APPENDIX E

Fate and Transport Modeling Results

THIS PAGE INTENTIONALLY LEFT BLANK.

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES (continued)

Tables

THIS PAGE INTENTIONALLY LEFT BLANK.

Table E-1. Physical and Chemical Properties of Inorganic SRCs in Surface and Subsurface Soil at Load Line 7

Analyte	K_d (L/kg)	Reference	HLC (atm-m^3/mol)	Reference	C_w (mg/L)	SSL Type	Generic SSL	Reference	SSL Type
Metals									
Aluminum	1.50E+03	a	NA	-	2.00E+01	RSL	3.00E+04	a	RSL
Arsenic	2.90E+01	a	NA	-	1.00E-02	MCL	2.90E-01	a	MCL
Barium	4.10E+01	a	NA	-	2.00E+00	MCL	8.20E+01	a	MCL
Beryllium	7.90E+02	a	NA	-	4.00E-03	MCL	3.20E+00	a	MCL
Cadmium	7.50E+01	a	NA	-	5.00E-03	MCL	3.80E-01	a	MCL
Chromium	1.90E+01	a	NA	-	1.00E-01	MCL	1.80E+05	a	MCL
Cobalt	4.50E+01	a	NA	-	6.00E-03	RSL	**2.70E-01**	a	RSL
Copper	3.50E+01	a	NA	-	1.30E+00	MCL	4.60E+01	a	MCL
Lead	9.00E+02	a	NA	-	1.50E-02	MCL	1.40E+01	a	MCL
Manganese	6.50E+01	a	NA	-	4.30E-01	RSL	**2.80E+01**	a	RSL
Mercury	5.20E+01	a	1.14E-02	a	2.00E-03	MCL	1.00E-01	a	MCL
Nickel	6.50E+01	a	NA	-	3.90E-01	RSL	**2.60E+01**	a	RSL
Selenium	5.00E+00	a	NA	-	5.00E-02	MCL	2.60E-01	a	MCL
Silver	8.30E+00	a	NA	-	9.40E-02	RSL	**8.00E-01**	a	RSL
Thallium	7.10E+01	a	NA	-	2.00E-03	MCL	1.40E-01	a	MCL
Zinc	6.20E+01	a	NA	-	6.00E+00	RSL	**3.70E+02**	a	RSL
Anions									
Nitrate	NA	-	NA	-	1.00E+01	MCL	NA	-	NA

[a]U.S. Environmental Protection Agency (USEPA) regional screening levels (RSL) Generic Tables June 2015; found at: <http://www2.epa.gov/risk/risk-based-screening-table-generic-tables>.
atm-m^3/mol =
C_w = Target Groundwater Concentration (either MCL or RSL).
HLC = Henry's Law Constant.
K_d = Distribution Coefficient.
L/kg = Liters per Kilogram.
MCL = Clean Water Act Drinking Water Maximum Contaminant Level.
mg/L = Milligrams per Liter.
NA = Not Applicable.
RSL = USEPA Regional Screening Level (USEPA 2015).
SRC = Site-related Contaminant.
SSL = Soil Screening Level.

Table E-2. Physical and Chemical Properties of Organic SRCs in Surface and Subsurface Soil at Load Line 7

Analyte	K_{oc} (L/kg)	Reference	HLC (atm-m^3/ mol)	Reference	C_w (mg/L)	SSL Type	Generic SSL (mg/kg)	Reference	SSL Type
Explosives									
2,4,6-Trinitrotoluene	2.81E+03	a	2.08E-08	a	2.50E-03	RSL	1.50E-02	a	Risk
2,6-Dinitrotoluene	5.87E+02	a	7.47E-07	a	4.80E-05	RSL	6.70E-05	a	Risk
2-Amino-4,6-dinitrotoluene	2.83E+02	a	1.62E-10	a	3.90E-02	RSL	3.00E-02	a	Risk
3-Nitrotoluene	3.63E+02	a	9.30E-06	a	1.70E-03	RSL	1.60E-03	a	Risk
HMX	5.32E+02	a	8.67E-10	a	1.00E+00	RSL	1.30E+00	a	Risk
Nitrocellulose	1.00E+01	a	3.29E-23	a	6.00E+04	RSL	1.30E+04	a	Risk
Nitroglycerin	1.16E+02	a	8.66E-08	a	2.00E-03	RSL	8.50E-04	a	Risk
PETN	6.48E+02	a	1.20E-11	a	1.90E-02	RSL	2.80E-02	a	Risk
RDX	8.91E+01	a	2.01E-11	a	7.00E-04	RSL	2.70E-04	a	Risk
Tetryl	4.61E+03	a	2.71E-09	a	3.90E-02	RSL	3.70E-01	a	Risk
Semi-volatile Organic Compounds									
2-Methylnaphthalene	2.48E+03	a	5.18E-04	a	3.60E-02	RSL	1.90E-01	a	Risk
Acenaphthene	5.03E+03	a	1.84E-04	a	5.30E-01	RSL	5.50E+00	a	Risk
Anthracene	1.64E+04	a	5.56E-05	a	1.80E+00	RSL	5.80E+01	a	Risk
Benz(*a*)anthracene	1.77E+05	a	1.20E-05	a	1.20E-05	RSL	4.25E-03	a	Risk
Benzenemethanol	2.15E+01	a	3.37E-07	a	2.00E+00	RSL	4.80E-01	a	Risk
Benzo(*a*)pyrene	5.87E+05	a	4.57E-07	a	2.00E-04	MCL	2.40E-01	a	MCL
Benzo(*b*)fluoranthene	5.99E+05	a	6.57E-07	a	3.40E-05	RSL	4.10E-02	a	Risk
Benzo(*ghi*)perylene[b]	1.07E+07	c	1.40E-07	c	1.20E-01	RSL	1.30E+01	a	Risk
Benzo(*k*)fluoranthene	5.87E+05	a	5.84E-07	a	3.40E-04	RSL	4.00E-01	a	Risk
Bis(2-ethylhexyl)phthalate	1.20E+05	a	2.70E-07	a	6.00E-03	RSL	1.40E+00	a	Risk
Carbazole	NA	-	NA	-	NA	-	NA	-	-
Chrysene	1.81E+05	a	5.23E-06	a	3.40E-03	RSL	1.20E+00	a	Risk
Dibenz(*a*,*h*)anthracene	1.91E+06	a	1.41E-07	a	3.40E-06	RSL	1.30E-02	a	Risk
Dibenzofuran	9.16E+03	a	2.13E-04	a	7.90E-03	RSL	1.50E-01	a	Risk
Diethyl phthalate	1.05E+02	a	6.10E-07	a	1.50E+01	RSL	6.10E+00	a	Risk
Fluoranthene	5.55E+04	a	8.86E-06	a	8.00E-01	RSL	8.90E+01	a	Risk

Table E-2. Physical and Chemical Properties of Organic SRCs in Surface and Subsurface Soil at Load Line 7 (continued)

Analyte	K_{oc} (L/kg)	Reference	HLC (atm-m^3/mol)	Reference	C_w (mg/L)	SSL Type	Generic SSL (mg/kg)	Reference	SSL Type
Fluorene	9.16E+03	a	9.62E-05	a	2.90E-01	RSL	5.40E+00	a	Risk
Indeno(1,2,3-*cd*)pyrene	1.95E+06	a	3.48E-07	a	3.40E-05	RSL	1.30E-01	a	Risk
Naphthalene	1.54E+03	a	4.40E-04	a	1.70E-04	RSL	5.40E-04	a	Risk
Phenanthrene[b]	1.82E+04	c	3.93E-05	c	1.20E-01	RSL	1.30E+01	a	Risk
Pyrene	5.43E+04	a	1.19E-05	a	1.20E-01	RSL	1.30E+01	a	Risk
Volatile Organic Compounds									
2-Butanone	4.51E+00	a	5.69E-05	a	5.60E+00	RSL	1.20E+00	a	Risk
Acetone	2.36E+00	a	3.50E-05	a	1.40E+01	RSL	2.90E+00	a	Risk
Dimethylbenzene (xylene mixture)	3.83E+02	a	5.18E-03	a	1.00E+01	MCL	9.80E+00	a	Risk
Ethylbenzene	4.46E+02	a	7.88E-03	a	7.00E-01	MCL	7.80E-01	a	MCL
Pesticides/PCBs									
PCB-1254	1.31E+05	a	2.83E-04	a	7.80E-06	RSL	2.00E-03	a	Risk

[a]U.S. Environmental Protection Agency (USEPA) regional screening levels (RSL) Generic Tables June 2015; found at: http://www2.epa.gov/risk/risk-based-screening-table-generic-tables.
[b]Pyrene C_w and Generic SSL was used as a surrogate for benzo(*ghi*)perylene and phenanthrene.
[c]USEPA 1994. Risk Reduction Engineering Laboratory (RREL) Treatability Database, Ver. 5.0, Office of Research and Development, Cincinnati, Ohio.
atm-m^3/mol =
C_w = Target Groundwater Concentration (either MCL or RSL).
HLC = Henry's Law Constant.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
K_{oc} = Organic Carbon Partition Coefficient.
L/kg = Liters per Kilogram.
mg/L = Milligrams per Liter.
MCL = Clean Water Act Drinking Water Maximum Contaminant Level.
NA = Not Available.
PCB = Polychlorinated Biphenyl.
PETN = Pentaerythrite Tetranitrate.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
RSL = USEPA Regional Screening Level (USEPA 2015).
SRC = Site-related Contaminant.
SSL = Soil Screening Level.

Table E-3. HELP Model Parameters for Developing Water Balance Estimates

Layer	Layer Type	Thickness (inch)	Effective K (cm/sec)
1	1 – Vertical Percolation Layer	60	2.50E-05
2	3 – Barrier Soil Liner	84	8.20E-06
Evapotranspiration and Weather Data			
Station Latitude =		41.24	
Maximum Leaf Area Index =		3.5	
Start of Growing Season (Julian Date) =		120	
End of Growing Season (Julian Date) =		290	
Evaporative Zone Depth (inch) =		20 (Fair)	
General Design and Evaporative Zone Data			
Fraction of Area Allowing Runoff (%) =		100	
Default Soil Database Texture =		Silty Clay	
Vegetative Cover =		Poor Stand of Grass	
Surface Slope (%) =		4	
Slope Length (ft) =		500	
SCS Runoff Curve Number =		93	
Precipitation Data			
Synthetically Generated Using Cleveland, Ohio, Coefficients			
Temperature Data			
Synthetically Generated Using Cleveland, Ohio, Coefficients			
Solar Radiation Data			
Synthetically Generated Using Cleveland, Ohio, Coefficients			

cm/sec = Centimeters per Second.
ft = Feet.
HELP = Hydrologic Evaluation of Landfill Performance.
K = Hydraulic Conductivity.
SCS = Soil Conservation Service.

Table E-4. Initial CMCOPCs Based on Maximum Concentration of SRCs Compared to GSSL for Load Line 7

Analyte	CAS Number	Maximum Concentration (mg/kg)	GSSL (mg/kg)	GSSL Type (mg/kg)	Initial CMCOPC? (Yes/No)	CMCOPC Justification	Samples > SSL/ Total Samples	Sample ID at Maximum Concentration	Date Collected
Metals									
Aluminum	7429-90-5	2.17E+04	3.00E+04	Risk	No	Below SSL	0/81	LL7sb-061-5182-SO	3/9/2010
Arsenic	**7440-38-2**	**2.70E+01**	**2.90E-01**	**MCL**	**Yes**	**Exceeds SSL**	**81/81**	**LL7sb-068-5208-SO**	**3/10/2010**
Barium	**7440-39-3**	**1.60E+02**	**8.20E+01**	**MCL**	**Yes**	**Exceeds SSL**	**16/81**	**LL7ss-002M-SO**	**11/8/2004**
Beryllium	7440-41-7	2.80E+00	3.20E+00	MCL	No	Below SSL	0/81	LL7ss-002M-SO	11/8/2004
Cadmium	**7440-43-9**	**8.50E+00**	**3.80E-01**	**MCL**	**Yes**	**Exceeds SSL**	**10/81**	**LL7ss-073M-5064-SO**	**3/15/2010**
Chromium	7440-47-3	9.75E+01	1.80E+05	MCL	No	Below SSL	0/81	LL7ss-052M-SO	8/13/2007
Cobalt	**7440-48-4**	**1.34E+01**	**2.70E-01**	**Risk**	**Yes**	**Exceeds SSL**	**81/81**	**LL7sb-060-5178-SO**	**3/9/2010**
Copper	**7440-50-8**	**8.80E+01**	**4.60E+01**	**MCL**	**Yes**	**Exceeds SSL**	**2/81**	**LL7ss-018M-SO**	**11/10/2004**
Lead	**7439-92-1**	**1.60E+02**	**1.40E+01**	**MCL**	**Yes**	**Exceeds SSL**	**66/81**	**LL7ss-004M-SO**	**11/8/2004**
Manganese	**7439-96-5**	**1.60E+03**	**2.80E+01**	**Risk**	**Yes**	**Exceeds SSL**	**81/81**	**LL7ss-002M-SO**	**11/8/2004**
Mercury	**7439-97-6**	**4.00E-01**	**1.00E-01**	**MCL**	**Yes**	**Exceeds SSL**	**4/81**	**LL7ss-004M-SO**	**11/8/2004**
Nickel	7440-02-0	**3.30E+01**	**2.60E+01**	**Risk**	**Yes**	**Exceeds SSL**	**11/81**	**LL7sb-062-5187-SO**	**3/11/2010**
Selenium	**7782-49-2**	**2.50E+00**	**2.60E-01**	**MCL**	**Yes**	**Exceeds SSL**	**68/81**	**LL7sd-029M-SD**	**11/9/2004**
Silver	**7440-22-4**	**8.00E+01**	**8.00E-01**	**Risk**	**Yes**	**Exceeds SSL**	**3/81**	**LL7ss-027M-SO**	**11/10/2004**
Thallium	**7440-28-0**	**3.10E-01**	**1.40E-01**	**MCL**	**Yes**	**Exceeds SSL**	**21/81**	**LL7ss-007M-SO**	**11/8/2004**
Zinc	**7440-66-6**	**9.99E+02**	**3.70E+02**	**Risk**	**Yes**	**Exceeds SSL**	**1/81**	**LL7ss-073M-5064-SO**	**3/15/2010**
Anions									
Nitrate	14797-55-8	9.10E+00	NA	NA	No	No SSL	0/32	LL7ss-006M-SO	11/09/04
Explosives									
2,4,6-Trinitrotoluene	**118-96-7**	**2.70E+00**	**1.50E-02**	**Risk**	**Yes**	**Exceeds SSL**	**3/81**	**LL7ss-014M-SO**	**11/09/04**
2,6-Dinitrotoluene	**606-20-2**	**2.80E-01**	**6.70E-05**	**Risk**	**Yes**	**Exceeds SSL**	**1/81**	**LL7ss-013M-SO**	**11/09/04**
2-Amino-4,6-Dinitrotoluene	**35572-78-2**	**1.00E-01**	**3.00E-02**	**Risk**	**Yes**	**Exceeds SSL**	**1/81**	**LL7ss-013M-SO**	**11/09/04**
3-Nitrotoluene	**99-08-1**	**1.30E-01**	**1.60E-03**	**Risk**	**Yes**	**Exceeds SSL**	**5/81**	**LL7ss-013M-SO**	**11/09/04**
HMX	**2691-41-0**	**7.90E+00**	**1.30E+00**	**Risk**	**Yes**	**Exceeds SSL**	**1/81**	**LL7ss-014M-SO**	**11/09/04**
Nitrocellulose	9004-70-0	1.56E+02	1.30E+04	Risk	No	Below SSL	0/25	LL7ss-009M-SO	11/08/04
Nitroglycerin	**55-63-0**	**1.80E+01**	**8.50E-04**	**Risk**	**Yes**	**Exceeds SSL**	**2/65**	**LL7ss-009M-SO**	**11/08/04**
PETN	**78-11-5**	**4.30E-02**	**2.80E-02**	**Risk**	**Yes**	**Exceeds SSL**	**2/49**	**LL7sb-061-5182-SO**	**03/09/10**
RDX	**121-82-4**	**4.50E+01**	**2.70E-04**	**Risk**	**Yes**	**Exceeds SSL**	**6/81**	**LL7ss-014M-SO**	**11/09/04**
Tetryl	479-45-8	4.00E-02	3.70E-01	Risk	No	Below SSL	0/81	LL7sb-069-5212-SO	03/10/10

Table E-4.Initial CMCOPCs Based on Maximum Concentration of SRCs Compared to GSSL for Load Line 7 (continued)

