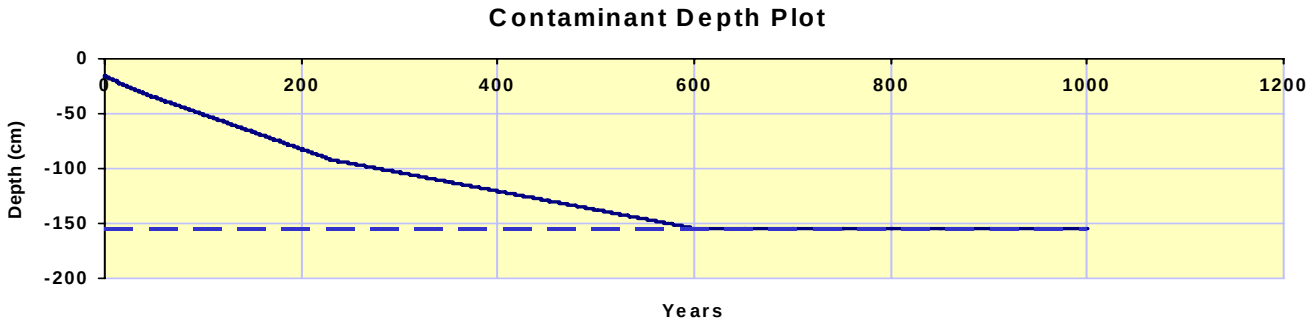
Starting Depth: 15.79 **cm**

Ending Depth: 154.00 **cm**

Total Depth: 154.00 **cm**



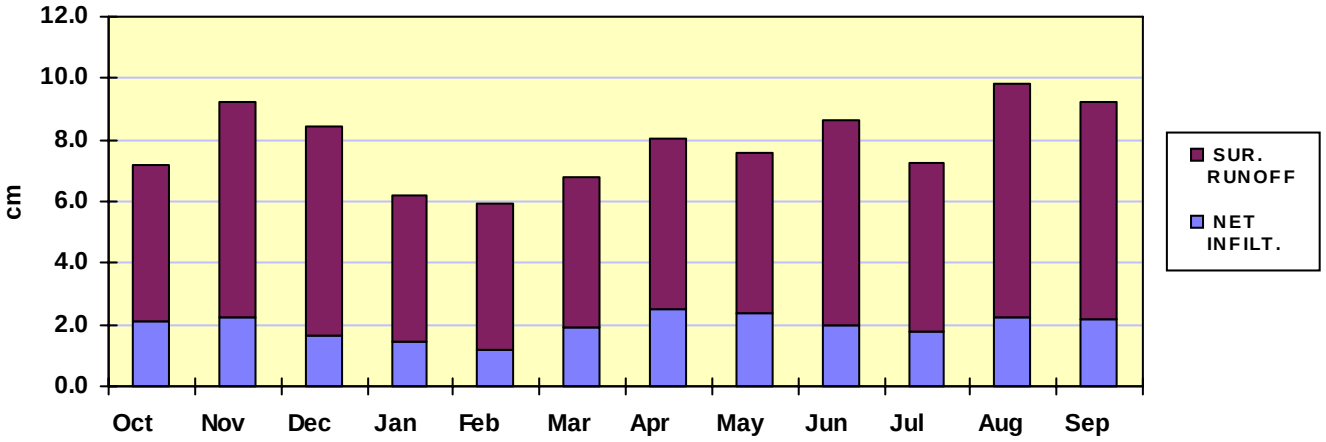


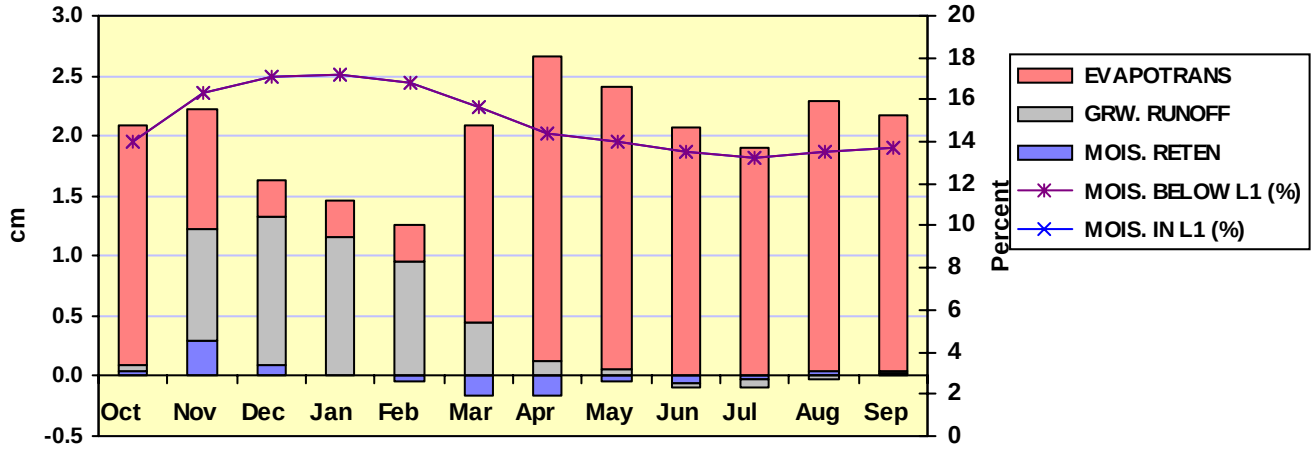


SESOIL Hydrologic Cycle Report

Scenario Description: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 2.0e3

SESOIL Output File: C:\SEVIEW63\IA03SJ.OUT





	Surface Water Runoff		Net Infiltration		Evapotranspiration		Soil Moisture Retention		Groundwater Runoff (Recharge)		Soil Moisture	
											Layer 1	Below Layer 1
Units	cm	Inches	cm	Inches	cm	Inches	cm	Inches	cm	Inches	Percent	Percent
October	5.09	2.00	2.09	0.82	2.00	0.79	0.04	0.02	0.05	0.02	14.04	14.04
November	6.99	2.75	2.22	0.87	1.00	0.39	0.30	0.12	0.92	0.36	16.36	16.36
December	6.83	2.69	1.64	0.65	0.30	0.12	0.10	0.04	1.24	0.49	17.10	17.10
January	4.71	1.85	1.46	0.57	0.30	0.12	0.01	0.00	1.15	0.45	17.16	17.16
February	4.70	1.85	1.22	0.48	0.30	0.12	-0.04	-0.02	0.95	0.37	16.84	16.84
March	4.87	1.92	1.93	0.76	1.65	0.65	-0.16	-0.06	0.44	0.17	15.62	15.62
April	5.51	2.17	2.51	0.99	2.54	1.00	-0.15	-0.06	0.13	0.05	14.42	14.42
May	5.19	2.04	2.36	0.93	2.36	0.93	-0.05	-0.02	0.06	0.02	14.02	14.02
June	6.67	2.63	1.98	0.78	2.08	0.82	-0.07	-0.03	-0.03	-0.01	13.50	13.50
July	5.46	2.15	1.80	0.71	1.90	0.75	-0.03	-0.01	-0.07	-0.03	13.28	13.28
August	7.54	2.97	2.27	0.89	2.26	0.89	0.03	0.01	-0.02	-0.01	13.54	13.54
September	7.09	2.79	2.17	0.85	2.13	0.84	0.03	0.01	0.01	0.00	13.76	13.76
Total	70.66	27.82	23.63	9.30	18.81	7.41	0.00	0.00	4.82	1.90		

SESOIL Profile and Load Report

Layer No.	Number of Sub-Layers	Thickness		Intrinsic Permeability	Organic Carbon Content	Adsorption Coefficient	Cation Exchange Capacity	Freundlich Exponent	Solid Phase Degradation Rate	Liquid Phase Degradation Rate	Soil pH
		cm	feet	cm^2	percent	µg/g / µg/mL	mEq / 100 g soil	unitless	1/day	1/day	pH
1	10	15.0	0.49	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
2	10	15.0	0.49	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
3	10	62.0	2.03	5.00E-11	0.00	1365.00	0.00	1.00	0.00E+00	0.00E+00	7.00
4	10	62.0	2.03	5.00E-11	0.00	1365.00	0.00	1.00	0.00E+00	0.00E+00	7.00

Soil Parameters

Bulk Density (g/cm^3)	1.31
Effective Porosity (fraction)	0.20
Soil Pore Disconnectedness	10.00

Application Parameters

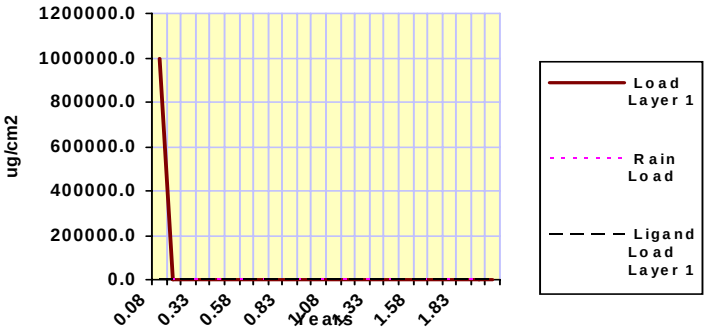
Area	cm^2	1.60E+7
	ft^2	1.72E+4
Latitude	degrees	43.2
Spill Index		1

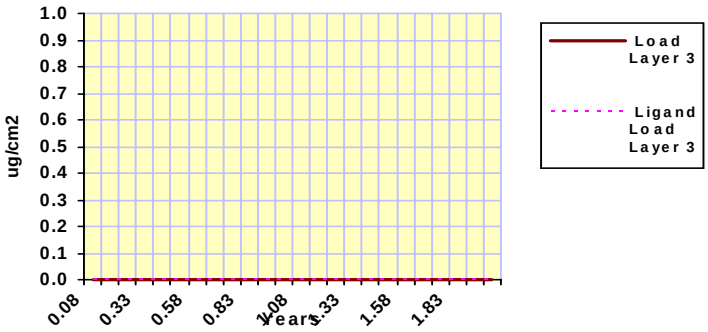
Chemical Parameters

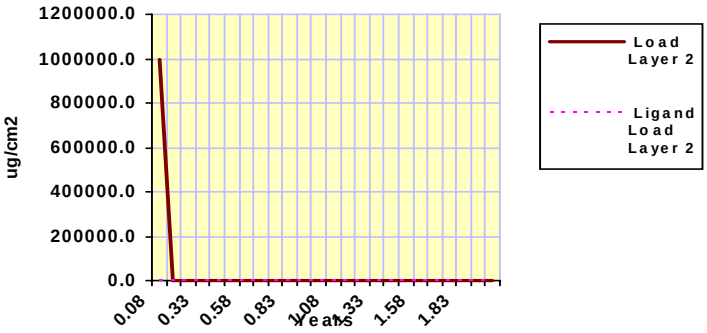
Water Solubility	(µg/mL)	150.0	**Moles Ligand / Moles Chemical**	0.00
Henry's Law	(M^3-atm/mol)	.000	**Ligand Molecular Weight** (g/mol)	0.00
K_{oc}	(µg/g)/(µg/mL)	0.00	**Base Hydrolysis Rate** (L/mol/day)	0.00
Valance	(g/mole)	0.00	**Ligand Dissociation Constant**	0.00
Air Diffusion Coefficient	(cm^2/sec)	.000	**Neutral Hydrolysis Rate** (L/mol/day)	0.00
Water Diffusion Coefficient	(cm^2/sec)	1.10E-6	**Acid Hydrolysis Rate** (L/mol/day)	0.00
Molecular Weight	(g/mol)	238.00		

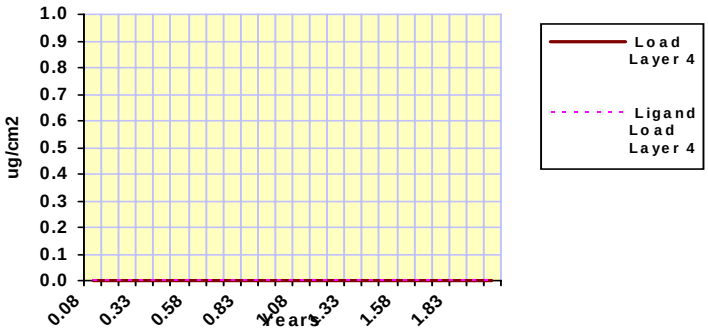
Output File: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 2.0e3
C:\SEVIEW63\IA03SJ.OUT
Chemical File: Uranium
C:\SEVIEW63\URANIUM.CHM
Soil File: Lockport soil, Perm = 5.00E-6 cm/sec, D=10, n=0.
C:\SEVIEW63\LOCKPOR4.SOI
Application File: IA03S Application Parameters higher Kd native so
C:\SEVIEW63\IA03SKD.APL

Sublayer Loads	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Layer 1 (ug/g)										
Layer 2 (ug/g)										
Layer 3 (ug/g)										
Layer 4 (ug/g)										









SESOIL Pollutant Cycle Report

Scenario Description: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 2.0e3

SESOIL Output File: C:\SEVIEW63\IA03SJ.OUT

SESOIL Process	Pollutant Mass (µg)	Percent of Total
Volatilized	0.000E+00	0.00
In Soil Air	0.000E+00	0.00
Sur. Runoff	0.000E+00	0.00
In Washld	0.000E+00	0.00
Ads On Soil	3.061E+13	95.66
Hydrol Soil	0.000E+00	0.00
Degrad Soil	0.000E+00	0.00
Pure Phase	0.000E+00	0.00
Complexed	0.000E+00	0.00
Immobile CEC	0.000E+00	0.00
Hydrol CEC	0.000E+00	0.00
In Soil Moi	2.356E+09	0.01
Hydrol Mois	0.000E+00	0.00
Degrad Mois	0.000E+00	0.00
Other Trans	0.000E+00	0.00
Other Sinks	0.000E+00	0.00
Gwr. Runoff	0.000E+00	0.00
Total Output	3.061E+13	95.66
Total Input	3.200E+13	
Input - Output	1.387E+12	

Maximum leachate concentration: 0.000E+00 **mg/l**

Climate File: LOCKPORT 2 NE
C:\SEVIEW63\LOCKPORT.CLM

Chemical File: Uranium
C:\SEVIEW63\URANIUM.CHM

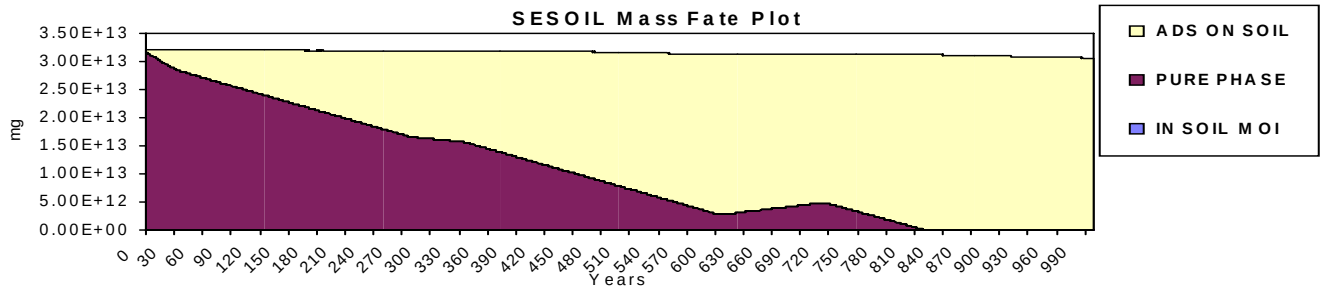
Soil File: Lockport soil, Perm = 5.00E-6 cm/sec, D=10, n=0.
C:\SEVIEW63\LOCKPOR4.SOI

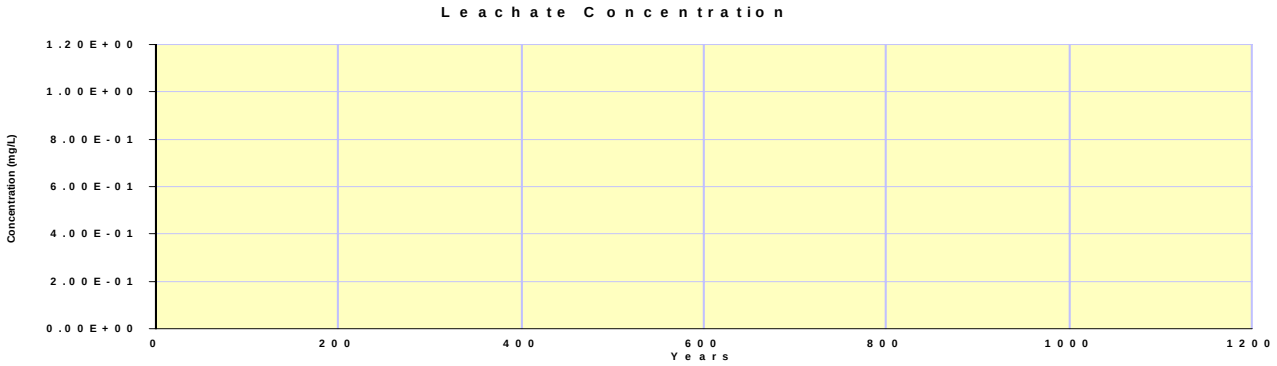
Application File: IA03S Application Parameters higher Kd native so
C:\SEVIEW63\IA03SKD.APL

