APPENDIX C

HUMAN HEALTH RISK ASSESSMENT SUPPORTING INFORMATION

Appendix C

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Appendix C.1

Southwest Properties Background Data

C.1.1 Background Data for Soil
Wells G&H Superfund Site, Operable Unit 2
Woburn, Massachusetts

Property	Aberjona	Aberjona	Aberjona	Murphy	Murphy	Whitney	Whitney
Location	AB-10	AB-17	AB-17	MR-08	MR-19	WB-05	WB-14
Sample ID	AB10SS(0-2.0)	AB17SS(0-2.0)	AB21SS(0-2.0)	MR8SS(0-1.0)	MR19SS(0-1.5)	WB5SS(0-2.0)	WB14SS(0-2.0)
Date	12/2/2002	12/2/2002	12/2/2002	11/21/2002	11/21/2002	12/3/2002	12/3/2002
Soil (S)	S	S	S	S	S	S	S
Top (ft)	0	0	0	0	0	0	0
Bottom (ft)	2	2	2	1	1.5	2	2
Metals							
Chromium (VI)	1200 UJ	1100 UJ	1400 J	1200 UJ	1300 UJ	1100 UJ	1100 UJ
Aluminum	9260000	7830000	7400000	9950000	8740000	4090000	8900000
Antimony	370 UJ	350 UJ	350 UJ	410 J	470 J	2360 J	350 UJ
Arsenic	8890	7330	8090	6220	6330	7100	12000
Barium	25000	25000	23000	24000	33000	27000	35000
Beryllium	400	350 U	350	430	380	320 U	440
Cadmium	780	920	650	800	850	1520	1160
Calcium	1150000 J	1540000 J	1340000 J	726000 J	1080000 J	1200000	1850000
Chromium	23000	12000	12000	16000	16000	34000 J	18000 J
Cobalt	5160	5730	5160	6230	6630	3470	8120
Copper	17000	20000	21000	19000	21000	25000	30000
Cyanide	200 U	180 U	190 U	190 U	230 U	180 U	190 U
Iron	10100000	9900000	8780000	11200000	11200000	13800000	14100000
Lead	57000	20000	20000	45000	57000	216000	73000
Magnesium	1830000	2800000	2190000	2630000	3170000	1540000	3820000
Manganese	140000	142000	129000	117000	147000	115000	175000
Mercury	100 U	85 U	74 U	100 U	152 U	112	90
Nickel	7700	12000	9080	11000	13000	17000	13000
Potassium	468000 J	853000 J	970000 J	912000 J	1350000 J	659000 J	1380000 J
Selenium	750 UJ	700 UJ	700 UJ	690 UJ	750 UJ	640 UJ	700 UJ
Silver	370 UJ	350 UJ	350 UJ	350 UJ	380 UJ	320 UJ	350 UJ
Sodium	37000 U	35000 U	35000 U	35000 UJ	38000 U	32000 UJ	35000 U
Thallium	160 U	140 U	140 U	140 UJ	140 U	140 U	150 U
Vanadium	19000	22000	18000	23000	23000	13000	28000
Zinc	48000	33000	35000	37000	42000	129000	276000

C.1.2 Background Data for Groundwater
Wells G&H Superfund Site, Operable Unit 2
Woburn, Massachusetts

Property	Murphy	Murphy	Murphy	Murphy	Murphy
Location	MW-01	MW-01	MW-01	MW-02	MW-02
Sample ID	MW-1	MW-1	MW1	MW-2	MW2
Date	12/12/2002	11/8/2001	12/12/2002	11/7/2001	12/13/2002
Volatile Organic Compounds					
Hexachlorobutadiene		11 U		10 U	
m- & p- Xylenes		20 U	2 U	20 U	
Naphthalene		11 U		11 U	
o-Xylene		10 U	1 U	10 U	
Dichlorodifluoromethane	10 U	10 U	1 U	10 U	
Chloromethane	0.1 UJ	10 U	1 U	10 U	
Vinyl chloride	0.1 U	10 U	0.08 UJ	10 U	
Bromomethane	0.1 UJ	10 U	1 U	10 U	
Chloroethane	2 U	10 U	1 UJ	10 U	
Fluorotrichloromethane	10 U	10 U	1 UJ	10 U	
1,1-Dichloroethene	0.1 U	10 U	0.08 UJ	10 U	
1,1,2-Trichloro-1,2,2-trifluoroethane	10 U	10 U	1 U	10 U	
Acetone	10 U	4 U	5 U	10 U	
Carbon disulfide	0.1 U	10 U	1 U	10 U	
Methyl acetate (acetic acid, methyl ester)	10 U	10 U	1 U	10 U	
Methylene chloride	2 U	4 J	1 U	10 U	
trans-1,2-Dichloroethene	10 U	10 U	1 U	10 U	
Methyl tert-butyl ether	10 U	15 U	1 U	15 U	
1,1-Dichloroethane	10 U	10 U	1 U	10 U	
cis-1,2-Dichloroethene	2 U	10 U	1 U	10 U	
2-Butanone (MEK)	10 U	10 U	3 UJ	10 U	
Chloroform	0.1 U	10 U	0.08 UJ	10 U	
1,1,1-Trichloroethane	10 U	10 U	0.3 U	10 U	
Cyclohexane	10 U	10 U	1 U	10 U	
Carbon tetrachloride	0.1 U	10 U	0.08 UJ	10 U	
Benzene	0.1 U	10 U	0.08 UJ	10 U	
1,2-Dichloroethane	0.1 U	10 U	0.08 UJ	10 U	
Trichloroethene	0.1 U	10 U	5 U	10 U	
Methyl cyclohexane	10 U	10 U	1 U	10 U	
1,2-Dichloropropane	0.1 U	10 U	0.08 UJ	10 U	
Bromodichloromethane	0.1 U	10 U	0.08 UJ	10 U	
cis-1,3-Dichloropropene	0.1 U	10 U	0.08 UJ	10 U	
4-Methyl-2-pentanone	10 UJ	10 U	5 U	10 U	
Toluene	2 U	15 U	1 U	15 U	
trans-1,3-Dichloropropene	0.1 U	10 U	0.08 UJ	10 U	
1,1,2-Trichloroethane	0.1 U	10 U	0.08 UJ	10 U	
Tetrachloroethene	0.1 U	10 U	1 U	10 U	
2-Hexanone	10 UJ	10 U	1 UJ	10 U	
Chlorodibromomethane	0.1 U	10 U	0.08 UJ	10 U	
Ethylenedibromide	0.1 U	10 U	0.01 U	10 U	
Chlorobenzene	10 U	10 U	1 U	10 U	
Ethylbenzene	2 U	10 U	1 U	10 U	
Xylenes (total)	10 U	10 U		10 U	
Styrene	10 U	10 U	1 U	10 U	
Bromoform	2 U	10 U	1 U	10 U	
Isopropylbenzene	10 U	10 U	1 U	10 U	
1,1,2,2-Tetrachloroethane	0.1 U	10 U	0.08 UJ	10 U	
1,3-Dichlorobenzene	0.1 U	10 U	1 U	10 U	
1,4-Dichlorobenzene	0.1 U	10 U	0.08 UJ	10 U	
1,2-Dichlorobenzene	10 U	10 U	1 U	10 U	
1,2-Dibromo-3-chloropropane	0.1 UJ	10 U	0.01 U	10 U	
1,2,4-Trichlorobenzene	10 U	10 U	1 U	10 U	

