APPENDIX L

CONTAMINANT FATE AND TRANSPORT MODELING RESULTS

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LIST OF TABLES

Table L-1. Physical and Chemical Properties of Metal SRCs

Analyte	K_d (L/kg)	Reference	H' (atm-m^3/mol)	Reference	C_w (mg/L)	C_w Reference	Generic SSL (DAF=1)	Reference
Aluminum	1.50E+03	b	NA		3.65E+01	PRG9	5.48E+04	
Antimony	4.50E+01	a	NA		6.00E-03	MCL	3.00E-01	a
Arsenic	2.90E+01	a	NA		1.00E-02	MCL	2.90E-01	a
Barium	4.10E+01	a	NA		2.00E+00	MCL	8.20E+01	a
Beryllium	7.90E+02	a	NA		4.00E-03	MCL	3.00E+00	a
Cadmium	7.50E+01	a	NA		5.00E-03	MCL	4.00E-01	a
Chromium	1.90E+01	a	NA		1.00E-01	MCL	2.00E+00	a
Cobalt	1.30E+03	c	NA		7.30E-01	PRG9	9.49E+02	
Copper	3.50E+01	b	NA		1.30E+00	MCL	4.58E+01	
Iron	8.00E+02	a	NA		1.10E+01	PRG9	8.80E+03	
Lead	1.60E+04	c	NA		1.50E-02	MCL	2.40E+02	
Manganese	7.50E+02	c	NA		8.76E-01	PRG9	6.57E+02	
Mercury	5.20E+01	a	1.14E-02	d	2.00E-03	MCL	1.00E-01	a
Nickel	6.50E+01	a	NA		7.30E-01	PRG9	7.00E+00	a
Selenium	5.00E+00	a	NA		5.00E-02	MCL	3.00E-01	a
Silver	8.30E+00	a	NA		1.83E-01	PRG9	2.00E+00	a
Thallium	7.10E+01	a	NA		2.00E-03	MCL	4.00E-02	a
Vanadium	1.00E+03	a	NA		2.56E-01	PRG9	3.00E+02	a
Zinc	6.20E+01	a	NA		1.10E+01	PRG9	6.20E+02	a

NA: not applicable

References:

a. EPA Soil Screening Guidance: Technical Background Document, May 1996.
b. Baes and Sharp 1983
c. Sheppard and Thibault 1990
d. RREL = Risk Reduction Engineering Laboratory (EPA 1994)

MCL = Clean Water Act Drinking Water MCL
PRG9 = EPA Region 9 Preliminary Remediation Goals
Cw = target groundwater concentration (either MCL or PRG9)
H' = Henry's Law Constant
Kd = Distribution Coefficient
DAF = Dilution Attenuation Factor

Table L-2. Physical and Chemical Properties of Organic SRCs

Analyte	K_{oc} (L/kg)	Reference	H' (atm-m^3/mol)	Reference	C_w (mg/L)	Reference
Explosives						
1,3,5-Trinitrobenzene	9.98E+00	d	3.30E-10	g	1.09E+00	PRG9
1,3-Dinitrobenzene	1.95E+01	d	2.31E-07	g	3.65E-03	PRG10
2,4,6-Trinitrotoluene	2.13E+05	d	2.00E-07	d	2.24E-03	PRG9
2,4-Dinitrotoluene	9.55E+01	a	9.26E-08	a	7.30E-02	PRG9
2,6-Dinitrotoluene	6.92E+01	a	7.47E-07	a	3.60E-02	PRG9
2-Amino-4,6-Dinitrotoluene	NF		NF		NF	
3-Nitrotoluene	2.59E+02	n	9.30E-06	o	6.10E-02	PRG9
4-Amino-2,6-Dinitrotoluene	NF		NF		NF	
Nitrobenzene	1.19E+02	a	2.40E-05	a	3.40E-03	PRG9
Nitrocellulose	NF		NF		NF	
RDX	4.67E+00	g	6.32E-08	g	6.10E-04	PRG9
Tetryl	2.75E+01	l	2.71E-09	g	3.60E-01	PRG10
Organics-Semivolatile						
Benz(a)anthracene	3.58E+05	a	3.35E-06	a	9.20E-05	PRG9
Benzo(a)pyrene	9.69E+05	a	1.13E-06	a	2.00E-04	MCL
Benzo(b)fluoranthene	1.23E+06	a	1.11E-04	a	9.20E-05	PRG9
Benzo(k)fluoranthene	1.23E+06	a	8.29E-07	a	9.20E-04	PRG9
Bis(2-ethylhexyl)phthalate	1.11E+05	a	1.02E-07	a	6.00E-03	MCL
Chrysene	3.98E+05	a	9.46E-05		9.20E-03	PRG9
Fluoranthene	4.91E+04	a	1.61E-05	a	1.50E+00	PRG9
Di-n-butyle phthalate	1.57E+03	a	9.38E-10	a	3.60E+00	PRG10
Pyrene	6.80E+04	a	1.10E-05	a	1.80E-01	PRG9
Organics-Volatile						
Acetone	5.75E-01	a	3.88E-05	a	6.08E-01	PRG9
Carbon disulfide	4.57E+01	a	3.03E-02	a	1.04E+00	PRG10
Methylene chloride	1.00E+01	a	2.19E-03	a	5.00E-03	MCL
TCE	9.40E+01	a	1.03E-02	a	5.00E-03	MCL
1,1,1,1-TCA	1.10E+02	a	1.72E-02	a	2.00E-01	MCL
1,1-DCE	6.50E+01	a	2.60E-02	a	7.00E-03	MCL

Table L-2. Physical and Chemical Properties of Organic SRCs (continued)

Analyte	K_{oc} (L/kg)	Reference	H' (atm-m^3/mol)	Reference	C_w (mg/L)	Reference
0-Xylene	3.63E+02	a	5.19E-03	a	1.00E+01	MCL
M+P-Xylene	3.89E+02	p	7.66E-03	p	1.00E+01	MCL
Toluene	1.40E+02	a	6.64E-03	a	1.00E+00	MCL