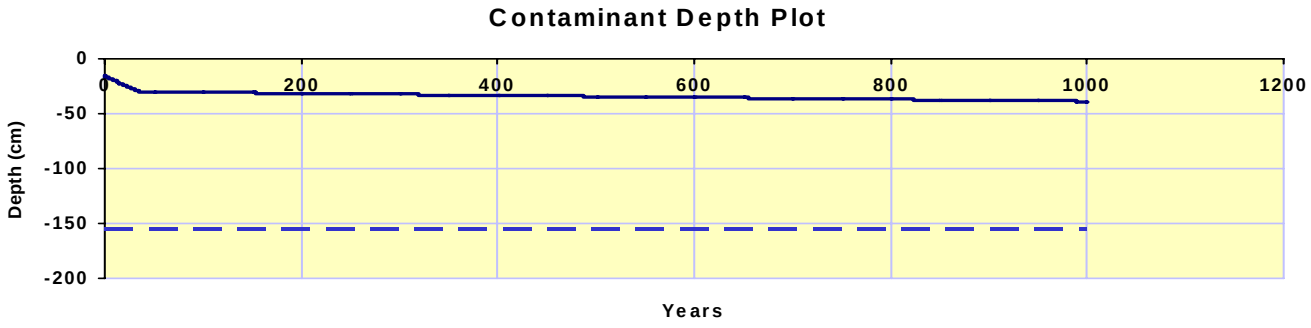
Starting Depth: 15.79 **cm**

Ending Depth: 38.72 **cm**

Total Depth: 154.00 **cm**



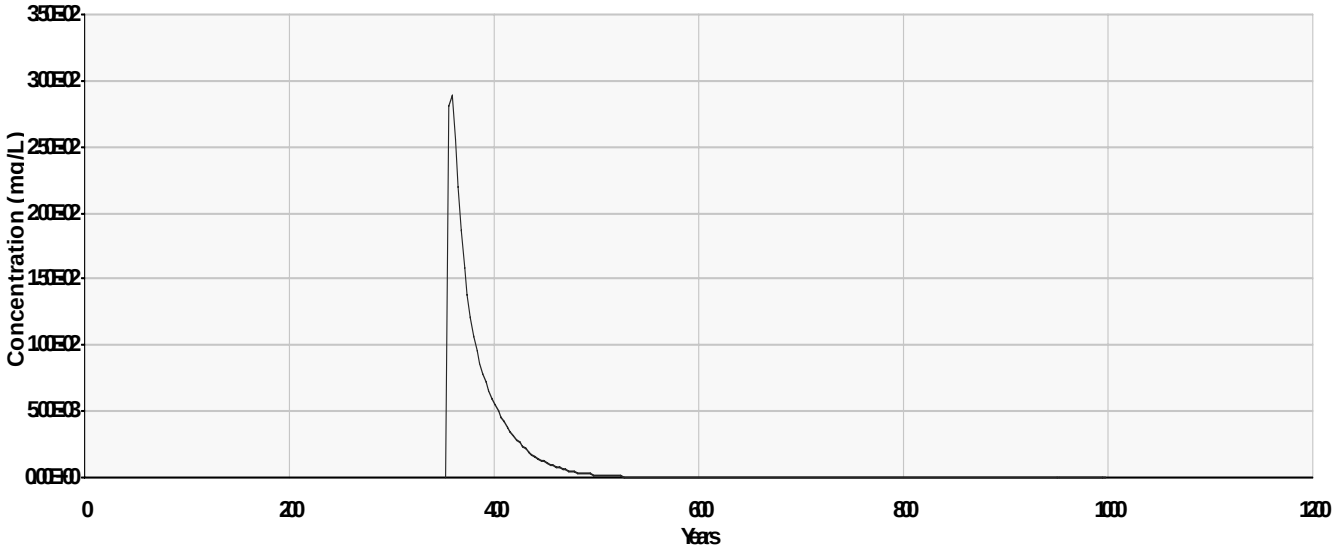




AT123D Point of Compliance Report

Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1400

Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1400



Maximum Concentration: 2.890E-02 mg/L
Year of Maximum Concentration: 359.00

Output Coordinates

X:	0.00000 m	0.0000 ft	**Output Time Step:**	0.2500 years	3.0016 months
Y:	0.00000 m	0.0000 ft	**Initial Load (mg/kg):**	0.0000E+00	
Z:	0.00000 m	0.0000 ft	**Initial Load (kg):**	0.7300E+03	

Input Parameters

Porosity:	0.03000		**Soil Organic Carbon Content (percent):**	0.00000
Hydraulic Gradient:	0.00700		**Carbon Adsorption Coeff. (ug/g)/(ug/ml):**	0.0000E+00
Hydraulic Conductivity:	1.500E-01	m/hr	4.166E-03	cm/sec
Soil Bulk Density:	2.610E+03	kg/m3	2.610E+00	g/cm3
Aquifer Width:	Infinite	m	Infinite	ft
Aquifer Depth:	9.000E+00	m	2.952E+01	ft
Kd:	2.200E-04	m3/kg	2.200E-01	(ug/g)(ug/ml)
Molecular Diffusion:	1.100E-06	m2/hr	3.055E-06	cm2/sec
Decay Coefficient:	0.000E+00	1/hr	0.000E+00	1/day

Retardation Factor:		2.014E+01		
Retarded Darcy Velocity:		1.738E-03	m2/hr	4.827E-03 cm2/sec
Retarded Longitudinal Disp. Coefficient:		1.564E-02	m2/hr	4.344E-02 cm2/sec
Retarded Lateral Dispersion Coefficient:		1.566E-03	m2/hr	4.350E-03 cm2/sec
Retarded Vertical Dispersion Coefficient:		1.566E-03	m2/hr	4.350E-03 cm2/sec

Dispersivities	**Meters**	**Feet**
Longitudinal:	9.000E+00	2.952E+01
Lateral:	9.000E-01	2.952E+00
Vertical:	9.000E-01	2.952E+00

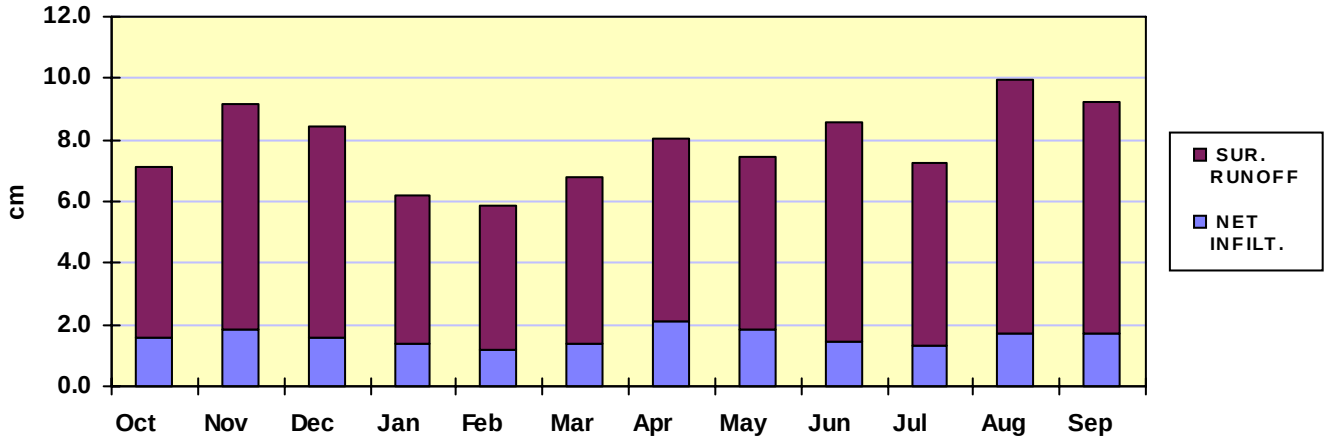
Load	Begin (m)	End (m)	Begin (ft)	End (ft)
X:	-2.000E+01	2.000E+01	-6.561E+01	6.561E+01
Y:	-2.000E+01	2.000E+01	-6.561E+01	6.561E+01
Z:	0.000E+00	0.000E+00	0.000E+00	0.000E+00

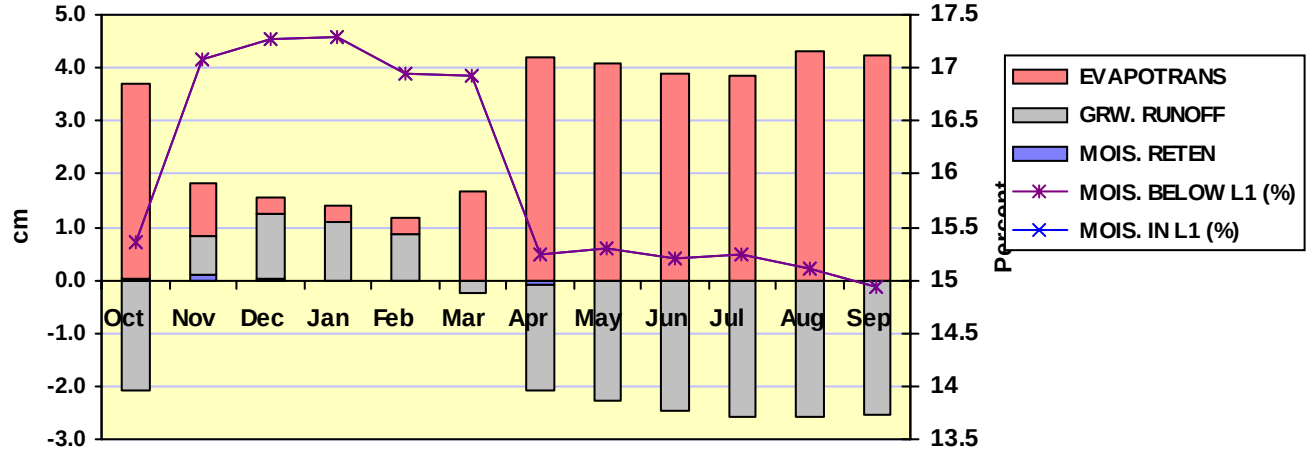
C:\SEVIEW63\IA04EE.ATI
C:\SEVIEW63\IA04EE.ATO

SESOIL Hydrologic Cycle Report

Scenario Description: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1400

SESOIL Output File: C:\SEVIEW63\IA04EE.OUT





	Surface Water Runoff		Net Infiltration		Evapotranspiration		Soil Moisture Retention		Groundwater Runoff (Recharge)		Soil Moisture	
											Layer 1	Below Layer 1
Units	cm	Inches	cm	Inches	cm	Inches	cm	Inches	cm	Inches	Percent	Percent
October	5.51	2.17	1.60	0.63	3.67	1.44	0.02	0.01	-2.09	-0.82	15.36	15.36
November	7.33	2.89	1.84	0.72	1.00	0.39	0.09	0.04	0.74	0.29	17.08	17.08
December	6.90	2.72	1.56	0.61	0.30	0.12	0.01	0.00	1.24	0.49	17.26	17.26
January	4.76	1.87	1.41	0.56	0.30	0.12	0.00	0.00	1.10	0.43	17.28	17.28
February	4.69	1.85	1.17	0.46	0.30	0.12	-0.02	-0.01	0.88	0.35	16.94	16.94
March	5.38	2.12	1.42	0.56	1.67	0.66	0.00	0.00	-0.26	-0.10	16.92	16.92
April	5.98	2.35	2.09	0.82	4.18	1.65	-0.09	-0.04	-2.00	-0.79	15.24	15.24
May	5.62	2.21	1.83	0.72	4.09	1.61	0.00	0.00	-2.26	-0.89	15.30	15.30
June	7.16	2.82	1.44	0.57	3.90	1.54	-0.01	0.00	-2.46	-0.97	15.20	15.20
July	5.98	2.35	1.30	0.51	3.86	1.52	0.00	0.00	-2.57	-1.01	15.24	15.24
August	8.22	3.24	1.73	0.68	4.31	1.70	-0.01	0.00	-2.57	-1.01	15.10	15.10
September	7.55	2.97	1.70	0.67	4.23	1.67	-0.01	0.00	-2.52	-0.99	14.94	14.94
Total	75.08	29.56	19.06	7.51	31.82	12.53	0.00	0.00	-12.76	-5.02		

SESOIL Profile and Load Report

Layer No.	Number of Sub-Layers	Thickness		Intrinsic Permeability	Organic Carbon Content	Adsorption Coefficient	Cation Exchange Capacity	Freundlich Exponent	Solid Phase Degradation Rate	Liquid Phase Degradation Rate	Soil pH
		cm	feet	cm^2	percent	µg/g / µg/mL	mEq / 100 g soil	unitless	1/day	1/day	pH
1	10	30.0	0.98	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
2	10	30.0	0.98	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
3	10	2.5	0.08	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
4	10	2.5	0.08	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00

Soil Parameters

Bulk Density (g/cm^3)	1.31
Effective Porosity (fraction)	0.20
Soil Pore Disconnectedness	10.00

Application Parameters

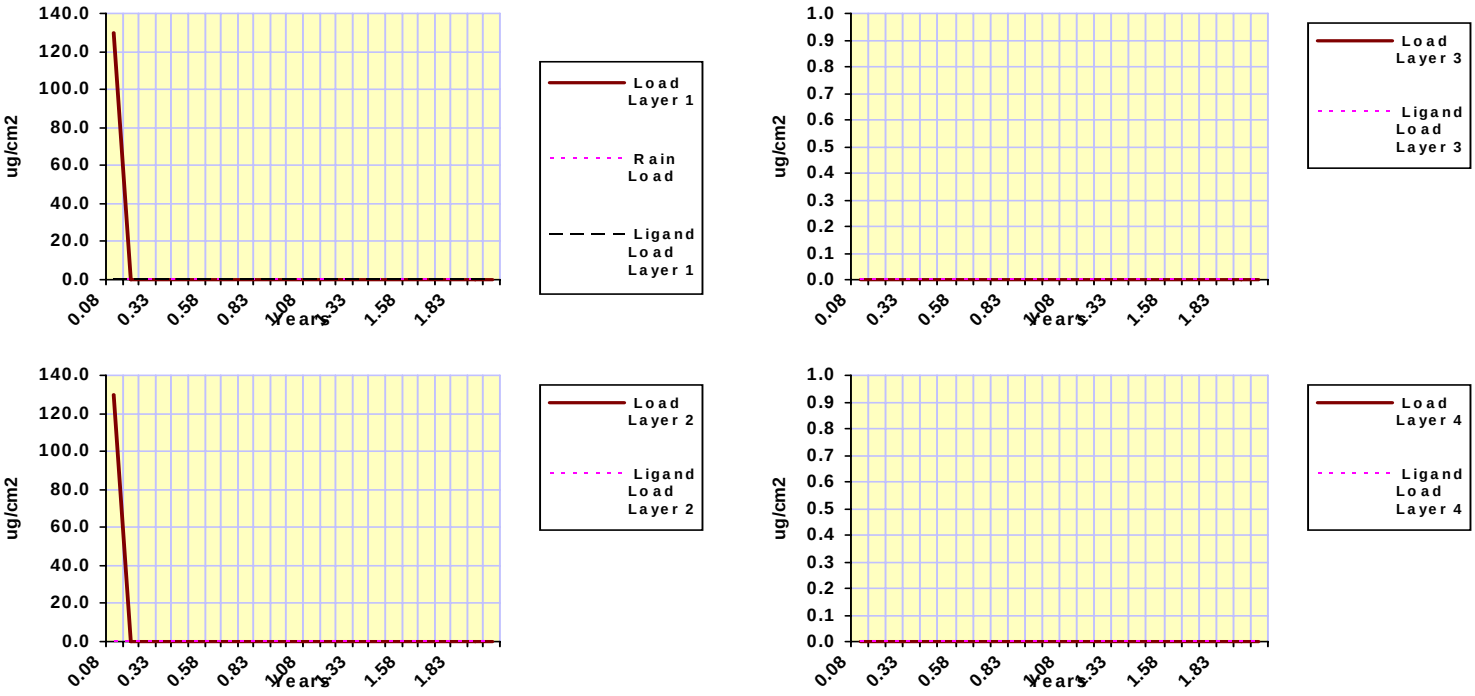
Area	cm^2	1.60E+7
	ft^2	1.72E+4
Latitude	degrees	43.2
Spill Index		1

Chemical Parameters

Water Solubility	(µg/mL)	150.0	**Moles Ligand / Moles Chemical**	0.00
Henry's Law	(M^3-atm/mol)	.000	**Ligand Molecular Weight** (g/mol)	0.00
K_{oc}	(µg/g)/(µg/mL)	0.00	**Base Hydrolysis Rate** (L/mol/day)	0.00
Valance	(g/mole)	0.00	**Ligand Dissociation Constant**	0.00
Air Diffusion Coefficient	(cm^2/sec)	.000	**Neutral Hydrolysis Rate** (L/mol/day)	0.00
Water Diffusion Coefficient	(cm^2/sec)	1.10E-6	**Acid Hydrolysis Rate** (L/mol/day)	0.00
Molecular Weight	(g/mol)	238.00		

Output File: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1400
C:\SEVIEW63\IA04EE.OUT
Chemical File: Uranium
C:\SEVIEW63\URANIUM.CHM
Soil File: Lockport soil, Perm = 5.00E-6 cm/sec, D=10, n=0.
C:\SEVIEW63\LOCKPOR4.SOI
Application File: IA04 East Application Parameters
C:\SEVIEW63\IA04E.APL