C.1.2 Background Data for Groundwater
Wells G&H Superfund Site, Operable Unit 2
Woburn, Massachusetts

Property	Murphy	Murphy	Murphy	Murphy	Murphy
Location	MW-01	MW-01	MW-01	MW-02	MW-02
Sample ID	MW-1	MW-1	MW1	MW-2	MW2
Date	12/12/2002	11/8/2001	12/12/2002	11/7/2001	12/13/2002
Semivolatile Organic Compounds					
1,2,4-Trichlorobenzene	10 U	10 U	1 U	10 U	
1,2-Dichlorobenzene	10 U	10 U	1 U	10 U	
1,3-Dichlorobenzene	0.1 U	10 U	1 U	10 U	
1,4-Dichlorobenzene	0.1 U	10 U	0.08 UJ	10 U	
Benzaldehyde		11 UJ		10 UJ	
Phenol		11 U		10 U	
2-Chlorophenol		11 U		10 U	
Bis(2-chloroethyl) ether		11 U		10 U	
2-Methylphenol		11 U		10 U	
2,2'-Oxybis(1-Chloropropane)		11 U		10 U	
Acetophenone		11 U		10 U	
4-Methylphenol		11 U		10 U	
N-Nitrosodi-n-propylamine		11 U		10 U	
Hexachloroethane		11 U		10 U	
Nitrobenzene		11 U		10 U	
Isophorone		11 U		10 U	
2-Nitrophenol		11 U		10 U	
2,4-Dimethylphenol		11 U		10 U	
Bis(2-chloroethoxy) methane		11 U		10 U	
2,4-Dichlorophenol		11 U		10 U	
Naphthalene		11 U		11 U	
4-Chloroaniline		11 U		10 U	
Hexachlorobutadiene		11 U		10 U	
Caprolactam		11 U		10 U	
4-Chloro-3-Methylphenol		11 U		10 U	
2-Methylnaphthalene		11 U		11 U	
Hexachlorocyclopentadiene		11 UJ		10 U	
2,4,6-Trichlorophenol		11 U		10 U	
2,4,5-Trichlorophenol		27 U		25 U	
1,1'-Biphenyl		11 U		10 U	
2-Chloronaphthalene		11 U		10 U	
2-Nitroaniline		27 U		25 U	
Dimethyl phthalate		11 U		10 U	
2,6-Dinitrotoluene		11 U		10 U	
Acenaphthylene		11 U		11 U	
3-Nitroaniline		27 U		25 U	
Acenaphthene		11 U		11 U	
2,4-Dinitrophenol		27 UJ		25 U	
4-Nitrophenol		27 U		25 U	
Dibenzofuran		11 U		10 U	
2,4-Dinitrotoluene		11 U		10 U	
Diethyl phthalate		11 U		10 U	
Fluorene		11 U		11 U	
4-Chlorophenyl phenyl ether		11 U		10 U	
4-Nitroaniline		27 U		25 U	
4,6-Dinitro-2-methylphenol		27 U		25 U	
N-Nitrosodiphenylamine		11 U		10 U	
4-Bromophenyl phenyl ether		11 U		10 U	
Hexachlorobenzene		11 U		10 U	
Atrazine		11 UJ		10 UJ	
Pentachlorophenol		27 U		25 U	
Phenanthrene		11 U		11 U	
Anthracene		11 U		11 U	
Carbazole		11 U		10 U	

C.1.2 Background Data for Groundwater
Wells G&H Superfund Site, Operable Unit 2
Woburn, Massachusetts