NF: not found

References:

a. EPA Soil Screening Guidance: Technical Background Document, May 1996.
b. Baes and Sharp 1983
c. Sheppard and Thibault 1990
d. RREL = Risk Reduction Engineering Laboratory (EPA 1994)
e. RBCA = Risk-based corrective action manual and protocol (SAIC 1999)
f. Calculated from EPA Superfund Office of Emergency and Remedial Response Soil Screening Guidance
g. http://www.syrres.com/esc/physdemo.htm

http://risk.lsd.ornl.gov
MCL = Clean Water Act Drinking Water MCL
PRG9 = EPA Region 9 Preliminary Remedial Goals
Cw = target groundwater concentration (either MCL or PRG9)
H' = Henry's Law Constant
Kd = Distribution Coefficient
Koc = octanol-water Coefficient

l. Estimated Koc for Tetryl.
- log Kow = 1.64, Koc = 0.63 Kow where Sw = Solubility in water (umol/L)
- Obtained Sw =1800 mg/L from EPA Risk Reduction Engineering Laboratory Treatability Data Base (EPA 1994).
- Noted MW = 227.10 g/mol implying Sw = 7926 umol/L

m. Estimated Koc for 2-Nitrotoluene.
- log Kow = 2.53, Koc = 0.63 Kow where Sw = Solubility in water (umol/L)
- Obtained Sw =650 mg/L from Syracuse Research Corporation (2004).
- Noted MW = 137.14 g/mol implying Sw = 4740 umol/L

n. Estimated Koc for 3-Nitrotoluene.
- log Kow = 2.61, Koc = 0.63 Kow where Sw = Solubility in water (umol/L)
- Obtained Sw =500 mg/L from Syracuse Research Corporation (2004).
- Noted MW = 137.14 g/mol implying Sw = 3645 umol/L

o. Syracuse Research Corporation, 2004. http://www.syrres.com/esc/physdemo.htm, August 03.

p. Estimated Kh for Nitroglucerine.
- Kh = (Vp/760)/(Sw/Mw)
- Obtained Vp =2.6E-4 tor, Sw =1.8E+3 mg/L, and MW = 227.10 g/mol from RREL.

Table L-3. Climatic Data from SESOIL
(Station: Youngstown WSO AP, Ohio)[1]

Month	Air Temp (^{o}C)	Cloud Cover	Humidity	ALBEDO	Evapotranspiration[2] (cm/d)	Precipitation (cm)	Duration (days)	Storms per Month	Model Days in Month
October	12	0.60	0.70	0.17	0	6.46	0.42	5.33	30.4
November	5.22	0.70	0.75	0.24	0	7.4	0.53	6.67	30.4
December	-1.06	0.80	0.75	0.31	0	7.06	0.57	6.14	30.4
January	-2.94	0.80	0.80	0.3	0	7.06	0.61	5.69	30.4
February	-2.33	0.70	0.75	0.32	0	5.76	0.53	5.09	30.4
March	2.33	0.70	0.70	0.29	0	8.26	0.55	7.14	30.4
April	9.11	0.70	0.70	0.19	0	8.83	0.48	7.4	30.4
May	14.61	0.60	0.70	0.16	0	8.46	0.45	7.15	30.4
June	19.89	0.60	0.70	0.16	0	9.07	0.36	6.57	30.4
July	21.89	0.50	0.70	0.16	0	9.8	0.3	6.06	30.4
August	21.11	0.55	0.70	0.16	0	8.14	0.3	6.06	30.4
September	17.67	0.55	0.70	0.16	0	7.85	0.4	5.44	30.4

[1] 1996 data from Youngstown, Ohio, Weather Service Office - Airport Station
[2] Data calculated in SESOIL model. 0.00 indicates evapotranspiration is calculated from other climatic data.

Table L-4(a). Initial Contaminant Migration Contaminants of Potential Concerns (CMCOPCs) Based on Comparison of the Site-Related-Contaminant (SRCs) Exposure Concentration with Generic Soil Screening Level (GSSL) with DAF=1.14 for FBQ

Analyte	Units	Exposure Concentration	GSSL*DAF	Preliminary CMCOPC? (DAF=1.14)
Metals				
Aluminum	mg/kg	1.28E+04	6.24E+04	
Antimony	mg/kg	2.65E+00	3.42E-01	Yes
Arsenic	mg/kg	1.33E+01	3.31E-01	Yes
Barium	mg/kg	1.01E+02	9.35E+01	Yes
Beryllium	mg/kg	7.69E-01	3.42E+00	
Cadmium	mg/kg	2.34E-01	4.56E-01	
Chromium	mg/kg	2.59E+01	2.28E+00	Yes
Cobalt	mg/kg	1.17E+01	1.08E+03	
Copper	mg/kg	3.31E+01	5.22E+01	
Iron	mg/kg	2.85E+04	1.00E+04	Yes
Lead	mg/kg	5.81E+01	2.74E+02	
Manganese	mg/kg	6.27E+02	7.49E+02	
Mercury	mg/kg	7.73E-02	1.14E-01	
Nickel	mg/kg	2.16E+01	7.98E+00	Yes
Selenium	mg/kg	1.37E+00	3.42E-01	Yes
Silver	mg/kg	6.20E-02	2.28E+00	
Vanadium	mg/kg	2.34E+01	3.42E+02	
Zinc	mg/kg	1.08E+02	7.07E+02	
Organics-Explosives				
1,3,5-Trinitrobenzene	mg/kg	1.04E-01	2.85E-01	
2,4,6-Trinitrotoluene	mg/kg	2.86E+00	6.50E-04	Yes
2,4-Dinitrotoluene	mg/kg	6.15E-02	4.56E-05	Yes
2,6-Dinitrotoluene	mg/kg	8.45E-02	4.79E-05	Yes
2-Amino-4,6-dinitrotoluene	mg/kg	4.12E-01		
4-Amino-2,6-dinitrotoluene	mg/kg	3.42E-01		
Nitrobenzene	mg/kg	5.31E-02	7.98E-03	Yes
Nitrocellulose	mg/kg	1.28E+02		
RDX	mg/kg	1.06E-01	1.46E-04	Yes
Organics-Pesticide/PCB				
4,4'-DDE	mg/kg	3.70E-04	3.42E+00	
Organics-Semivolatile				
Benz(*a*)anthracene	mg/kg	1.90E-01	9.12E-02	Yes
Benzo(*a*)pyrene	mg/kg	8.40E-02	4.67E-01	
Benzo(*b*)fluoranthene	mg/kg	2.18E-01	2.28E-01	
Benzo(*k*)fluoranthene	mg/kg	8.50E-02	2.28E+00	
Chrysene	mg/kg	2.40E-01	9.12E+00	
Di-n-butyl phthalate	mg/kg	2.20E-01	3.08E+02	
Fluoranthene	mg/kg	3.39E-01	2.39E+02	
Pyrene	mg/kg	2.98E-01	2.62E+02	

Table L-4(a). Initial Contaminant Migration Contaminants of Potential Concerns (CMCOPCs) Based on Comparison of the Site-Related-Contaminant (SRCs) Exposure Concentration with Generic Soil Screening Level (GSSL) with DAF=1.14 for FBQ (continued)

Analyte	Units	Exposure Concentration	GSSL*DAF	Preliminary CMCOPC? (DAF=1.14)
Organics-Volatile				
Acetone	mg/kg	5.10E-03	9.12E-01	
Carbon disulfide	mg/kg	2.93E-02	2.28E+00	
Methylene chloride	mg/kg	2.69E-02	1.14E-03	Yes
Trichloroethene	mg/kg	3.46E-03	3.47E-03	

GSSL * DAF = Generic soil screening level multiplied by a dilution attenutation factor of 1.14.