Analyte	CAS Number	Maximum Concentration (mg/kg)	GSSL (mg/kg)	GSSL Type (mg/kg)	Initial CMCOPC? (Yes/No)	CMCOPC Justification	Samples > SSL/Total Samples	Sample ID at Maximum Concentration	Date Collected
Semi-volatile Organic Compounds									
2-Methylnaphthalene	91-57-6	8.80E-02	1.90E-01	Risk	No	Below SSL	0/13	LL7ss-013M-SO	11/09/04
Acenaphthene	83-32-9	8.30E-01	5.50E+00	Risk	No	Below SSL	0/42	LL7ss-013M-SO	11/09/04
Anthracene	120-12-7	1.50E+00	5.80E+01	Risk	No	Below SSL	0/42	LL7sb-061-5182-SO	03/09/10
Benz(a)anthracene	**56-55-3**	**3.10E+00**	**4.25E-03**	**Risk**	**Yes**	**Exceeds SSL**	**31/48**	**LL7ss-013M-SO**	**11/09/04**
Benzenemethanol	**100-51-6**	**7.70E-01**	**4.80E-01**	**Risk**	**Yes**	**Exceeds SSL**	**1/11**	**LL7ss-032M-SO**	**11/10/04**
Benzo(a)pyrene	**50-32-8**	**2.30E+00**	**2.40E-01**	**MCL**	**Yes**	**Exceeds SSL**	**11/48**	**LL7ss-013M-SO**	**11/09/04**
Benzo(b)fluoranthene	**205-99-2**	**3.00E+00**	**4.10E-02**	**Risk**	**Yes**	**Exceeds SSL**	**27/48**	**LL7ss-013M-SO**	**11/09/04**
Benzo(ghi)perylene	191-24-2	9.70E-01	1.30E+01[a]	Risk	No	Below SSL	0/42	LL7sb-061-5182-SO	03/09/10
Benzo(k)fluoranthene	**207-08-9**	**1.90E+00**	**4.00E-01**	**Risk**	**Yes**	**Exceeds SSL**	**2/42**	**LL7ss-013M-SO**	**11/09/04**
Bis(2-ethylhexyl)phthalate	117-81-7	6.10E-01	1.40E+00	MCL	No	Below SSL	0/13	LL7ss-078M-5069-SO	03/15/10
Carbazole	86-74-8	8.50E-01	NA	NA	No	No SSL	0/13	LL7ss-013M-SO	11/09/04
Chrysene	**218-01-9**	**3.30E+00**	**1.20E+00**	**Risk**	**Yes**	**Exceeds SSL**	**2/42**	**LL7ss-013M-SO**	**11/09/04**
Dibenz(a,h)anthracene	**53-70-3**	**4.20E-01**	**1.30E-02**	**Risk**	**Yes**	**Exceeds SSL**	**16/48**	**LL7ss-013M-SO**	**11/09/04**
Dibenzofuran	**132-64-9**	**2.10E-01**	**1.50E-01**	**Risk**	**Yes**	**Exceeds SSL**	**1/13**	**LL7ss-013M-SO**	**11/09/04**
Diethyl phthalate	84-66-2	1.60E-02	6.10E+00	Risk	No	Below SSL	0/13	LL7ss-078M-5069-SO	03/15/10
Fluoranthene	206-44-0	8.20E+00	8.90E+01	Risk	No	Below SSL	0/42	LL7ss-013M-SO	11/09/04
Fluorene	86-73-7	7.10E-01	5.40E+00	Risk	No	Below SSL	0/42	LL7sb-061-5182-SO	03/09/10
Indeno (1,2,3-cd)pyrene	**193-39-5**	**8.60E-01**	**1.30E-01**	**Risk**	**Yes**	**Exceeds SSL**	**7/42**	**LL7sb-061-5182-SO**	**03/09/10**
Naphthalene	**91-20-3**	**5.00E-01**	**5.40E-04**	**Risk**	**Yes**	**Exceeds SSL**	**21/42**	**LL7sb-061-5182-SO**	**03/09/10**
Phenanthrene	85-01-8	5.20E+00	1.30E+01[a]	Risk	No	Below SSL	0/42	LL7ss-013M-SO	11/09/04
Pyrene	129-00-0	5.90E+00	1.30E+01	Risk	No	Below SSL	0/42	LL7ss-013M-SO	11/09/04
Volatile Organic Compounds									
2-Butanone	78-93-3	1.80E-03	1.20E+00	Risk	No	Below SSL	0/13	LL7sb-064-5194-SO	03/11/10
Acetone	67-64-1	1.10E-02	2.90E+00	Risk	No	Below SSL	0/13	LL7ss-023D-SO	11/09/04
Dimethylbenzene	1330-20-7	1.80E-03	9.80E+00	MCL	No	Below SSL	0/13	LL7ss-051D-SO	08/13/07
Ethylbenzene	100-41-4	3.40E-04	7.80E-01	MCL	No	Below SSL	0/13	LL7ss-051D-SO	08/13/07
Pesticides/PCBs									
PCB-1254	**11097-69-1**	**7.00E-02**	**2.00E-03**	**Risk**	**Yes**	**Exceeds SSL**	**1/13**	**LL7ss-005M-SO**	**11/08/04**

[a]Pyrene C_w and Generic SSL was used as a surrogate for benzo(*ghi*)perylene and phenanthrene.
CAS = Chemical Abstract Service.
CMCOPC = Contaminant Migration Chemical of Potential Concern.
GSSL = Generic Soil Screening Level.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
MCL = Maximum Contaminant Level.
mg/kg = Milligrams per Kilogram.
NA = Not Available.
PCB = Polychlorinated Biphenyl.
PETN = Pentaerythrite Tetranitrate.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related Contaminant.
SSL = Soil Screening Level.
Bold = SRCs that exceed the GSSL.

Table E-5. DAF Calculation for Load Line 7

$$DAF = 1 + \frac{(K \times i \times d)}{(q \times L)}$$

$$d = \sqrt{0.0112 \times L^2} + d_a \times \left[1 - \exp\left(\frac{-L \times q}{K \times i \times d_a}\right)\right]$$

Parameter	Symbol	Value	Unit	Note
DAF	DAF	2.48	unitless	Calculated from DAF equation shown above
Aquifer hydraulic conductivity	K	7.00E+01	m/year	Average from RVAAP range in MKM 2007
Horizontal hydraulic gradient	i	8.34E-03	m/m	Determined from Figure 3-1
Percolation rate	q	9.40E-02	m/year	Developed from HELP model from Cleveland, Ohio, weather data
Source length parallel to groundwater flow	L	15.0	m	Based on average area for all ISM areas for Load Line 7
Mixing zone depth	d	3.58	m	Determined from the lower value between above equation for "d" (d = 3.58 m) and d_a
Aquifer thickness	d_a	6	m	Facility-wide assumption for the unconsolidated aquifer presented in the Load Line 1 investigation (USACE 2003)

DAF = Dilution Attenuation Factor.
HELP = Hydrologic Evaluation of Landfill Performance.
ISM = Incremental Sampling Method.
m = Meter.
RVAAP = Ravenna Army Ammunition Plant.
MKM (MKM Engineers) 2007. *Final Characterization of 14 AOCs at Ravenna Army Ammunition Plant: Characterization of NACA Test Area*. March 2007.
USACE (United States Army Corp of Engineers) 2003. *Phase II Remedial Investigation Report for the Load Line 1 at the Ravenna Army Ammunition Plant, Ravenna, Ohio*. June 2003.

Table E-6. Initial CMCOPCs Based on Comparison of the SRC's Maximum Concentration at Load Line 7 with a DAF of 2.48

Analyte	CAS Number	Maximum Concentration (mg/kg)	SSSL (mg/kg)	Initial CMCOPC? (Yes/No)	CMCOPC Justification	Samples > SSL/ Total Samples	Sample ID at Maximum Concentration	Date Collected
Metals								
Arsenic	**7440-38-2**	**2.70E+01**	**7.19E-01**	**Yes**	**Exceeds SSSL**	**81/81**	**LL7sb-068-5208-SO**	**03/10/10**
Barium	7440-39-3	1.60E+02	2.03E+02	No	Below SSSL	16/81	LL7ss-002M-SO	11/08/04
Cadmium	**7440-43-9**	**8.50E+00**	**9.42E-01**	**Yes**	**Exceeds SSSL**	**10/81**	**LL7ss-073M-5064-SO**	**03/15/10**
Cobalt	**7440-48-4**	**1.34E+01**	**6.70E-01**	**Yes**	**Exceeds SSSL**	**81/81**	**LL7sb-060-5178-SO**	**03/09/10**
Copper	7440-50-8	8.80E+01	1.14E+02	No	Below SSSL	2/81	LL7ss-018M-SO	11/10/04
Lead	**7439-92-1**	**1.60E+02**	**3.47E+01**	**Yes**	**Exceeds SSSL**	**66/81**	**LL7ss-004M-SO**	**11/08/04**
Manganese	**7439-96-5**	**1.60E+03**	**6.94E+01**	**Yes**	**Exceeds SSSL**	**81/81**	**LL7ss-002M-SO**	**11/08/04**
Mercury	**7439-97-6**	**4.00E-01**	**2.48E-01**	**Yes**	**Exceeds SSSL**	**4/81**	**LL7ss-004M-SO**	**11/08/04**
Nickel	7440-02-0	3.30E+01	6.45E+01	No	Below SSSL	11/81	LL7sb-062-5187-SO	3/11/2010
Selenium	**7782-49-2**	**2.50E+00**	**6.45E-01**	**Yes**	**Exceeds SSSL**	**68/81**	**LL7sd-029M-SD**	**11/09/04**
Silver	**7440-22-4**	**8.00E+01**	**1.98E+00**	**Yes**	**Exceeds SSSL**	**2/81**	**LL7ss-027M-SO**	**11/10/04**
Thallium	7440-28-0	3.10E-01	3.47E-01	No	Below SSSL	21/81	LL7ss-007M-SO	11/08/04
Zinc	**7440-66-6**	**9.99E+02**	**9.18E+02**	**Yes**	**Exceeds SSSL**	**1/81**	**LL7ss-073M-5064-SO**	**03/15/10**
Explosives								
2,4,6-Trinitrotoluene	**118-96-7**	**2.70E+00**	**3.72E-02**	**Yes**	**Exceeds SSSL**	**3/81**	**LL7ss-014M-SO**	**11/09/04**
2,6-Dinitrotoluene	**606-20-2**	**2.80E-01**	**1.66E-04**	**Yes**	**Exceeds SSSL**	**1/81**	**LL7ss-013M-SO**	**11/09/04**
2-Amino-4,6-dinitrotoluene	**35572-78-2**	**1.00E-01**	**7.44E-02**	**Yes**	**Exceeds SSSL**	**1/81**	**LL7ss-013M-SO**	**11/09/04**
3-Nitrotoluene	**99-08-1**	**1.30E-01**	**3.97E-03**	**Yes**	**Exceeds SSSL**	**5/81**	**LL7ss-013M-SO**	**11/09/04**
HMX	**2691-41-0**	**7.90E+00**	**3.22E+00**	**Yes**	**Exceeds SSSL**	**1/81**	**LL7ss-014M-SO**	**11/09/04**
Nitroglycerin	**55-63-0**	**1.80E+01**	**2.11E-03**	**Yes**	**Exceeds SSSL**	**2/65**	**LL7ss-009M-SO**	**11/08/04**
PETN	78-11-5	4.30E-02	6.94E-02	No	Below SSSL	2/49	LL7sb-061-5182-SO	3/9/2010
RDX	**121-82-4**	**4.50E+01**	**6.70E-04**	**Yes**	**Exceeds SSSL**	**6/81**	**LL7ss-014M-SO**	**11/09/04**
Semi-volatile Organic Compounds								
Benz(*a*)anthracene	**56-55-3**	**3.10E+00**	**1.05E-02**	**Yes**	**Exceeds SSSL**	**24/42**	**LL7ss-013M-SO**	**11/09/04**
Benzenemethanol	100-51-6	7.70E-01	1.19E+00	No	Below SSSL	1/11	LL7ss-032M-SO	11/10/04
Benzo(*a*)pyrene	**50-32-8**	**2.30E+00**	**5.95E-01**	**Yes**	**Exceeds SSSL**	**7/42**	**LL7ss-013M-SO**	**11/09/04**
Benzo(*b*)fluoranthene	**205-99-2**	**3.00E+00**	**1.02E-01**	**Yes**	**Exceeds SSSL**	**22/42**	**LL7ss-013M-SO**	**11/09/04**
Benzo(*k*)fluoranthene	**207-08-9**	**1.90E+00**	**9.92E-01**	**Yes**	**Exceeds SSSL**	**2/42**	**LL7ss-013M-SO**	**11/09/04**
Chrysene	**218-01-9**	**3.30E+00**	**2.98E+00**	**Yes**	**Exceeds SSSL**	**2/42**	**LL7ss-013M-SO**	**11/09/04**
Dibenz(*a,h*)anthracene	**53-70-3**	**4.20E-01**	**3.22E-02**	**Yes**	**Exceeds SSSL**	**11/42**	**LL7ss-013M-SO**	**11/09/04**
Dibenzofuran	132-64-9	2.10E-01	3.72E-01	No	Below SSSL	1/13	LL7ss-013M-SO	11/9/2004
Indeno(1,2,3-*cd*)pyrene	**193-39-5**	**8.60E-01**	**3.22E-01**	**Yes**	**Exceeds SSSL**	**7/42**	**LL7sb-061-5182-SO**	**03/09/10**
Naphthalene	**91-20-3**	**5.00E-01**	**1.34E-03**	**Yes**	**Exceeds SSSL**	**21/42**	**LL7sb-061-5182-SO**	**03/09/10**

Table E-6. Initial CMCOPCs Based on Comparison of the SRC's Maximum Concentration at Load Line 7 with a DAF of 2.48 (continued)

Analyte	CAS Number	Maximum Concentration (mg/kg)	SSSL (mg/kg)	Initial CMCOPC? (Yes/No)	CMCOPC Justification	Samples > SSL/ Total Samples	Sample ID at Maximum Concentration	Date Collected
Pesticides/PCBs								
PCB-1254	**11097-69-1**	**7.00E-02**	**4.96E-03**	**Yes**	**Exceeds SSSL**	**1/13**	**LL7ss-005M-SO**	**11/08/04**

CAS = Chemical Abstract Service.
CMCOPC = Contaminant Migration Chemical of Potential Concern.
DAF = Dilution Attenuation Factor.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
mg/kg = Milligrams per Kilogram.
PCB = Polychlorinated Biphenyl.
PETN = Pentaerythritol tetranitrate.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related Contaminant.
SSL = Soil Screening Level.
SSSL = Site-specific Soil Screening Level; generic SSL multiplied by the DAF.
Bold = SRCs that exceed the SSSL.

Table E-7. Initial CMCOPCs Based on Arrival Time to Groundwater Table in Less Than or Equal to 1,000 Years at Load Line 7

$$R = 1 + \frac{\rho_b K_d}{\theta_w} \qquad T = L_z \theta_w R / q \qquad T = L_z \theta_w R / q$$

Parameter	Symbol	Value	Unit	Note
Percolation rate	q	0.31	ft/year	Developed from HELP model from Cleveland, Ohio, weather data
Soil-water distribution coefficient	K_d	chemical-specific	L/kg	See footnotes below for references
Organic carbon distribution coefficient	K_{oc}	chemical-specific	L/kg	See footnotes below for references
Fraction organic carbon	f_{oc}	0.0008	unitless	From PBA08 RI geotechnical samples LL7SB-067-5205-SO and LL7SB-090-5206-SO
Water-filled soil porosity	θ_w	0.3342	unitless	
Bulk density (dry)	ρ_b	1.63	gm/cm^3	
Leaching zone	L_z	0 to 17	ft	Distance from last layer of soil contamination greater than background concentration to top of water table
Retardation factor	R	chemical-specific		Calculated by equation shown above
Arrival time	T	chemical-specific	year	Calculated by equation shown above

CMCOPC = Contaminant Migration Chemical of Potential Concern.
ft = Feet.
gm/cm^3 = Grams per Cubic Centimeters.
HELP = Hydrologic Evaluation of Landfill Performance.
L/kg = Liters per Kilogram.
PBA08 RI = Performance Based Acquisition 2008 Remedial Investigation.

Table E-7. Initial CMCOPCs Based on Arrival Time to Groundwater Table in Less Than or Equal to 1,000 Years at Load Line 7 (continued)

Analyte	Initial CMCOPC Sample ID	Sample Depth[a] (ft)	Lz[b] (ft)	K_{oc} (L/kg)	Reference	K_d (L/kg)	Reference	Retardation Factor (R)	Arrival Time (T) From Sample Max Depth to Groundwater (year)	Is T <1,000? (Yes/No)
Metals										
Arsenic	LL7sb-068-5208-SO	1.0 - 4.0	9.0	NA	-	2.90E+01	c	1.42E+02	1,382	No
Cadmium	LL7ss-073M-5064-SO	0.0 - 1.0	13.0	NA	-	7.50E+01	c	3.67E+02	5,141	No
Cobalt	LL7ss-032M-SO	0.0 - 1.0	12.0	NA	-	4.50E+01	c	2.20E+02	2,850	No
Lead	**LL7sb-069-5214-SO**	**7.0 - 13.0**	**0.0**	**NA**	**-**	**9.00E+02**	**c**	**4.39E+03**	**0**	**Yes**
Manganese	LL7ss-002M-SO	0.0 - 1.0	12.0	NA	-	6.50E+01	c	3.18E+02	4,110	No
Mercury	LL7ss-004M-SO	0.0 - 1.0	12.0	NA	-	5.20E+01	c	2.55E+02	3,294	No
Selenium	**LL7sd-029M-SD**	**0.0 - 1.0**	**13.0**	**NA**	**-**	**5.00E+00**	**c**	**2.54E+01**	**356**	**Yes**
Silver	**LL7ss-027M-SO**	**0.0 - 1.0**	**17.0**	**NA**	**-**	**8.30E+00**	**c**	**4.15E+01**	**760**	**Yes**
Zinc	LL7ss-073M-5064-SO	0.0 - 1.0	13.0	NA	-	6.20E+01	c	3.03E+02	4,250	No
Explosives										
2,4,6-Trinitrotoluene	**LL7ss-014M-SO**	**0.0 - 1.0**	**12.0**	**2.81E+03**	**c**	**2.25E+00**	**d**	**1.20E+01**	**155**	**Yes**
2,6-Dinitrotoluene	**LL7ss-013M-SO**	**0.0 - 1.0**	**12.0**	**5.87E+02**	**c**	**4.70E-01**	**d**	**3.29E+00**	**43**	**Yes**
2-Amino-4,6-dinitrotoluene	**LL7ss-013M-SO**	**0.0 - 1.0**	**12.0**	**2.83E+02**	**c**	**2.26E-01**	**d**	**2.10E+00**	**27.2**	**Yes**
3-Nitrotoluene	**LL7ss-013M-SO**	**0.0 - 1.0**	**12.0**	**3.63E+02**	**c**	**2.91E-01**	**d**	**2.42E+00**	**31**	**Yes**
HMX	**LL7ss-014M-SO**	**0.0 - 1.0**	**12.0**	**5.32E+02**	**c**	**4.25E-01**	**d**	**3.07E+00**	**40**	**Yes**
Nitroglycerin	**LL7ss-009M-SO**	**0.0 - 1.0**	**9.0**	**1.16E+02**	**c**	**9.26E-02**	**d**	**1.45E+00**	**14**	**Yes**
RDX	**LL7sb-069-5214-SO**	**7.0 - 13.0**	**0.0**	**8.91E+01**	**c**	**7.13E-02**	**d**	**1.35E+00**	**0**	**Yes**
Semi-volatile Organic Compounds										
Benz(*a*)anthracene	LL7sb-069-5213-SO	4.0 - 7.0	4.0	1.77E+05	c	1.42E+02	d	6.91E+02	2,981	No
Benzo(*a*)pyrene	LL7sb-061-5182-SO	1.0 - 4.0	6.0	5.87E+05	c	4.70E+02	d	2.29E+03	14,822	No
Benzo(*b*) fluoranthene	**LL7sb-069-5214-SO**	**7.0 - 13.0**	**0.0**	**5.99E+05**	**c**	**4.80E+02**	**d**	**2.34E+03**	**0**	**Yes**
Benzo(*k*) fluoranthene	LL7sb-061-5182-SO	1.0 - 4.0	6.0	5.87E+05	c	4.70E+02	d	2.29E+03	14,822	No
Chrysene	LL7sb-061-5182-SO	1.0 - 4.0	6.0	1.81E+05	c	1.44E+02	d	7.07E+02	4,575	No
Dibenz(*a*,*h*) anthracene	LL7sb-069-5213-SO	4.0 - 7.0	4.0	1.91E+06	c	1.53E+03	d	7.45E+03	32,142	No
Indeno(1,2,3-*cd*) pyrene	LL7sb-061-5182-SO	1.0 - 4.0	6.0	1.95E+06	c	1.56E+03	d	7.61E+03	49,222	No
Naphthalene	**LL7sb-061-5183-SO**	**4.0 - 7.0**	**3.0**	**1.54E+03**	**c**	**1.23E+00**	**d**	**7.01E+00**	**23**	**Yes**