Sublayer Loads	1	2	3	4	5	6	7	8	9	10
Layer 1 (ug/g)										
Layer 2 (ug/g)										
Layer 3 (ug/g)										
Layer 4 (ug/g)										



SESOIL Pollutant Cycle Report

Scenario Description: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1400

SESOIL Output File: C:\SEVIEW63\IA04EE.OUT

SESOIL Process	Pollutant Mass (µg)	Percent of Total
Volatilized	0.000E+00	0.00
In Soil Air	0.000E+00	0.00
Sur. Runoff	0.000E+00	0.00
In Washld	0.000E+00	0.00
Ads On Soil	7.748E+04	0.00
Hydrol Soil	0.000E+00	0.00
Degrad Soil	0.000E+00	0.00
Pure Phase	0.000E+00	0.00
Complexed	0.000E+00	0.00
Immobile CEC	0.000E+00	0.00
Hydrol CEC	0.000E+00	0.00
In Soil Moi	2.266E+02	0.00
Hydrol Mois	0.000E+00	0.00
Degrad Mois	0.000E+00	0.00
Other Trans	0.000E+00	0.00
Other Sinks	0.000E+00	0.00
Gwr. Runoff	4.032E+09	96.93
Total Output	4.032E+09	96.93
Total Input	4.160E+09	
Input - Output	1.275E+08	

Maximum leachate concentration: 2.602E+00 **mg/l**

Climate File: LOCKPORT 2 NE
C:\SEVIEW63\LOCKPORT.CLM

Chemical File: Uranium
C:\SEVIEW63\URANIUM.CHM

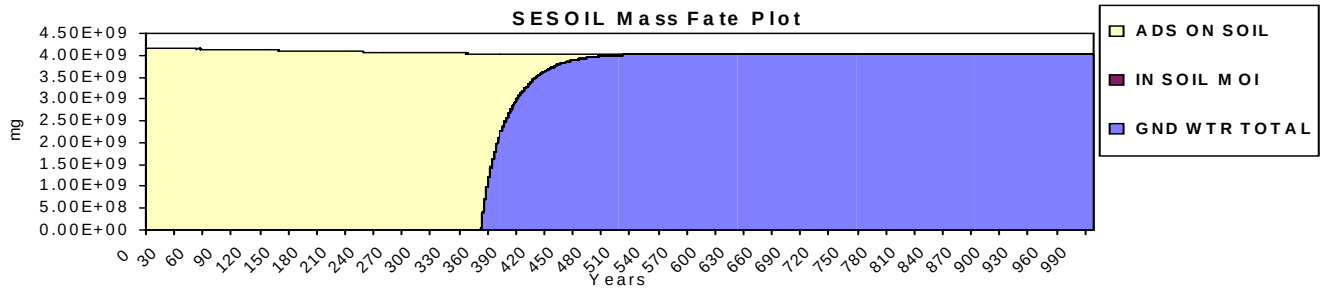
Soil File: Lockport soil, Perm = 5.00E-6 cm/sec, D=10, n=0.
C:\SEVIEW63\LOCKPOR4.SOI

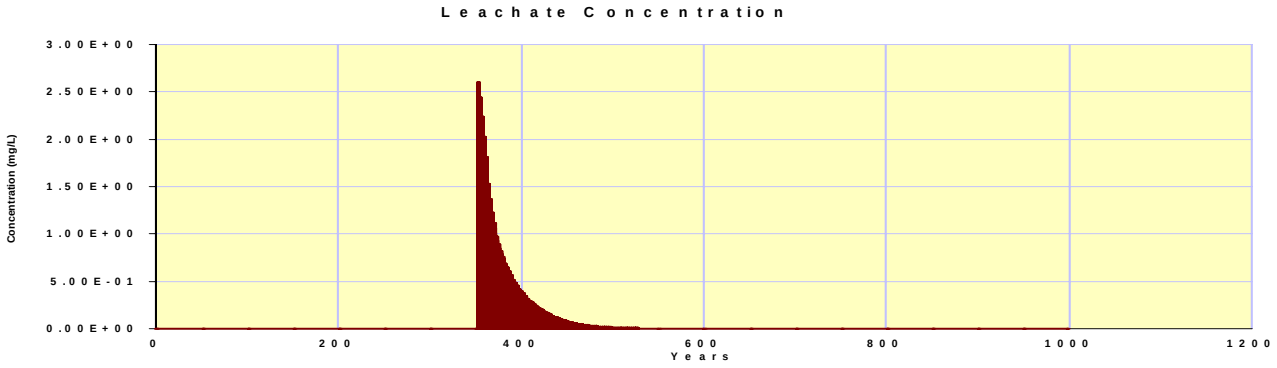
Application File: IA04 East Application Parameters
C:\SEVIEW63\IA04E.APL

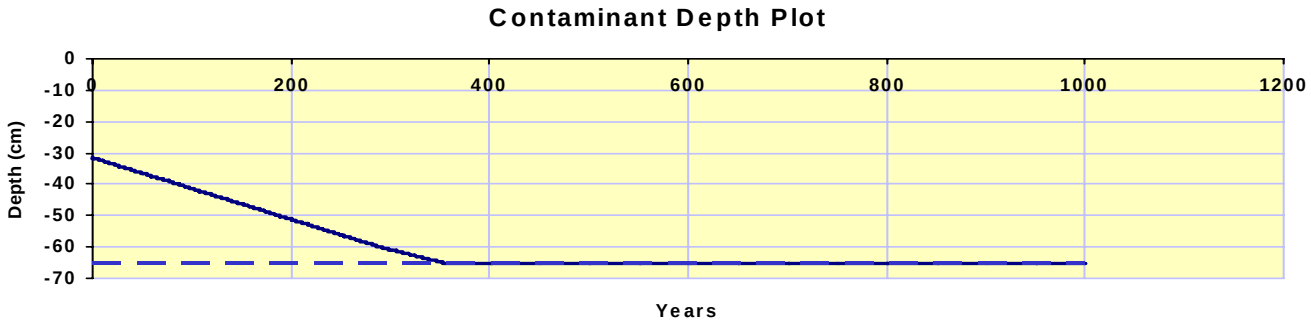
Starting Depth: 31.50 **cm**

Ending Depth: 65.01 **cm**

Total Depth: 65.00 **cm**



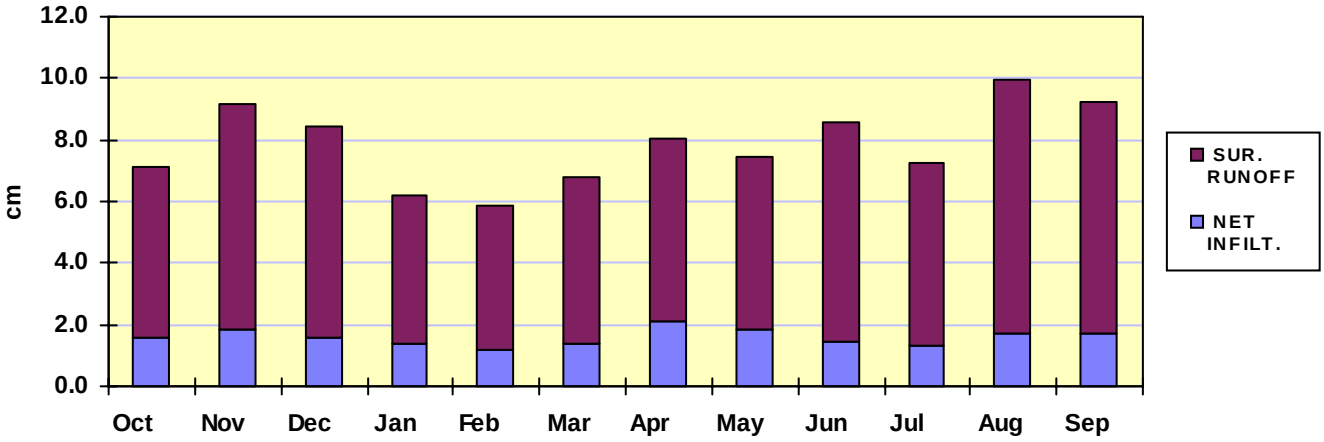


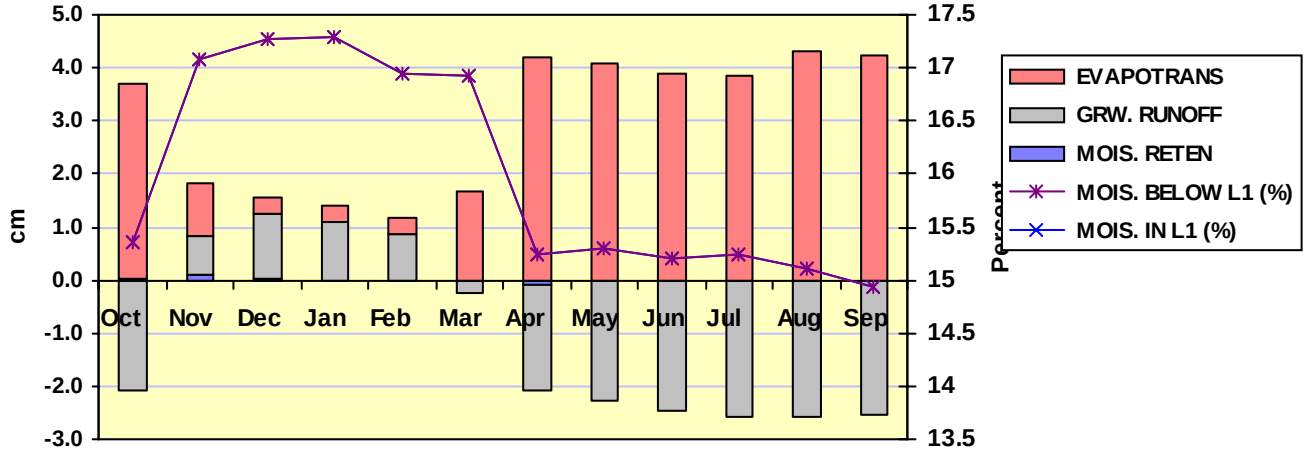


SESOIL Hydrologic Cycle Report

Scenario Description: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1.0e6 2 Kds

SESOIL Output File: C:\SEVIEW63\IA04EL.OUT





	Surface Water Runoff		Net Infiltration		Evapotranspiration		Soil Moisture Retention		Groundwater Runoff (Recharge)		Soil Moisture	
											Layer 1	Below Layer 1
Units	cm	Inches	cm	Inches	cm	Inches	cm	Inches	cm	Inches	Percent	Percent
October	5.51	2.17	1.60	0.63	3.67	1.44	0.02	0.01	-2.09	-0.82	15.36	15.36
November	7.33	2.89	1.84	0.72	1.00	0.39	0.09	0.04	0.74	0.29	17.08	17.08
December	6.90	2.72	1.56	0.61	0.30	0.12	0.01	0.00	1.24	0.49	17.26	17.26
January	4.76	1.87	1.41	0.56	0.30	0.12	0.00	0.00	1.10	0.43	17.28	17.28
February	4.69	1.85	1.17	0.46	0.30	0.12	-0.02	-0.01	0.88	0.35	16.94	16.94
March	5.38	2.12	1.42	0.56	1.67	0.66	0.00	0.00	-0.26	-0.10	16.92	16.92
April	5.98	2.35	2.09	0.82	4.18	1.65	-0.09	-0.04	-2.00	-0.79	15.24	15.24
May	5.62	2.21	1.83	0.72	4.09	1.61	0.00	0.00	-2.26	-0.89	15.30	15.30
June	7.16	2.82	1.44	0.57	3.90	1.54	-0.01	0.00	-2.46	-0.97	15.20	15.20
July	5.98	2.35	1.30	0.51	3.86	1.52	0.00	0.00	-2.57	-1.01	15.24	15.24
August	8.22	3.24	1.73	0.68	4.31	1.70	-0.01	0.00	-2.57	-1.01	15.10	15.10
September	7.55	2.97	1.70	0.67	4.23	1.67	-0.01	0.00	-2.52	-0.99	14.94	14.94
Total	75.08	29.56	19.06	7.51	31.82	12.53	0.00	0.00	-12.76	-5.02		

SESOIL Profile and Load Report

Layer No.	Number of Sub-Layers	Thickness		Intrinsic Permeability	Organic Carbon Content	Adsorption Coefficient	Cation Exchange Capacity	Freundlich Exponent	Solid Phase Degradation Rate	Liquid Phase Degradation Rate	Soil pH
		cm	feet	cm^2	percent	$\frac{\mu g/g}{\mu g/mL}$	$\frac{mEq}{100\ g\ soil}$	unitless	1/day	1/day	pH
1	10	30.0	0.98	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
2	10	30.0	0.98	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
3	10	2.5	0.08	5.00E-11	0.00	1365.00	0.00	1.00	0.00E+00	0.00E+00	7.00
4	10	2.5	0.08	5.00E-11	0.00	1365.00	0.00	1.00	0.00E+00	0.00E+00	7.00

Soil Parameters

Bulk Density (g/cm^3)	1.31
Effective Porosity (fraction)	0.20
Soil Pore Disconnectedness	10.00

Application Parameters

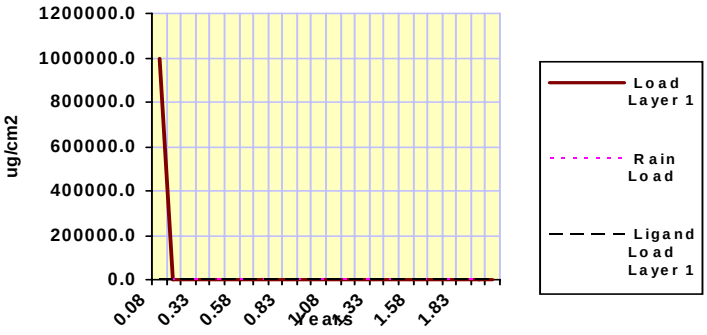
Area	cm^2	1.60E+7
	ft^2	1.72E+4
Latitude	degrees	43.2
Spill Index		1

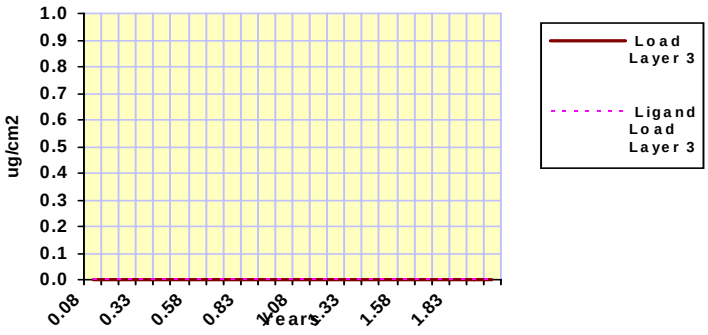
Chemical Parameters

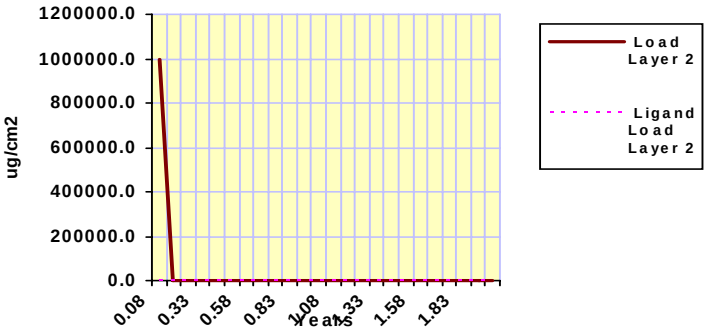
Water Solubility	(µg/mL)	150.0	**Moles Ligand / Moles Chemical**	0.00
Henry's Law	(M^3-atm/mol)	.000	**Ligand Molecular Weight** (g/mol)	0.00
K_{oc}	(µg/g)/(µg/mL)	0.00	**Base Hydrolysis Rate** (L/mol/day)	0.00
Valance	(g/mole)	0.00	**Ligand Dissociation Constant**	0.00
Air Diffusion Coefficient	(cm^2/sec)	.000	**Neutral Hydrolysis Rate** (L/mol/day)	0.00
Water Diffusion Coefficient	(cm^2/sec)	1.10E-6	**Acid Hydrolysis Rate** (L/mol/day)	0.00
Molecular Weight	(g/mol)	238.00		

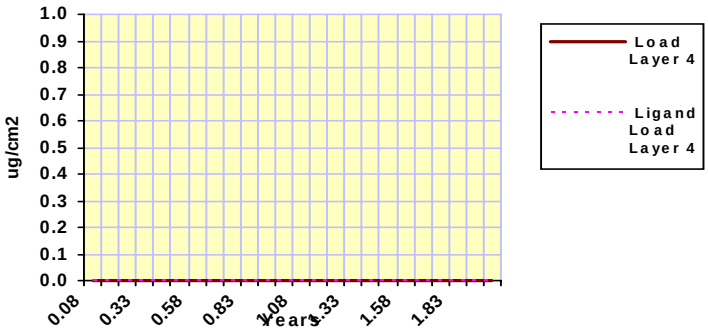
Output File: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1.0e6 2 Kds
C:\SEVIEW63\IA04EL.OUT
Chemical File: Uranium
C:\SEVIEW63\URANIUM.CHM
Soil File: Lockport soil, Perm = 5.00E-6 cm/sec, D=10, n=0.
C:\SEVIEW63\LOCKPOR4.SOI
Application File: IA04 East Application Parameters hi Kd lower soi
C:\SEVIEW63\IA04EKD.APL