Table L-4(b). Initial Contaminant Migration Contaminants of Potential Concerns (CMCOPCs) Based on Comparison of the Site-Related-Contaminant (SRCs) Exposure Concentration with Generic Soil Screening Level (GSSL) with DAF=1.3 for 40-mm Firing Range

Analyte	Units	Exposure Concentration	GSSL*DAF	Preliminary CMCOPC? (DAF=1.3)
Metals				
Aluminum	mg/kg	1.26E+04	7.01E+04	
Arsenic	mg/kg	1.50E+01	3.71E-01	Yes
Barium	mg/kg	7.13E+01	1.05E+02	
Beryllium	mg/kg	7.19E-01	3.84E+00	
Cadmium	mg/kg	1.21E-01	5.12E-01	
Chromium	mg/kg	3.36E+01	2.56E+00	Yes
Cobalt	mg/kg	1.04E+01	1.21E+03	
Copper	mg/kg	2.10E+01	5.86E+01	
Iron	mg/kg	2.57E+04	1.13E+04	Yes
Lead	mg/kg	1.72E+01	3.07E+02	
Manganese	mg/kg	5.12E+02	8.41E+02	
Nickel	mg/kg	2.01E+01	8.96E+00	Yes
Thallium	mg/kg	8.38E-01	5.12E-02	Yes
Vanadium	mg/kg	2.25E+01	3.84E+02	
Zinc	mg/kg	6.29E+01	7.94E+02	
Organics-Explosives				
2,4,6-Trinitrotoluene	mg/kg	5.24E-02	7.30E-04	Yes
2,4-Dinitrotoluene	mg/kg	5.19E-02	5.12E-05	Yes
3-Nitrotoluene	mg/kg	1.00E-01	5.61E-02	Yes
HMX	mg/kg	1.07E-01	4.80E-01	
Nitrobenzene	mg/kg	4.98E-02	8.96E-03	Yes
Nitrocellulose	mg/kg	5.53E+01		
Tetryl	mg/kg	1.04E-01	1.18E-01	
Organics-Pesticide/PCB				
4,4'-DDE	mg/kg	3.30E-04	3.84E+00	
Aldrin	mg/kg	1.13E-03	2.56E-02	
Endrin aldehyde	mg/kg	8.50E-04	6.40E-02	
Endrin ketone	mg/kg	3.40E-04	6.40E-02	
Heptachlor	mg/kg	7.90E-04	1.28E+00	
Lindane	mg/kg	9.30E-04	6.40E-04	Yes
Organics-Semivolatile				
Bis(2-ethylhexyl)phthalate	mg/kg	1.50E-01	2.30E+02	
Diethyl phthalate	mg/kg	2.47E+00	2.88E+01	
Organics-Volatile				
1,1,1-Trichloroethane	mg/kg	7.28E-03	1.28E-01	
1,1-Dichloroethene	mg/kg	5.84E-03	3.84E-03	Yes
O-Xylene	mg/kg	2.00E-03	1.28E+01	
Carbon disulfide	mg/kg	8.55E-03	2.56E+00	
M + P Xylene	mg/kg	3.98E-03	1.28E+01	
Toluene	mg/kg	3.44E-03	7.68E-01	

GSSL * DAF = Generic soil screening level multiplied by a dilution attenuation factor of 1.3.

Table L-4(c). Initial Contaminant Migration Contaminants of Potential Concerns (CMCOPCs) Based on Comparison of the Site-Related-Contaminant (SRCs) Exposure Concentration with Generic Soil Screening Level (GSSL) with DAF=1.91 for Sediment Aggregate at FBQ

Analyte	Units	Exposure Concentration	GSSL*DAF	Preliminary CMCOPC? (DAF=1.91)
Metals				
Aluminum	mg/kg	1.72E+04	1.05E+05	
Antimony	mg/kg	1.91E+00	5.73E-01	Yes
Arsenic	mg/kg	1.34E+01	5.54E-01	Yes
Barium	mg/kg	1.61E+02	1.57E+02	Yes
Beryllium	mg/kg	9.18E-01	5.73E+00	
Cadmium	mg/kg	1.38E+00	7.64E-01	Yes
Chromium	mg/kg	2.30E+01	3.82E+00	Yes
Cobalt	mg/kg	1.10E+01	1.81E+03	
Copper	mg/kg	3.14E+01	8.74E+01	
Lead	mg/kg	9.70E+01	4.58E+02	
Manganese	mg/kg	8.69E+02	1.26E+03	
Mercury	mg/kg	2.91E-01	1.91E-01	Yes
Nickel	mg/kg	2.46E+01	1.34E+01	Yes
Selenium	mg/kg	8.19E-01	5.73E-01	Yes
Vanadium	mg/kg	2.99E+01	5.73E+02	
Zinc	mg/kg	1.80E+02	1.18E+03	
Organics-Explosives				
1,3,5-Trinitrobenzene	mg/kg	5.62E-02	4.78E-01	
1,3-Dinitrobenzene	mg/kg	5.78E-02	1.83E-03	Yes
2,4,6-Trinitrotoluene	mg/kg	5.10E-02	1.09E-03	Yes
2,6-Dinitrotoluene	mg/kg	5.45E-02	8.02E-05	Yes
3-Nitrotoluene	mg/kg	1.06E-01	8.37E-02	Yes
HMX	mg/kg	1.01E-01	7.16E-01	
Nitrobenzene	mg/kg	5.26E-02	1.34E-02	Yes
Nitrocellulose	mg/kg	5.78E+01	NA	
Organics-Pesticide/PCB				
4,4'-DDD	mg/kg	3.03E-03	1.53E+00	
4,4'-DDE	mg/kg	1.00E-03	5.73E+00	
Dieldrin	mg/kg	5.50E-04	3.82E-04	Yes
Methoxychlor	mg/kg	1.66E-03	1.53E+01	
Organics-Semivolatile				
2-Methylnaphthalene	mg/kg	4.50E-01	3.53E+00	
4-Methylphenol	mg/kg	3.68E-01	0.00E+00	
Benz(a)anthracene	mg/kg	3.60E-01	1.53E-01	Yes
Benzo(a)pyrene	mg/kg	3.24E-01	7.83E-01	
Bis(2-ethylhexyl)phthalate	mg/kg	7.60E-02	3.44E+02	
Chrysene	mg/kg	3.38E-01	1.53E+01	
Dibenzofuran	mg/kg	3.16E-01	7.82E-01	
Fluoranthene	mg/kg	5.11E-01	4.01E+02	
Indeno(1,2,3-cd)pyrene	mg/kg	3.07E-01	1.34E+00	
Naphthalene	mg/kg	3.69E-01	7.64E+00	
Pyrene	mg/kg	4.06E-01	4.39E+02	