Property	Murphy	Murphy	Murphy	Murphy	Murphy
Location	MW-01	MW-01	MW-01	MW-02	MW-02
Sample ID	MW-1	MW-1	MW1	MW-2	MW2
Date	12/12/2002	11/8/2001	12/12/2002	11/7/2001	12/13/2002
Semivolatile Organic Compounds (cont.)					
Di-n-butyl phthalate		11 U		10 U	
Fluoranthene		11 U		11 U	
Pyrene		11 U		11 U	
Butyl benzyl phthalate		11 U		10 U	
3,3'-Dichlorobenzidine		11 U		10 U	
Benzo(a)Anthracene		11 U		11 U	
Chrysene		11 U		11 U	
Bis(2-ethylhexyl) phthalate		11 U		10 U	
Di-n-octyl phthalate		11 U		10 U	
Benzo(b)Fluoranthene		11 U		11 U	
Benzo(k)Fluoranthene		11 U		11 U	
Benzo(a)Pyrene		11 U		11 U	
Indeno(1,2,3-cd)pyrene		11 U		11 U	
Dibenz(a,h) anthracene		11 U		11 U	
Benzo(g,h,i)perylene		11 U		11 U	
EPH/VPH					
C11-C22 Aromatic		170 U		220 U	
C19-C36 Aliphatic		81 U		100 U	
C5-C8 Aliphatic		40 U		40 U	
C9-C10 Aromatic		10 U		10 U	
C9-C12 Aliphatic		10 U		10 U	
C9-C18 Aliphatic		61 U		79 U	
PCB Congeners					
PCB 105	0.0001 U	0.01 U		0.01 U	
PCB 114	0.0001 U	0.01 U		0.01 U	
PCB 118	0.0001 U	0.01 U		0.01 U	
PCB 123	0.0001 U	0.01 U		0.01 U	
PCB 126	0.0001 U	0.01 U		0.01 U	
PCB 156/157	0.0001 U	0.01 U		0.01 U	
PCB 157		0.01 U		0.01 U	
PCB 167	0.0001 U	0.01 U		0.01 U	
PCB 169	0.0001 U	0.01 U		0.01 U	
PCB 170	0.0001 U	0.01 U		0.01 U	
PCB 189	0.0001 U	0.01 U		0.01 U	
PCB 193/180	0.0001 U	0.01 U		0.01 U	
PCB 77	0.0001 U	0.01 U		0.01 U	
PCB 81	0.0001 U	0.01 U		0.01 U	
TEQ (no 170/193/180) Birds	0				
TEQ (no 170/193/180) Humans	0	0		0	

C.1.2 Background Data for Groundwater
Wells G&H Superfund Site, Operable Unit 2
Woburn, Massachusetts

Property	Murphy	Murphy	Murphy	Murphy	Murphy
Location	MW-01	MW-01	MW-01	MW-02	MW-02
Sample ID	MW-1	MW-1	MW1	MW-2	MW2
Date	12/12/2002	11/8/2001	12/12/2002	11/7/2001	12/13/2002
Metals					
Chromium (VI)		10 U		10 U	
Aluminum	23.8 J	47.7 U		30 U	
Antimony	0.076 UJ	4.6 U		4.5 U	
Arsenic	0.18 UJ	4.4 U		4.6 U	
Barium	20.6 J	20.1 J		15.3 J	
Beryllium	0.006 UJ	0.5 U		0.5 U	
Cadmium	0.155 J	0.8 U		0.8 U	
Calcium	26500	26200		37700	
Chromium	0.72 J	0.9 U		2.7 U	
Cobalt	1.33 J	2.4 J		3.8 J	
Copper	2.18 UJ	1.3 U		2 J	
Cyanide	3.6 J		3		3
Iron	54.4	25 J		39.9 J	
Lead	0.057 UJ	2 UJ		2.3 UJ	
Magnesium	4100	3670 J		6800	
Manganese	23.7 J	54		3.5 J	
Mercury	0.1 U		0.2		0.2 U
Nickel	1.16 UJ	1.3 U		2.4 J	
Potassium	2930	3770 J		7440	
Selenium	0.2 UJ	4.9 U		5.8 J	
Silver	0.003 UJ	1 U		1 U	
Sodium	41000	35700		43200 J	
Thallium	0.041 J	10 U		10 UJ	
Vanadium	0.6 U	1 U		1 U	
Zinc	1.4 UJ	4.6 U		5 U	

TABLE C.1.3
SUMMARY OF ECOLOGICAL COPCs DETECTED IN SURFACE WATER AT RIVER REFERENCE WELLS G&H SUPERFUND SITE (OU3)