Sublayer Loads	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Layer 1 (ug/g)										
Layer 2 (ug/g)										
Layer 3 (ug/g)										
Layer 4 (ug/g)										









SESOIL Pollutant Cycle Report

Scenario Description: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1.0e6 2 Kds

SESOIL Output File: C:\SEVIEW63\IA04EL.OUT

SESOIL Process	Pollutant Mass (µg)	Percent of Total
Volatilized	0.000E+00	0.00
In Soil Air	0.000E+00	0.00
Sur. Runoff	0.000E+00	0.00
In Washld	0.000E+00	0.00
Ads On Soil	9.250E+12	28.91
Hydrol Soil	0.000E+00	0.00
Degrad Soil	0.000E+00	0.00
Pure Phase	2.269E+13	70.92
Complexed	0.000E+00	0.00
Immobile CEC	0.000E+00	0.00
Hydrol CEC	0.000E+00	0.00
In Soil Moi	8.089E+09	0.03
Hydrol Mois	0.000E+00	0.00
Degrad Mois	0.000E+00	0.00
Other Trans	0.000E+00	0.00
Other Sinks	0.000E+00	0.00
Gwr. Runoff	0.000E+00	0.00
Total Output	3.195E+13	99.85
Total Input	3.200E+13	
Input - Output	4.830E+10	

Maximum leachate concentration: 0.000E+00 **mg/l**

Climate File: LOCKPORT 2 NE
C:\SEVIEW63\LOCKPORT.CLM

Chemical File: Uranium
C:\SEVIEW63\URANIUM.CHM

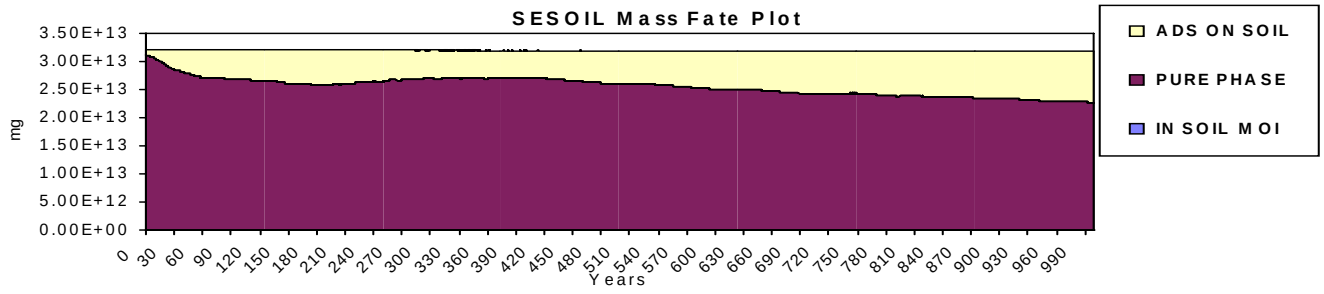
Soil File: Lockport soil, Perm = 5.00E-6 cm/sec, D=10, n=0.
C:\SEVIEW63\LOCKPOR4.SOI

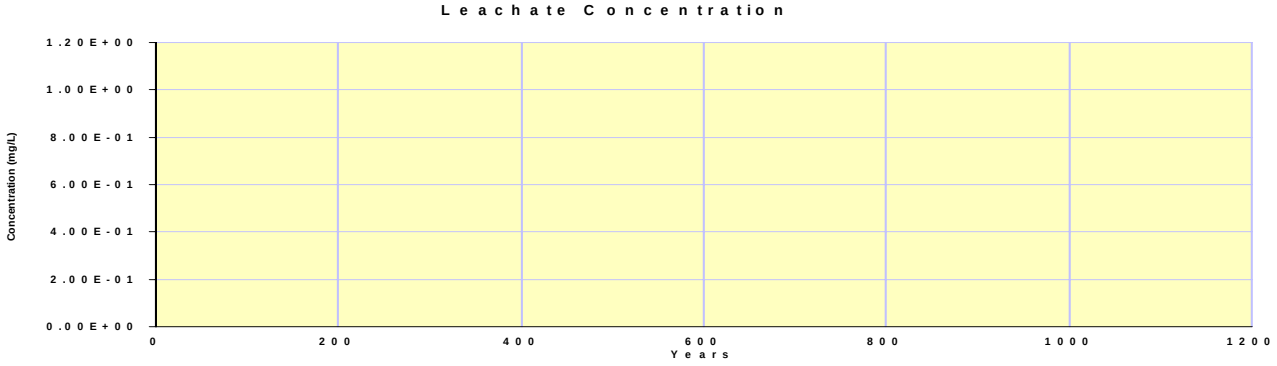
Application File: IA04 East Application Parameters hi Kd lower soi
C:\SEVIEW63\IA04EKD.APL

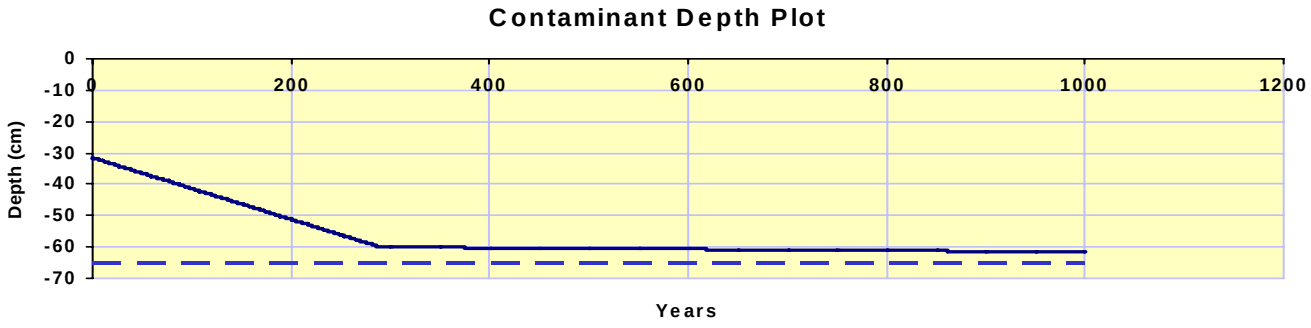
Starting Depth: 31.50 **cm**

Ending Depth: 61.54 **cm**

Total Depth: 65.00 **cm**



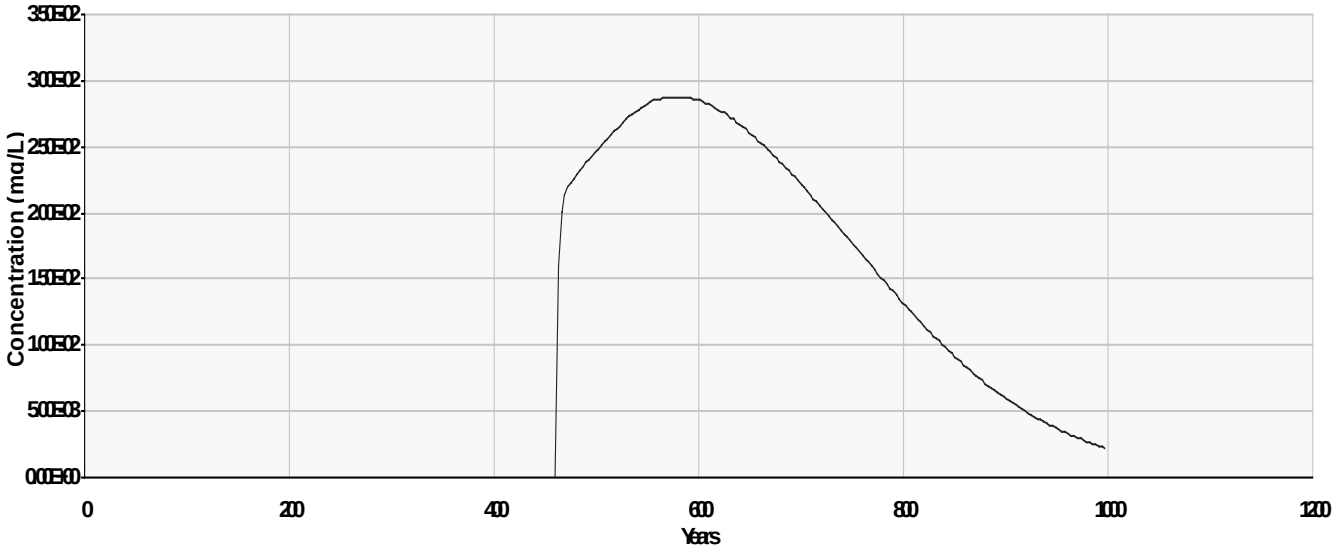




AT123D Point of Compliance Report

Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1400

Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1400



Maximum Concentration: 2.880E-02 mg/L
Year of Maximum Concentration: 571.00

Output Coordinates

X:	0.00000 m	0.0000 ft	**Output Time Step:**	0.2500 years	3.0016 months
Y:	0.00000 m	0.0000 ft	**Initial Load (mg/kg):**	0.0000E+00	
Z:	0.00000 m	0.0000 ft	**Initial Load (kg):**	0.7300E+03	

Input Parameters

Porosity:	0.03000		**Soil Organic Carbon Content (percent):**	0.00000
Hydraulic Gradient:	0.00700		**Carbon Adsorption Coeff. (ug/g)/(ug/ml):**	0.0000E+00
Hydraulic Conductivity:	1.500E-01	m/hr	4.166E-03	cm/sec
Soil Bulk Density:	2.610E+03	kg/m3	2.610E+00	g/cm3
Aquifer Width:	Infinite	m	Infinite	ft
Aquifer Depth:	9.000E+00	m	2.952E+01	ft
Kd:	2.200E-04	m3/kg	2.200E-01	(ug/g)(ug/ml)
Molecular Diffusion:	1.100E-06	m2/hr	3.055E-06	cm2/sec
Decay Coefficient:	0.000E+00	1/hr	0.000E+00	1/day

Retardation Factor:		2.014E+01		
Retarded Darcy Velocity:		1.738E-03	m2/hr	4.827E-03 cm2/sec
Retarded Longitudinal Disp. Coefficient:		1.564E-02	m2/hr	4.344E-02 cm2/sec
Retarded Lateral Dispersion Coefficient:		1.566E-03	m2/hr	4.350E-03 cm2/sec
Retarded Vertical Dispersion Coefficient:		1.566E-03	m2/hr	4.350E-03 cm2/sec

Dispersivities	**Meters**	**Feet**
Longitudinal:	9.000E+00	2.952E+01
Lateral:	9.000E-01	2.952E+00
Vertical:	9.000E-01	2.952E+00

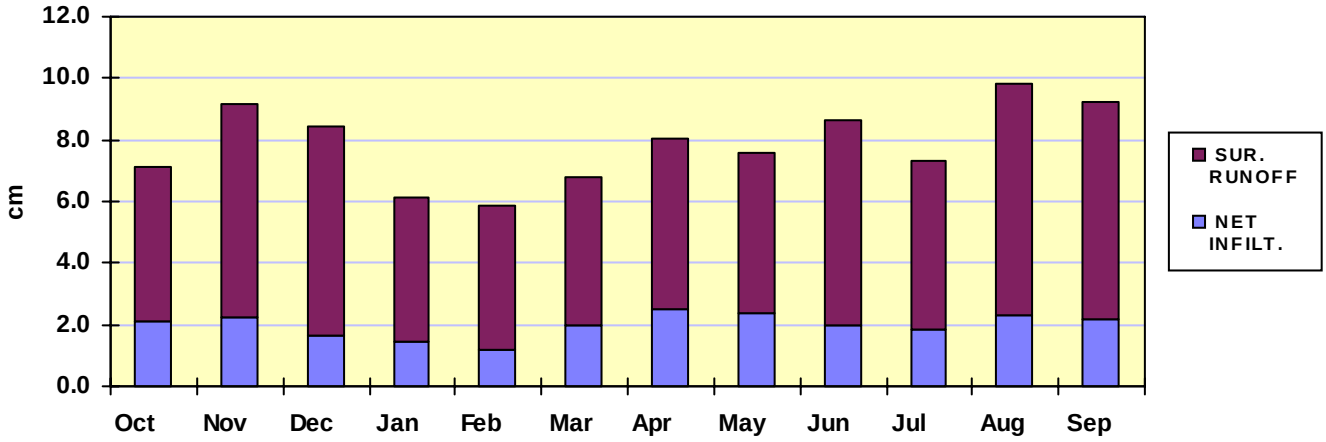
Load	Begin (m)	End (m)	Begin (ft)	End (ft)
X:	-2.000E+01	2.000E+01	-6.561E+01	6.561E+01
Y:	-2.000E+01	2.000E+01	-6.561E+01	6.561E+01
Z:	0.000E+00	0.000E+00	0.000E+00	0.000E+00

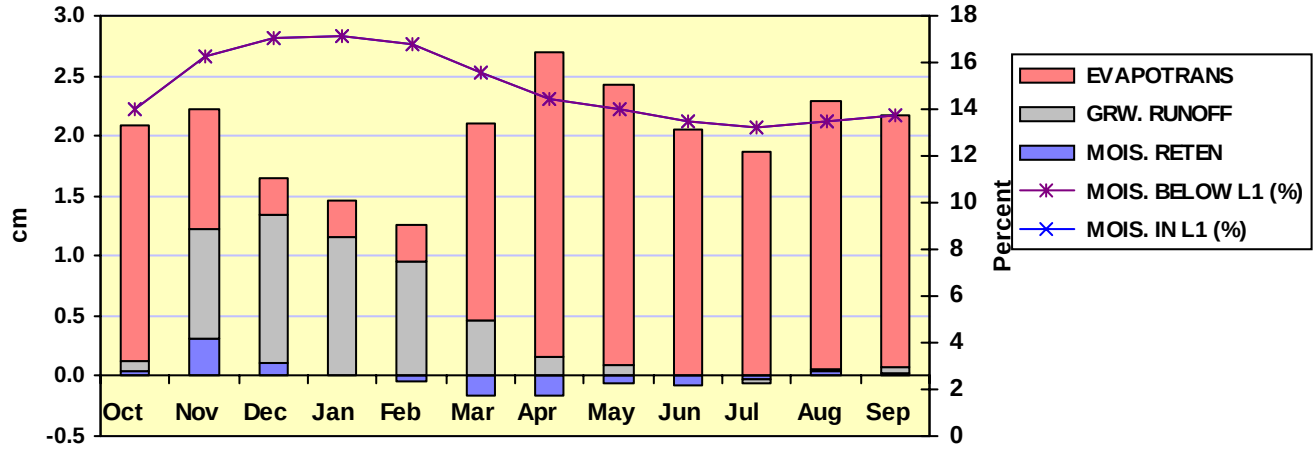
C:\SEVIEW63\IA04WE.ATI
C:\SEVIEW63\IA04WE.ATO

SESOIL Hydrologic Cycle Report

Scenario Description: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1400

SESOIL Output File: C:\SEVIEW63\IA04WE.OUT





	Surface Water Runoff		Net Infiltration		Evapotranspiration		Soil Moisture Retention		Groundwater Runoff (Recharge)		Soil Moisture	
											Layer 1	Below Layer 1
Units	cm	Inches	cm	Inches	cm	Inches	cm	Inches	cm	Inches	Percent	Percent
October	5.06	1.99	2.09	0.82	1.96	0.77	0.04	0.02	0.09	0.04	14.00	14.00
November	6.93	2.73	2.23	0.88	1.00	0.39	0.32	0.13	0.92	0.36	16.30	16.30
December	6.77	2.67	1.64	0.65	0.30	0.12	0.10	0.04	1.23	0.48	17.06	17.06
January	4.64	1.83	1.46	0.57	0.30	0.12	0.01	0.00	1.15	0.45	17.12	17.12
February	4.64	1.83	1.22	0.48	0.30	0.12	-0.04	-0.02	0.96	0.38	16.80	16.80
March	4.87	1.92	1.95	0.77	1.64	0.65	-0.17	-0.07	0.47	0.19	15.60	15.60
April	5.54	2.18	2.53	1.00	2.53	1.00	-0.16	-0.06	0.17	0.07	14.42	14.42
May	5.20	2.05	2.38	0.94	2.34	0.92	-0.06	-0.02	0.10	0.04	14.00	14.00
June	6.64	2.61	1.98	0.78	2.05	0.81	-0.07	-0.03	0.01	0.00	13.46	13.46
July	5.47	2.15	1.82	0.72	1.87	0.74	-0.03	-0.01	-0.03	-0.01	13.24	13.24
August	7.53	2.96	2.28	0.90	2.23	0.88	0.04	0.02	0.02	0.01	13.50	13.50
September	7.06	2.78	2.18	0.86	2.10	0.83	0.03	0.01	0.05	0.02	13.72	13.72
Total	70.37	27.70	23.74	9.35	18.62	7.33	0.00	0.00	5.13	2.02		