Table L-4(c). Initial Contaminant Migration Contaminants of Potential Concerns (CMCOPCs) Based on Comparison of the Site-Related-Contaminant (SRCs) Exposure Concentration with Generic Soil Screening Level (GSSL) with DAF=1.91 for Sediment Aggregate at FBQ (continued)

Analyte	Units	Exposure Concentration	GSSL*DAF	Preliminary CMCOPC? (DAF=1.91)
Organics-Volatile				
2-Butanone	mg/kg	1.08E-02	8.40E+00	
Acetone	mg/kg	1.54E-02	1.53E+00	
Carbon disulfide	mg/kg	3.60E-03	3.82E+00	
Toluene	mg/kg	1.64E-02	1.15E+00	

Table L-5(a). Initial CMCOPCs for FBQ (Extracted from Table L-4a)

Analyte	Units	Exposure Concentration	GSSL*DAF	Preliminary CMCOPC? (DAF=1.14)
Metals				
Antimony	mg/kg	2.65E+00	3.42E-01	Yes
Arsenic	mg/kg	1.33E+01	3.31E-01	Yes
Barium	mg/kg	1.01E+02	9.35E+01	Yes
Chromium	mg/kg	2.59E+01	2.28E+00	Yes
Iron	mg/kg	2.85E+04	1.00E+04	Yes
Nickel	mg/kg	2.16E+01	7.98E+00	Yes
Selenium	mg/kg	1.37E+00	3.42E-01	Yes
Explosives				
2,4,6-Trinitrotoluene	mg/kg	2.86	0.0006498	Yes
2,4-Dinitrotoluene	mg/kg	0.06	0.0000456	Yes
2,6-Dinitrotoluene	mg/kg	0.08	0.00004788	Yes
Nitrobenzene	mg/kg	0.05	0.00798	Yes
RDX	mg/kg	0.11	0.000145575	Yes
Organics-Semivolatile				
Benz(*a*)anthracene	mg/kg	0.19	0.0912	Yes
Organics-Volatile				
Methylene chloride	mg/kg	0.03	0.00114	Yes

GSSL * DAF = Generic soil screening level multiplied by a dilution attenuation factor of 1.14.

Table L-5(b). Initial CMCOPCs for 40-mm Firing Range (Extracted from Table L-4b)

Analyte	Units	Exposure Concentration	GSSL*DAF	Preliminary CMCOPC? (DAF=1.47)
Metals				
Arsenic	mg/kg	1.50E+01	3.71E-01	Yes
Chromium	mg/kg	3.36E+01	2.56E+00	Yes
Iron	mg/kg	2.57E+04	1.13E+04	Yes
Nickel	mg/kg	2.01E+01	8.96E+00	Yes
Thallium	mg/kg	8.38E-01	5.12E-02	Yes
2,4,6-Trinitrotoluene	mg/kg	5.24E-02	7.30E-04	Yes
2,4-Dinitrotoluene	mg/kg	5.19E-02	5.12E-05	Yes
3-Nitrotoluene	mg/kg	1.00E-01	5.61E-02	Yes
Nitrobenzene	mg/kg	4.98E-02	8.96E-03	Yes
Organics-Pesticide/PCB				
Lindane	mg/kg	9.30E-04	6.40E-04	Yes
Organics-Volatile				
1,1-Dichloroethene	mg/kg	5.84E-03	3.84E-03	Yes

GSSL * DAF = Generic soil screening level multiplied by a dilution attenutation factor of 1.3.

Table L-5(c). Initial CMCOPCs for Sediment Aggregate at FBQ (Extracted from Table L-4c)

Analyte	Units	Exposure Concentration	GSSL*DAF	Preliminary CMCOPC? (DAF=1.91)
Metals				
Antimony	mg/kg	1.91E+00	5.73E-01	Yes
Arsenic	mg/kg	1.34E+01	5.54E-01	Yes
Barium	mg/kg	1.61E+02	1.57E+02	Yes
Cadmium	mg/kg	1.38E+00	7.64E-01	Yes
Chromium	mg/kg	2.30E+01	3.82E+00	Yes
Mercury	mg/kg	2.91E-01	1.91E-01	Yes
Nickel	mg/kg	2.46E+01	1.34E+01	Yes
Selenium	mg/kg	8.19E-01	5.73E-01	Yes
Organics-Explosives				
1,3,5-Trinitrobenzene	mg/kg	5.62E-02	4.78E-01	
1,3-Dinitrobenzene	mg/kg	5.78E-02	1.83E-03	Yes
2,4,6-Trinitrotoluene	mg/kg	5.10E-02	1.09E-03	Yes
2,6-Dinitrotoluene	mg/kg	5.45E-02	8.02E-05	Yes
3-Nitrotoluene	mg/kg	1.06E-01	8.37E-02	Yes
Nitrobenzene	mg/kg	5.26E-02	1.34E-02	Yes
Organics-Pesticide/PCB				
Dieldrin	mg/kg	5.50E-04	3.82E-04	Yes
Organics-Semivolatile				
Benz(a)anthracene	mg/kg	3.60E-01	1.53E-01	Yes

Table L-6(a). Initial CMCOPCs Reaching the Groundwater Table (based on Arrival Time <= 1500 years) for FBQ

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

Parameter	Symbol	Value	Units	Notes
Percolation rate	q	0.3100	ft/yr	0.1 * (SESOIL Recharge)
Soil-water distribution coefficient	K_d	constituent-specific	L/kg	Literature
Organic carbon distribution coefficient	K_{oc}	constituent-specific	L/kg	Literature
Fraction organic carbon	f_{oc}	0.0050	unitless	
Water filled soil porosity	q_w	0.3458	unitless	Site-specific
Bulk density (dry)	r_b	1.7716	gm/cm^3	Site-specific
Leaching Zone	Lz	10.8830	ft	
Retardation Factor	R	constituent-specific	unitless	Calculated
Arrival Time	T	constituent-specific	yr	Calculated