Parameter	Minimum Detected Concentration	Minimum Qualifier	Maximum Detected Concentration	Maximum Qualifier	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	95% UCL / Max Detected Concentration[1]	95% UCL Ref[2]
VOCs - ug/L										
2-Butanone						0 / 5	2 - 5	1.6	3.2	10
Acetone						0 / 5	5.0	2.5	2.5	6
cis-1,2-Dichloroethene						0 / 5	1 - 2	0.80	1.1	7
Tetrachloroethene						0 / 5	1 - 2	0.80	1.1	7
Trichloroethene						0 / 5	1 - 2	0.80	1.1	7
SVOCs - ug/L										
2-Methylnaphthalene						0 / 5	4 - 5	2.3	2.6	7
Acenaphthylene						0 / 5	4 - 5	2.3	2.6	7
Anthracene						0 / 5	4 - 5	2.3	2.6	7
Benzo(a)anthracene						0 / 5	4 - 5	2.3	2.6	7
Benzo(a)pyrene						0 / 5	4 - 5	2.3	2.6	7
Benzo(b)fluoranthene						0 / 5	4 - 5	2.3	2.6	7
Benzo(g,h,i)perylene						0 / 5	4 - 5	2.3	2.6	7
Benzo(k)fluoranthene						0 / 5	4 - 5	2.3	2.6	7
Carbazole						0 / 3	4 - 5	2.2	0.0	*1
Chrysene						0 / 5	4 - 5	2.3	2.6	7
Dibenz(a,h)anthracene						0 / 5	4 - 5	2.3	2.6	7
Dibenzofuran						0 / 5	4 - 5	2.3	2.6	7
Fluoranthene						0 / 5	4 - 5	2.3	2.6	7
Fluorene						0 / 5	4 - 5	2.3	2.6	7
Indeno(1,2,3-cd)pyrene						0 / 5	4 - 5	2.3	2.6	7
Naphthalene						0 / 5	4 - 5	2.3	2.7	2
N-nitrosodiphenylamine						0 / 5	4 - 5	2.3	2.6	7
Phenanthrene						0 / 5	4 - 5	2.3	2.6	7
Pyrene						0 / 5	4 - 5	2.3	2.6	7
PCBs/Pesticides - ug/L										
4,4'-DDD						0 / 5	0.0083 - 0.1	0.023	0.07	10
4,4'-DDE						0 / 5	0.0083 - 0.1	0.023	0.07	10
4,4'-DDT						0 / 5	0.0083 - 0.1	0.023	0.07	10
Aldrin						0 / 5	0.0083 - 0.05	0.013	0.035	10
alpha-Chlordane						0 / 5	0.0083 - 0.05	0.013	0.035	10
Aroclor 1248						0 / 5	0.042 - 1	0.21	0.72	10
Aroclor 1254						0 / 5	0.042 - 1	0.21	0.72	10
Aroclor 1260						0 / 5	0.042 - 1	0.21	0.72	10
beta-BHC						0 / 5	0.0083 - 0.05	0.013	0.035	10
delta-BHC						0 / 5	0.0083 - 0.05	0.013	0.035	10
Endosulfan I						0 / 5	0.0083 - 0.05	0.013	0.035	10
Endosulfan Sulfate						0 / 5	0.0083 - 0.1	0.023	0.07	10
Endrin Aldehyde						0 / 5	0.0083 - 0.1	0.023	0.07	10
gamma-Chlordane						0 / 5	0.0083 - 0.05	0.013	0.035	10
Metals - ug/L										
Aluminum	21.3		2500		SW-01-00-IP	4 / 5	23.5	567	3809	5
Antimony						0 / 5	1.1 - 18.3	5.7	10	7
Arsenic	1.1	J	15.7	J	SW-01-00-IP	4 / 5	1.7	4.5	12	4
Barium	15.4		64		SW-01-00-IP	5 / 5	N/A	32	50	2
Beryllium						0 / 5	0.099 - 0.22	0.09	0.15	10
Cadmium						0 / 5	0.15 - 0.78	0.3	0.43	7
Chromium	0.34		0.47		SW-23-01	2 / 5	9	2.9	5.0	7
Cobalt	7.1	J	7.1	J	SW-01-00-IP	1 / 5	0.5 - 3	2.1	7.2	4
Copper	0.45		13.8		SW-01-00-IP	4 / 5	0.35	3.7	27	5
Cyanide						0 / 2	5	2.5	0.0	*1
Iron	251		15800		SW-01-00-IP	5 / 5	N/A	3940	11772	4
Lead	4	J	51.4		SW-01-00-IP	3 / 5	0.75	12.35	95	5
Manganese	47.5		1960		SW-01-00-IP	5 / 5	N/A	650	1396	2
Mercury	0.097		0.11		SW-23-01	2 / 5	0.04 - 0.087	0.06	0.10	2
Nickel	0.66		6.5	J	SW-01-00-IP	4 / 5	1.2	2.0	22	3
Selenium	1.6	J	1.6	J	SW-04-00-IP	1 / 5	1.1 - 1.8	0.90	1.3	2
Silver						0 / 5	0.4 - 0.78	0.31	0.41	7
Thallium						0 / 5	1.2 - 1.5	0.66	0.82	10
Vanadium	0.89		12	J	SW-01-00-IP	2 / 5	0.55 - 2.6	3.2	9.3	4
Zinc	2.2	J	71.7		SW-01-00-IP	3 / 5	1.6 - 9	20	152	5

N/A = Not Applicable or Not Available
J = Estimated Value
UCL = Upper Confidence Limit
[1] The lesser value of the maximum detected concentration and the 95% UCL concentration, as used in the maximum exposure case calculations, is provided.
[2] 95% UCL References:

- * Maximum detected value is shown
- 1 Sample size too small to calculate 95% UCL (<4)
- 2 Normal data - Student's-t
- 3 Lognormal data - H-UCL
- 4 Lognormal data - 95% Chebyshev (MVUE) UCL
- 5 Lognormal data - 99% Chebyshev (MVUE) UCL
- 6 Nonparametric data - CLT
- 7 Nonparametric data - Jackknife
- 8 Nonparametric data - Standard Bootstrap
- 9 Nonparametric data - Bootstrap-t
- 10 Nonparametric data - Chebyshev (Mean, Std)

In the case that the 95% UCL reference displays a "1" indicating that the sample size was too small to calculate a 95% UCL, the maximum detected concentration, if available, is provided. Zero concentration values represent compounds that were not detected.

TABLE C.1.4
SUMMARY OF ECOLOGICAL COPCs DETECTED IN SEDIMENT AT REFERENCE WETLAND LOCATIONS
WELLS G&H SUPERFUND SITE (OU3)