Table E-7. Initial CMCOPCs Based on Arrival Time to Groundwater Table in Less Than or Equal to 1,000 Years at Load Line 7 (continued)

Analyte	Initial CMCOPC Sample ID	Sample Depth[a] (ft)	Lz[b] (ft)	K_{oc} (L/kg)	Reference	K_d (L/kg)	Reference	Retardation Factor (R)	Arrival Time (T) From Sample Max Depth to Groundwater (year)	Is T <1,000? (Yes/No)
Pesticides/PCBs										
PCB-1254	LL7ss-005M-SO	0.0 - 1.0	13.0	1.31E+05	e	1.04E+02	g	5.12E+02	7,178	No

[a]The maximum depth of an initial CMCOPC (based on the maximum depth that an analyte is detected above facility-wide background).
[b]Based on each average depth to water from ground surface and depth of soil sample.
[c]U.S. Environmental Protection Agency (USEPA) regional screening levels (RSL) Generic Tables June 2015; found at: < http://www2.epa.gov/risk/risk-based-screening-table-generic-tables>.
[d]K_d value for organic chemicals calculated by multiplying K_{oc} by fraction organic carbon (f_{oc}) of 0.0008 (average from Performance Based Acquisition 2008 Remedial Investigation geotechnical samples LL7SB-067-5205-SO and LL7SB-090-5206-SO).
CMCOPC = Contaminant Migration Chemical of Potential Concern.
ft = Feet.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
K_d = Distribution Coefficient.
K_{oc} = Organic Carbon Partition Coefficient.
L/kg = Liters per Kilogram.
Lz = Leaching Zone.
NA = Not Applicable.
PCB = Polychlorinated Biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
Bold = Initial CMCOPCs that exceed the 1,000-year travel time screen.

Table E-8. Climatic Data from SESOIL for Load Line 7

Month	Air Temp (°C)	Cloud Cover	Humidity	Albedo	Evapotranspiration[a] (cm/day)	Precipitation (cm)	Duration (days)	Storms per Month	Model Days in Month
October	12	0.60	0.70	0.17	0.00	6.46	0.42	5.33	30.4
November	5.22	0.70	0.75	0.24	0.00	7.4	0.53	6.67	30.4
December	-1.06	0.80	0.75	0.31	0.00	7.06	0.57	6.14	30.4
January	-2.94	0.80	0.80	0.3	0.00	7.06	0.61	5.69	30.4
February	-2.33	0.70	0.75	0.32	0.00	5.76	0.53	5.09	30.4
March	2.33	0.70	0.70	0.29	0.00	8.26	0.55	7.14	30.4
April	9.11	0.70	0.70	0.19	0.00	8.83	0.48	7.4	30.4
May	14.61	0.60	0.70	0.16	0.00	8.46	0.45	7.15	30.4
June	19.89	0.60	0.70	0.16	0.00	9.07	0.36	6.57	30.4
July	21.89	0.50	0.70	0.16	0.00	9.8	0.3	6.06	30.4
August	21.11	0.55	0.70	0.16	0.00	8.14	0.3	6.06	30.4
September	17.67	0.55	0.70	0.16	0.00	7.85	0.4	5.44	30.4

[a]Data calculated in SESOIL model; 0.00 indicates evapotranspiration is calculated from other climatic data 1996 data from Youngstown, Ohio, Weather Service Office – Airport Station.
cm/day = Centimeters per Day.
SESOIL = Seasonal Soil Compartment.

Table E-9. Physical and Chemical Properties of Initial CMCOPCs Selected for SESOIL Modeling for Load Line 7

Initial CMCOPC	Molecular Weight	Solubility (mg/L)	Reference	K_d (L/kg)[a]	Reference	Diffusion Coefficient in Air (cm^2/sec)	Reference	Biodegradation Rate (1/day)	Sample Location	Application Area (cm^2)
Metals										
Lead	207.2	0.00E+00	b	.9.00E+02	b	NA	NA	NA	LL7ss-004M-SO	3.45E+06
Selenium	79.0	0.00E+00	b	5.00E+00	b	NA	NA	NA	LL7sd-029M-SD	2.24E+06[c]
Silver	107.9	0.00E+00	b	8.30E+00	b	NA	NA	NA	LL7ss-027M-SO	3.69E+06
Explosives										
2,4,6-Trinitrotoluene	227.1	1.15E+02	b	2.25E+00	b	3.0E-02	b	NA	LL7ss-014M-SO	2.57E+06
2,6-Dinitrotoluene	182.1	1.82E+02	b	4.70E-01	b	3.7E-02	b	NA	LL7ss-013M-SO	1.84E+06
2-Amino-4,6-dinitrotoluene	197.2	3.19E+02	b	2.26E-01	b	5.6E-02	b	NA	LL7ss-013M-SO	1.84E+06
3-Nitrotoluene	137.1	5.00E+02	b	2.91E-01	b	5.9E-02	b	NA	LL7ss-013M-SO	1.84E+06
HMX	296.2	5.00E+00	b	4.25E-01	b	4.3E-02	b	NA	LL7ss-014M-SO	2.57E+06
Nitroglycerin	227.1	1.38E+03	b	9.26E-02	b	2.9E-02	b	NA	LL7ss-009M-SO	1.35E+06
RDX	222.1	5.97E+01	b	7.13E-02	b	3.1E-02	b	NA	LL7ss-014M-SO	2.57E+06
Semi-volatile Organic Compounds										
Benzo(*b*)fluoranthene	252.3	1.50E-03	b	4.80E+02	b	4.8E-02	b	NA	LL7ss-013M-SO	1.84E+06
Naphthalene	128.2	3.10E+01	b	1.23E+00	b	6.0E-02	b	NA	LL7sb-061-5182-SO	1.16E+06

[a]K_d value for organic chemicals calculated by multiplying organic carbon partition coefficient (K_{oc}) by fraction organic carbon (f_{oc}) of 0.0008 (average from Performance Based Acquisition 2008 Remedial Investigation geotechnical samples LL7SB-067-5205-SO and LL7SB-090-5206-SO).
[b]U.S. Environmental Protection Agency (USEPA) regional screening level (RSL) Generic Tables June 2015; found at: < http://www2.epa.gov/risk/risk-based-screening-table-generic-tables>.
[c]The application area for LL7sd-029M-SD was based on the average application area for all incremental sampling method areas located within the area of concern.
CMCOPC = Contaminant Migration Chemical of Potential Concern.
cm^2/sec = Square Centimeters per Second.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
K_d = Distribution Coefficient.
L/kg = Liters per Kilogram.
mg/L = Milligrams per Liter.
NA = Not Applicable.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SESOIL = Seasonal Soil Compartment.

Table E-10. Load Application Data for SESOIL Model at Load Line 7

13-ft-Thick Vadose Zone for Lead at Load Line 7

Analyte	Number of Layers	Layer Number	Thickness of Layer (ft)	Number of Sublayers	Sublayer Number	Maximum Concentration (mg/kg)	Layer Purpose
Lead	4	1	1	2	1	160.0	Contaminant Loading
					2	160.0	
		2	6	4	1	0.0	Leaching
					2	0.0	
					3	0.0	
					4	0.0	
		3	5.5	2	1	0.0	
					2	0.0	
		4	0.5	1	1	0.0	

14-ft-Thick Vadose Zone for Selenium at Load Line 7

Analyte	Number of Layers	Layer Number	Thickness of Layer (ft)	Number of Sublayers	Sublayer Number	Maximum Concentration (mg/kg)	Layer Purpose
Selenium	4	1	1	2	1	2.5	Contaminant Loading
					2	2.5	
		2	6	4	1	0.0	Leaching
					2	0.0	
					3	0.0	
					4	0.0	
		3	6.5	2	1	0.0	
					2	0.0	
		4	0.5	1	1	0.0	

18-ft-Thick Vadose Zone for Silver at Load Line 7

Analyte	Number of Layers	Layer Number	Thickness of Layer (ft)	Number of Sublayers	Sublayer Number	Maximum Concentration (mg/kg)	Layer Purpose
Silver	4	1	4	4	1	80.0	Contaminant Loading
					2	0.11	
					3	0.11	
					4	0.11	
		2	7	4	1	0.0	Leaching
					2	0.0	
					3	0.0	
					4	0.0	
		3	6.5	2	1	0.0	
					2	0.0	
		4	0.5	1	1	0.0	

Table E-10. Load Application Data for SESOIL Model at Load Line 7 (continued)

13-ft-Thick Vadose Zone for 2,4,6-Trinitrotoluene at Load Line 7

Analyte	Number of Layers	Layer Number	Thickness of Layer (ft)	Number of Sublayers	Sublayer Number	Maximum Concentration (mg/kg)	Layer Purpose
2,4,6-Trinitrotoluene	4	1	1	2	1	2.7	Contaminant Loading
					2	2.7	
		2	6	4	1	0.0	Leaching
					2	0.0	
					3	0.0	
					4	0.0	
		3	5.5	2	1	0.0	
					2	0.0	
		4	0.5	1	1	0.0	

13-ft-Thick Vadose Zone for 2,6-Dinitrotoluene at Load Line 7

Analyte	Number of Layers	Layer Number	Thickness of Layer (ft)	Number of Sublayers	Sublayer Number	Maximum Concentration (mg/kg)	Layer Purpose
2,6-Dinitrotoluene	4	1	1	2	1	0.28	Contaminant Loading
					2	0.28	
		2	6	4	1	0.0	Leaching
					2	0.0	
					3	0.0	
					4	0.0	
		3	5.5	2	1	0.0	
					2	0.0	
		4	0.5	1	1	0.0	

13-ft-Thick Vadose Zone for 2-Amino-4,6-Dinitrotoluene at Load Line 7

Analyte	Number of Layers	Layer Number	Thickness of Layer (ft)	Number of Sublayers	Sublayer Number	Maximum Concentration (mg/kg)	Layer Purpose
2-Amino-4,6-Dinitrotoluene	4	1	1	2	1	0.1	Contaminant Loading
					2	0.1	
		2	6	4	1	0.0	Leaching
					2	0.0	
					3	0.0	
					4	0.0	
		3	5.5	2	1	0.0	
					2	0.0	
		4	0.5	1	1	0.0	

Table E-10. Load Application Data for SESOIL Model at Load Line 7 (continued)

13-ft-Thick Vadose Zone for 3-Nitrotoluene at Load Line 7

Analyte	Number of Layers	Layer Number	Thickness of Layer (ft)	Number of Sublayers	Sublayer Number	Maximum Concentration (mg/kg)	Layer Purpose
3-Nitrotoluene	4	1	1	2	1	0.13	Contaminant Loading
					2	0.13	
		2	6	4	1	0.0	Leaching
					2	0.0	
					3	0.0	
					4	0.0	
		3	5.5	2	1	0.0	
					2	0.0	
		4	0.5	1	1	0.0	

13-ft-Thick Vadose Zone for HMX at Load Line 7

Analyte	Number of Layers	Layer Number	Thickness of Layer (ft)	Number of Sublayers	Sublayer Number	Maximum Concentration (mg/kg)	Layer Purpose
HMX	4	1	1	2	1	7.9	Contaminant Loading
					2	7.9	
		2	6	4	1	0.0	Leaching
					2	0.0	
					3	0.0	
					4	0.0	
		3	5.5	2	1	0.0	
					2	0.0	
		4	0.5	1	1	0.0	

10-ft-Thick Vadose Zone for Nitroglycerin at Load Line 7

Analyte	Number of Layers	Layer Number	Thickness of Layer (ft)	Number of Sublayers	Sublayer Number	Maximum Concentration (mg/kg)	Layer Purpose
Nitroglycerin	4	1	1	2	1	18.0	Contaminant Loading
					2	18.0	
		2	4	4	1	0.0	Leaching
					2	0.0	
					3	0.0	
					4	0.0	
		3	4.5	2	1	0.0	
					2	0.0	
		4	0.5	1	1	0.0	

Table E-10. Load Application Data for SESOIL Model at Load Line 7 (continued)

13-ft-Thick Vadose Zone for RDX at Load Line 7

Analyte	Number of Layers	Layer Number	Thickness of Layer (ft)	Number of Sublayers	Sublayer Number	Maximum Concentration (mg/kg)	Layer Purpose
RDX	4	1	1	2	1	45.0	Contaminant Loading
					2	45.0	
		2	6	4	1	0.0	Leaching
					2	0.0	
					3	0.0	
					4	0.0	
		3	5.5	2	1	0.0	
					2	0.0	
		4	0.5	1	1	0.0	

13-ft-Thick Vadose Zone for Benzo(b)fluoranthene at Load Line 7

Analyte	Number of Layers	Layer Number	Thickness of Layer (ft)	Number of Sublayers	Sublayer Number	Maximum Concentration (mg/kg)	Layer Purpose
Benzo(*b*) fluoranthene	4	1	1	2	1	3.0	Contaminant Loading
					2	3.0	
		2	6	4	1	0.0	Leaching
					2	0.0	
					3	0.0	
					4	0.0	
		3	5.5	2	1	0.0	
					2	0.0	
		4	0.5	1	1	0.0	

10-ft-Thick Vadose Zone for Naphthalene at Load Line 7

Analyte	Number of Layers	Layer Number	Thickness of Layer (ft)	Number of Sublayers	Sublayer Number	Maximum Concentration (mg/kg)	Layer Purpose
Naphthalene	4	1	1	2	1	0.0	Contaminant Loading
					2	0.0	
		2	6	4	1	0.5	
					2	0.5	
					3	0.011	
					4	0.011	
		3	2.5	2	1	0.0	Leaching
					2	0.0	
		4	0.5	1	1	0.0	

Ft = Feet.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
mg/kg = Milligrams per Kilogram.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SESOIL = Seasonal Soil Compartment.

Table E-11. Physical and Chemical Properties of Final CMCOPCs Selected for AT123D Modeling at Load Line 7

Analyte	K_d (L/kg)[a]	Source	Retardation Factor (R)	Source	Diffusion Coefficient in Water (cm^2/sec)	Source	Biodegradation Rate (1/day)	Source
Metals								
Selenium	5.00E+00	c	2.54E+01	b	NA	NA	0.00E+00	NA
Silver	8.30E+00	c	4.15E+01	b	NA	NA	0.00E+00	NA
Explosives								
2,4,6-Trinitrotoluene	2.25E+00	c	1.20E+01	b	7.92E-06	c	0.00E+00	NA
2,6-Dinitrotoluene	4.70E-01	c	3.29E+00	b	7.80E-06	c	0.00E+00	NA
2,Amino-4,6-Dinitrotoluene	2.26E-01	c	2.10E+00	b	6.55E-06	c	0..00E+00	NA
3-Nitrotoluene	2.91E-01	c	2.42E+00	b	8.70E-06	c	0.00E+00	NA
HMX	4.25E-01	c	3.07E+00	b	5.00E-06	c	0.00E+00	NA
Nitroglycerin	9.26E-02	c	1.45E+00	b	7.74E-06	c	0.00E+00	NA
RDX	7.13E-02	c	1.35E+00	b	8.50E-06	c	0.00E+00	NA
Semi-volatile Organic Compounds								
Naphthalene	1.23E+00	c	7.01E+00	b	8.40E-06	c	0.00E+00	NA

[a]Kd value for organic chemicals calculated by multiplying organic carbon partition coefficient (K_{oc}) by fraction organic carbon (f_{oc}) of 0.0008 (average from Performance Based Acquisition 2008 Remedial Investigation geotechnical samples LL7SB-067-5205-SO and LL7SB-090-5206-SO).
[b]R value calculated from the equation in Table E-7.
[c]U.S. Environmental Protection Agency (USEPA) regional screening level (RSL) Generic Tables June 2015; found at: < http://www2.epa.gov/risk/risk-based-screening-table-generic-tables>.
AT123D = Analytical Transient 1-,2-,3-Dimensional.
CMCOPC = Contaminant Migration Chemical of Potential Concern.
cm/sec^2 = Square Centimeters per Second.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
L/kg = Liters per Kilogram.
K_d = Distribution Coefficient.
NA = Not Applicable.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.

THIS PAGE INTENTIONALLY LEFT BLANK.

Figures

THIS PAGE INTENTIONALLY LEFT BLANK.