Analyte	K_{oc} (L/kg)	K_d (L/kg)	R	T (yr)	T < 1500?
Explosives					
2,4,6-Trinitrotoluene	2.13E+05	1.07E+03	5.46E+03	6.62E+04	
2,4-Dinitrotoluene	9.55E+01	4.78E-01	3.45E+00	4.18E+01	Yes
2,6-Dinitrotoluene	6.92E+01	3.46E-01	2.77E+00	3.37E+01	Yes
Nitrobenzene	1.19E+02	5.95E-01	4.05E+00	4.91E+01	Yes
RDX	4.67E+00	2.34E-02	1.12E+00	1.36E+01	Yes
Metals					
Antimony		4.50E+01	2.32E+02	2.81E+03	
Arsenic		2.90E+01	1.50E+02	1.82E+03	
Barium		4.10E+01	2.11E+02	2.56E+03	
Chromium		1.90E+01	9.83E+01	1.19E+03	Yes
Iron		8.00E+02	4.10E+03	4.98E+04	
Nickel		6.50E+01	3.34E+02	4.05E+03	
Selenium		5.00E+00	2.66E+01	3.23E+02	Yes
Organics-Semivolatile					
Benzo(*a*)anthracene	3.58E+05	1.79E+03	9.17E+03	1.11E+05	
Organics-Volatile					
Methylene chloride	1.00E+01	4.20E-01	3.15E+00	3.83E+01	Yes

Table L-6(b). Initial CMCOPCs Reaching the Groundwater Table (based on Arrival Time <= 1500 years) for 40-mm Firing Range

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

Parameter	Symbol	Value	Units	Notes
Percolation rate	q	0.3100	ft/yr	0.1 * (SESOIL Recharge)
Soil-water distribution coefficient	K_d	constituent-specific	L/kg	Literature
Organic carbon distribution coefficient	K_{oc}	constituent-specific	L/kg	Literature
Fraction organic carbon	f_{oc}	0.0050	unitless	
Water filled soil porosity	q_w	0.3458	unitless	Site-specific
Bulk density (dry)	r_b	1.7716	gm/cm^3	Site-specific
Leaching Zone	Lz	10.8830	ft	
Retardation Factor	R	constituent-specific	unitless	Calculated
Arrival Time	T	constituent-specific	yr	Calculated

Analyte	K_{oc} (L/kg)	K_d (L/kg)	R	T (yr)	T < 1500?
Explosives					
2,4,6-Trinitrotoluene	2.13E+05	1.07E+03	5.46E+03	6.62E+04	
2,4-Dinitrotoluene	9.55E+01	4.78E-01	3.45E+00	4.18E+01	Yes
3-Nitrotoluene	2.59E+02	1.30E+00	7.63E+00	9.27E+01	Yes
Nitrobenzene	1.19E+02	5.95E-01	4.05E+00	4.91E+01	Yes
Metals					
Arsenic		2.90E+01	1.50E+02	1.82E+03	
Chromium		1.90E+01	9.83E+01	1.19E+03	Yes
Iron		8.00E+02	4.10E+03	4.98E+04	
Nickel		6.50E+01	3.34E+02	4.05E+03	
Thallium		7.10E+01	3.65E+02	4.43E+03	
Organics-Volatile					
1,1-Dichloroethene	5.89E+01	2.95E-01	2.51E+00	3.05E+01	Yes

Table L-6(c). Initial CMCOPCs Reaching the Groundwater Table (based on Arrival Time <= 1500 years) for Sediment Aggregate at FBQ

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

Parameter	Symbol	Value	Units	Notes
Percolation rate	q	0.3100	ft/yr	0.1 * (SESOIL Recharge)
Soil-water distribution coefficient	K_d	constituent-specific	L/kg	Literature
Organic carbon distribution coefficient	K_{oc}	constituent-specific	L/kg	Literature
Fraction organic carbon	f_{oc}	0.042	unitless	
Water filled soil porosity	q_w	0.35	unitless	Site-specific
Bulk density (dry)	r_b	1.80	gm/cm^3	Site-specific
Leaching Zone	Lz	13.3830	ft	
Retardation Factor	R	constituent-specific	unitless	Calculated
Arrival Time	T	constituent-specific	yr	Calculated

Analyte	K_{oc} (L/kg)	K_d (L/kg)	R	T (yr)	T < 1500?
Explosives					
1,3,5-Trinitrobenzene	9.98E+00	4.20E-01	3.15E+00	4.71E+01	Yes
1,3-Dinitrobenzene	1.95E+01	8.21E-01	5.21E+00	7.77E+01	Yes
2,4,6-Trinitrotoluene	2.13E+05	1.07E+03	5.46E+03	6.62E+04	
2,6-Dinitrotoluene	6.92E+01	2.91E+00	15.92549946	237.7441474	Yes
3-Nitrotoluene	2.59E+02	1.30E+00	7.63E+00	9.27E+01	Yes
Nitrobenzene	1.19E+02	5.95E-01	4.05E+00	4.91E+01	Yes
Metals					
Antimony		4.50E+01	2.35E+02	3.54E+03	
Arsenic		2.90E+01	1.52E+02	2.29E+03	
Barium		4.10E+01	2.14E+02	3.23E+03	
Cadmium		7.50E+01	3.91E+02	5.89E+03	
Chromium (total)		1.90E+01	9.99E+01	1.50E+03	
Mercury		5.20E+01	2.72E+02	4.09E+03	
Nickel		6.50E+01	3.39E+02	5.11E+03	
Selenium		5.00E+00	2.70E+01	4.07E+02	Yes
Organics-Pesticide/PCB					
Dieldrin	2.55E+04	1.07E+03	5.59E+03	8.42E+04	
Organics-Semivolatile					
Benz(a)anthracene	3.58E+05	1.51E+04	7.85E+04	1.18E+06	

Table L-7(a). Initial CMCOPCs for Leachate Modeling at FBQ [based on Table L-6(a)]

Analyte	Leachate Modeling?
Explosives	
2,4-Dinitrotoluene	Yes
2,6-Dinitrotoluene	Yes
Nitrobenzene	Yes
RDX	Yes
Metals	
Chromium	Yes
Selenium	Yes
Organics-Volatile	
Methylene chloride	Yes

Table L-7(b). Initial CMCOPCs for Leachate Modeling at the 40-mm Firing Range [based on Table L-6(b)]

Analyte	Leachate Modeling?
Explosives	
2,4-Dinitrotoluene	Yes
3-Nitrotoluene	Yes
Nitrobenzene	Yes
Metals	
Chromium	Yes
Organics-Pesticides	
Lindane	Yes
Organics-Volatile	
1,1-Dichloroethene	Yes

Table L-7(c). Initial CMCOPCs for Leachate Modeling at FBQ Sediment Aggregate [based on Table L-6(c)]