Parameter	Minimum Detected Concentration	Minimum Qualifier	Maximum Detected Concentration	Maximum Qualifier	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Average Concentration	95% UCL / Max Detected Concentration[1]	95% UCL Ref[2]
VOCs - ug/Kg										
2-Butanone						0 / 5	13 - 46	9	16	10
Acetone						0 / 5	10 - 180	34	71	2
cis-1,2-Dichloroethene						0 / 3	16 - 46	11.5	0	*1
Tetrachloroethene						0 / 6	13 - 69	12.9	33	10
Trichloroethene						0 / 6	13 - 46	9.1	12	2
SVOCs - ug/Kg										
2-Methylnaphthalene	23	J	360	J	SD-24-02-FW	2 / 6	67 - 460	195	289	2
Acenaphthylene	44	J	800	J	SD-24-02-FW	3 / 6	67 - 460	243	662	4
Anthracene	48	J	1900	J	SD-24-02-FW	4 / 6	67 - 460	440	1154	4
Benzo(a)anthracene	110	J	5900		SD-24-02-FW	5 / 6	67 - 460	1360	3814	4
Benzo(a)pyrene	130	J	5500		SD-24-02-FW	5 / 6	67 - 460	1233	3185	4
Benzo(b)fluoranthene	180	J	10000		SD-24-02-FW	5 / 6	67 - 460	2188	6041	4
Benzo(g,h,i)perylene	210	J	920	J	SD-24-02-FW	3 / 6	67 - 460	376	627	2
Benzo(k)fluoranthene	400		9600		SD-24-02-FW	4 / 6	67 - 460	2023	9600	*5
Carbazole	48	J	990	J	SD-24-02-FW	2 / 5	230 - 460	323	947	4
Chrysene	140	J	7300		SD-24-02-FW	5 / 6	67 - 460	1610	4300	4
Dibenz(a,h)anthracene	120	J	500	J	SD-24-02-FW	2 / 6	67 - 460	234	350	2
Dibenzofuran	1000	J	1000	J	SD-24-02-FW	1 / 5	230 - 460	357	1000	*3
Fluoranthene	210	J	15000		SD-24-02-FW	5 / 6	67 - 460	3293	15000	*5
Fluorene	44	J	2800		SD-24-02-FW	4 / 6	67 - 460	568	1369	4
Indeno(1,2,3-cd)pyrene	210	J	1700	J	SD-24-02-FW	3 / 6	67 - 460	518	1700	*3
Naphthalene	23	J	520	J	SD-24-02-FW	2 / 6	67 - 460	221	359	2
N-nitrosodiphenylamine						0 / 5	230 - 2100	367	2035	3
Phenanthrene	170	J	12000		SD-24-02-FW	5 / 6	67 - 570	2408	11700	5
Pyrene	280		11000		SD-24-02-FW	5 / 6	67 - 460	2577	7544	4
PCBs/Pesticides - ug/Kg										
4,4'-DDD	4.5		390		SD-24-03-ME	5 / 6	1.9 - 3.6	95	390	*5
4,4'-DDE	3.9		37		SD-24-03-ME	5 / 6	1.9 - 3.6	13	23	2
4,4'-DDT	2.2		130		SD-24-02-FW	5 / 6	1.9 - 3.6	34	130	*5
Aldrin	0.29	J	1.6	J	SD-24-02-FW	3 / 6	0.93 - 1.8	0.8	1.1	2
alpha-Chlordane	2	J	5.3		SD-24-03-FW	2 / 6	0.93 - 2.4	1.8	5.3	*3
Aroclor 1248	290	J	290	J	SD-24-03-ME	1 / 6	3.2 - 46	64	261	10
Aroclor 1254						0 / 6	3.2 - 46	16	23	2
Aroclor 1260	200		200		SD-24-03-ME	1 / 6	3.2 - 46	49	181	10
beta-BHC	0.4	J	0.4	J	SD-24-01-FW	1 / 6	0.93 - 2.2	0.8	0.4	*2
delta-BHC						0 / 6	0.93 - 2.4	0.9	1.1	2
Endosulfan I	0.22	J	0.22	J	SD-24-03-FW	1 / 6	0.93 - 2.4	0.8	0.2	*2
Endosulfan Sulfate	6.6		6.6		SD-24-01-FW	1 / 6	1.9 - 4.3	2.5	6.2	3
Endrin Aldehyde	1.1	J	5.9	J	SD-24-03-ME	2 / 6	1.9 - 4.6	2.4	5.9	*3
gamma-Chlordane	1.5	J	4.6		SD-24-03-FW	3 / 6	0.93 - 2.4	2.1	3.6	2
Metals - mg/Kg										
Aluminum	2560		14300		SD-SA-01-TR	6 / 6	3.5 - 9.14	8195	12242	2
Antimony	0.5	J	1.2	J	SD-24-03-ME	4 / 6	0.067 - 1.4	0.75	1.05	2
Arsenic	3.8		40.6		SD-24-03-FW	6 / 6	0.22 - 1	21	33	2
Barium	13.3		87.5		SD-SA-01-TR	6 / 6	0.018 - 0.4	48	72	2
Beryllium	0.73	J	1.2		SD-24-03-FW	4 / 6	0.027 - 0.22	0.66	1.03	2
Cadmium	0.22		2.9		SD-HB-00-TR	6 / 6	0.35 - 0.6	1.30	2.17	2
Chromium	10.3	J	410	J	SD-24-03-ME	6 / 6	0.055 - 1	129	410	*5
Cobalt	1.9		13.2	J	SD-SA-01-TR	6 / 6	0.36 - 0.37	8.4	12.5	2
Copper	11.6		130		SD-24-03-ME	6 / 6	0.082 - 0.44	57	93	2
Cyanide						0 / 3	0.52 - 1.4	0.43	0.00	*1
Iron	4790		24200		SD-SA-01-TR	6 / 6	0.57 - 1.4	15518	22525	2
Lead	73.9		581		SD-24-03-FW	6 / 6	0.27 - 0.6	332	524	2
Manganese	50.4	J	263		SD-SA-01-TR	6 / 6	0.018 - 0.24	133	210	2
Mercury	0.021	J	0.71		SD-24-03-ME	5 / 6	0.005 - 0.02	0.28	0.71	*5
Nickel	6		27.3		SD-HB-00-TR	6 / 6	0.15 - 0.8	19	27	7
Selenium	0.91	J	2.1		SD-24-03-FW	2 / 6	0.053 - 1	0.76	2.10	*3
Silver	2.5	J	2.9		SD-24-03-FW	2 / 6	0.01 - 1	1.11	2.90	*4
Thallium						0 / 6	0.038 - 2	0.47	0.73	2
Vanadium	7.1		148		SD-24-03-FW	6 / 6	0.073 - 0.64	56	99	2
Zinc	47		251	J	SD-24-03-ME	6 / 6	0.16 - 1.7	155	232	2
Total Combustible Organics (mg/Kg)	2810		183000		SD-24-03-FW	4 / 4	2000	89178	183000	*2
Total Organic Carbon (mg/Kg)	170000		250000		SD-HB-00-TR	2 / 2	250	210000	250000	*1

N/A = Not Applicable or Not Available
J = Estimated Value
UCL = Upper Confidence Limit
[1] The lesser value of the maximum detected concentration and the 95% UCL concentration, as used in the maximum exposure case calculations, is provided.
[2] 95% UCL References:

* Maximum detected value is shown
1 Sample size too small to calculate 95% UCL (<4)
2 Normal data - Student's-t
3 Lognormal data - H-UCL
4 Lognormal data - 95% Chebyshev (MVUE) UCL
5 Lognormal data - 99% Chebyshev (MVUE) UCL
6 Nonparametric data - CLT
7 Nonparametric data - Jackknife
8 Nonparametric data - Standard Bootstrap
9 Nonparametric data - Bootstrap-t
10 Nonparametric data - Chebyshev (Mean, Std)

In the case that the 95% UCL reference displays a "1" indicating that the sample size was too small to calculate a 95% UCL, the maximum detected concentration, if available, is provided. Zero concentration values represent compounds that were not detected.