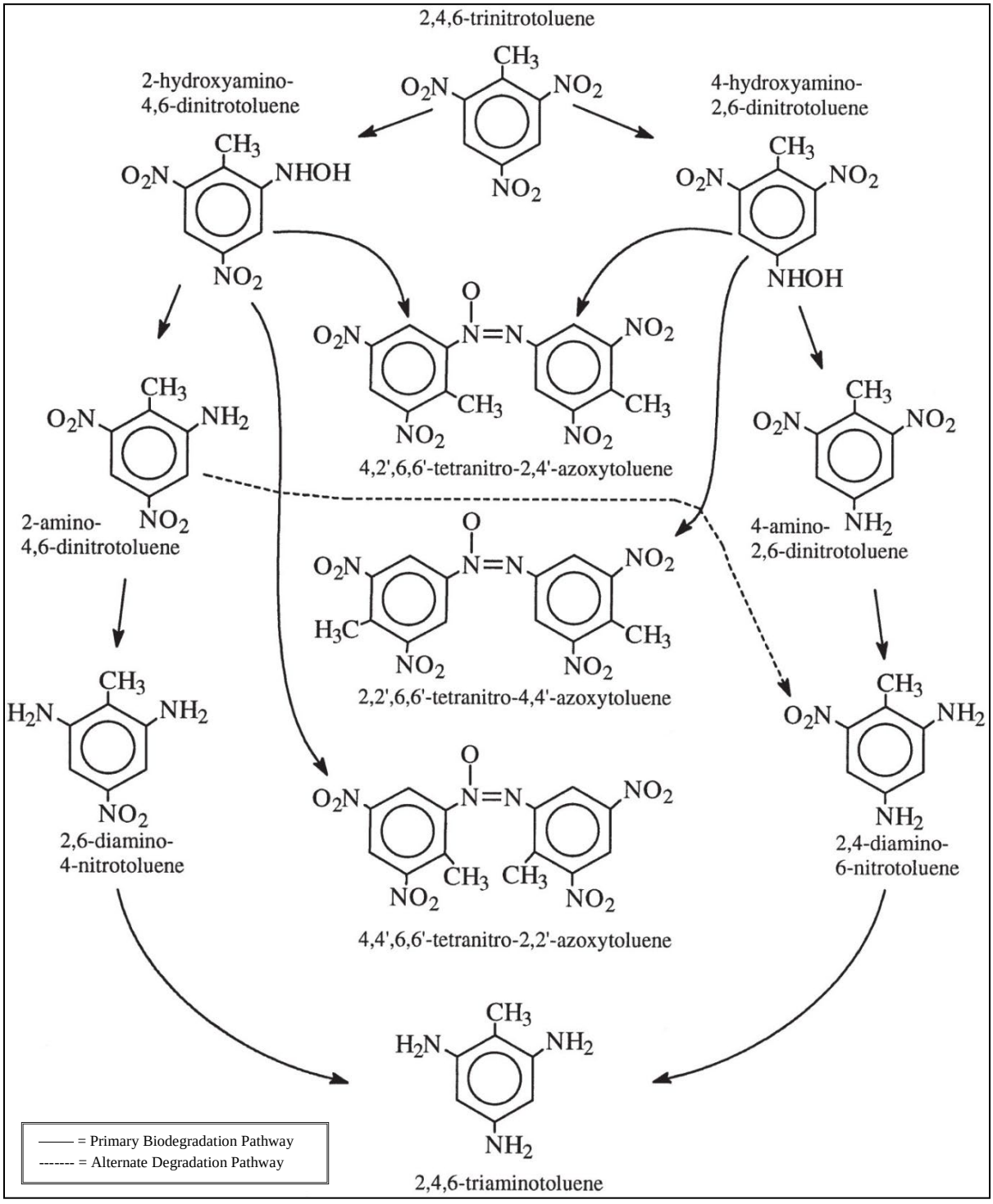

Figure E-1. TNT Biotransformation Pathway

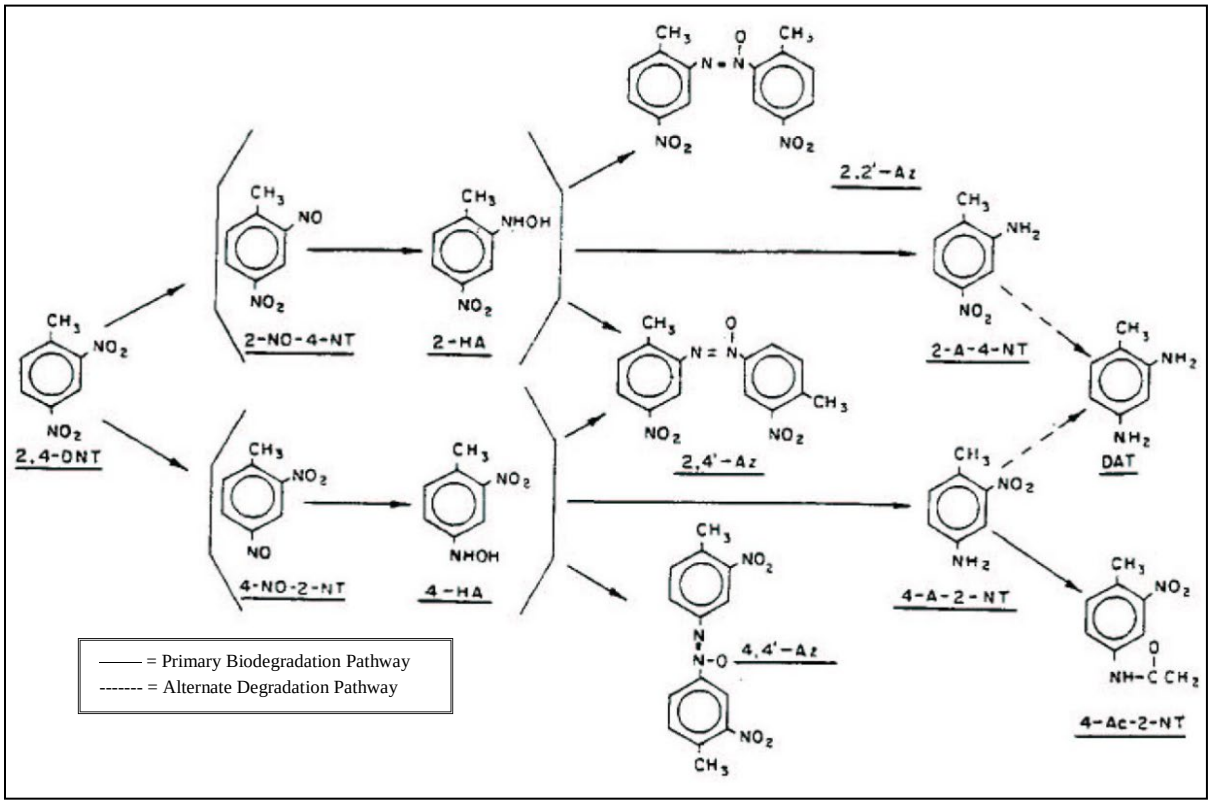

Figure E-2. 2,4-DNT Biotransformation Pathway

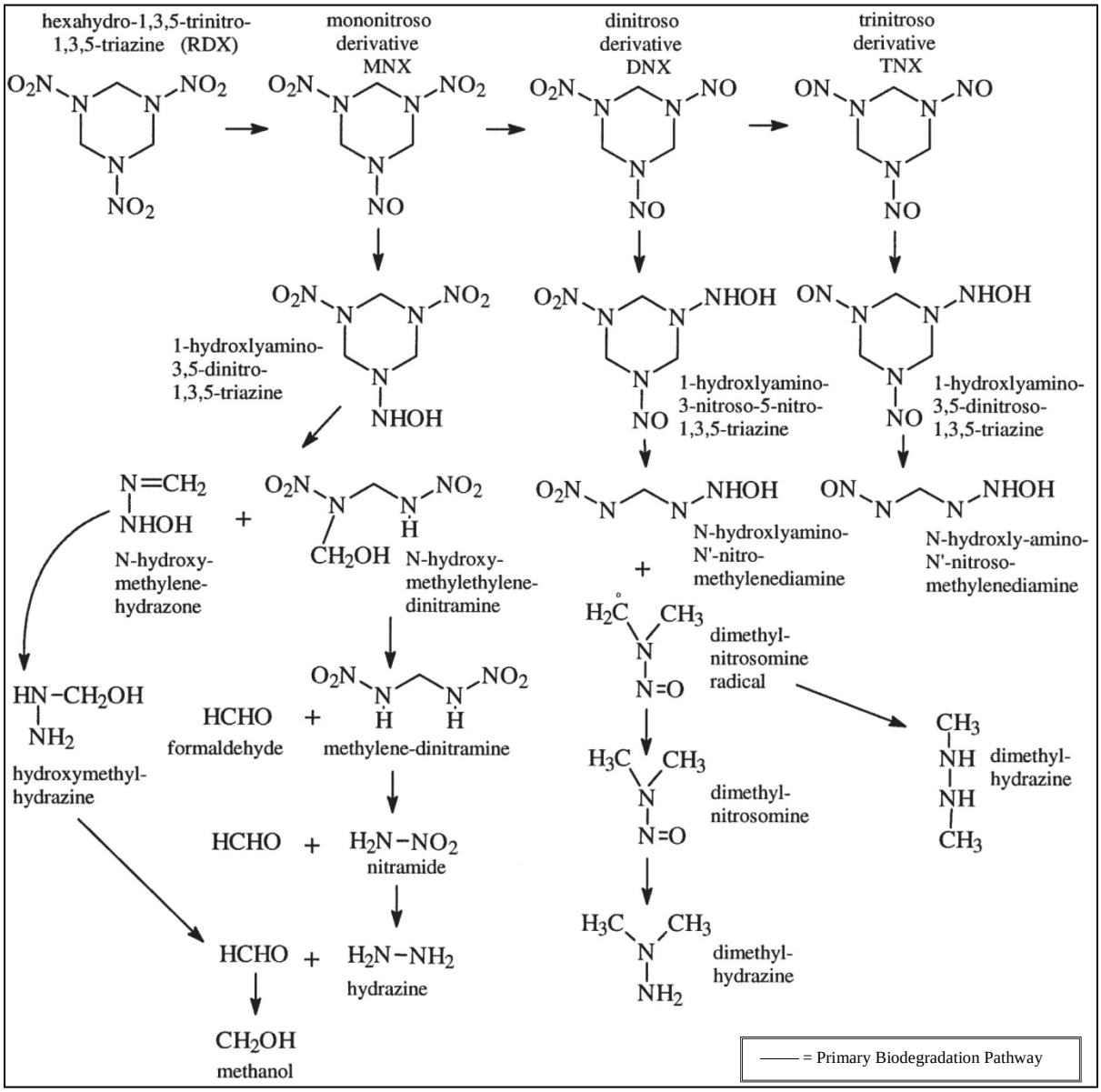

Figure E-3. RDX Biotransformation Pathway

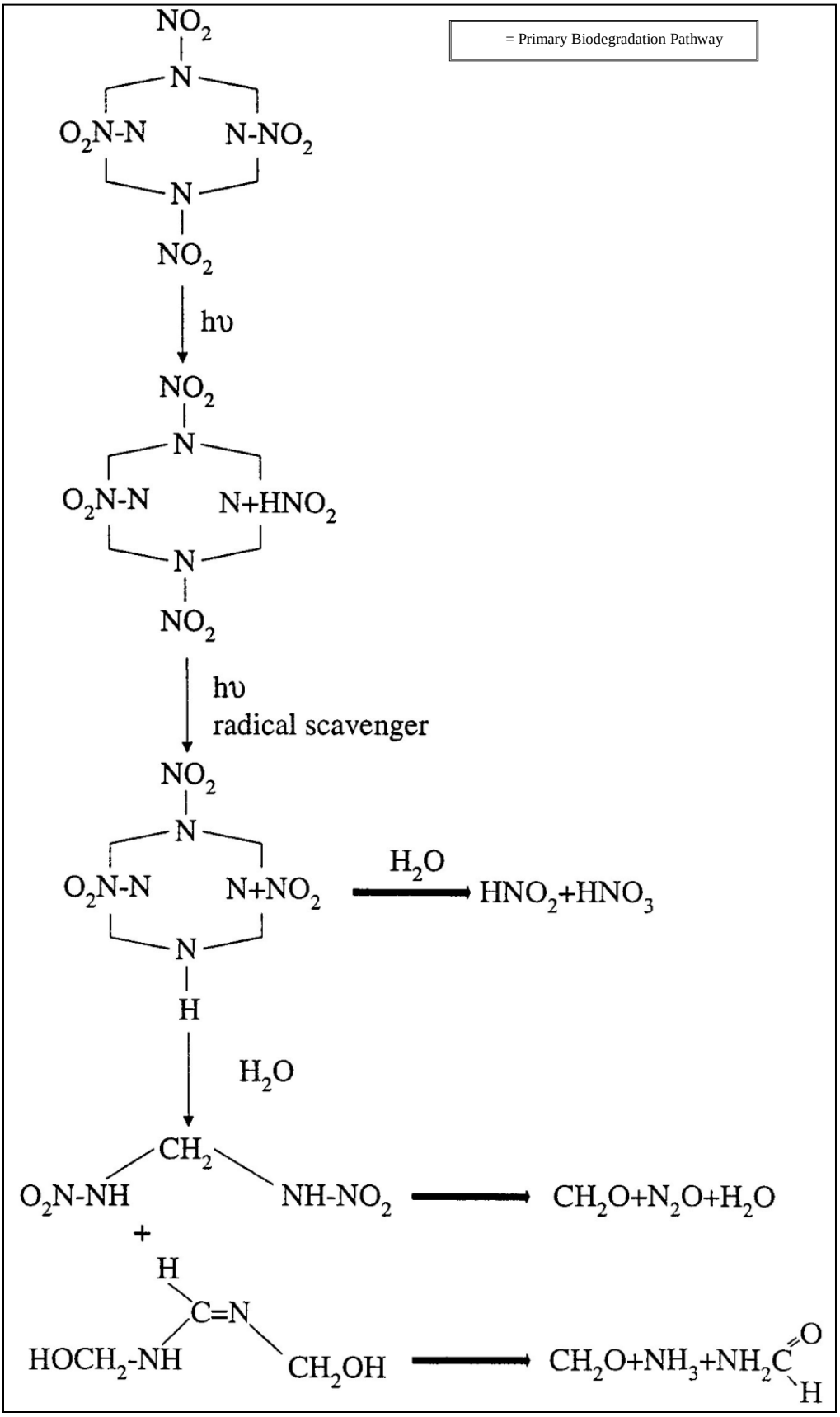

Figure E-4. HMX Biotransformation Pathway

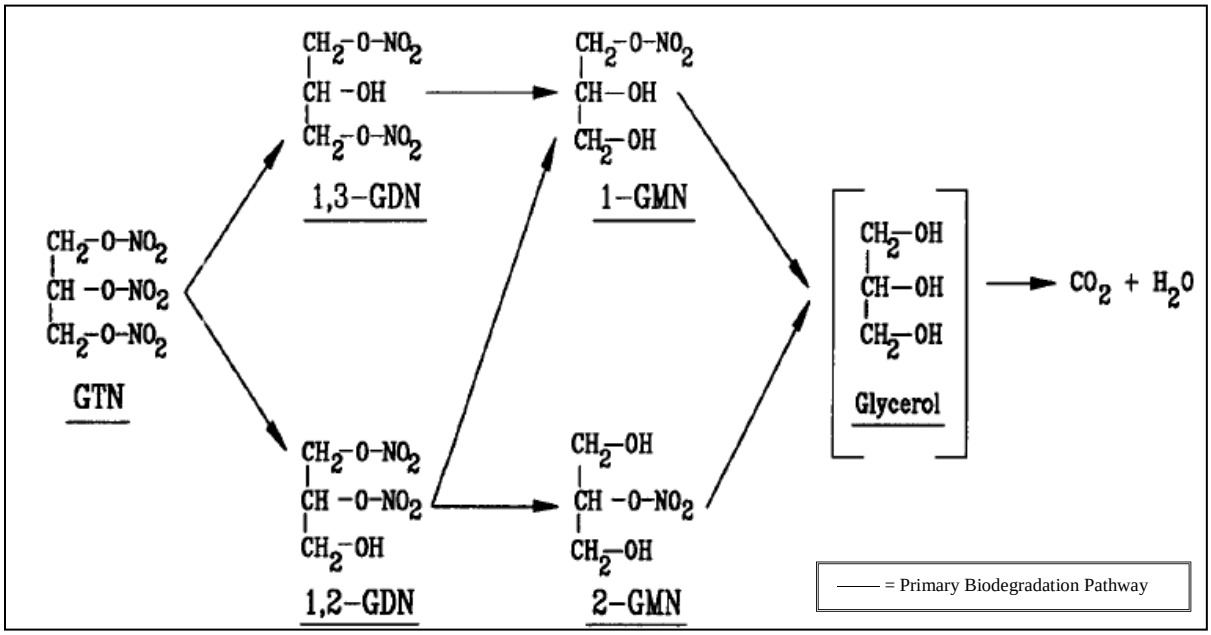

Figure E-5. Nitroglycerin (GTN) Biodegradation Pathway

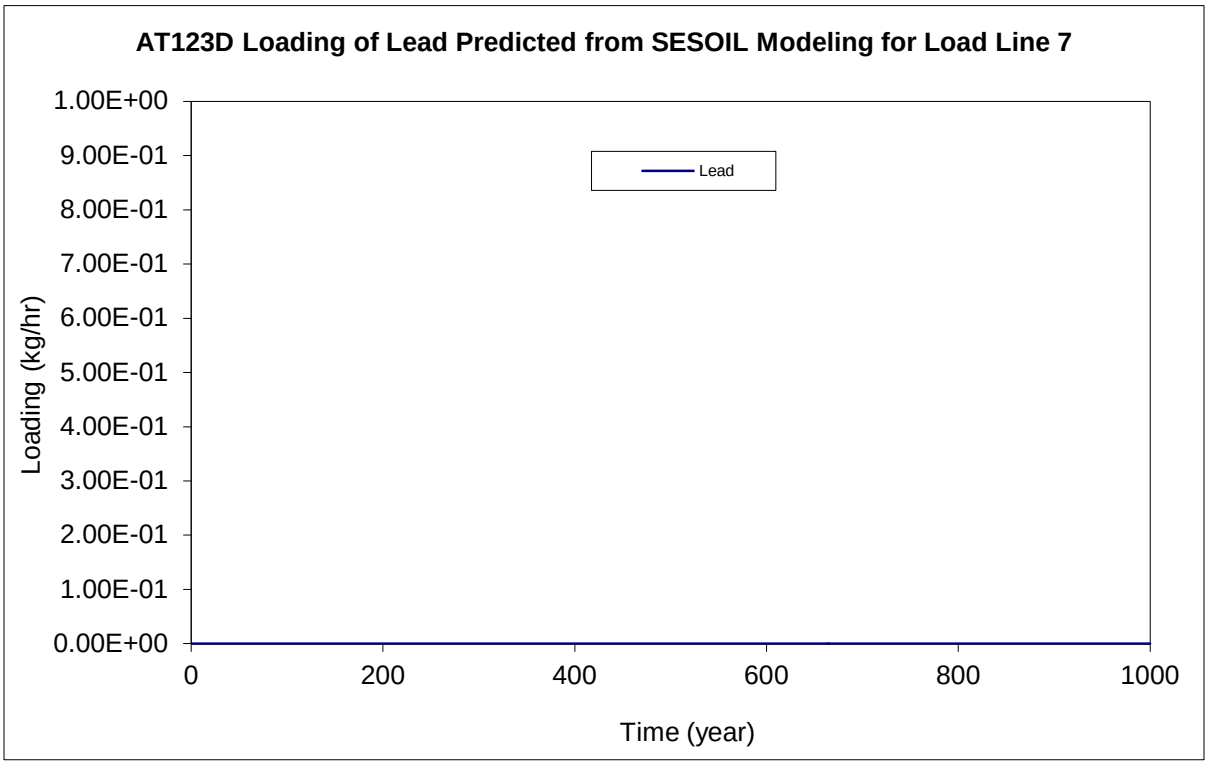

Figure E-6. Predicted Contaminant Mass Loading for AT123D Modeling at Load Line 7 – Lead