SESOIL Profile and Load Report

Layer No.	Number of Sub-Layers	Thickness		Intrinsic Permeability	Organic Carbon Content	Adsorption Coefficient	Cation Exchange Capacity	Freundlich Exponent	Solid Phase Degradation Rate	Liquid Phase Degradation Rate	Soil pH
		cm	feet	cm^2	percent	µg/g / µg/mL	mEq / 100 g soil	unitless	1/day	1/day	pH
1	10	75.0	2.46	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
2	10	75.0	2.46	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
3	10	7.5	0.25	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
4	10	7.5	0.25	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00

Soil Parameters

Bulk Density (g/cm^3)	1.31
Effective Porosity (fraction)	0.20
Soil Pore Disconnectedness	10.00

Application Parameters

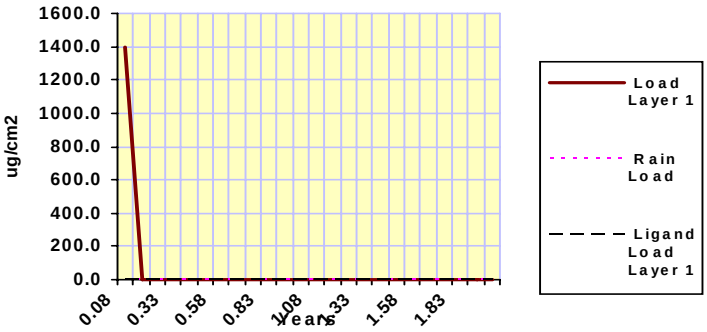
Area	cm^2	1.60E+7
	ft^2	1.72E+4
Latitude	degrees	43.2
Spill Index		1

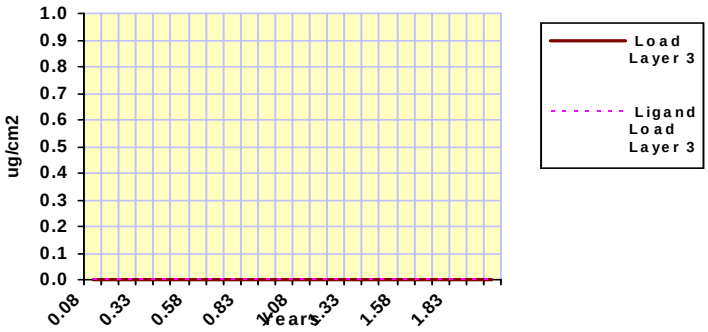
Chemical Parameters

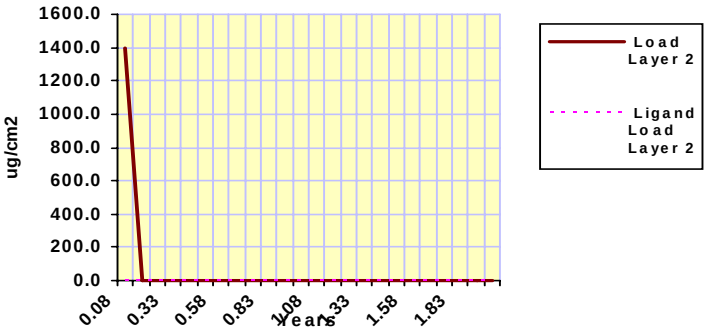
Water Solubility	(µg/mL)	150.0	**Moles Ligand / Moles Chemical**	0.00
Henry's Law	(M^3-atm/mol)	.000	**Ligand Molecular Weight** (g/mol)	0.00
K_{oc}	(µg/g)/(µg/mL)	0.00	**Base Hydrolysis Rate** (L/mol/day)	0.00
Valance	(g/mole)	0.00	**Ligand Dissociation Constant**	0.00
Air Diffusion Coefficient	(cm^2/sec)	.000	**Neutral Hydrolysis Rate** (L/mol/day)	0.00
Water Diffusion Coefficient	(cm^2/sec)	1.10E-6	**Acid Hydrolysis Rate** (L/mol/day)	0.00
Molecular Weight	(g/mol)	238.00		

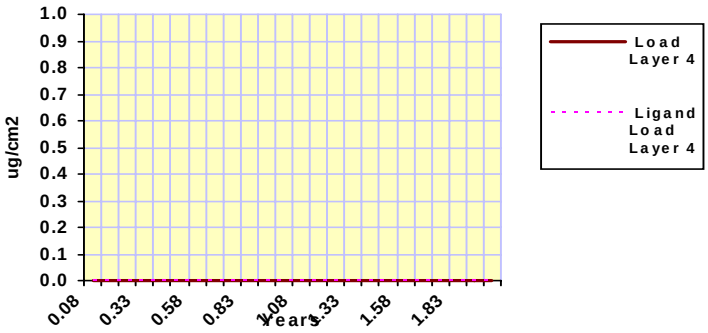
Output File: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1400
C:\SEVIEW63\IA04WE.OUT
Chemical File: Uranium
C:\SEVIEW63\URANIUM.CHM
Soil File: Lockport soil, Perm = 5.00E-6 cm/sec, D=10, n=0.
C:\SEVIEW63\LOCKPOR4.SOI
Application File: IA04 west Application Parameters
C:\SEVIEW63\IA04W.APL

Sublayer Loads	1	2	3	4	5	6	7	8	9	10
Layer 1 (ug/g)										
Layer 2 (ug/g)										
Layer 3 (ug/g)										
Layer 4 (ug/g)										









SESOIL Pollutant Cycle Report

Scenario Description: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1400

SESOIL Output File: C:\SEVIEW63\IA04WE.OUT

SESOIL Process	Pollutant Mass (µg)	Percent of Total
Volatilized	0.000E+00	0.00
In Soil Air	0.000E+00	0.00
Sur. Runoff	0.000E+00	0.00
In Washld	0.000E+00	0.00
Ads On Soil	8.282E+08	1.85
Hydrol Soil	0.000E+00	0.00
Degrad Soil	0.000E+00	0.00
Pure Phase	0.000E+00	0.00
Complexed	0.000E+00	0.00
Immobile CEC	0.000E+00	0.00
Hydrol CEC	0.000E+00	0.00
In Soil Moi	2.224E+06	0.00
Hydrol Mois	0.000E+00	0.00
Degrad Mois	0.000E+00	0.00
Other Trans	0.000E+00	0.00
Other Sinks	0.000E+00	0.00
Gwr. Runoff	4.164E+10	92.97
Total Output	4.247E+10	94.82
Total Input	4.480E+10	
Input - Output	2.320E+09	

Maximum leachate concentration: 1.576E+00 **mg/l**

Climate File: LOCKPORT 2 NE
C:\SEVIEW63\LOCKPORT.CLM

Chemical File: Uranium
C:\SEVIEW63\URANIUM.CHM

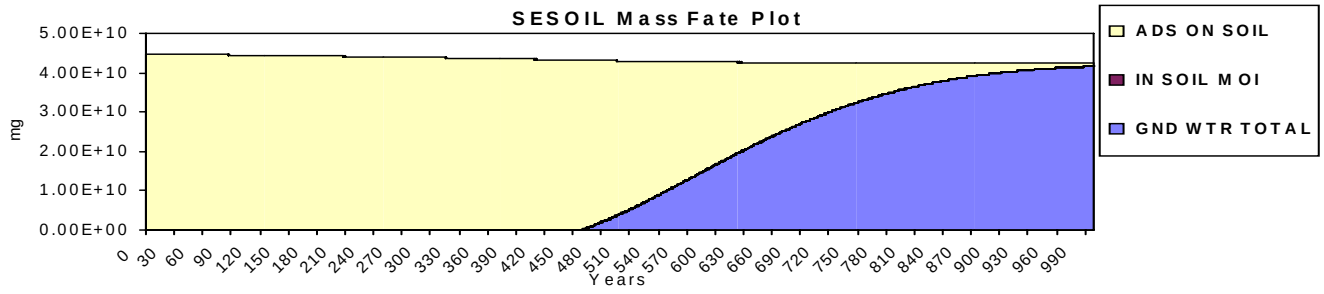
Soil File: Lockport soil, Perm = 5.00E-6 cm/sec, D=10, n=0.
C:\SEVIEW63\LOCKPOR4.SOI

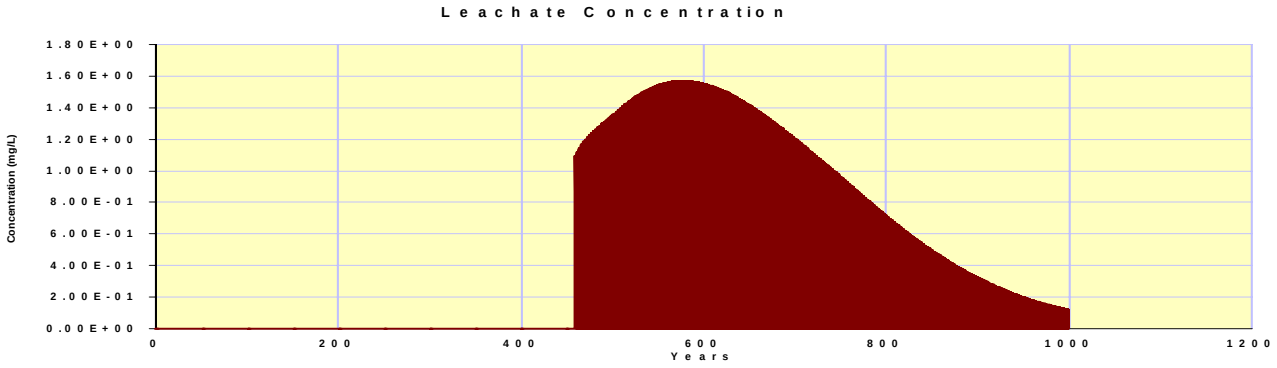
Application File: IA04 west Application Parameters
C:\SEVIEW63\IA04W.APL

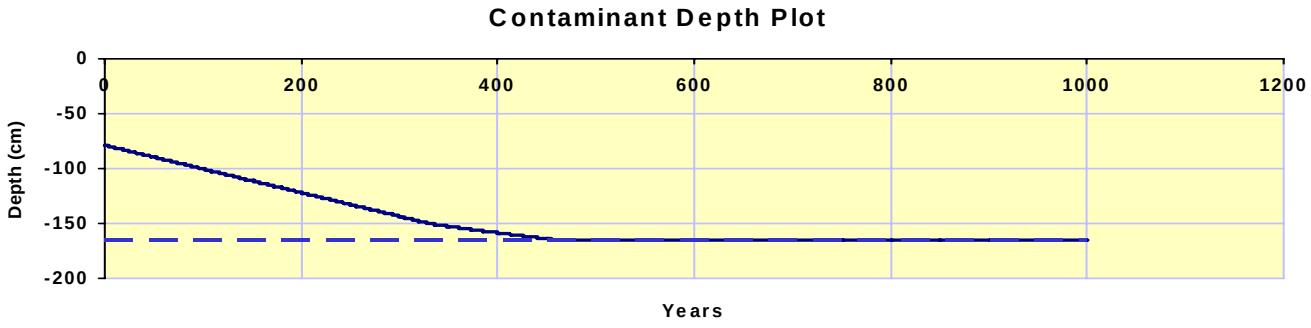
Starting Depth: 78.76 **cm**

Ending Depth: 165.00 **cm**

Total Depth: 165.00 **cm**



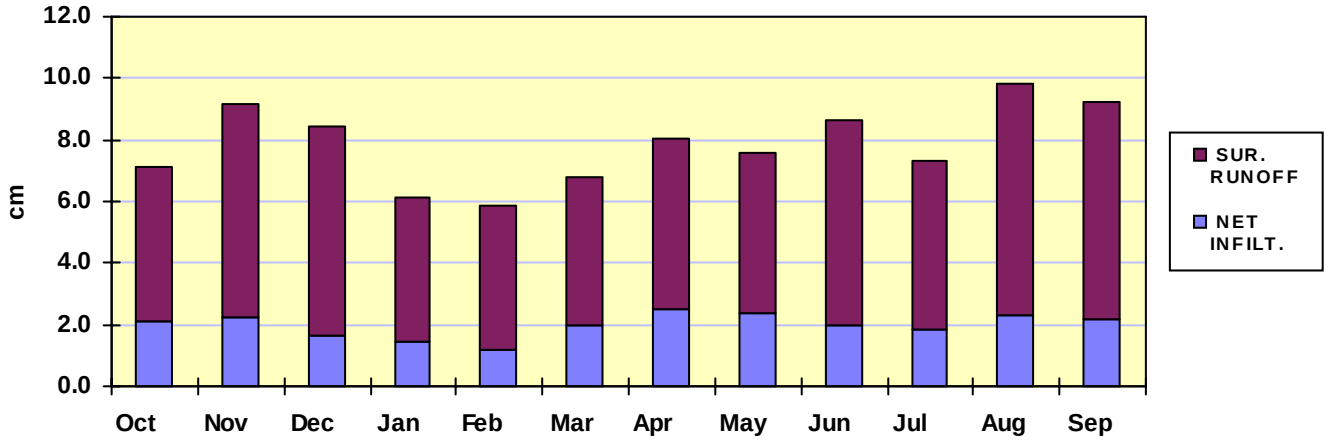


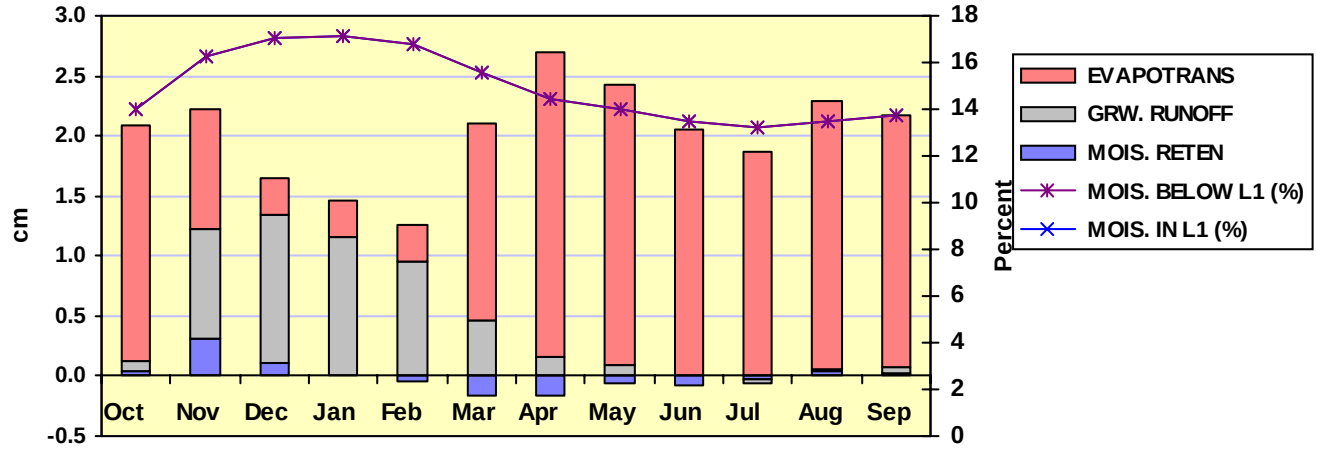


SESOIL Hydrologic Cycle Report

Scenario Description: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1.0e6 2 Kds

SESOIL Output File: C:\SEVIEW63\IA04WF.OUT





	Surface Water Runoff		Net Infiltration		Evapotranspiration		Soil Moisture Retention		Groundwater Runoff (Recharge)		Soil Moisture	
											Layer 1	Below Layer 1
Units	cm	Inches	cm	Inches	cm	Inches	cm	Inches	cm	Inches	Percent	Percent
October	5.06	1.99	2.09	0.82	1.96	0.77	0.04	0.02	0.09	0.04	14.00	14.00
November	6.93	2.73	2.23	0.88	1.00	0.39	0.32	0.13	0.92	0.36	16.30	16.30
December	6.77	2.67	1.64	0.65	0.30	0.12	0.10	0.04	1.23	0.48	17.06	17.06
January	4.64	1.83	1.46	0.57	0.30	0.12	0.01	0.00	1.15	0.45	17.12	17.12
February	4.64	1.83	1.22	0.48	0.30	0.12	-0.04	-0.02	0.96	0.38	16.80	16.80
March	4.87	1.92	1.95	0.77	1.64	0.65	-0.17	-0.07	0.47	0.19	15.60	15.60
April	5.54	2.18	2.53	1.00	2.53	1.00	-0.16	-0.06	0.17	0.07	14.42	14.42
May	5.20	2.05	2.38	0.94	2.34	0.92	-0.06	-0.02	0.10	0.04	14.00	14.00
June	6.64	2.61	1.98	0.78	2.05	0.81	-0.07	-0.03	0.01	0.00	13.46	13.46
July	5.47	2.15	1.82	0.72	1.87	0.74	-0.03	-0.01	-0.03	-0.01	13.24	13.24
August	7.53	2.96	2.28	0.90	2.23	0.88	0.04	0.02	0.02	0.01	13.50	13.50
September	7.06	2.78	2.18	0.86	2.10	0.83	0.03	0.01	0.05	0.02	13.72	13.72
Total	70.37	27.70	23.74	9.35	18.62	7.33	0.00	0.00	5.13	2.02		