Analyte	Leachate Modeling?
Explosives	
1,3,5-Trinitrobenzene	Yes
1,3-Dinitrobenzene	Yes
2,6-Dinitrotoluene	Yes
3-Nitrotoluene	Yes
Nitrobenzene	Yes
Metals	
Selenium	Yes

Table L-8. Physical and Chemical Properties of Initial CMCOPCs Selected for Leachate Modeling

Initial CMCOPC	Molecular Weight	Solubility (mg/L)	Kd or Koc (L/kg)	Diffusion Coefficient in Air (cm2/s)	Biodegradation Rate (1/day)
Explosives					
1,3-Dinitrobenzene	168.1	8.61E+02	6.92E+01	2.00E-01	1.90E-03
1,3,5-Trinitrobenzene	213.1	3.50E+02	9.98E+00	2.49E-01	NF
2,4-Dinitrotoluene	182.0	2.70E+02	9.55E+01	2.00E-01	1.90E-03
2,6-Dinitrotoluene	182.0	1.82E+02	6.92E+01	2.00E-01	1.90E-03
3-Nitrotoluene	137.0	5.00E+02	2.59E+02	2.30E-01	NF
Nitrobenzene	123.1	2.09E+03	1.19E+02	7.60E-02	1.76E-03
RDX	222.0	6.00E-02	4.67E+00	7.40E-02	5.00E-04
Metals					
Chromium (total)	52.0	1.00E+05	1.90E+01	NA	NA
Selenium	79.0	1.00E+05	5.00E+00	NA	NA
Organics-Volatile					
1,1-Dichloroethene	96.9	2.25E+03	6.50E+01	2.60E-02	3.85E-03
Dichloromethane (methylene chloride)	84.9	1.30E+04	1.00E+01	1.01E-01	6.19E-03

NA: Not Applicable
NF: Not Found
Kd = distribution coefficient
Koc = organic-carbon partition coefficient

Table L-9. Layers Used in Leachate Model for FBQ, 40-mm Firing Range Area, and FBQ Sediment Aggregate

Transect	Layer Number	Layer Thickness	Number of Sublayers	Purpose
Quarry Ponds and 40-mm Range Area	1	1.0 m (3 ft)	1	Contaminant Loading
	2	3 m (10 ft)	5	Leaching
	3	0.3 m (1 ft)	2	Leaching
Sediment Aggregate	1	0.15 m (0.5 ft)	1	Contaminant Loading
	2	3.9 m (13 ft)	1	Leaching
	3	0.15 m (0.5 ft)	1	Leaching

Table L-10(a). SESOIL Source Term Data for Leachate Modeling at FBQ

Analyte	No. of Layers	Layer No.	Thickness of Layer (feet)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
2,4-Dinitrotoluene	3	1	3	1	1	6.15E-02
		2	10	5	1	0
					2	0
					3	0
					4	0
					5	0
		3	1	2	1	0
					2	0
2,6-Dinitrotoluene	3	1	3	1	1	8.45E-02
		2	10	5	1	0
					2	0
					3	0
					4	0
					5	0
		3	1	2	1	0
					2	0
Nitrobenzene	3	1	3	1	1	5.31E-02
		2	10	5	1	0
					2	0
					3	0
					4	0
					5	0
		3	1	2	1	0
					2	0
RDX	3	1	3	1	1	1.06E-01
		2	10	5	1	0
					2	0
					3	0
					4	0
					5	0
		3	1	2	1	0
					2	0

Table L-10(a). SESOIL Source Term Data for Leachate Modeling at FBQ (continued)

Analyte	No. of Layers	Layer No.	Thickness of Layer (feet)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
Methylene chloride	3	1	3	1	1	2.69E-02
		2	10	5	1	0
					2	0
					3	0
					4	0
					5	0
		3	1	2	1	0
					2	0
Chromium	3	1	3	1	1	2.59E+01
		2	10	5	1	0
					2	0
					3	0
					4	0
					5	0
		3	1	2	1	0
					2	0
Selenium	3	1	3	1	1	1.37E+00
		2	10	5	1	0
					2	0
					3	0
					4	0
					5	0
		3	1	2	1	0
					2	0

Table L-10(b). SESOIL Source Term Data for Leachate Modeling at the 40-mm Firing Range

Analyte	No. of Layers	Layer No.	Thickness of Layer (feet)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
2,4-Dinitrotoluene	3	1	3	1	1	5.19E-02
		2	10	5	1	0
					2	0
					3	0
					4	0
					5	0
		3	1	2	1	0
					2	0
3-Nitrotoluene	3	1	3	1	1	1.00E-01
		2	10	5	1	0
					2	0
					3	0
					4	0
					5	0
		3	1	2	1	0
					2	0
Nitrobenzene	3	1	3	1	1	4.98E-02
		2	10	5	1	0
					2	0
					3	0
					4	0
					5	0
		3	1	2	1	0
					2	0
Lindane	3	1	3	1	1	9.30E-04
		2	10	5	1	0
					2	0
					3	0
					4	0
					5	0
		3	1	2	1	0
					2	0

Table L-10(b). SESOIL Source Term Data for Leachate Modeling at the 40-mm Firing Range (continued)

Analyte	No. of Layers	Layer No.	Thickness of Layer (feet)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
1,1-Dichloroethene	3	1	3	1	1	5.84E-03
		2	10	5	1	0
					2	0
					3	0
					4	0
					5	0
		3	1	2	1	0
					2	0
Chromium	3	1	3	1	1	3.36E+01
		2	10	5	1	0
					2	0
					3	0
					4	0
					5	0
		3	1	2	1	0
					2	0

Table L-10(c). SESOIL Source Term Data for Leachate Modeling at FBQ Sediment Aggregate

Analyte	No. of Layers	Layer No.	Thickness of Layer (feet)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
1,3-Dinitrobenzene	3	1	0.5	1	1	5.78E-02
		2	13	1	1	0
						0
		3	0.5	1	1	0
1,3,5-Trinitrobenzene	3	1	0.5	1	1	5.62E-02
		2	13	1	1	0
		3	0.5	1	1	0
2,6-Dinitrotoluene	3	1	0.5	1	1	5.45E-02
		2	13	1	1	0
		3	0.5	1	1	0
3-Nitrotoluene	3	1	0.5	1	1	1.06E-01
		2	13	1	1	0
		3	0.5	1	1	0
Nitrobenzene	3	1	0.5	1	1	5.26E-02
		2	13	1	1	0
		3	0.5	1	1	0
Selenium	3	1	0.5	1	1	8.19E-01
		2	13	1	1	0
		3	0.5	1	1	0

Table L-10(c). SESOIL Source Term Data for Leachate Modeling at FBQ Sediment Aggregate (continued)