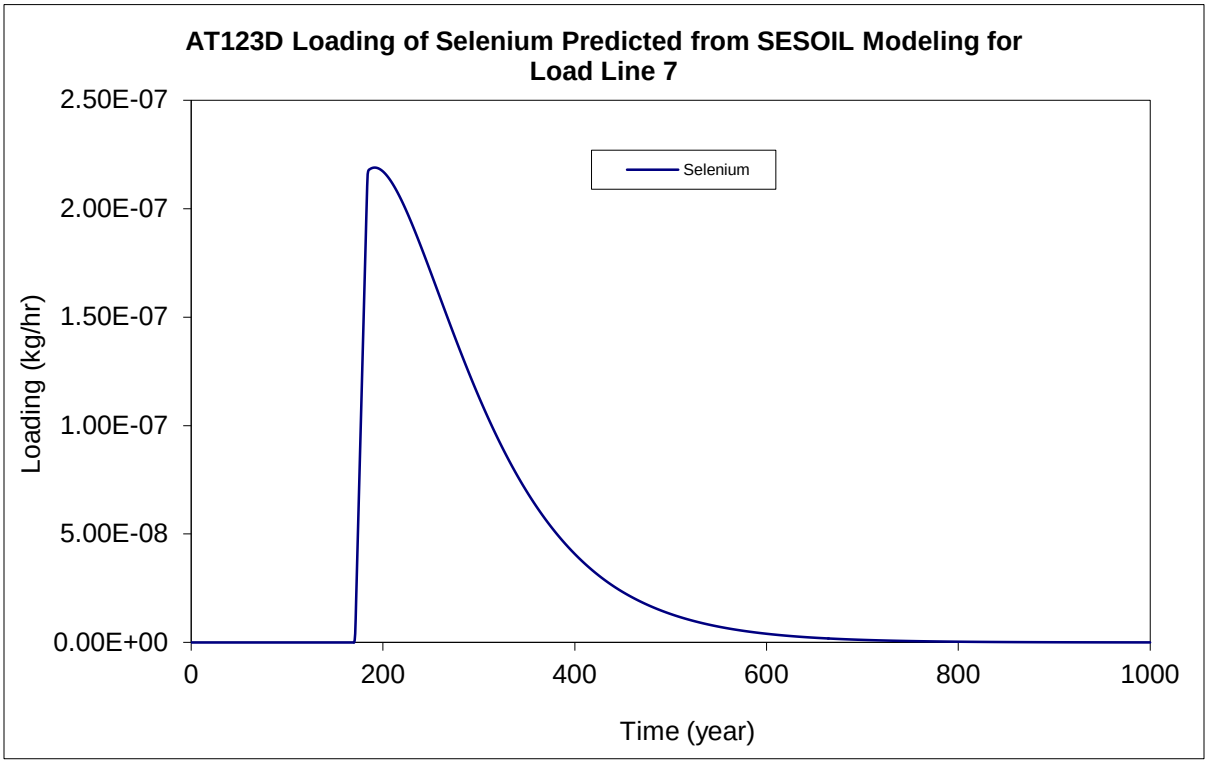

Figure E-7. Predicted Contaminant Mass Loading for AT123D Modeling at Load Line 7 – Selenium

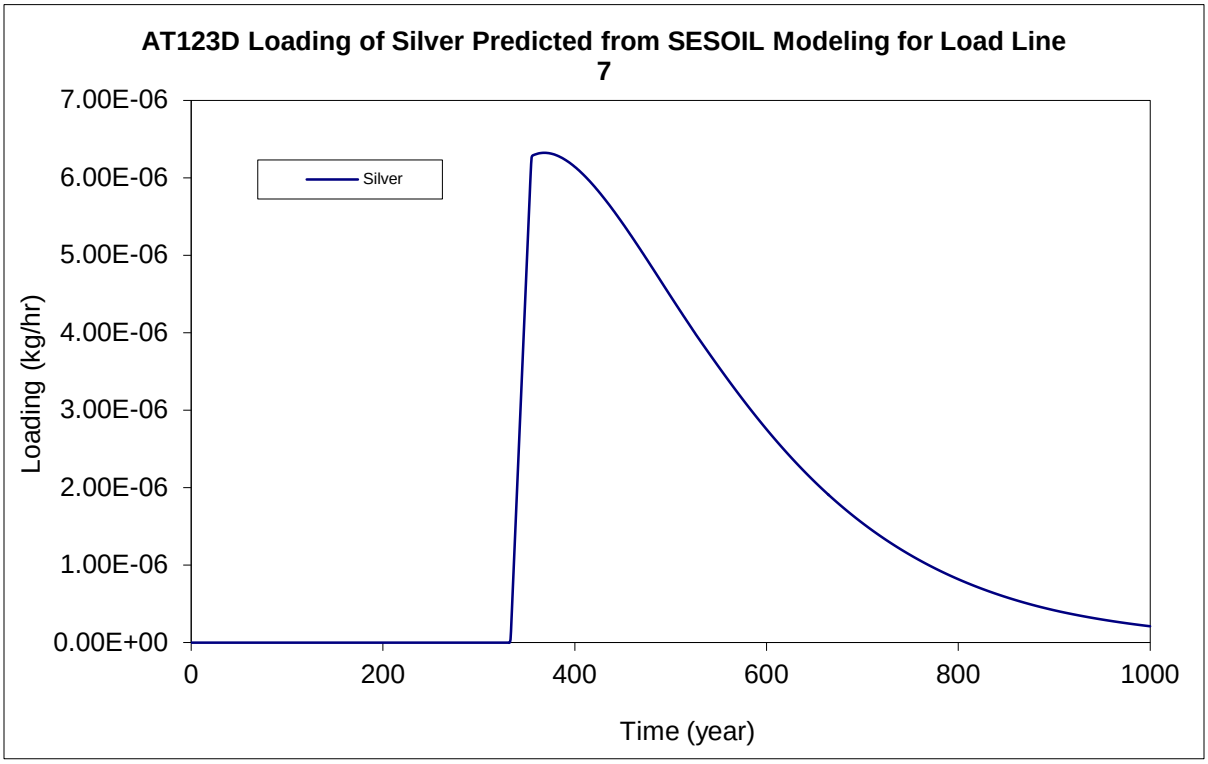

Figure E-8. Predicted Contaminant Mass Loading for AT123D Modeling at Load Line 7 – Silver

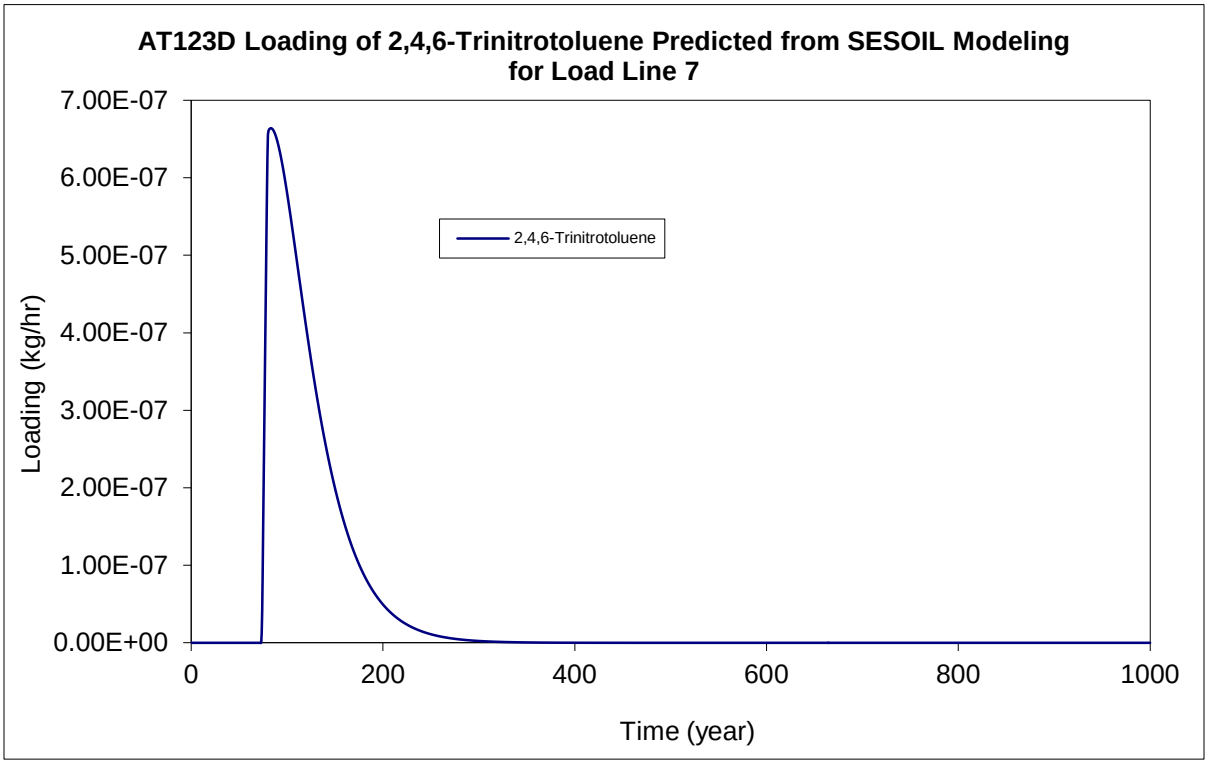

Figure E-9. Predicted Contaminant Mass Loading for AT123D Modeling at Load Line 7 – TNT

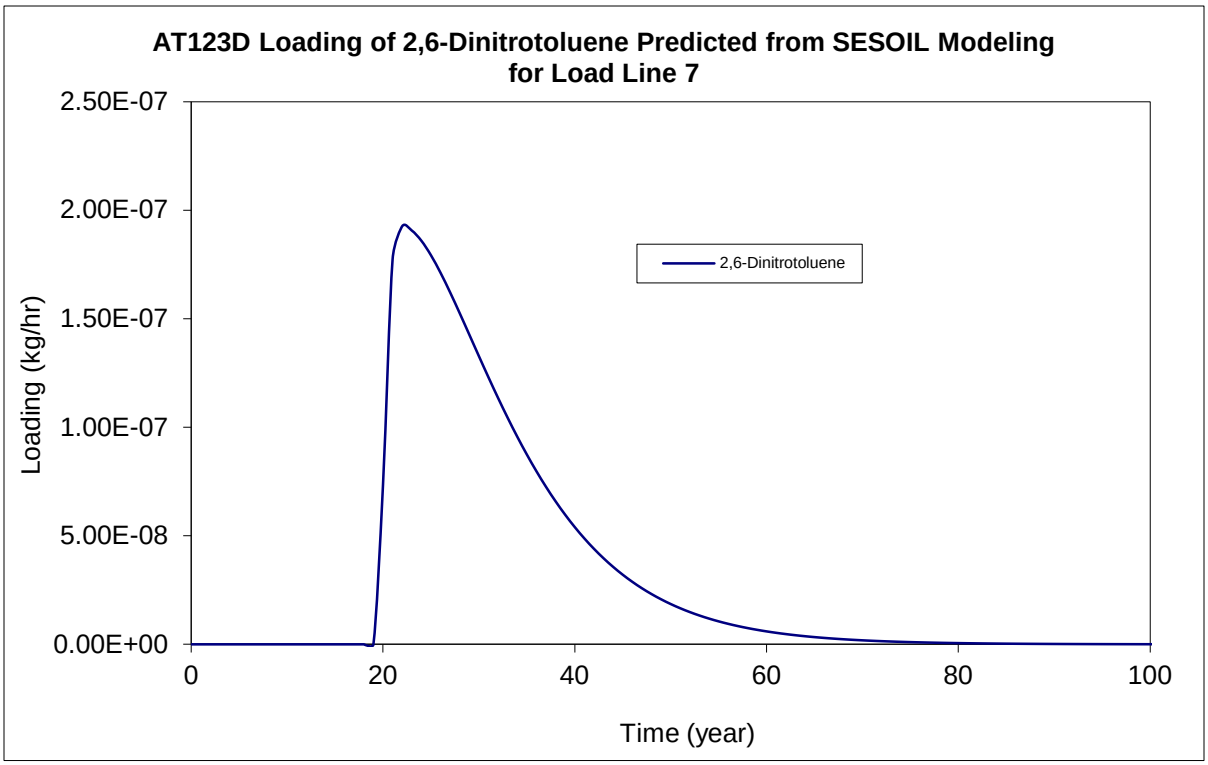

Figure E-10. Predicted Contaminant Mass Loading for AT123D Modeling at Load Line 7 – 2,6-DNT

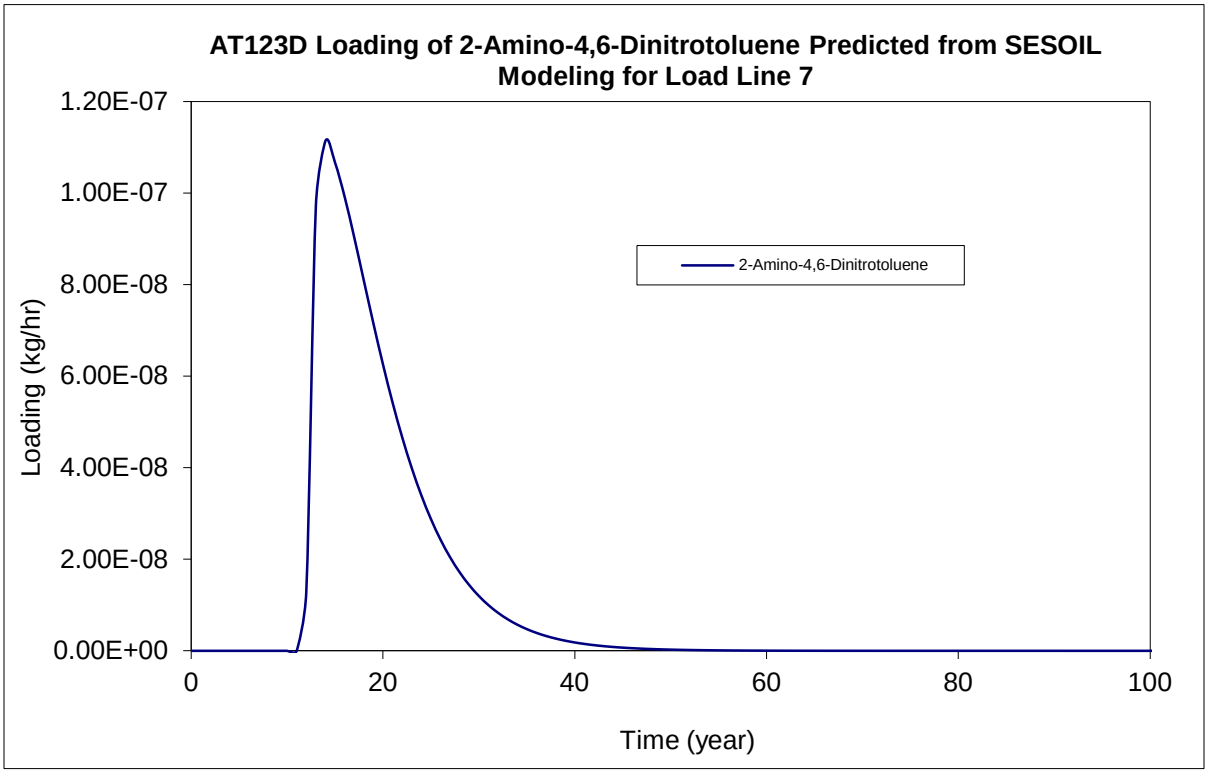

Figure E-11. Predicted Contaminant Mass Loading for AT123D Modeling at Load Line 7 – 2-Amino-4,6-DNT

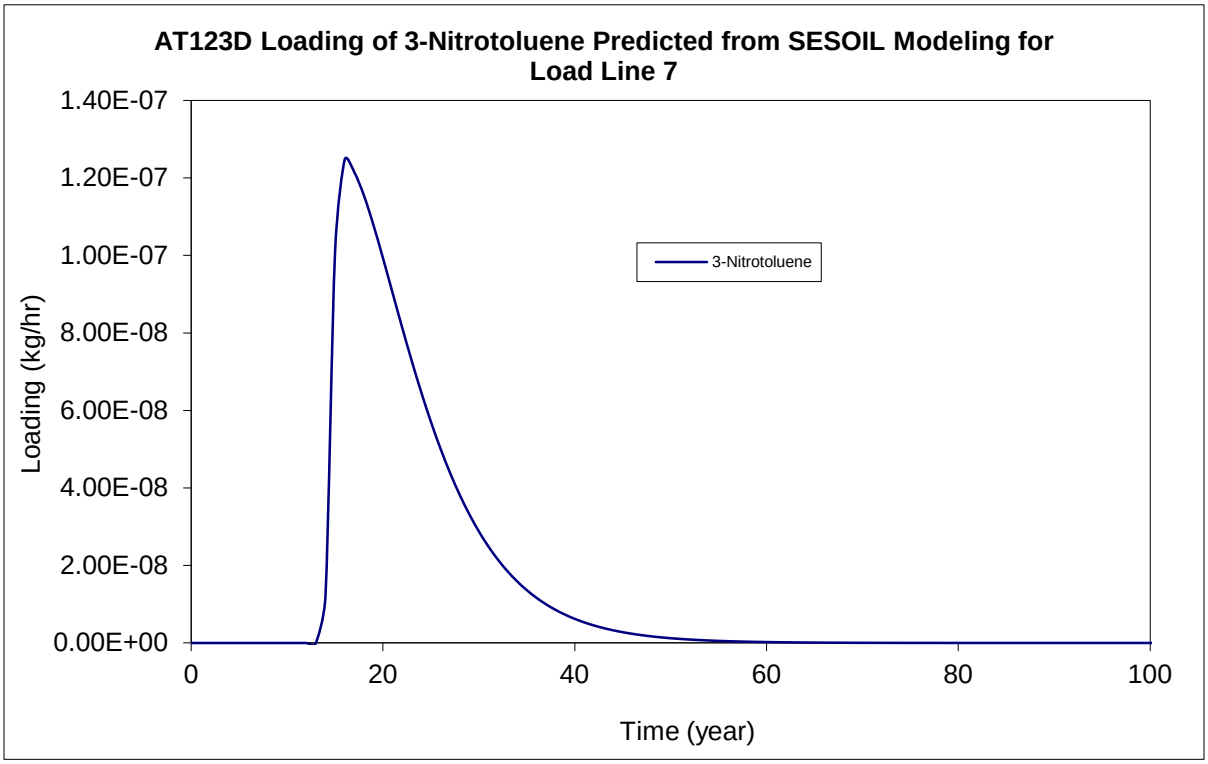

Figure E-12. Predicted Contaminant Mass Loading for AT123D Modeling at Load Line 7 – 3-Nitrotoluene