SESOIL Profile and Load Report

Layer No.	Number of Sub-Layers	Thickness		Intrinsic Permeability	Organic Carbon Content	Adsorption Coefficient	Cation Exchange Capacity	Freundlich Exponent	Solid Phase Degradation Rate	Liquid Phase Degradation Rate	Soil pH
		cm	feet	cm^2	percent	µg/g / µg/mL	mEq / 100 g soil	unitless	1/day	1/day	pH
1	10	75.0	2.46	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
2	10	75.0	2.46	5.00E-11	0.00	39.00	0.00	1.00	0.00E+00	0.00E+00	7.00
3	10	7.5	0.25	5.00E-11	0.00	1365.00	0.00	1.00	0.00E+00	0.00E+00	7.00
4	10	7.5	0.25	5.00E-11	0.00	1365.00	0.00	1.00	0.00E+00	0.00E+00	7.00

Soil Parameters

Bulk Density (g/cm^3)	1.31
Effective Porosity (fraction)	0.20
Soil Pore Disconnectedness	10.00

Application Parameters

Area	cm^2	1.60E+7
	ft^2	1.72E+4
Latitude	degrees	43.2
Spill Index		1

Chemical Parameters

Water Solubility	(µg/mL)	150.0	**Moles Ligand / Moles Chemical**	0.00
Henry's Law	(M^3-atm/mol)	.000	**Ligand Molecular Weight** (g/mol)	0.00
K_{oc}	(µg/g)/(µg/mL)	0.00	**Base Hydrolysis Rate** (L/mol/day)	0.00
Valance	(g/mole)	0.00	**Ligand Dissociation Constant**	0.00
Air Diffusion Coefficient	(cm^2/sec)	.000	**Neutral Hydrolysis Rate** (L/mol/day)	0.00
Water Diffusion Coefficient	(cm^2/sec)	1.10E-6	**Acid Hydrolysis Rate** (L/mol/day)	0.00
Molecular Weight	(g/mol)	238.00		

Output File: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1.0e6 2 Kds
C:\SEVIEW63\IA04WF.OUT
Chemical File: Uranium
C:\SEVIEW63\URANIUM.CHM
Soil File: Lockport soil, Perm = 5.00E-6 cm/sec, D=10, n=0.
C:\SEVIEW63\LOCKPOR4.SOI
Application File: IA04 west Application Parameters 2 Kds
C:\SEVIEW63\IA04WKD.APL

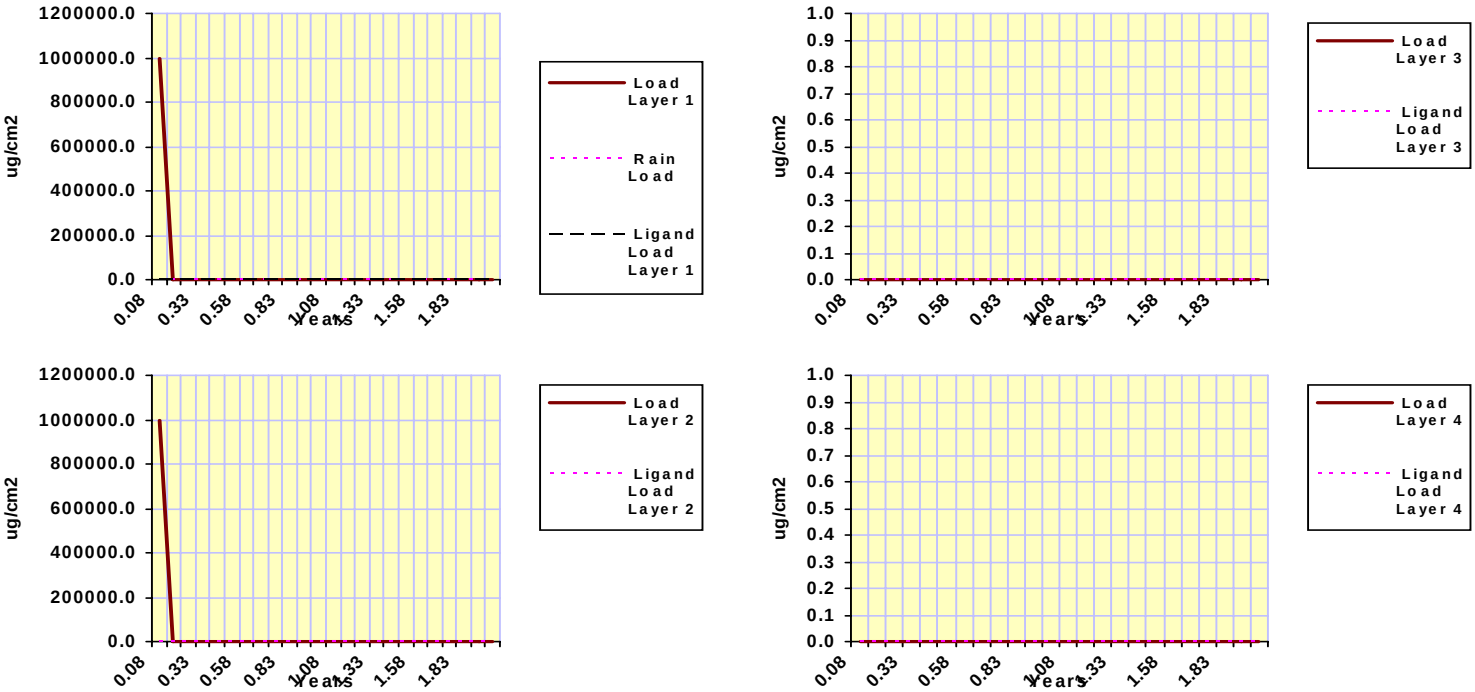
Sublayer Loads 1 2 3 4 5 6 7 8 9 10

Layer 1 (ug/g)

Layer 2 (ug/g)

Layer 3 (ug/g)

Layer 4 (ug/g)



SESOIL Pollutant Cycle Report

Scenario Description: Perm = 5.0E-6 cm/sec, D=10, n=0.20 Polin = 1.0e6 2 Kds

SESOIL Output File: C:\SEVIEW63\IA04WF.OUT

SESOIL Process	Pollutant Mass (µg)	Percent of Total
Volatilized	0.000E+00	0.00
In Soil Air	0.000E+00	0.00
Sur. Runoff	0.000E+00	0.00
In Washld	0.000E+00	0.00
Ads On Soil	1.669E+13	52.18
Hydrol Soil	0.000E+00	0.00
Degrad Soil	0.000E+00	0.00
Pure Phase	1.523E+13	47.61
Complexed	0.000E+00	0.00
Immobile CEC	0.000E+00	0.00
Hydrol CEC	0.000E+00	0.00
In Soil Moi	2.296E+10	0.07
Hydrol Mois	0.000E+00	0.00
Degrad Mois	0.000E+00	0.00
Other Trans	0.000E+00	0.00
Other Sinks	0.000E+00	0.00
Gwr. Runoff	0.000E+00	0.00
Total Output	3.195E+13	99.86
Total Input	3.200E+13	
Input - Output	4.439E+10	

Maximum leachate concentration: 0.000E+00 **mg/l**

Climate File: LOCKPORT 2 NE
C:\SEVIEW63\LOCKPORT.CLM

Chemical File: Uranium
C:\SEVIEW63\URANIUM.CHM

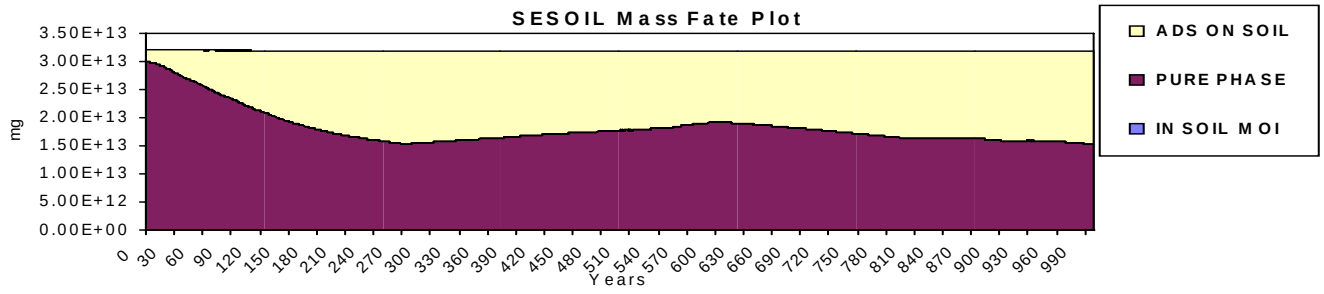
Soil File: Lockport soil, Perm = 5.00E-6 cm/sec, D=10, n=0.
C:\SEVIEW63\LOCKPOR4.SOI

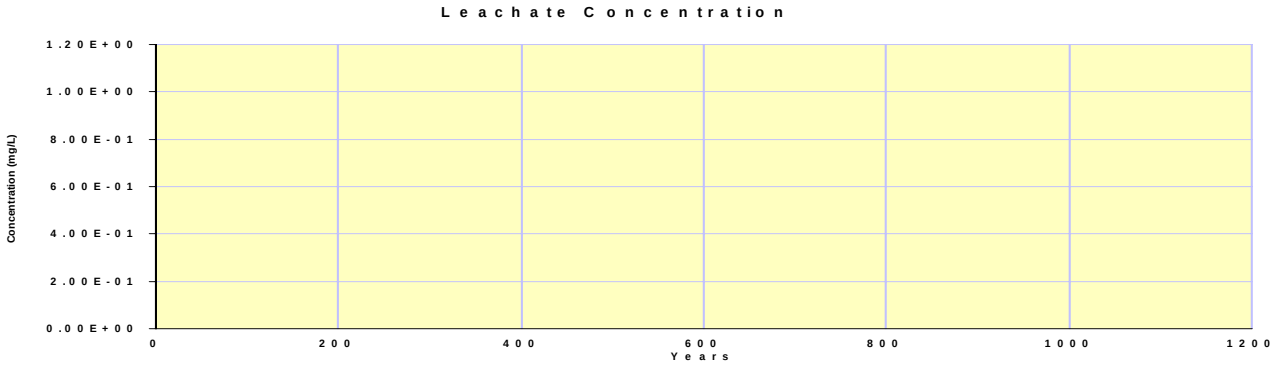
Application File: IA04 west Application Parameters 2 Kds
C:\SEVIEW63\IA04WKD.APL

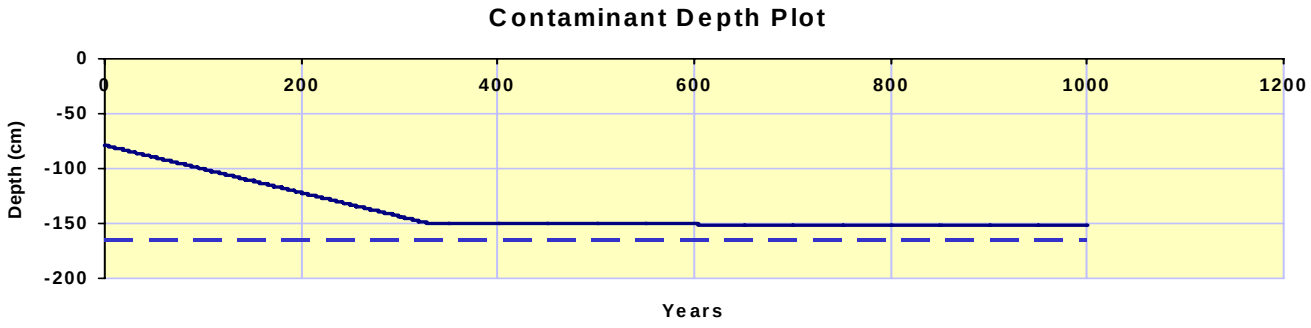
Starting Depth: 78.76 **cm**

Ending Depth: 151.80 **cm**

Total Depth: 165.00 **cm**

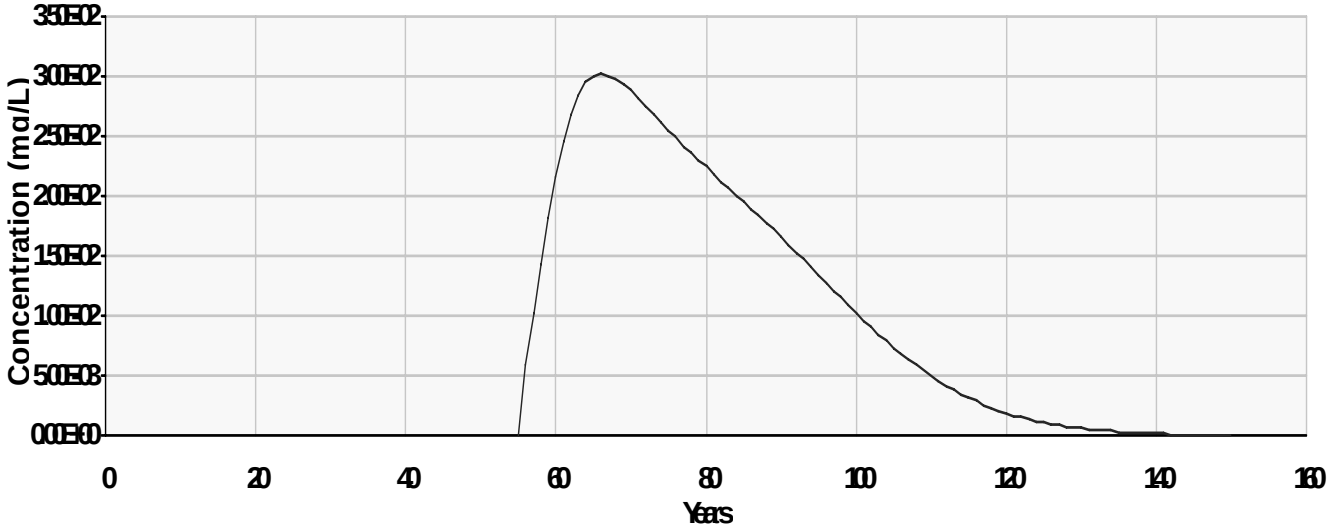






AT123D Point of Compliance Report

General model n = 0.20, D = 10 Int Perm = 5.5e-10 cm2 Kd = 25 for all layers
General model n = 0.20, D = 10 Int Perm = 5.5e-10 cm2 Kd = 25 for all layers



Maximum Concentration: 3.020E-02 mg/L
Year of Maximum Concentration: 66.0000

Output Coordinates

X:	0.00000 m	0.0000 ft	**Output Time Step:**	0.0833 years	1.0005 months
Y:	0.00000 m	0.0000 ft	**Initial Load (mg/kg):**	0.0000E+00	
Z:	0.00000 m	0.0000 ft	**Initial Load (kg):**	0.7300E+03	

Input Parameters

Porosity:	0.03000		**Soil Organic Carbon Content (percent):**	0.00000	
Hydraulic Gradient:	0.00700		**Carbon Adsorption Coeff. (ug/g)/(ug/ml):**	0.0000E+00	
Hydraulic Conductivity:	1.760E-01	m/hr	4.888E-03	cm/sec	
Soil Bulk Density:	2.610E+03	kg/m3	2.610E+00	g/cm3	
Aquifer Width:	Infinite	m	Infinite	ft	
Aquifer Depth:	9.000E+00	m	2.952E+01	ft	
Kd:	2.200E-04	m3/kg	2.200E-01	(ug/g)(ug/ml)	
Molecular Diffusion:	1.101E-06	m2/hr	3.058E-06	cm2/sec	
Decay Coefficient:	0.000E+00	1/hr	0.000E+00	1/day	
Retardation Factor:			2.014E+01		
Retarded Darcy Velocity:			2.039E-03	m2/hr	5.663E-03 cm2/sec
Retarded Longitudinal Disp. Coefficient:			1.998E-02	m2/hr	5.550E-02 cm2/sec
Retarded Lateral Dispersion Coefficient:			2.000E-03	m2/hr	5.555E-03 cm2/sec
Retarded Vertical Dispersion Coefficient:			2.000E-03	m2/hr	5.555E-03 cm2/sec

Dispersivities	**Meters**	**Feet**
Longitudinal:	9.800E+00	3.215E+01
Lateral:	9.800E-01	3.215E+00
Vertical:	9.800E-01	3.215E+00

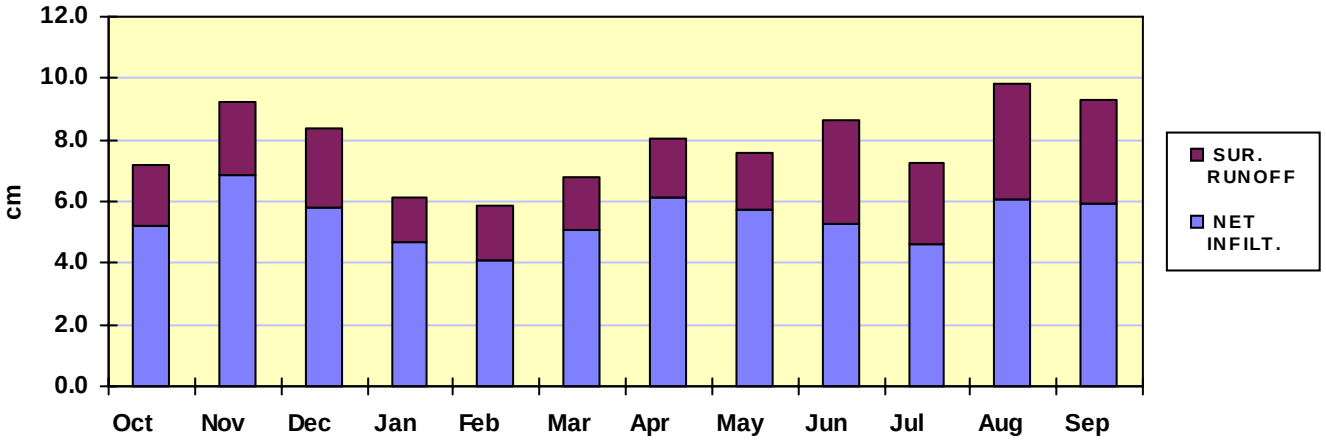
Load	Begin (m)	End (m)	Begin (ft)	End (ft)
X:	-1.293E+02	1.293E+02	-4.245E+02	4.245E+02
Y:	-1.293E+02	1.293E+02	-4.245E+02	4.245E+02
Z:	0.000E+00	0.000E+00	0.000E+00	0.000E+00