Analyte	No. of Layers	Layer No.	Thickness of Layer (feet)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
1,1-Dichloroethene	3	1	3	1	1	5.84E-03
		2	10	5	1	0
					2	0
					3	0
					4	0
					5	0
		3	1	2	1	0
					2	0
Chromium	3	1	3	1	1	3.36E+01
		2	10	5	1	0
					2	0
					3	0
					4	0
					5	0
		3	1	2	1	0
					2	0

Table L-11. Summary of Leachate Modeling Results

Initial CMCOPC	RME 0-3 ft[1] (mg/kg)	Predicted $C_{leachate,max}$ Beneath the Source (mg/L)	Predicted $C_{leachate,max}$ Predicted Tmax (years)	Predicted $C_{gw,max}$ At the Source[2] (mg/L)	Observed $C_{gw,max}$ Downgradient of Source (mg/L)	MCL/RBC (mg/L)	Final CM COPC[3]
FBQ							
Explosives							
2,4-Dinitrotoluene	6.15E-02	6.40E-08	20	5.61E-08	3.10E-04	7.30E-02	
2,6-Dinitrotoluene	8.45E-02	2.20E-06	16	1.93E-06	ND	3.60E-02	
Nitrobenzene	5.31E-02	1.00E-10	22	8.77E-11	1.70E-04	3.40E-03	
RDX	1.06E-01	1.30E-01	7	1.14E-01	ND	6.10E-04	Yes
Metals							
Chromium	2.59E+01	8.16E-01	720	7.16E-01	1.00E-02	1.00E-01	Yes
Selenium	1.37E+00	1.63E-01	195	1.43E-01		5.00E-02	Yes
Organics-Volatile							
Methylene chloride	2.69E-02	1.00E-09	10	2.28E-07	ND	5.00E-03	
40-mm Firing Range							
Explosives							
2,4-Dinitrotoluene	5.19E-02	2.40E-08	20	1.85E-08	3.10E-04	7.30E-02	
3-Nitrotoluene	1.00E-01	2.35E-02	40	1.81E-02	ND	6.10E-02	
Nitrobenzene	4.98E-02	0.00E+00	NA	NA	1.70E-04	3.40E-03	
Pesticide							
Lindane	9.30E-04	0.00E+00	NA	NA	ND	7.30E-02	
Metals							
Chromium	3.36E+01	1.04E+00	720	7.99E-01	ND	1.00E-01	Yes
Organics-Volatile							
1,1-Dichloroethene	5.84E-03	2.80E-06	17	2.15E-06	4.20E-03	5.00E-03	
Sediment Aggregate at FBQ							
Explosives							
1,3-Dinitrobenzene	0.0578	1.00E-10	90	5.24E-11		3.65E-03	
1,3,5-Trinitrobenzene	0.0562	0.003985	20	2.09E-03		1.09E+00	
2,6-Dinitrotoluene	0.0545	1.00E-10	90	5.24E-11	ND	3.60E-02	
3-Nitrotoluene	0.106	3.75E-04	370	1.96E-04		6.10E-02	
Nitrobenzene	0.0526	1.00E-10	150	5.24E-11	1.70E-04	3.40E-03	
Metals							
Selenium	8.19E-01	6.40E-03	175	3.35E-03		5.00E-02	

[1] The depth of RME for sediment aggregate is 0.0 to 0.5 ft.
[2] The concentration was calculated using DAF=1.14 for FBQ, DAF=1.3 for 40 mm Firing Range, and DAF=1.91 for Sediment Aggregate at FBQ.
[3] The final contaminant migration constituent of potential concern (CMCOPC) was identified comparing redicted/observed concentration in groundwater to the maximum contaminant level/risk-based concentration (MCL/RBC). A constituent is a Final CM COPC if its predicted/observed concentration in groundwater exceeds its MCL/RBC within 1,000 years.
ND = Not detected
RBQ = Fuze and Booster Quarry Landfill/Ponds.
RME = Reasonable maximum exposure.
RVAAP = Ravenna Army Ammunition Plant

Table L-12. Development of Additional Final Contaminant Migration Contaminants of Potential Concerns (CMCOPCs) Based on Comparison of Observed Maximum Groundwater Concentration with its Target Groundwater Concentration

Analyte	Units	Maximum Concentration (mg/L)	MCL/RBC (mg/L)	Final CMCOPC?
Unconsolidated Groundwater				
Metals				
Barium	mg/L	6.24E-02	2.00E+00	
Cadmium	mg/L	1.30E-03	5.00E-03	
Cobalt	mg/L	1.37E-02	7.30E-01	
Copper	mg/L	5.90E-03	1.30E+00	
Iron	mg/L	1.64E+01	1.10E+01	Yes
Manganese	mg/L	6.77E+00	8.76E-01	Yes
Nickel	mg/L	1.78E-02	7.30E-01	
Zinc	mg/L	1.56E-02	1.10E+01	
Organics-Explosives				
2-Amino-4,6-dinitrotoluene	mg/L	2.30E-04	NA	
4-Amino-2,6-dinitrotoluene	mg/L	3.30E-04	NA	
Nitrocellulose	mg/L	3.50E-01	NA	
Organics-Semivolatile				
Bis(2-ethylhexyl)phthalate	mg/L	2.20E-03	6.00E-03	
Caprolactam	mg/L	3.60E-02	1.83E+01	
Organics-Volatile				
1,1,1-Trichloroethane	mg/L	5.80E-03	2.00E-01	
1,1-Dichloroethene	mg/L	4.20E-03	7.00E-03	
Acetone	mg/L	6.20E-03	6.08E-01	
Carbon disulfide	mg/L	9.70E-04	1.04E+00	
Bedrock Groundwater				
Metals				
Aluminum	mg/L	6.78E-02	3.65E+01	
Barium	mg/L	8.67E-02	2.00E+00	
Cobalt	mg/L	9.30E-03	7.30E-01	
Chromium, hexavalent	mg/L	1.00E-02	1.00E-01	
Iron	mg/L	5.56E+00	1.10E+01	
Manganese	mg/L	4.15E+00	8.76E-01	Yes
Nickel	mg/L	2.55E-01	7.30E-01	
Zinc	mg/L	2.06E-02	1.10E+01	
Organics-Explosives				
2,4,6-Trinitrotoluene	mg/L	1.80E-02	2.24E-03	Yes
2,4-Dinitrotoluene	mg/L	3.10E-04	7.30E-02	
2-Amino-4,6-dinitrotoluene	mg/L	2.80E-02	NA	
4-Amino-2,6-dinitrotoluene	mg/L	2.80E-02	NA	
Nitrobenzene	mg/L	1.70E-04	3.40E-03	
Nitrocellulose	mg/L	3.20E-01	NA	