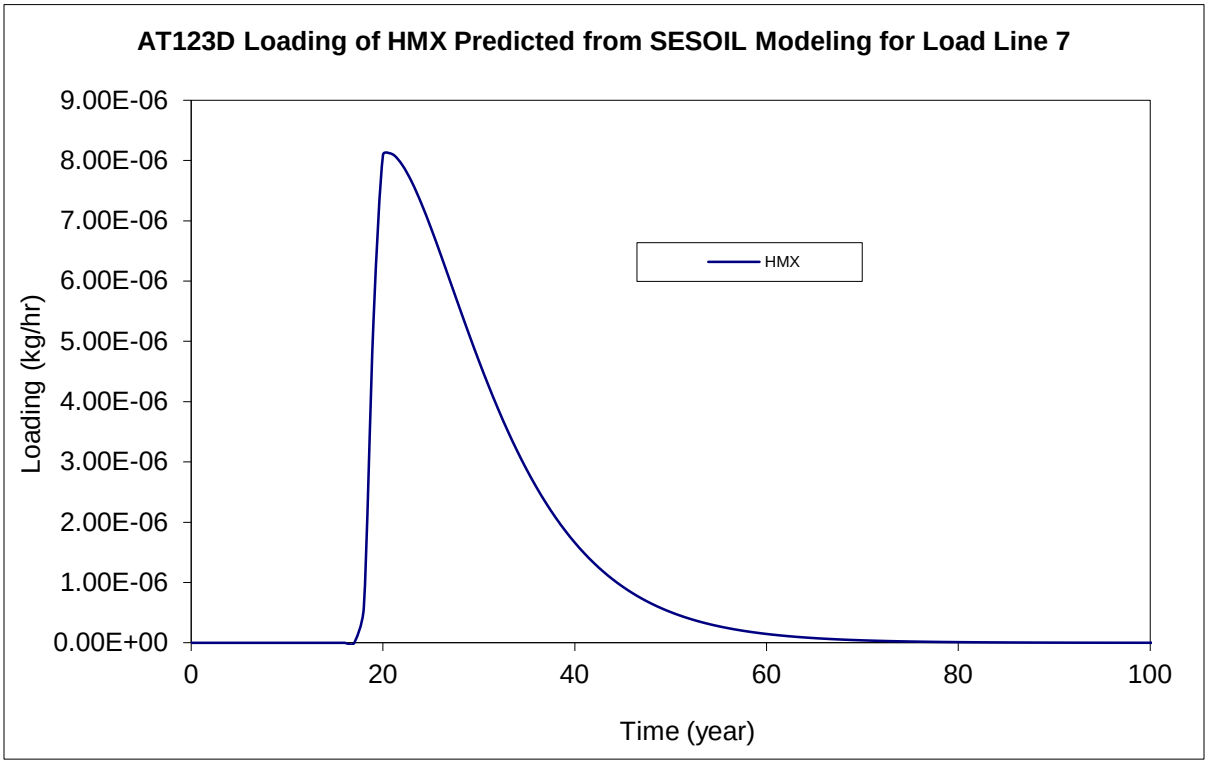

Figure E-13. Predicted Contaminant Mass Loading for AT123D Modeling at Load Line 7 – HMX

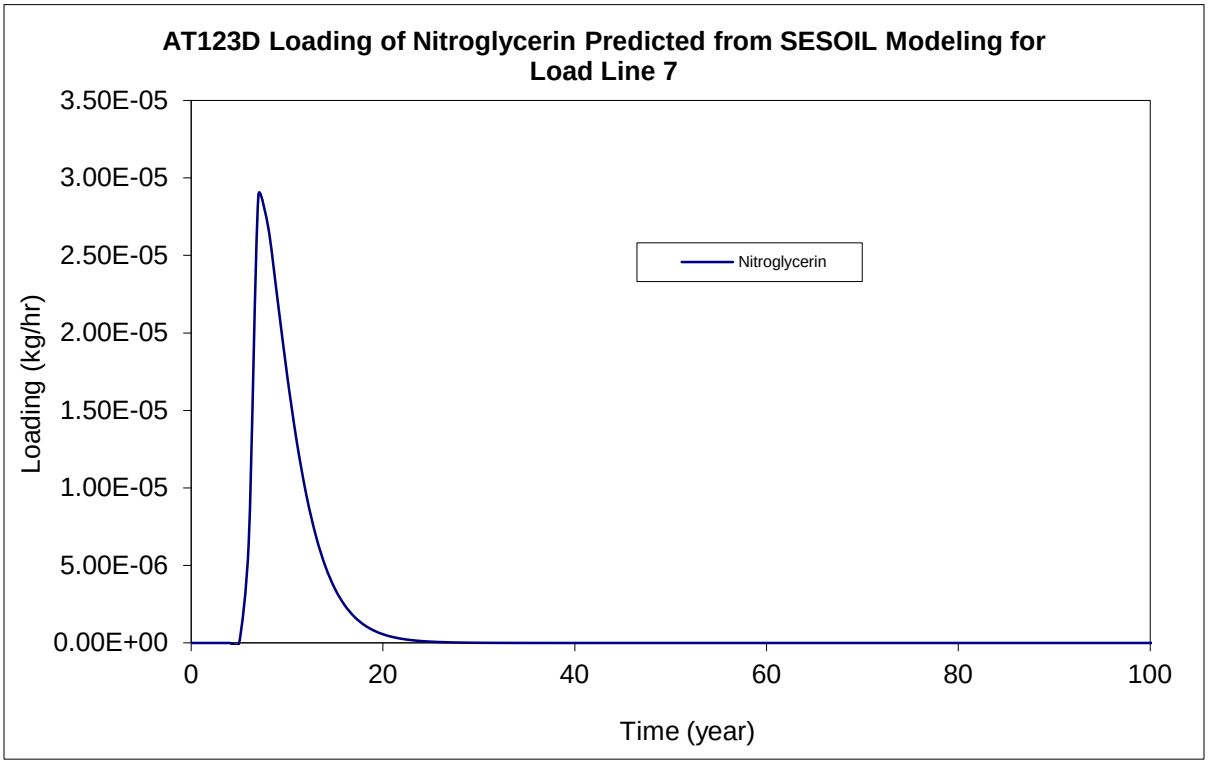

Figure E-14. Predicted Contaminant Mass Loading for AT123D Modeling at Load Line 7 – Nitroglycerin

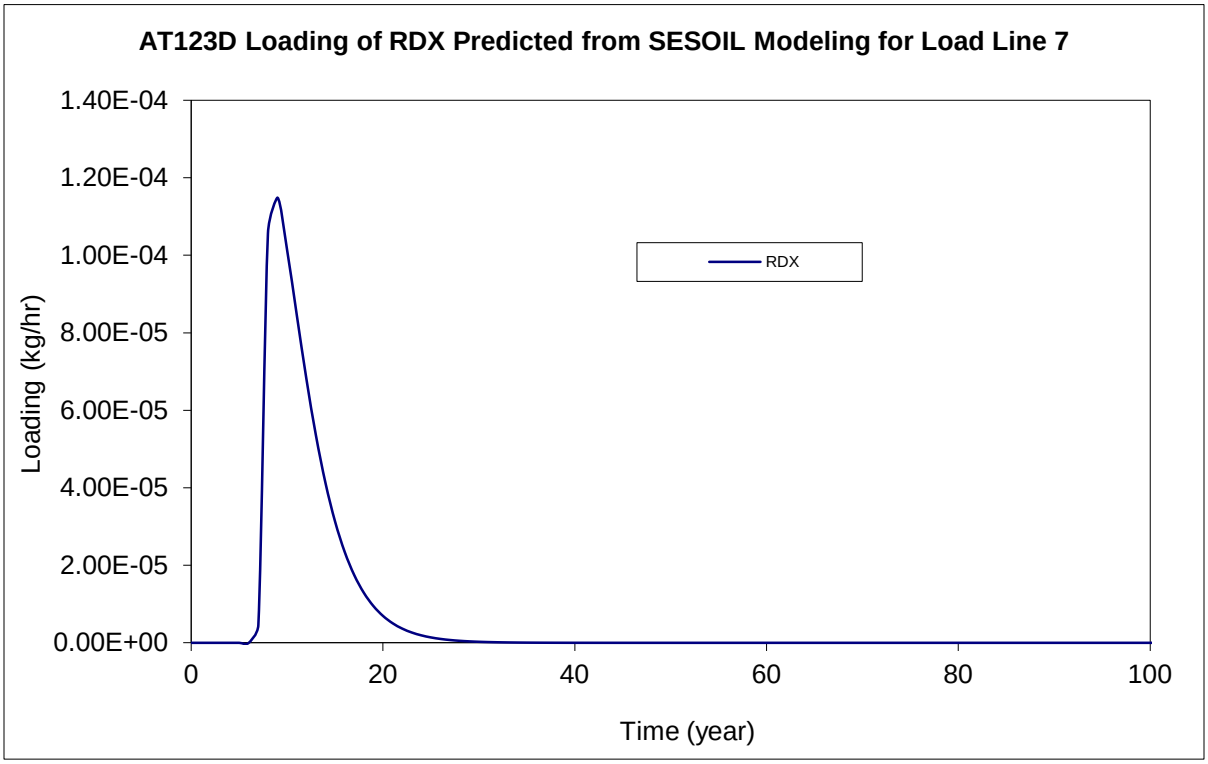

Figure E-15. Predicted Contaminant Mass Loading for AT123D Modeling at Load Line 7 – RDX

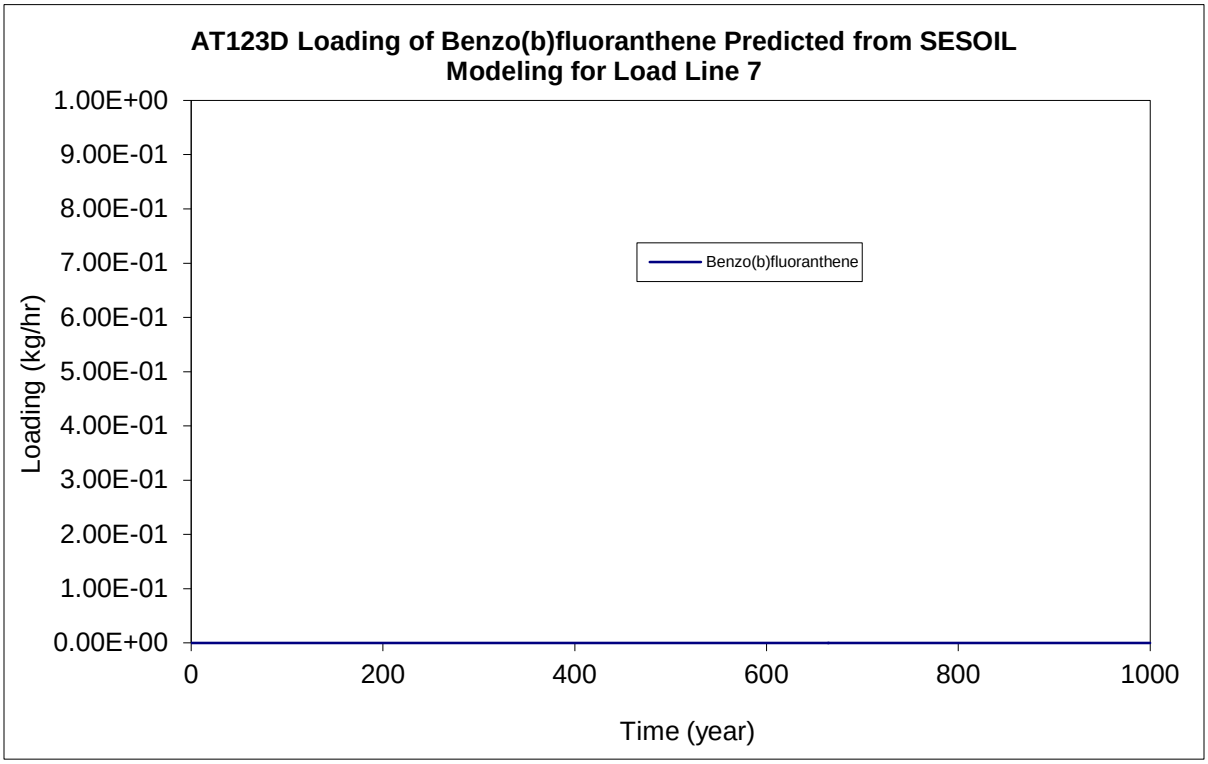

Figure E-16. Predicted Contaminant Mass Loading For AT123D Modeling at Load Line 7 – Benzo(*b*)fluoranthene

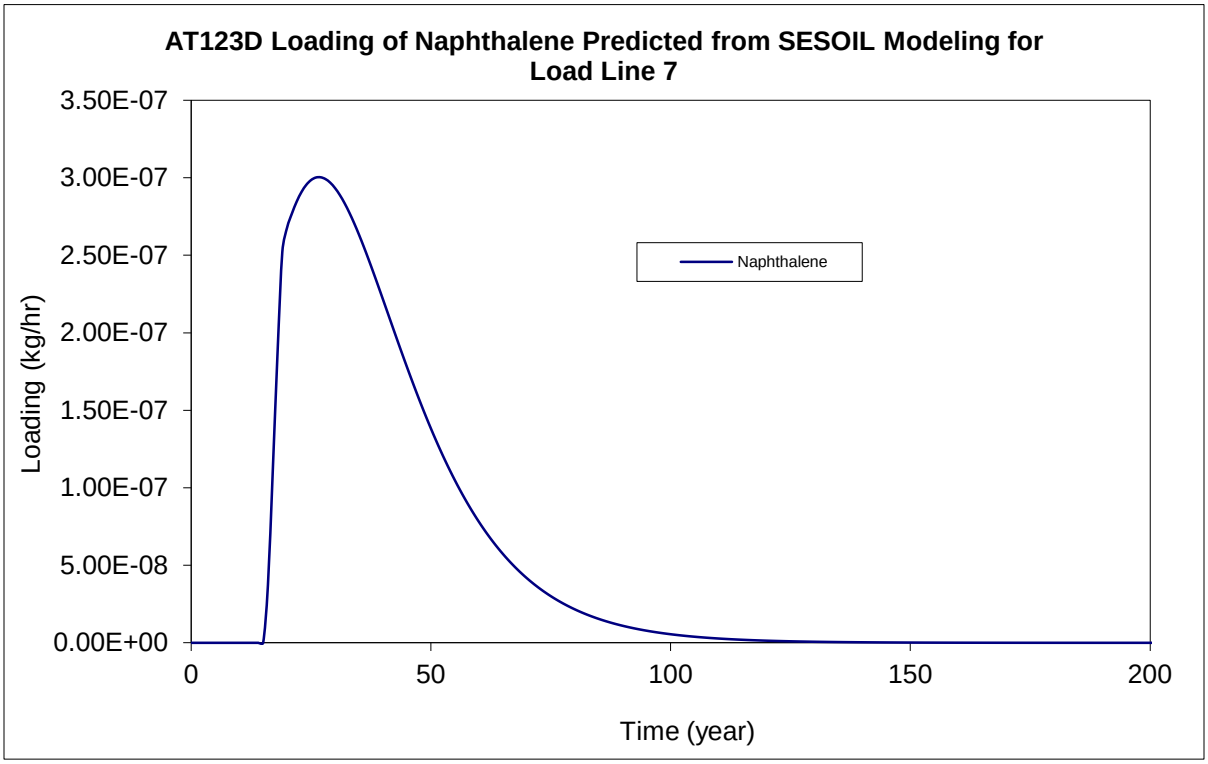

Figure E-17. Predicted Contaminant Mass Loading for AT123D Modeling at Load Line 7 – Naphthalene

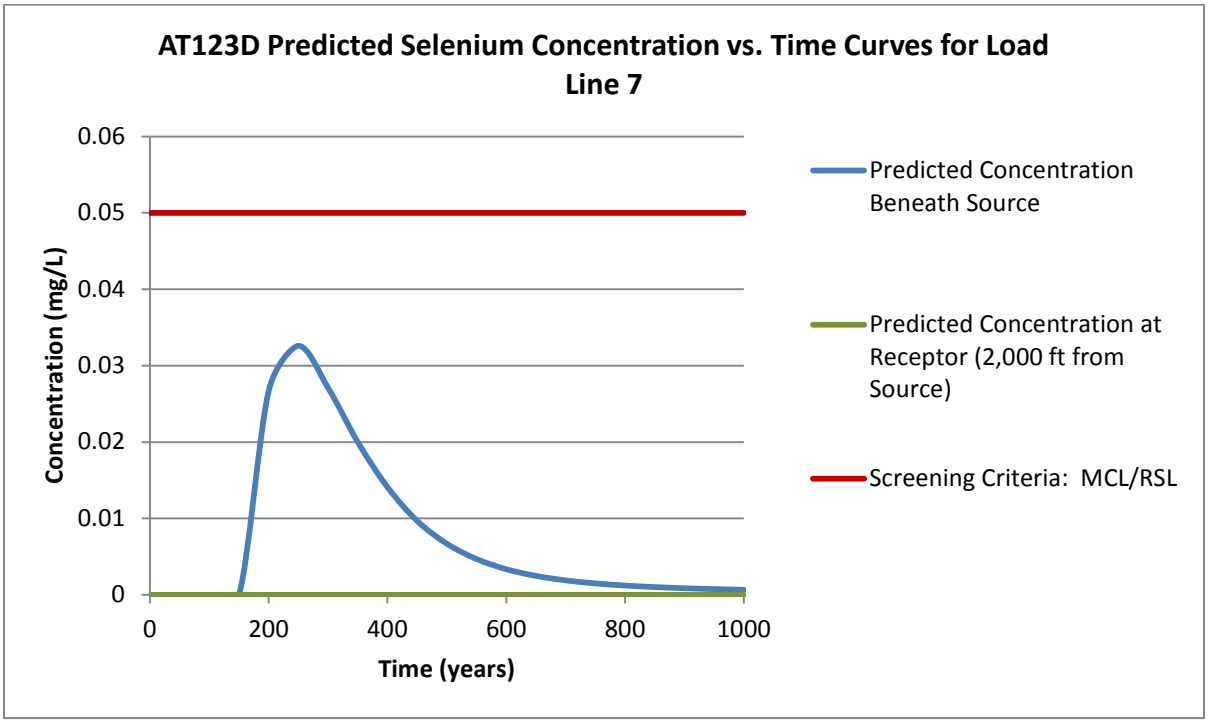

Figure E-18. Predicted Concentration of Selenium in Groundwater Based on AT123D Modeling at Load Line 7