Appendix C.2

Southwest Properties Background Risk Calculations

BACKGROUND TABLE 3-2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Southwest Properties, Wells G&H Superfund Site Operable Unit 2 Woburn, Massachusetl

Scenario Timeframe: Current
Medium: Soil
Exposure Medium: Surface Soil (0-2 ft

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)		Maximum Concentration (Qualifier) (1)		Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)			Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Combined Data (a)	18540299	Chromium (VI)	9.75E-01	J	9.75E-01	J	mg/kg	AB17SS(0-2.0)	1/6	1100-1300	1.0	N/A	30	C	R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7429905	Aluminum	4.09E+03		9.95E+03		mg/kg	MR8SS(0-1.0)	6/6	NA	9950	N/A	7600	N	R9 PRG for Res. Soil	N/A	N/A	N	NTX
	7440360	Antimony	4.10E-01	J	2.36E+00	J	mg/kg	WB5SS(0-2.0)	3/6	350-370	2.36	N/A	3.1	N	R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7440382	Arsenic	6.22E+00		1.20E+01		mg/kg	WB14SS(0-2.0)	6/6	NA	12	N/A	0.39	C	R9 PRG for Res. Soil	N/A	N/A	Y	ASL
	7440393	Barium	2.40E+01		3.50E+01		mg/kg	WB14SS(0-2.0)	6/6	NA	35	N/A	540	N	R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7440417	Beryllium	3.50E-01		4.40E-01		mg/kg	WB14SS(0-2.0)	5/6	320-320	0.44	N/A	15	N	R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7440439	Cadmium	7.80E-01		1.52E+00		mg/kg	WB5SS(0-2.0)	6/6	NA	1.52	N/A	3.7	N	R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7440702	Calcium	7.26E+02	J	1.85E+03		mg/kg	WB14SS(0-2.0)	6/6	NA	1850	N/A	4000000	N	Allowable Daily Intake	N/A	N/A	N	NUT
	7440473	Chromium	1.20E+01		3.40E+01	J	mg/kg	WB5SS(0-2.0)	6/6	NA	34	N/A	12000	N	R9 Intercalc HQ=0.1	N/A	N/A	N	BSL
	7440484	Cobalt	3.47E+00		8.12E+00		mg/kg	WB14SS(0-2.0)	6/6	NA	8.12	N/A	900	C	R9 PRG for Res. Soil	N/A	N/A	N	NTX
	7440508	Copper	1.70E+01		3.00E+01		mg/kg	WB14SS(0-2.0)	6/6	NA	30	N/A	310	N	R9 PRG for Res. Soil	N/A	N/A	N	BSL
	57125	Cyanide	ND		ND		mg/kg		0/6	180-230	ND	N/A	120	N	R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7439896	Iron	9.34E+03		1.41E+04		mg/kg	WB14SS(0-2.0)	6/6	NA	14100	N/A	2300	N	R9 PRG for Res. Soil	N/A	N/A	N	NTX
	7439921	Lead	2.00E+01		2.16E+02		mg/kg	WB5SS(0-2.0)	6/6	NA	216	N/A	400	N	R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7439954	Magnesium	1.54E+03		3.82E+03		mg/kg	WB14SS(0-2.0)	6/6	NA	3820	N/A	8050000	N	Allowable Daily Intake	N/A	N/A	N	NUT
	7439965	Manganese	1.15E+02		1.75E+02		mg/kg	WB14SS(0-2.0)	6/6	NA	175	N/A	180	N	R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7439976	Mercury	9.00E-02		1.12E-01		mg/kg	WB5SS(0-2.0)	2/6	74-152	0.112	N/A	0.61	N	PRG Surrogate (Methyl mercury)	N/A	N/A	N	BSL
	7440020	Nickel	7.70E+00		1.70E+01		mg/kg	WB5SS(0-2.0)	6/6	NA	17	N/A	160	N	R9 PRG for Res. Soil	N/A	N/A	N	BSL
	2023695	Potassium	4.68E+02	J	1.38E+03	J	mg/kg	WB14SS(0-2.0)	6/6	NA	1380	N/A	1000000	N	Allowable Daily Intake	N/A	N/A	N	NUT
	7782492	Selenium	ND		ND		mg/kg		0/6	640-750	ND	N/A	39	N	R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7440224	Silver	ND		ND		mg/kg		0/6	320-380	ND	N/A	39	N	R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7440235	Sodium	ND		ND		mg/kg		0/6	32000-38000	ND	N/A	1000000	N	Allowable Daily Intake	N/A	N/A	N	NUT
	7440280	Thallium	ND		ND		mg/kg		0/6	140-160	ND	N/A	0.52	N	R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7440622	Vanadium	1.30E+01		2.80E+01		mg/kg	WB14SS(0-2.0)	6/6	NA	28	N/A	55	N	R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7440666	Zinc	3.40E+01		2.76E+02		mg/kg	WB14SS(0-2.0)	6/6	NA	276	N/A	2300	N	R9 PRG for Res. Soil	N/A	N/A	N	BSL

(a) Data presented are from soil samples AB10SS(0-2.0),AB17SS(0-2.0),AB21SS(0-2.0),MR8SS(0-1.0),MR19SS(0-1.5),WB5SS(0-2.0),WB14SS(0-2.0)

(1) Minimum/maximum detected concentration
(2) Maximum concentration used for screening
(3) Refer to supporting information for background discussior
(4) USEPA Region 9 PRGs for residential soil (adjusted to an hazard quotient = 0.1 for noncarcinogens), October 1, 200
PRG for chromium III used for total chromium
PRG for chromium VI used for chromium VI
PRG for methylmercury used for mercury
PRG for free cyanide used for total cyanide
The screening toxicity value for lead is the residential soil lead guidance level of 400 mg/Kg (USEPA, 1994a
(5) Rationale Codes:
Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)
Low Concentration, Low Frequency of Detection (LCF)