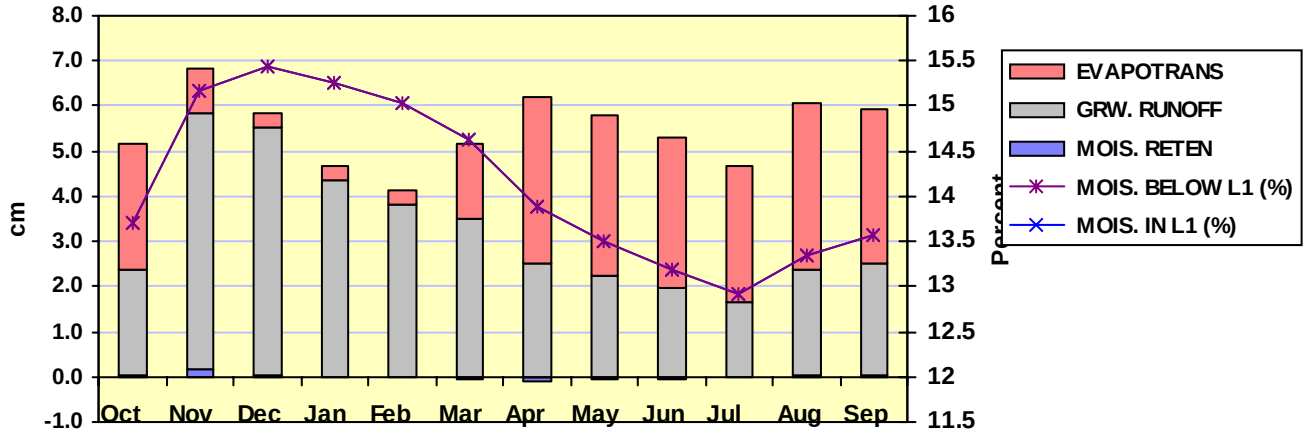
C:\SEVIEW63\SS37.ATI
C:\SEVIEW63\SS37.ATO

SESOIL Hydrologic Cycle Report

Scenario Description: General model n = 0.20, D = 10 Int Perm = 5.5e-10 cm2 Kd = 25 for all layers

SESOIL Output File: C:\SEVIEW63\SS37.OUT





	Surface Water Runoff		Net Infiltration		Evapotranspiration		Soil Moisture Retention		Groundwater Runoff (Recharge)		Soil Moisture	
											Layer 1	Below Layer 1
Units	cm	Inches	cm	Inches	cm	Inches	cm	Inches	cm	Inches	Percent	Percent
October	2.00	0.79	5.18	2.04	2.79	1.10	0.02	0.01	2.38	0.94	13.71	13.71
November	2.40	0.94	6.84	2.69	1.00	0.39	0.16	0.06	5.68	2.24	15.17	15.17
December	2.58	1.02	5.83	2.30	0.30	0.12	0.03	0.01	5.50	2.17	15.45	15.45
January	1.47	0.58	4.66	1.83	0.30	0.12	-0.02	-0.01	4.37	1.72	15.27	15.27
February	1.77	0.70	4.10	1.61	0.30	0.12	-0.03	-0.01	3.82	1.50	15.03	15.03
March	1.68	0.66	5.11	2.01	1.67	0.66	-0.04	-0.02	3.48	1.37	14.63	14.63
April	1.94	0.76	6.13	2.41	3.72	1.46	-0.08	-0.03	2.49	0.98	13.89	13.89
May	1.84	0.72	5.75	2.26	3.57	1.41	-0.04	-0.02	2.22	0.87	13.51	13.51
June	3.36	1.32	5.26	2.07	3.34	1.31	-0.04	-0.02	1.95	0.77	13.19	13.19
July	2.64	1.04	4.64	1.83	3.02	1.19	-0.03	-0.01	1.65	0.65	12.91	12.91
August	3.75	1.48	6.08	2.39	3.71	1.46	0.05	0.02	2.32	0.91	13.35	13.35
September	3.35	1.32	5.92	2.33	3.40	1.34	0.02	0.01	2.50	0.98	13.57	13.57
Total	28.78	11.33	65.48	25.78	27.13	10.68	0.00	0.00	38.36	15.10		

SESOIL Profile and Load Report

Layer No.	Number of Sub-Layers	Thickness		Intrinsic Permeability	Organic Carbon Content	Adsorption Coefficient	Cation Exchange Capacity	Freundlich Exponent	Solid Phase Degradation Rate	Liquid Phase Degradation Rate	Soil pH
		cm	feet	cm^2	percent	$\frac{\mu g/g}{\mu g/mL}$	$\frac{mEq}{100\ g\ soil}$	unitless	1/day	1/day	pH
1	10	50.0	1.64	5.50E-10	0.00	25.00	0.00	1.00	0.00E+00	0.00E+00	7.00
2	10	50.0	1.64	5.50E-10	0.00	25.00	0.00	1.00	0.00E+00	0.00E+00	7.00
3	10	15.0	0.49	5.50E-10	0.00	25.00	0.00	1.00	0.00E+00	0.00E+00	7.00
4	10	15.0	0.49	5.50E-10	0.00	25.00	0.00	1.00	0.00E+00	0.00E+00	7.00

Soil Parameters

Bulk Density (g/cm^3)	1.31
Effective Porosity (fraction)	0.20
Soil Pore Disconnectedness	10.00

Application Parameters

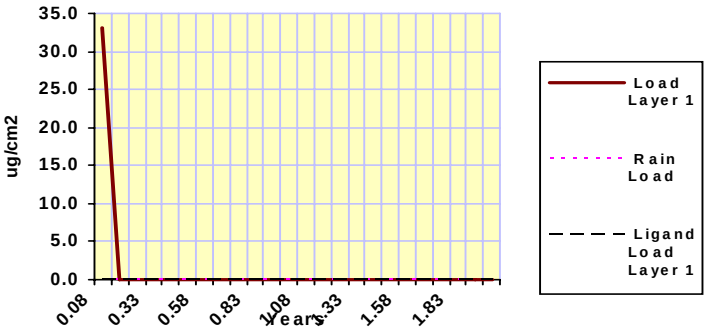
Area	cm^2	6.70E+8
	ft^2	7.21E+5
Latitude	degrees	43.2
Spill Index		1

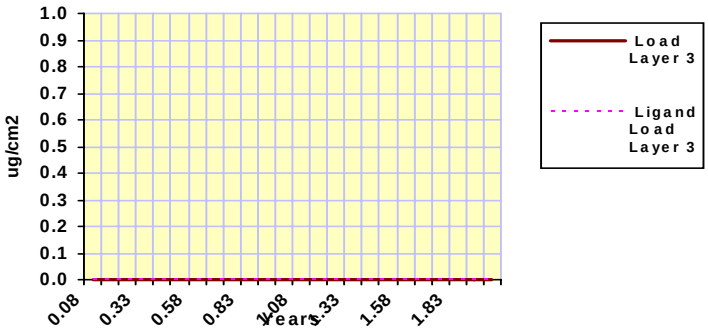
Chemical Parameters

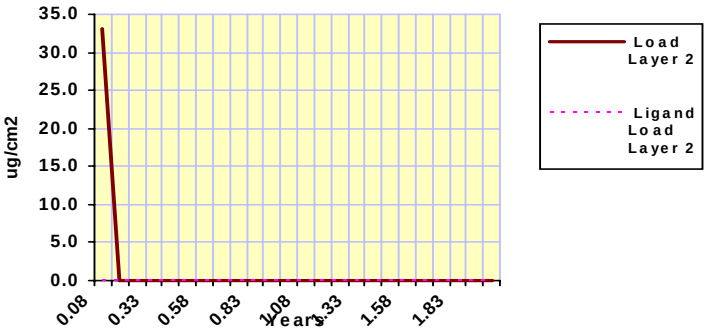
Water Solubility	(µg/mL)	150.0	**Moles Ligand / Moles Chemical**	0.00
Henry's Law	(M^3-atm/mol)	.000	**Ligand Molecular Weight** (g/mol)	0.00
K_{oc}	(µg/g)/(µg/mL)	0.00	**Base Hydrolysis Rate** (L/mol/day)	0.00
Valance	(g/mole)	0.00	**Ligand Dissociation Constant**	0.00
Air Diffusion Coefficient	(cm^2/sec)	.000	**Neutral Hydrolysis Rate** (L/mol/day)	0.00
Water Diffusion Coefficient	(cm^2/sec)	3.06E-6	**Acid Hydrolysis Rate** (L/mol/day)	0.00
Molecular Weight	(g/mol)	238.00		

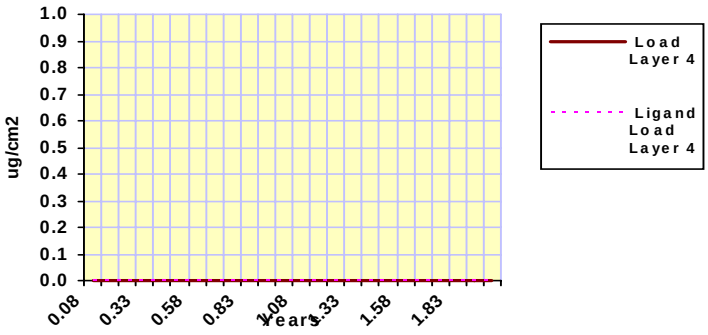
Output File: General model n = 0.20, D = 10 Int Perm = 5.5e-10 cm2 Kd = 25 for all layers
C:\SEVIEW63\SS37.OUT
Chemical File: Uranium
C:\SEVIEW63\URANIUX.CHM
Soil File: Lockport soil, general model
C:\SEVIEW63\LCKPRTG4.SOI
Application File: Overall site model
C:\SEVIEW63\GENMODL1.APL

Sublayer Loads	1	2	3	4	5	6	7	8	9	10
Layer 1 (ug/g)										
Layer 2 (ug/g)										
Layer 3 (ug/g)										
Layer 4 (ug/g)										









SESOIL Pollutant Cycle Report

Scenario Description: General model n = 0.20, D = 10 Int Perm = 5.5e-10 cm2 Kd = 25 for all layers

SESOIL Output File: C:\SEVIEW63\SS37.OUT

SESOIL Process	Pollutant Mass (µg)	Percent of Total
Volatilized	0.000E+00	0.00
In Soil Air	0.000E+00	0.00
Sur. Runoff	0.000E+00	0.00
In Washld	0.000E+00	0.00
Ads On Soil	4.506E+06	0.01
Hydrol Soil	0.000E+00	0.00
Degrad Soil	0.000E+00	0.00
Pure Phase	0.000E+00	0.00
Complexed	0.000E+00	0.00
Immobile CEC	0.000E+00	0.00
Hydrol CEC	0.000E+00	0.00
In Soil Moi	1.867E+04	0.00
Hydrol Mois	0.000E+00	0.00
Degrad Mois	0.000E+00	0.00
Other Trans	0.000E+00	0.00
Other Sinks	0.000E+00	0.00
Gwr. Runoff	4.401E+10	99.54
Total Output	4.402E+10	99.55
Total Input	4.422E+10	
Input - Output	1.970E+08	

Maximum leachate concentration: 5.516E-02 **mg/l**

Climate File: LOCKPORT 2 NE
C:\SEVIEW63\LOCKPORT.CLM

Chemical File: Uranium
C:\SEVIEW63\URANIUX.CHM

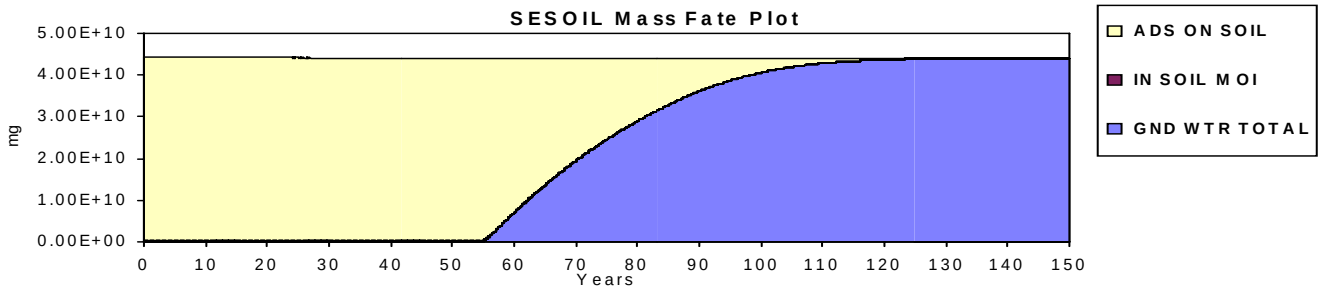
Soil File: Lockport soil, general model
C:\SEVIEW63\LCKPRTG4.SOI

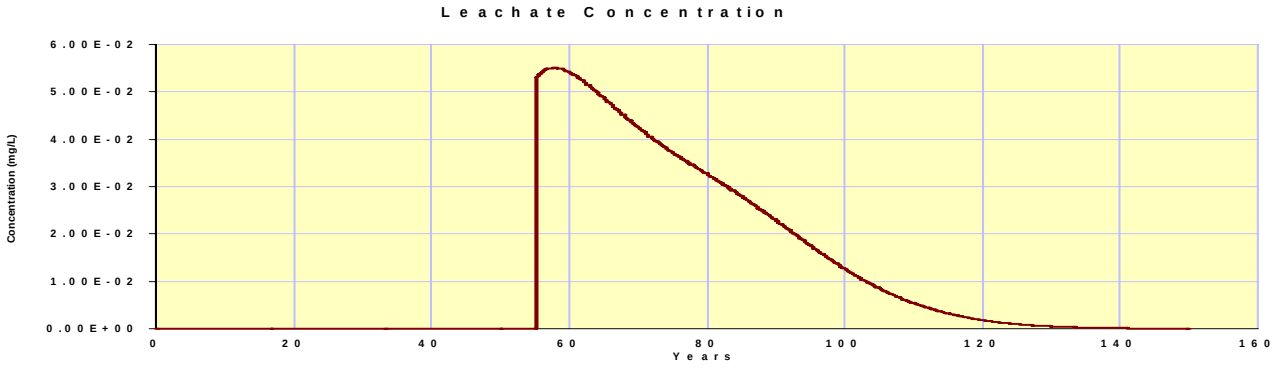
Application File: Overall site model
C:\SEVIEW63\GENMODL1.APL

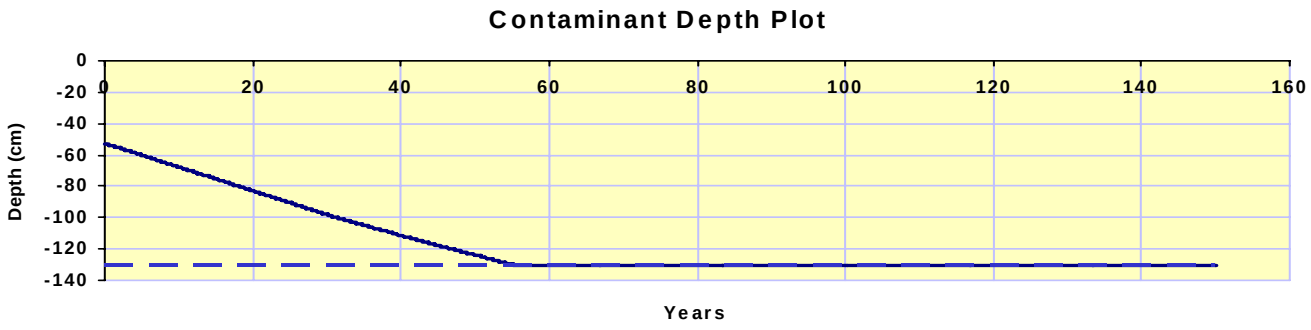
Starting Depth: 52.61 **cm**

Ending Depth: 130.00 **cm**

Total Depth: 130.00 **cm**

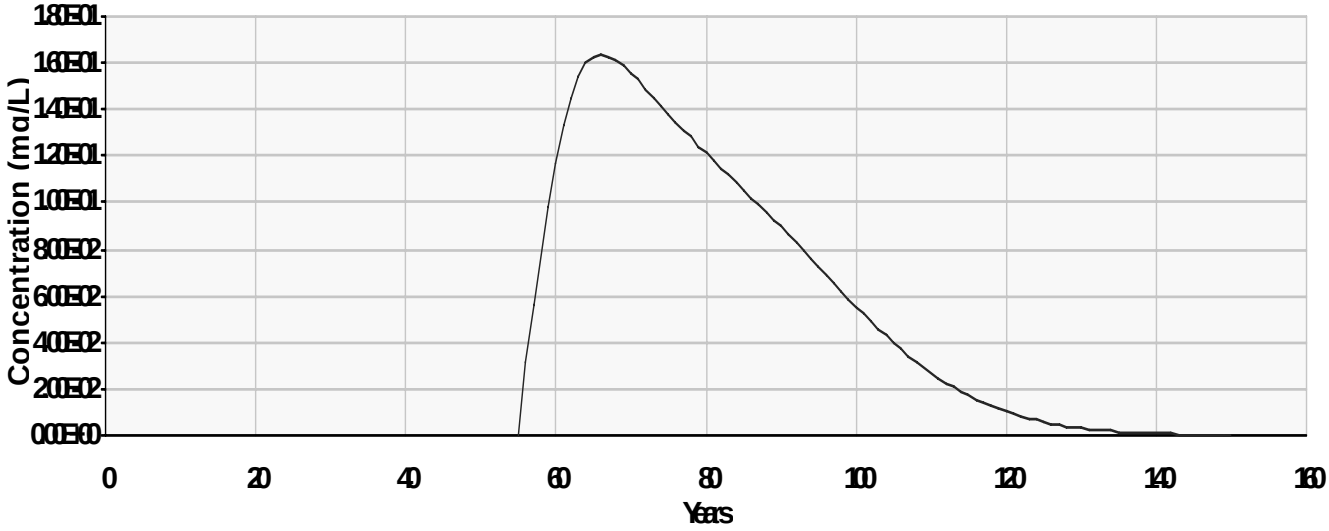






AT123D Point of Compliance Report

General model n = 0.20, D = 10 Int Perm = 5.5e-10 cm2 Kd = 25 for all layers
General model n = 0.20, D = 10 Int Perm = 5.5e-10 cm2 Kd = 25 for all layers