Table L-12. Development of Additional Final Contaminant Migration Contaminants of Potential Concerns (CMCOPCs) Based on Comparison of Observed Maximum Groundwater Concentration with its Target Groundwater Concentration (continued)

Analyte	Units	Maximum Concentration (mg/L)	MCL/RBC (mg/L)	Final CMCOPC?
Organics-Semivolatiles				
Bis(2-ethylhexyl)phthalate	mg/L	2.40E-03	6.00E-03	
Butyl benzyl phthalate	mg/L	1.40E-02	7.30E+00	
Caprolactam	mg/L	3.90E-01	1.83E+01	
Di-n-butyl phthalate	mg/L	2.30E-03	3.60E+00	
Organics-Volatile				
Acetone	mg/L	6.20E-03	6.08E-01	
Trichloroethene	mg/L	1.20E-02	5.00E-03	Yes

Table L-13. Final CMCOPCs in Groundwater based on Leachate Modeling and Observed Groundwater Concentration

Initial CMCOPC	RME 0-3 ft (mg/kg)	Predicted $C_{leachate,max}$		Predicted Observed $C_{gw,max}$		MCL/RBC (mg/L)	Final CM COPC[2]
		Beneath the Source (mg/L)	Predicted Tmax (years)	$C_{gw,max}$ At the Source[1] (mg/L)	Downgradient of Source (mg/L)		
FBQ							
Explosives							
2,4,6-Trinitrotoluene					1.80E-02	2.24E-03	Yes
RDX	1.06E-01	1.30E-01	7	1.14E-01	ND	6.10E-04	Yes
Metals							
Chromium	2.59E+01	8.16E-01	720	7.16E-01	1.00E-02	1.00E-01	Yes
Iron					1.64E+01	1.10E+01	Yes
Manganese					6.77E+00	8.76E-01	Yes
Selenium	1.37E+00	1.63E-01	195	1.43E-01		5.00E-02	Yes
Organics-Volatile							
Trichloroethene					1.20E-02	5.00E-03	Yes
40-mm Firing Range Area							
Metals							
Chromium	3.36E+01	1.04E+00	720	7.99E-01	ND	1.00E-01	Yes

Table L-14. Final CMCOPCs Reaching the Nearest Receptor (based on Arrival Time <= 1500 years)

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

Parameter	Symbol	Value	Units	Notes
Darcy flux	q	2.8760	ft/yr	Site-specific
Soil-water distribution coefficient	K_d	constituent-specific	L/kg	Literature
Organic carbon distribution coefficient	K_{oc}	constituent-specific	L/kg	Literature
Fraction organic carbon	f_{oc}	0.0050	unitless	
Effective porosity	q_{we}	0.2000	unitless	Site-specific
Bulk density (dry)	r_b	1.7716	gm/cm^3	Site-specific
Effective Porosity	q_w	0.2000	unitless	Site-specific
Distance to nearest receptor	Lx	0.0000	ft	
Retardation Factor	R	constituent-specific	unitless	Calculated
Arrival Time	T	constituent-specific	yr	Calculated

Analyte	K_{oc} (L/kg)	K_d (L/kg)	R	T (yr)	T < 1500?
Explosives					
2,4,6-Trinitrotoluene	2.13E+05	1.05E+03	9.33E+03	0.00E+00	Yes
RDX	4.67E+00	2.34E-02	1.21E+00		Yes
Metals					
Chromium		1.90E+01	1.69E+02	0.00E+00	Yes
Iron		8.00E+02	7.08E+03	0.00E+00	Yes
Manganese		7.50E+02	6.64E+03	0.00E+00	Yes
Selenium		5.00E+00	4.53E+01	0.00E+00	Yes
Organics-Volatile					
Trichloroethene	9.40E+01	4.65E-01	5.12E+00	0.00E+00	Yes

Table L-15. Physical and Chemical Properties of Final CMCOPCs Selected for Groundwater Modeling

Analyte	Distribution Coefficient, Kd (L/kg)	Retardation factor, R	Diffusion Coefficient in Water (cm2/s)	Biodegradation Rate (1/hr)
Explosives				
2,4,6-Trinitrotoluene	1.05E+03	9.33E+03	6.30E-06	7.90E-05
RDX	2.34E-02	1.21E+00	7.15E-06	2.08E-05
Metals				
Chromium	1.90E+01	1.69E+02	1.00E-06	NA
Iron	8.00E+02	7.08E+03	1.00E-06	NA
Manganese	7.50E+02	6.64E+03	1.00E-06	NA
Selenium	5.00E+00	4.53E+01	1.00E-06	NA
Organics-Volatile				
Trichloroethene	4.65E-01	5.12E+00	9.10E-06	2.75E-05

Table L-16. Summary of Fate and Transport Modeling Results

Initial CMCOPC	Predicted/Observed $C_{gw,max}$ At the Source[1] (mg/L)	Predicted $C_{gw,max}$ at Receptors Locations		Observed $C_{gw,max}$	MCL/RBC (mg/L)	Final CM COPC[2]	Comment
		at Source Boundary (mg/L)	at the unnamed Creek (mg/L)	Downgradient of Source (mg/L)			
FBQ							
Explosives							
2,4,6-Trinitrotoluene[3]	1.80E-02	0.00E+00	0.00E+00	1.80E-02	2.24E-03	Yes	a
RDX	1.10E-01	1.93E-02	5.88E-05	ND	6.10E-04	Yes	b
Metals							
Chromium	7.16E-01	1.65E-01	0.00E+00	1.00E-02	1.00E-01	Yes	b
Iron[4]	1.64E+01	0.00E+00	0.00E+00	1.64E+01	1.10E+01	Yes	a
Manganese[5]	6.77E+00	0.00E+00	0.00E+00	6.77E+00	8.80E-01	Yes	a
Selenium	1.43E-01	4.80E-02	0.00E+00	ND	5.00E-02		
Organics-Volatile							
Trichloroethene	1.20E-02	8.00E-09	0.00E+00	1.20E-02	5.00E-03	Yes	a
40-mm Firing Range							
Metals							
Chromium	7.99E-01	2.04E-01	0.00E+00	1.00E-02	1.00E-01	Yes	b

ND = Not Detected

[1] The concentration was calculated using DAF=1.14 for FBQ and DAF=1.3 for 40 mm Firing Range.

[2] The Final CM COPC was identified comparing predicted/observed concentration in groundwater at the receptor locations to its MCL or /RBC. A constituent is a Final CM COPC if its predicted/observed concentration in groundwater at any of the receptor locat

a = the constituent is a CM COC because the maximum observed groundwater exceeds its MCL/RBC

b = the constituent is a CM COC because the maximum predicted groundwater concentration at the source boundary exceeds its MCL/RBC.