Definitions:
ug/kg = micrograms per kilogram
CAS = Chemical Abstract Service
COPCs = Chemicals of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considere
PRG = Preliminary Remedial Goa
TEQ = Toxic Equivalent for PCB Dioxin-like congener
N/A = Not Applicable or Not Available
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
B = Reported value is less than the contract required detection limit but greater than or equal to the instrument detection li
E = Exceeds Instrument Detection Limit, Diluted
T = C11-C22 Aromatic Measured as Total Petroleum Hydrocarbons by Method 8100M
EB = Analyte Detected In the Associated Equipment Blank
ND = Not Detected
TCDD = tetrachlorodibenzo-p-dioxin
MADEP = Massachusetts Department of Environmental Protection
S-1/GW-1 = MADEP Soil Cleanup Criteria
* PCB Dioxin-like congeners
PCB = polychlorinated biphenyls

TABLE 3-2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Southwest Properties, Wells G&H Superfund Site Operable Unit 2 Woburn, Massachusett

Scenario Timeframe: Current
Medium: Soil
Exposure Medium: Surface Soil (0-2 ft) Background sample

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
	7440382	Arsenic	6.22E+00	1.20E+01	mg/kg	WB14SS(0-2.0)	6/6	NA	12	N/A	0.39 C R9 PRG for Res. Soil	N/A	N/A	Y	ASL

(a) Data presented are from soil samples AB-13/0-2,AB13SS(0-2.0),AB-14/0-2,AB14SS(0-2.0),AB-15/0-2,AB15SS(0-2.0),AB-16/0-2,AB16SS(0-2.0),AB-SS1,AB-SS2,AB-SS3,AB-SS4,AB-SS5,AB-SS6,AB-SS7,AB-SS8,AB-SS9,AB-SS9 DUP,B-13 SS-1 (0-2),B-18 SS-1 (0-2),B-4 SS-1 (0
B-8 SS-1 (0-2),CHI-7/88 (0-2),MR-10/0-2,MR10SS(0-2.0),MR-SS1,MR-SS2,MR-SS3,MW-1 SS-1 (0-2),MW-18D SS-1 (0-2),MW-2 SS-1 (0-2),MW-3 SS-1 (0-2),MW-4 SS-1 (0-2),MW-5S SS-1 (0-2),MW-6 SS-1 (0-2),W-89-S1(0-2),W-89-S14(0-2),W-89-S15(0-2),W-89-S16(0-2),W-8
W-89-S18(0-2),W-89-S3(0-2),W-89-S4(0-2),WB-10/0-2,WB10SS(0-2.0),WB-11/1-1.75,WB11SS(0-1.0),WB12SS(1.0-2.0),WB-13/0-2,WB13SS(0-2.0),WB21SS(0-1.0),WB-6/0-2,WB6SS(0-2.0),WB-7/0-2,WB7SS(0-2.0),WB-8/0-2,WB8SS(0-1.0),WB-SS1,WB-SS2,WB-SS3,WB-SS4

(1) Minimum/maximum detected concentration
(2) Maximum concentration used for screening
(3) Refer to supporting information for background discussior
(4) USEPA Region 9 PRGs for residential soil (adjusted to an hazard quotient = 0.1 for noncarcinogens), October 1, 200
PRG for chromium III used for total chromium
PRG for chromium VI used for chromium VI
PRG for methylmercury used for mercury
PRG for free cyanide used for total cyanide
The screening toxicity value for lead is the residential soil lead guidance level of 400 mg/Kg (USEPA, 1994

(5) Rationale Codes:
Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)
Low Concentration, Low Frequency of Detection (LCF)

Definitions:
ug/kg = micrograms per kilogram
CAS = Chemical Abstract Service
COPCs = Chemicals of Potential Concerr
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considere
PRG = Preliminary Remedial Goa
TEQ = Toxic Equivalent for PCB Dioxin-like congener
N/A = Not Applicable or Not Available
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
B = Reported value is less than the contract required detection limit but greater than or equal to the instrument detection li
E = Exceeds Instrument Detection Limit, Diluted
T = C11-C22 Aromatic Measured as Total Petroleum Hydrocarbons by Method 8100M
EB = Analyte Detected In the Associated Equipment Blank
ND = Not Detected
TCDD = tetrachlorodibenzo-p-dioxin
MADEP = Massachusetts Department of Environmental Protection
S-1/GW-1 = MADEP Soil Cleanup Criteria
* PCB Dioxin-like congeners
PCB = polychlorinated biphenyls

BACKGROUND TABLE 3-2.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Southwest Properties, Wells G&H Superfund Site Operable Unit 2 Woburn, Massachusett