Maximum Concentration: 1.640E-01 mg/L
Year of Maximum Concentration: 66.0000

Output Coordinates

X:	0.00000 m	0.0000 ft	**Output Time Step:**	0.0833 years	1.0005 months
Y:	0.00000 m	0.0000 ft	**Initial Load (mg/kg):**	0.0000E+00	
Z:	0.00000 m	0.0000 ft	**Initial Load (kg):**	0.7300E+03	

Input Parameters

Porosity:	0.03000		**Soil Organic Carbon Content (percent):**	0.00000
Hydraulic Gradient:	0.00700		**Carbon Adsorption Coeff. (ug/g)/(ug/ml):**	0.0000E+00
Hydraulic Conductivity:	1.760E-01	m/hr	4.888E-03	cm/sec
Soil Bulk Density:	2.610E+03	kg/m3	2.610E+00	g/cm3
Aquifer Width:	Infinite	m	Infinite	ft
Aquifer Depth:	9.000E+00	m	2.952E+01	ft
Kd:	2.200E-04	m3/kg	2.200E-01	(ug/g)(ug/ml)
Molecular Diffusion:	1.101E-06	m2/hr	3.058E-06	cm2/sec
Decay Coefficient:	0.000E+00	1/hr	0.000E+00	1/day

Retardation Factor:			2.014E+01	
Retarded Darcy Velocity:			2.039E-03	m2/hr	5.663E-03	cm2/sec
Retarded Longitudinal Disp. Coefficient:			1.998E-02	m2/hr	5.550E-02	cm2/sec
Retarded Lateral Dispersion Coefficient:			2.000E-03	m2/hr	5.555E-03	cm2/sec
Retarded Vertical Dispersion Coefficient:			2.000E-03	m2/hr	5.555E-03	cm2/sec

Dispersivities	**Meters**	**Feet**
Longitudinal:	9.800E+00	3.215E+01
Lateral:	9.800E-01	3.215E+00
Vertical:	9.800E-01	3.215E+00

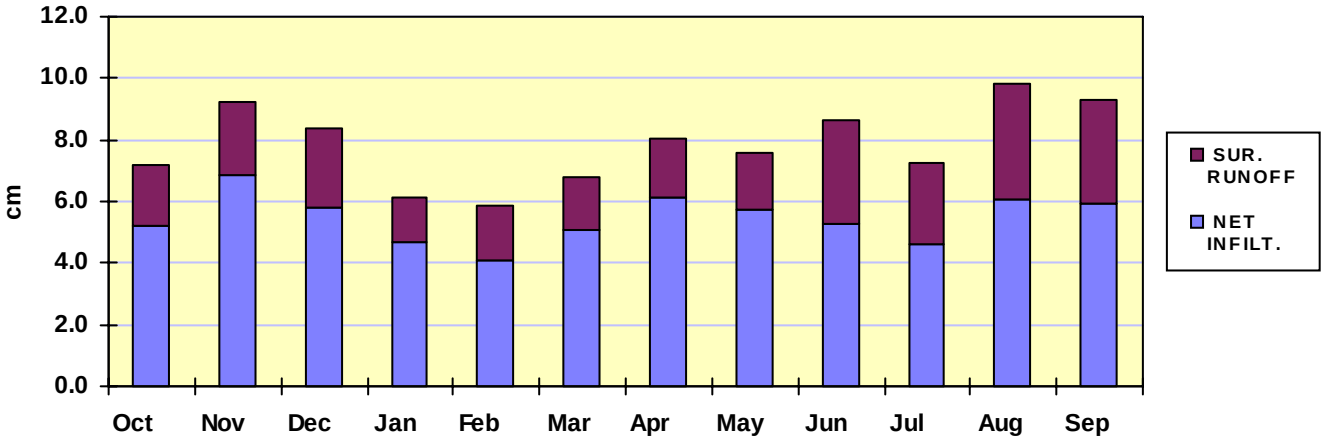
Load	Begin (m)	End (m)	Begin (ft)	End (ft)
X:	-1.293E+02	1.293E+02	-4.245E+02	4.245E+02
Y:	-1.293E+02	1.293E+02	-4.245E+02	4.245E+02
Z:	0.000E+00	0.000E+00	0.000E+00	0.000E+00

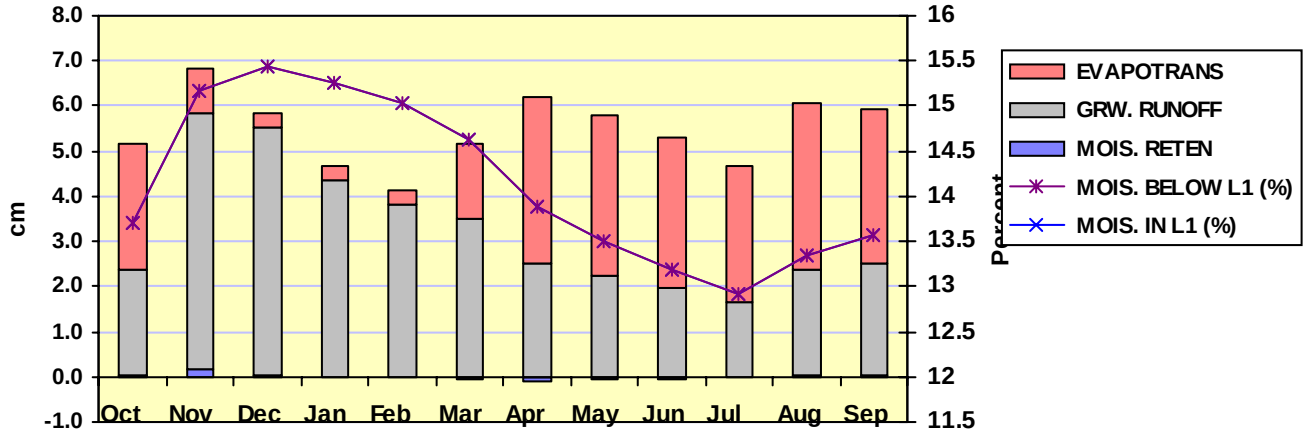
C:\SEVIEW63\SS38.ATI
C:\SEVIEW63\SS38.ATO

SESOIL Hydrologic Cycle Report

Scenario Description: General model n = 0.20, D = 10 Int Perm = 5.5e-10 cm2 Kd = 25 for all layers

SESOIL Output File: C:\SEVIEW63\SS38.OUT





	Surface Water Runoff		Net Infiltration		Evapotranspiration		Soil Moisture Retention		Groundwater Runoff (Recharge)		Soil Moisture	
											Layer 1	Below Layer 1
Units	cm	Inches	cm	Inches	cm	Inches	cm	Inches	cm	Inches	Percent	Percent
October	2.00	0.79	5.18	2.04	2.79	1.10	0.02	0.01	2.38	0.94	13.71	13.71
November	2.40	0.94	6.84	2.69	1.00	0.39	0.16	0.06	5.68	2.24	15.17	15.17
December	2.58	1.02	5.83	2.30	0.30	0.12	0.03	0.01	5.50	2.17	15.45	15.45
January	1.47	0.58	4.66	1.83	0.30	0.12	-0.02	-0.01	4.37	1.72	15.27	15.27
February	1.77	0.70	4.10	1.61	0.30	0.12	-0.03	-0.01	3.82	1.50	15.03	15.03
March	1.68	0.66	5.11	2.01	1.67	0.66	-0.04	-0.02	3.48	1.37	14.63	14.63
April	1.94	0.76	6.13	2.41	3.72	1.46	-0.08	-0.03	2.49	0.98	13.89	13.89
May	1.84	0.72	5.75	2.26	3.57	1.41	-0.04	-0.02	2.22	0.87	13.51	13.51
June	3.36	1.32	5.26	2.07	3.34	1.31	-0.04	-0.02	1.95	0.77	13.19	13.19
July	2.64	1.04	4.64	1.83	3.02	1.19	-0.03	-0.01	1.65	0.65	12.91	12.91
August	3.75	1.48	6.08	2.39	3.71	1.46	0.05	0.02	2.32	0.91	13.35	13.35
September	3.35	1.32	5.92	2.33	3.40	1.34	0.02	0.01	2.50	0.98	13.57	13.57
Total	28.78	11.33	65.48	25.78	27.13	10.68	0.00	0.00	38.36	15.10		

SESOIL Profile and Load Report

Layer No.	Number of Sub-Layers	Thickness		Intrinsic Permeability	Organic Carbon Content	Adsorption Coefficient	Cation Exchange Capacity	Freundlich Exponent	Solid Phase Degradation Rate	Liquid Phase Degradation Rate	Soil pH
		cm	feet	cm^2	percent	$\frac{\mu g/g}{\mu g/mL}$	$\frac{mEq}{100\ g\ soil}$	unitless	1/day	1/day	pH
1	10	50.0	1.64	5.50E-10	0.00	25.00	0.00	1.00	0.00E+00	0.00E+00	7.00
2	10	50.0	1.64	5.50E-10	0.00	25.00	0.00	1.00	0.00E+00	0.00E+00	7.00
3	10	15.0	0.49	5.50E-10	0.00	25.00	0.00	1.00	0.00E+00	0.00E+00	7.00
4	10	15.0	0.49	5.50E-10	0.00	25.00	0.00	1.00	0.00E+00	0.00E+00	7.00

Soil Parameters

Bulk Density (g/cm^3)	1.31
Effective Porosity (fraction)	0.20
Soil Pore Disconnectedness	10.00

Application Parameters

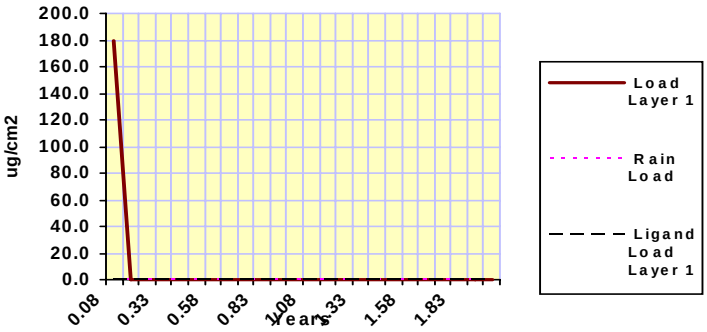
Area	cm^2	6.70E+8
	ft^2	7.21E+5
Latitude	degrees	43.2
Spill Index		1

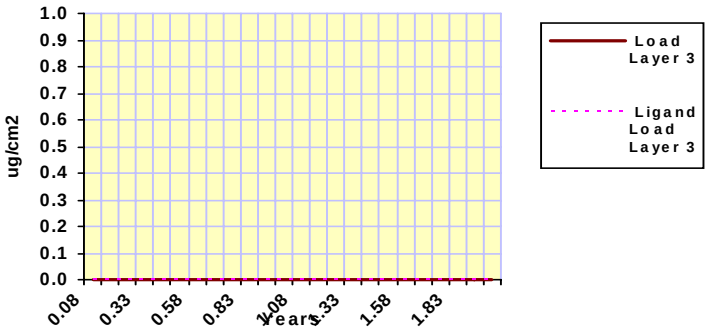
Chemical Parameters

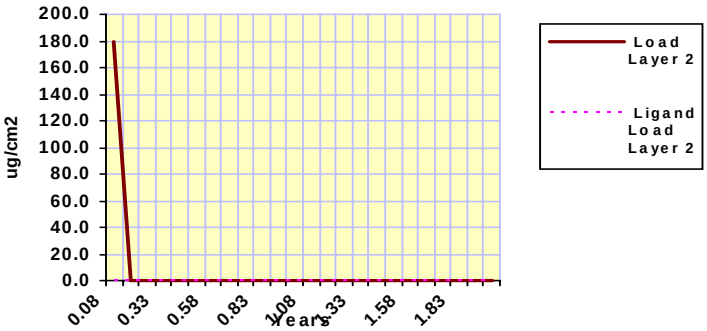
Water Solubility	(µg/mL)	150.0	**Moles Ligand / Moles Chemical**	0.00
Henry's Law	(M^3-atm/mol)	.000	**Ligand Molecular Weight** (g/mol)	0.00
K_{oc}	(µg/g)/(µg/mL)	0.00	**Base Hydrolysis Rate** (L/mol/day)	0.00
Valance	(g/mole)	0.00	**Ligand Dissociation Constant**	0.00
Air Diffusion Coefficient	(cm^2/sec)	.000	**Neutral Hydrolysis Rate** (L/mol/day)	0.00
Water Diffusion Coefficient	(cm^2/sec)	3.06E-6	**Acid Hydrolysis Rate** (L/mol/day)	0.00
Molecular Weight	(g/mol)	238.00		

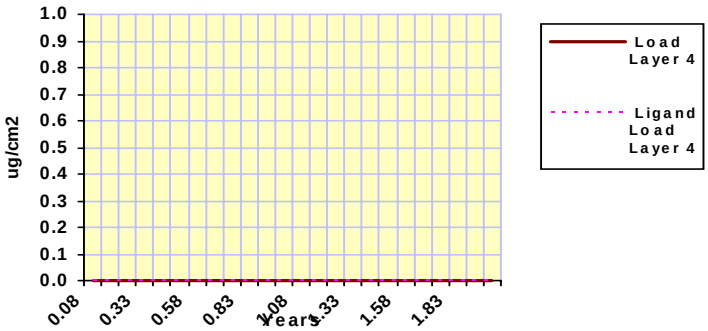
Output File: General model n = 0.20, D = 10 Int Perm = 5.5e-10 cm2 Kd = 25 for all layers
C:\SEVIEW63\SS38.OUT
Chemical File: Uranium
C:\SEVIEW63\URANIUX.CHM
Soil File: Lockport soil, general model
C:\SEVIEW63\LCKPRTG4.SOI
Application File: Overall site model
C:\SEVIEW63\GENMODL2.APL

Sublayer Loads	1	2	3	4	5	6	7	8	9	10
Layer 1 (ug/g)										
Layer 2 (ug/g)										
Layer 3 (ug/g)										
Layer 4 (ug/g)										









SESOIL Pollutant Cycle Report

Scenario Description: General model n = 0.20, D = 10 Int Perm = 5.5e-10 cm2 Kd = 25 for all layers

SESOIL Output File: C:\SEVIEW63\SS38.OUT

SESOIL Process	Pollutant Mass (µg)	Percent of Total
Volatilized	0.000E+00	0.00
In Soil Air	0.000E+00	0.00
Sur. Runoff	0.000E+00	0.00
In Washld	0.000E+00	0.00
Ads On Soil	2.036E+07	0.01
Hydrol Soil	0.000E+00	0.00
Degrad Soil	0.000E+00	0.00
Pure Phase	0.000E+00	0.00
Complexed	0.000E+00	0.00
Immobile CEC	0.000E+00	0.00
Hydrol CEC	0.000E+00	0.00
In Soil Moi	8.437E+04	0.00
Hydrol Mois	0.000E+00	0.00
Degrad Mois	0.000E+00	0.00
Other Trans	0.000E+00	0.00
Other Sinks	0.000E+00	0.00
Gwr. Runoff	2.383E+11	99.35
Total Output	2.383E+11	99.36
Total Input	2.399E+11	
Input - Output	1.544E+09	

Maximum leachate concentration: 2.990E-01 **mg/l**

Climate File: LOCKPORT 2 NE
C:\SEVIEW63\LOCKPORT.CLM

Chemical File: Uranium
C:\SEVIEW63\URANIUX.CHM

Soil File: Lockport soil, general model
C:\SEVIEW63\LCKPRTG4.SOI

Application File: Overall site model
C:\SEVIEW63\GENMODL2.APL

Starting Depth: 52.61 **cm**

Ending Depth: 130.00 **cm**

Total Depth: 130.00 **cm**