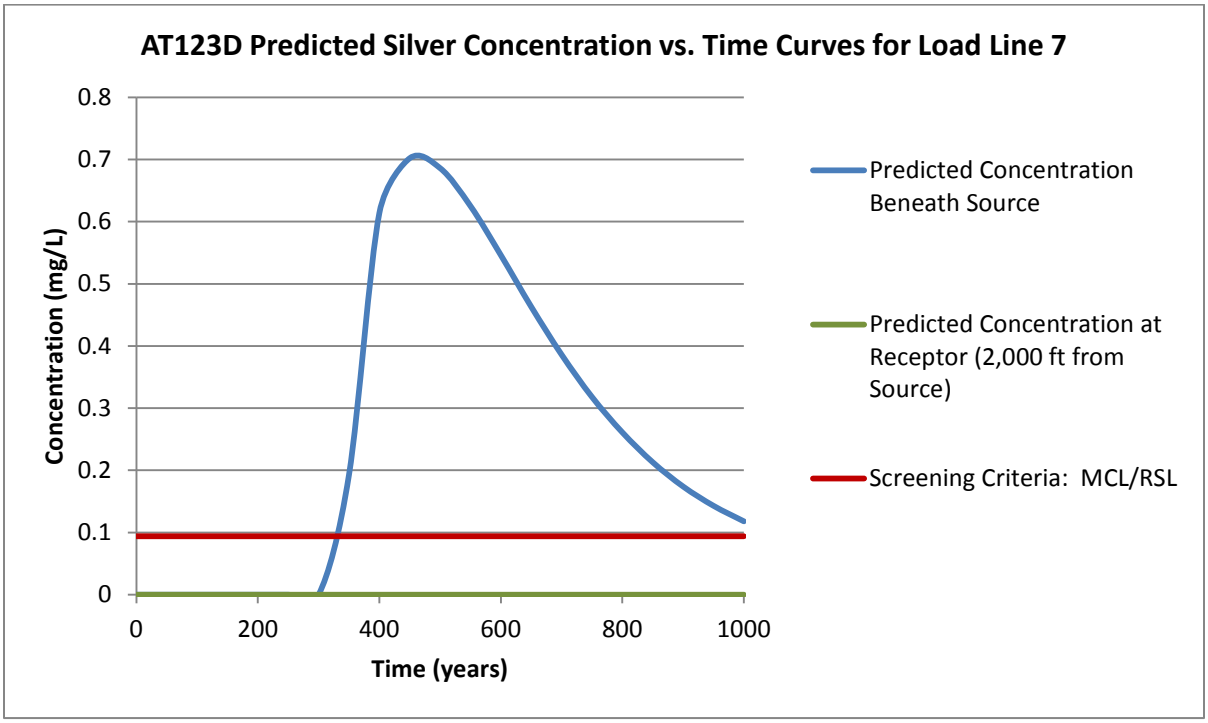

Figure E-19. Predicted Concentration of Silver in Groundwater Based on AT123D Modeling at Load Line 7

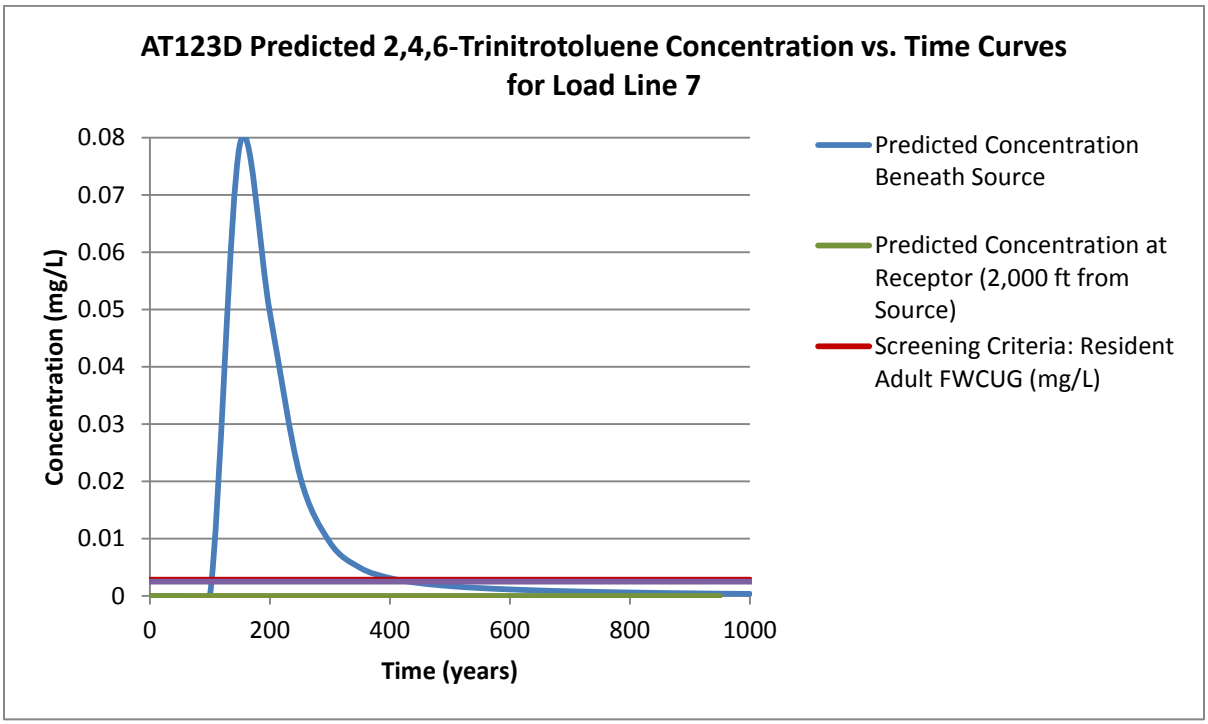

Figure E-20. Predicted Concentration of 2,4,6TNT in Groundwater Based on AT123D Modeling at Load Line 7

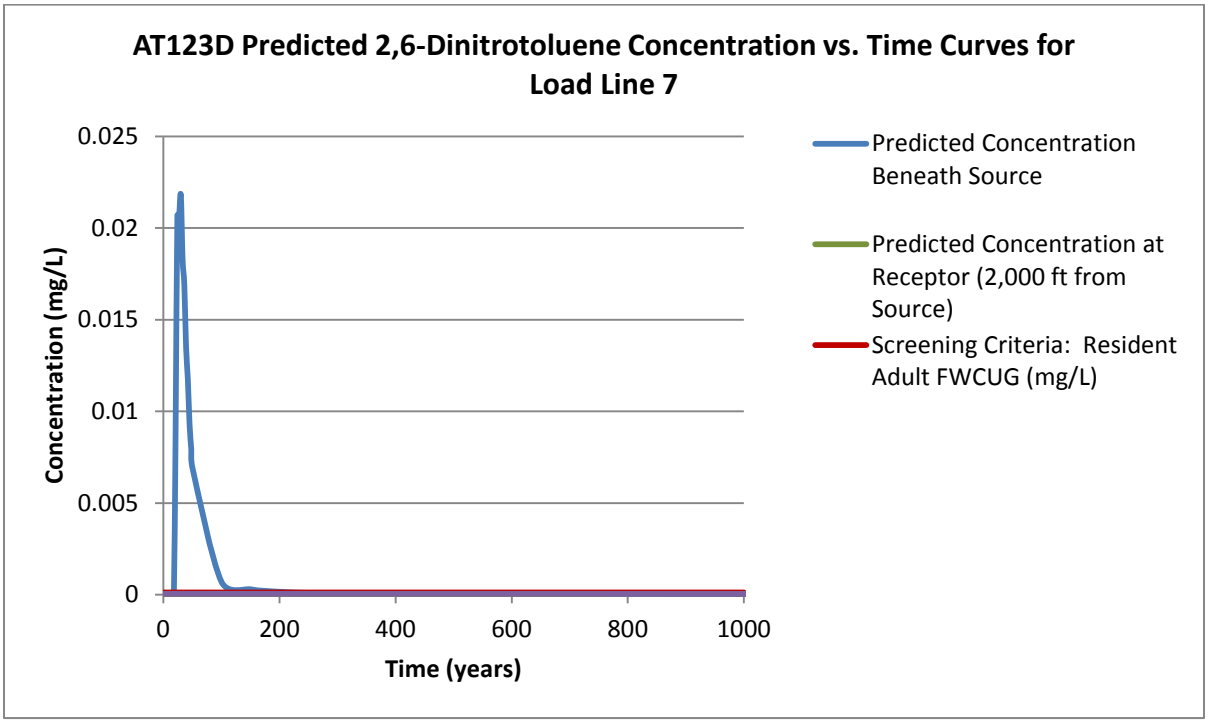

Figure E-21. Predicted Concentration of 2,6-DNT in Groundwater Based on AT123D Modeling at Load Line 7

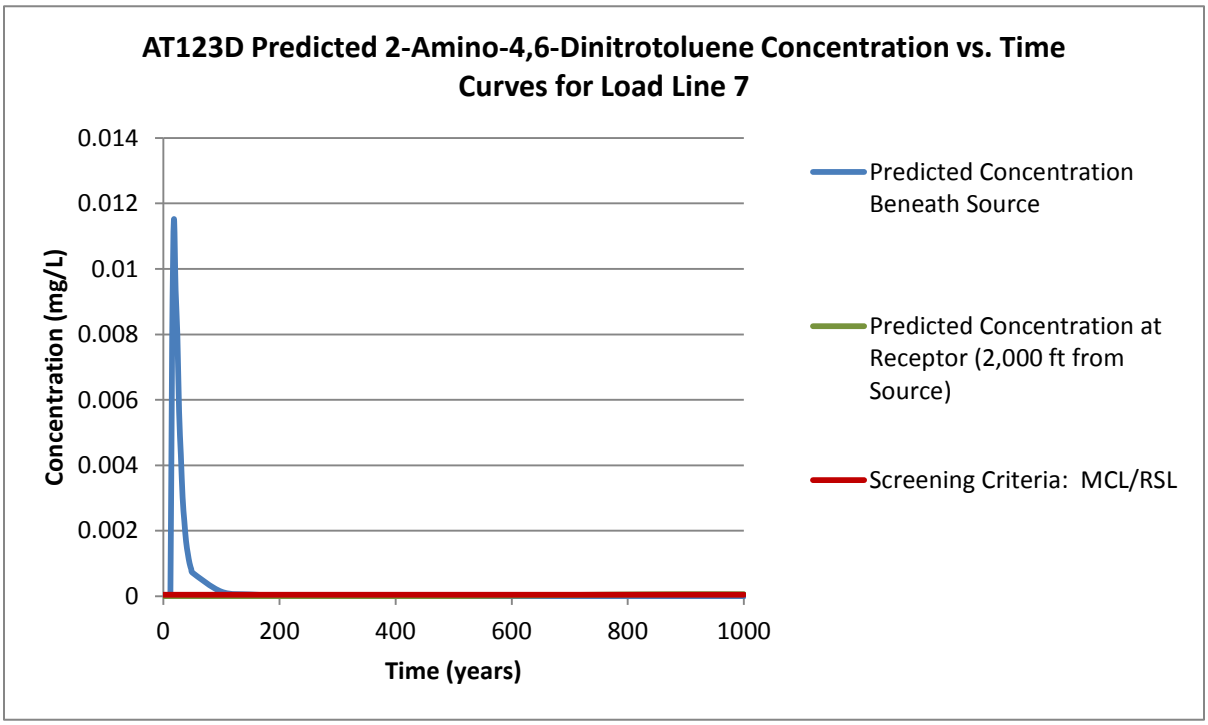

Figure E-22. Predicted Concentration of 4-Amino-2,6-DNT in Groundwater Based on AT123D Modeling at Load Line 7

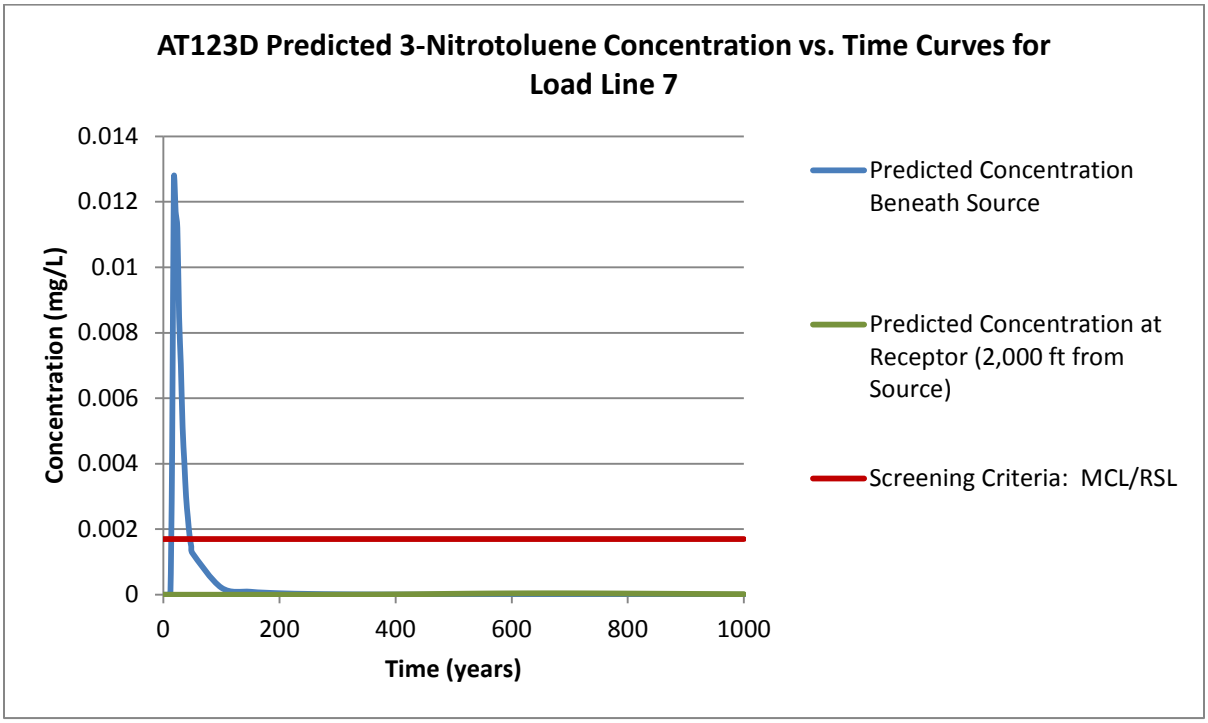

Figure E-23. Predicted Concentration of 3-Nitrotoluene in Groundwater Based on AT123D Modeling at Load Line 7

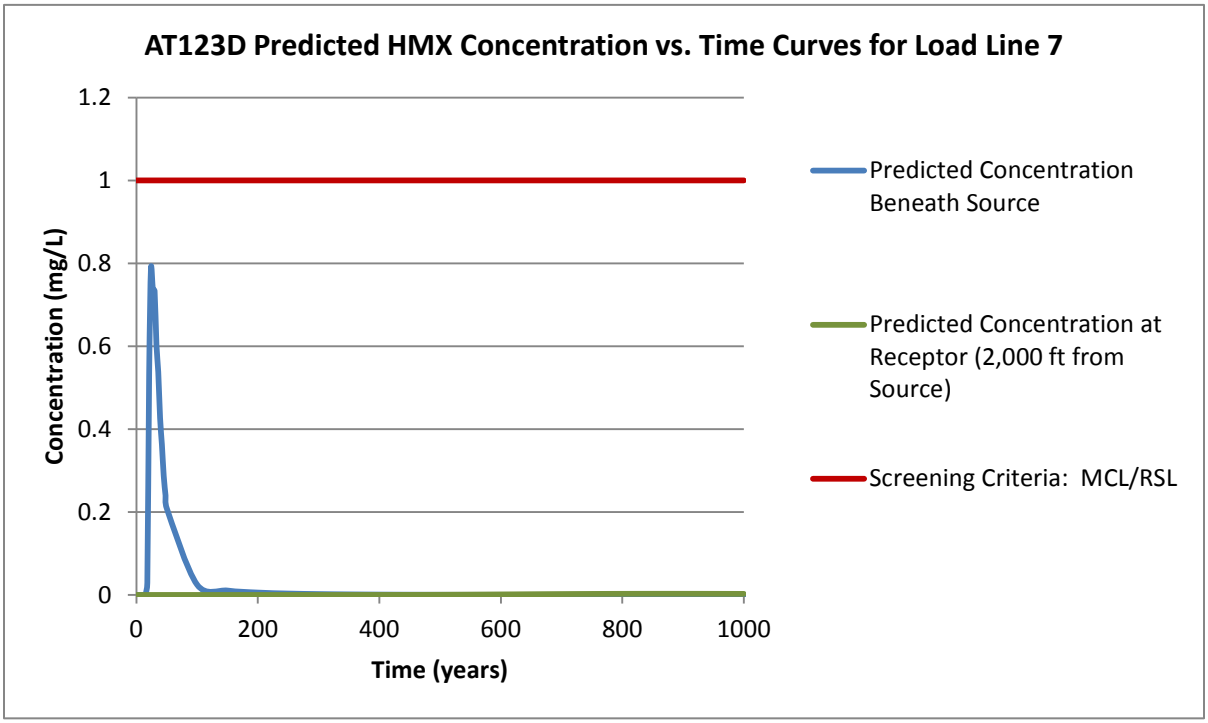

Figure E-24. Predicted Concentration of HMX in Groundwater Based on AT123D Modeling at Load Line 7

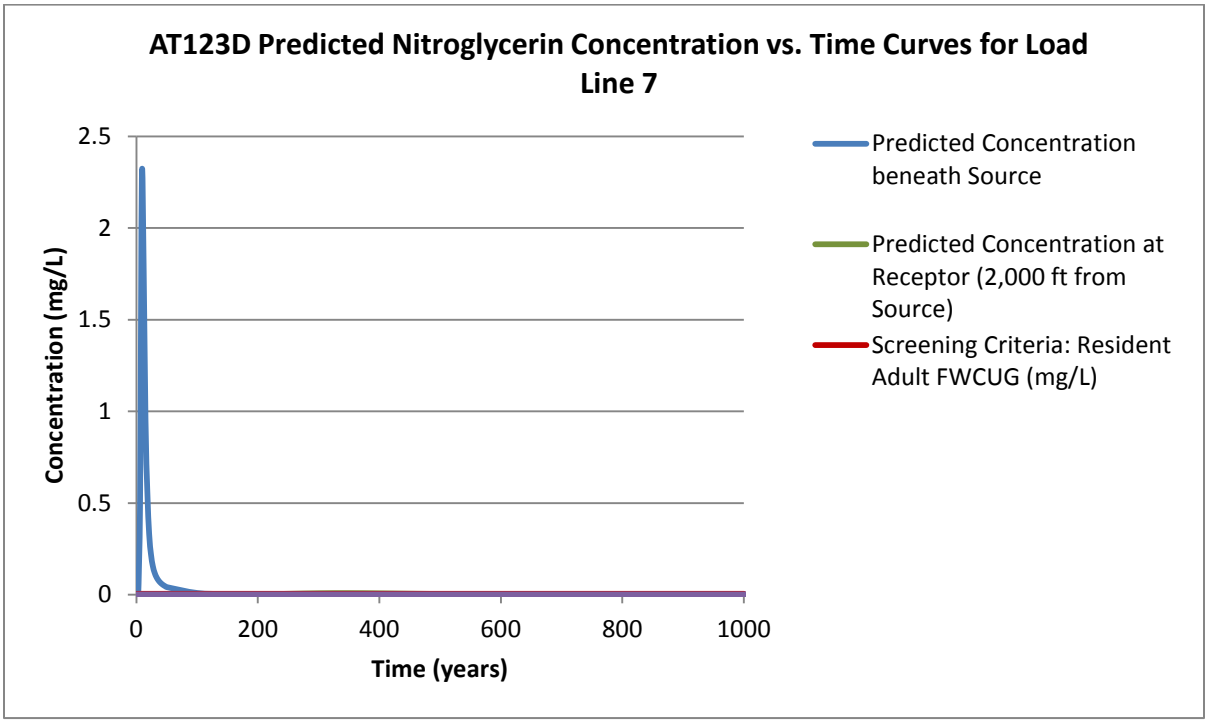

Figure E-25. Predicted Concentration of Nitroglycerin in Groundwater Based on AT123D Modeling at Load Line 7

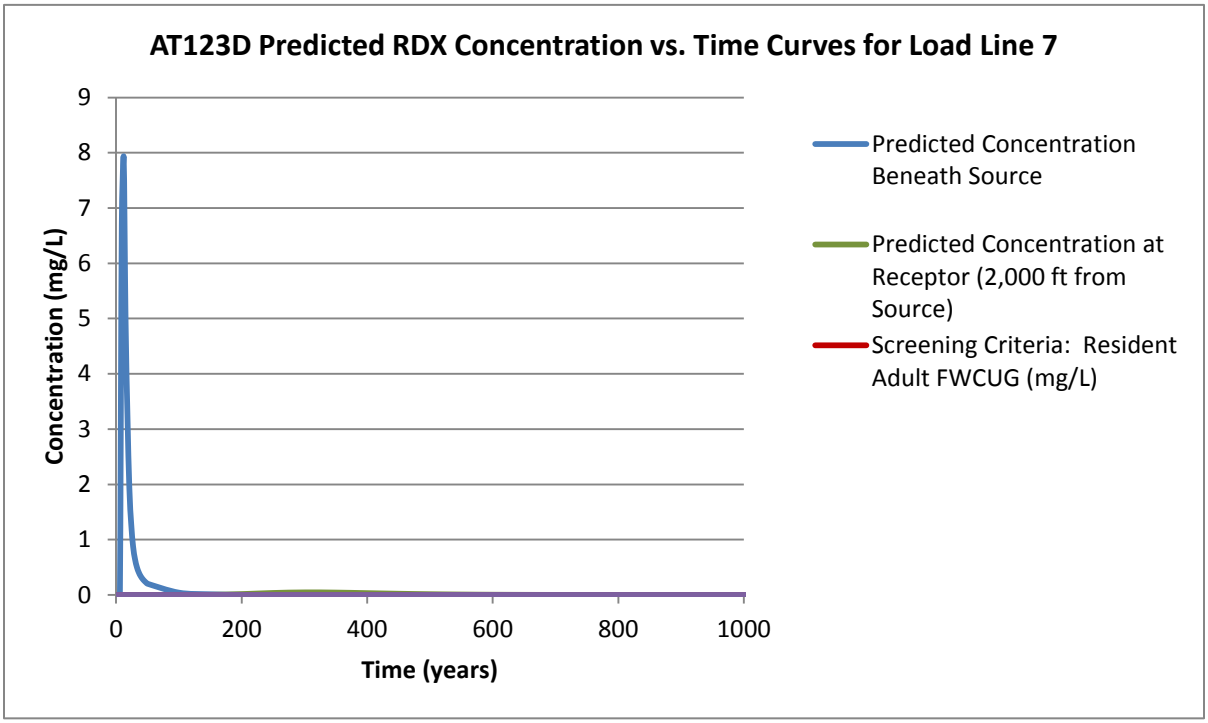

Figure E-26. Predicted Concentration of RDX in Groundwater Based on AT123D Modeling at Load Line 7

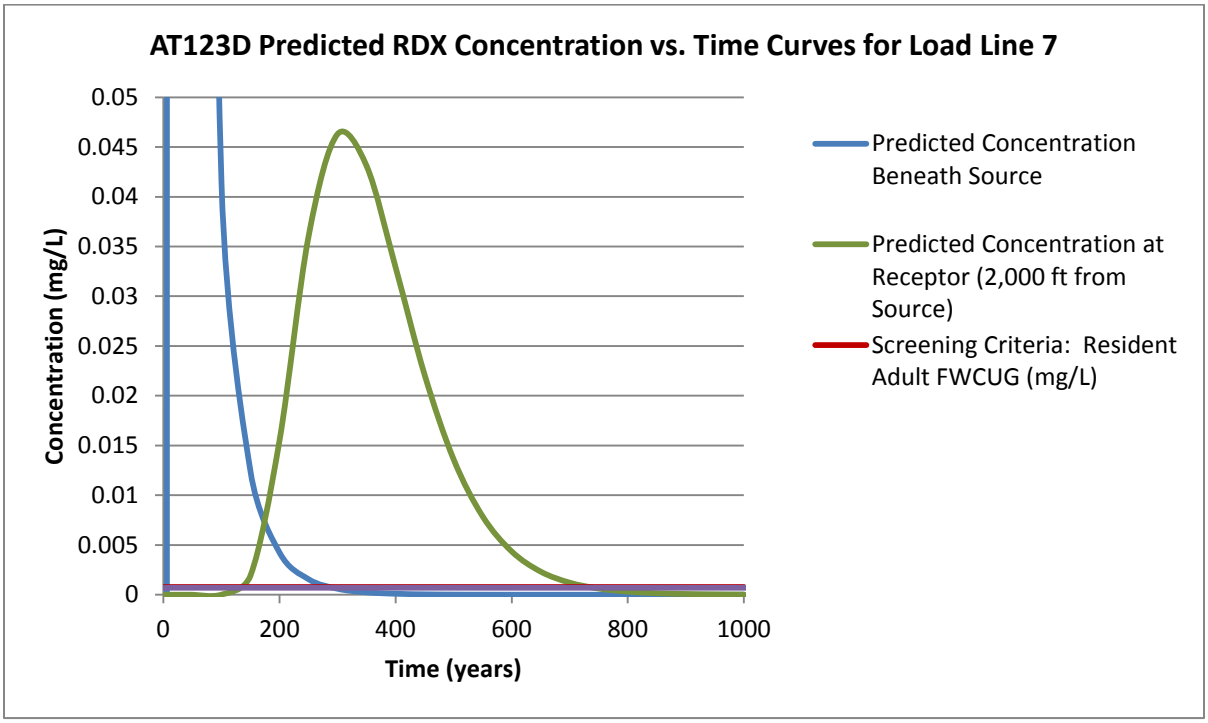

Figure E-27. Predicted Concentration of RDX in Groundwater Based on AT123D Modeling at Load Line 7 Showing Concentrations at Downgradient Receptor

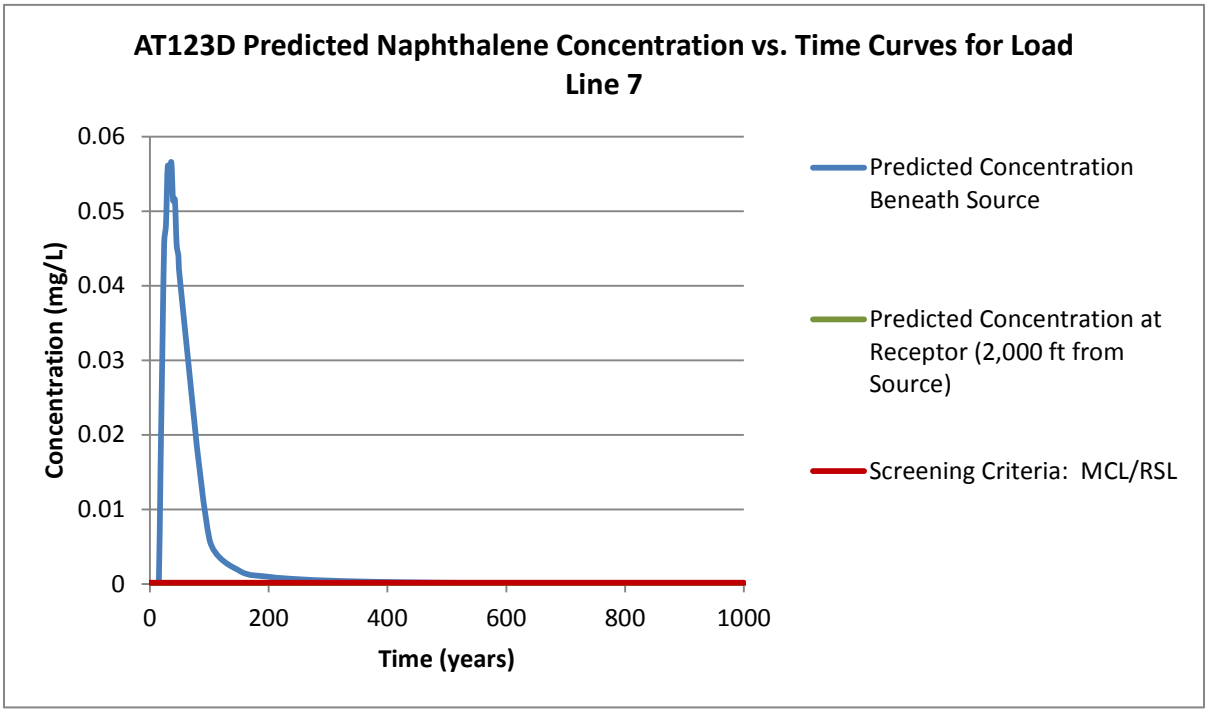

Figure E-28. Predicted Concentration of Naphthalene in Groundwater Based on AT123D Modeling at Load Line 7

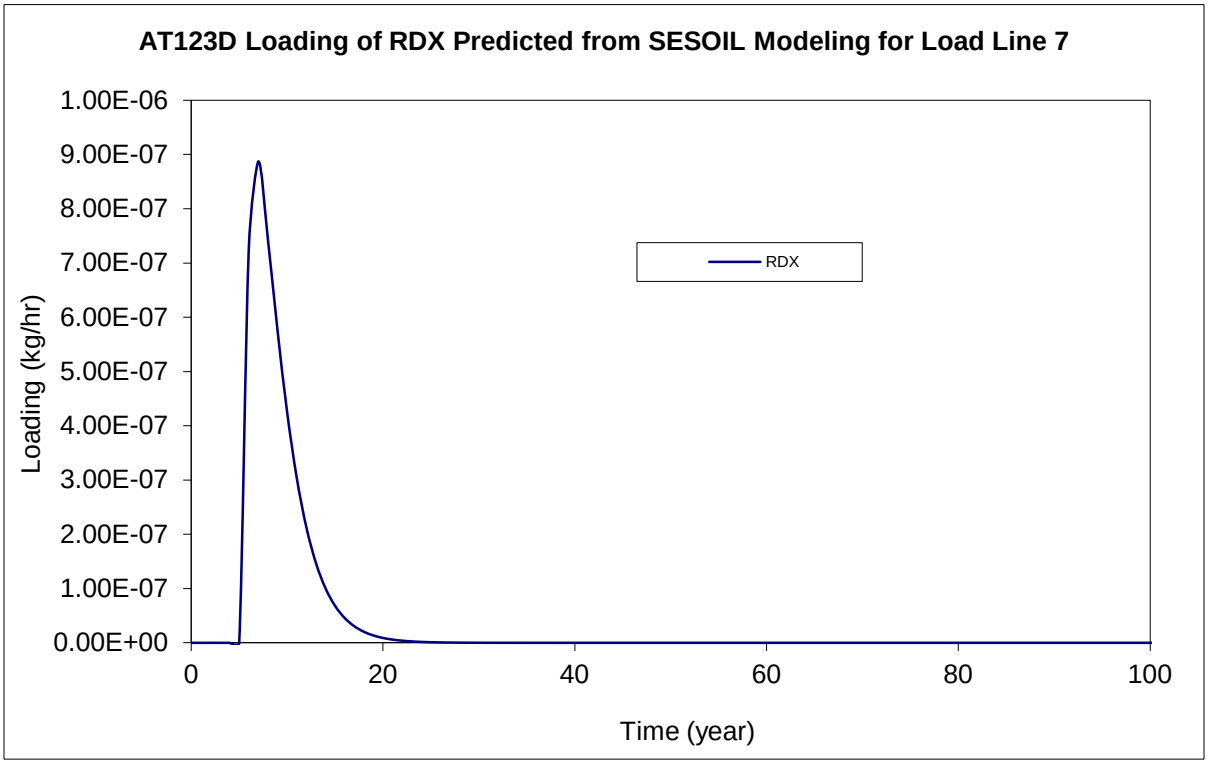

Figure E-29. Predicted Contaminant Mass Loading for AT123D Modeling at Load Line 7 – Second Highest Concentration of RDX in Soil

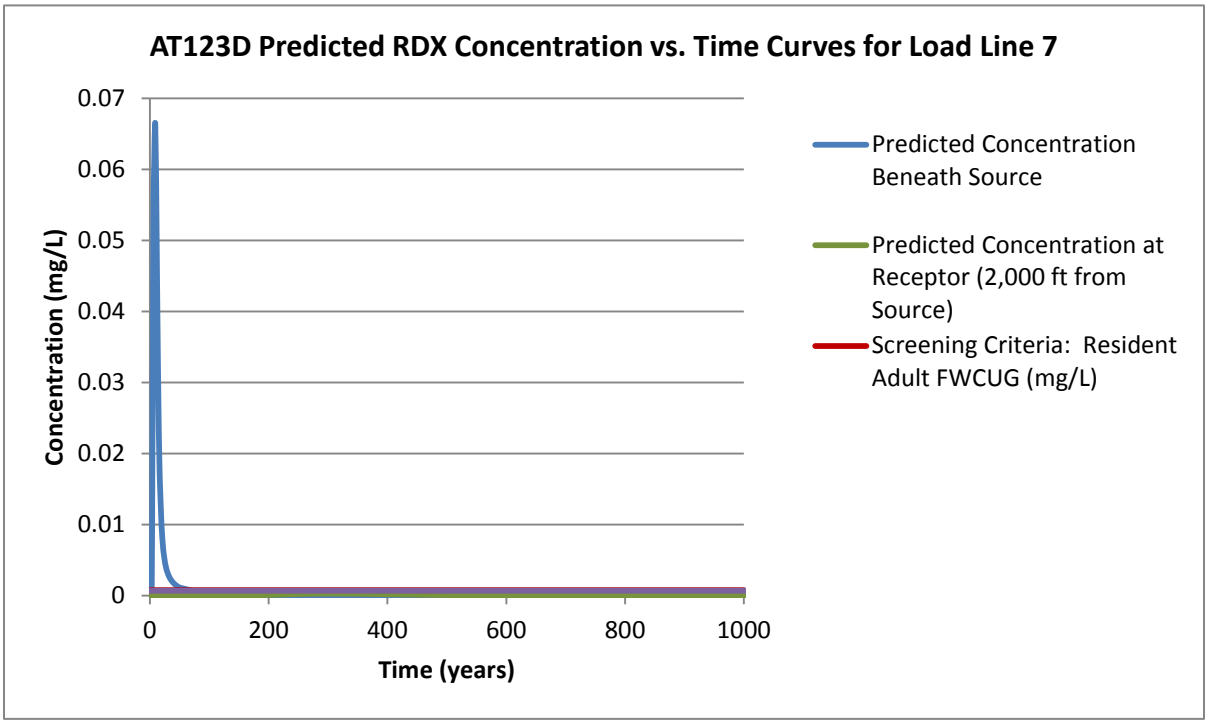

Figure E-30. Predicted Concentration of RDX in Groundwater Based on AT123D Modeling at Load Line 7 from the Second Highest Soil Concentration Source Area

THIS PAGE INTENTIONALLY LEFT BLANK.