Scenario Timeframe: Current
Medium: Soil
Exposure Medium: Subsurface Soil (2-15 ft)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)		Maximum Concentration (Qualifier) (1)		Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Combined Data (a)	18540299	Chromium (VI)	2.20E+00	J	2.20E+00	J	mg/kg	WB5D(5.0-7.0)	1/6	1000-1200	2.20E+00	N/A	3.00E+01	C R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7429905	Aluminum	5.46E+03		1.04E+04		mg/kg	MR8D(5.0-7.0)	6/6	0-0	1.04E+04	N/A	7.60E+03	N R9 PRG for Res. Soil	N/A	N/A	N	NTX
	7440360	Antimony	6.50E-01	J	6.50E-01	J	mg/kg	WB5D(5.0-7.0)	1/6	350-380	6.50E-01	N/A	3.10E+00	N R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7440382	Arsenic	3.59E+00		7.42E+00		mg/kg	WB5D(5.0-7.0)	6/6	0-0	7.42E+00	N/A	3.90E-01	C R9 PRG for Res. Soil	N/A	N/A	Y	ASL
	7440393	Barium	1.40E+01		3.00E+01		mg/kg	MR8D(5.0-7.0)	6/6	0-0	3.00E+01	N/A	5.40E+02	N R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7440417	Beryllium	3.80E-01		4.50E-01		mg/kg	WB5D(5.0-7.0)	4/6	350-380	4.50E-01	N/A	1.50E+01	N R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7440439	Cadmium	4.40E-01		1.68E+00		mg/kg	WB5D(5.0-7.0)	6/6	0-0	1.68E+00	N/A	3.70E+00	N R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7440702	Calcium	3.30E+02	J	1.62E+03	J	mg/kg	MR8D(5.0-7.0)	6/6	0-0	1.62E+03	N/A	4.00E+06	N Allowable Daily Intake	N/A	N/A	N	NUT
	7440473	Chromium	7.55E+00		2.70E+01		mg/kg	MR8D(5.0-7.0)	6/6	0-0	2.70E+01	N/A	1.20E+04	N R9 Intercalc HQ=0.1	N/A	N/A	N	BSL
	7440484	Cobalt	3.18E+00		1.20E+01		mg/kg	MR8D(5.0-7.0)	6/6	0-0	1.20E+01	N/A	9.00E+02	C R9 PRG for Res. Soil	N/A	N/A	N	NTX
	7440508	Copper	7.18E+00		2.60E+01		mg/kg	WB5D(5.0-7.0)	6/6	0-0	2.60E+01	N/A	3.10E+02	N R9 PRG for Res. Soil	N/A	N/A	N	BSL
	57125	Cyanide	ND		ND		mg/kg		0/6	170-210	ND	N/A	1.20E+02	N R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7439896	Iron	5.67E+03		1.69E+04		mg/kg	MR8D(5.0-7.0)	6/6	0-0	1.69E+04	N/A	2.30E+03	N R9 PRG for Res. Soil	N/A	N/A	N	NTX
	7439921	Lead	3.09E+00		1.13E+02		mg/kg	WB5D(5.0-7.0)	6/6	0-0	1.13E+02	N/A	4.00E+02	N R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7439954	Magnesium	1.34E+03		6.62E+03		mg/kg	MR8D(5.0-7.0)	6/6	0-0	6.62E+03	N/A	8.05E+06	N Allowable Daily Intake	N/A	N/A	N	NUT
	7439965	Manganese	7.40E+01		2.59E+02		mg/kg	MR8D(5.0-7.0)	6/6	0-0	2.59E+02	N/A	1.80E+02	N R9 PRG for Res. Soil	N/A	N/A	Y	ASL
	7439976	Mercury	ND		ND		mg/kg		0/6	69-225	ND	N/A	6.10E-01	N PRG Surrogate (Methyl mercury)	N/A	N/A	N	BSL
	7440020	Nickel	6.08E+00		1.90E+01		mg/kg	MR8D(5.0-7.0)	6/6	0-0	1.90E+01	N/A	1.60E+02	N R9 PRG for Res. Soil	N/A	N/A	N	BSL
	2023695	Potassium	3.70E+02	J	2.62E+03	J	mg/kg	MR8D(5.0-7.0)	6/6	0-0	2.62E+03	N/A	1.00E+06	N Allowable Daily Intake	N/A	N/A	N	NUT
	7782492	Selenium	ND		ND		mg/kg		0/6	690-750	ND	N/A	3.90E+01	N R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7440224	Silver	ND		ND		mg/kg		0/6	350-380	ND	N/A	3.90E+01	N R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7440235	Sodium	ND		ND		mg/kg		0/6	35000-189000	ND	N/A	1.00E+06	N Allowable Daily Intake	N/A	N/A	N	NUT
	7440280	Thallium	ND		ND		mg/kg		0/6	130-160	ND	N/A	5.20E-01	N R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7440622	Vanadium	9.62E+00		3.70E+01		mg/kg	MR8D(5.0-7.0)	6/6	0-0	3.70E+01	N/A	5.50E+01	N R9 PRG for Res. Soil	N/A	N/A	N	BSL
	7440666	Zinc	1.60E+01		1.00E+02		mg/kg	WB5D(5.0-7.0)	6/6	0-0	1.00E+02	N/A	2.30E+03	N R9 PRG for Res. Soil	N/A	N/A	N	BSL

(a) Data presented are from soil samples AB10D(5-5.5),AB17D(3.5-4.0),MR8D(5.0-7.0),MR19D(5.0-7.0),WB5D(5.0-7.0),WB14D(5.0-7.0)

(1) Minimum/maximum detected concentration
(2) Maximum concentration used for screening
(3) Refer to supporting information for background discussior
(4) USEPA Region 9 PRGs for residential soil (adjusted to an hazard quotient = 0.1 for noncarcinogens), October 1, 200
PRG for chromium III used for total chromium
PRG for chromium VI used for chromium VI
PRG for methylmercury used for mercury
PRG for free cyanide used for total cyanide
The screening toxicity value for lead is the residential soil lead guidance level of 400 mg/Kg (USEPA, 1994a
(5) Rationale Codes:
Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)
Low Concentration, Low Frequency of Detection (LCF)

Definitions:
ug/kg = micrograms per kilogram
CAS = Chemical Abstract Service
COPCs = Chemicals of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considere
PRG = Preliminary Remedial Goa
TEQ = Toxic Equivalent for PCB Dioxin-like congener
N/A = Not Applicable or Not Available
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
B = Reported value is less than the contract required detection limit but greater than or equal to the instrument detection li
E = Exceeds Instrument Detection Limit, Diluted
T = C11-C22 Aromatic Measured as Total Petroleum Hydrocarbons by Method 8100M
EB = Analyte Detected In the Associated Equipment Blank
ND = Not Detected
TCDD = tetrachlorodibenzo-p-dioxin
MADEP = Massachusetts Department of Environmental Protection
S-1/GW-1 = MADEP Soil Cleanup Criteria
* PCB Dioxin-like congeners
PCB = polychlorinated biphenyls

BACKGROUND TABLE 3-2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Southwest Properties, Wells G&H Superfund Site Operable Unit 2 Woburn, Massachusetts

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)		Maximum Concentration (Qualifier) (1)		Units	Location of Maximum Concentration	Detection Frequency	Range of Detection	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Combined Data (a)	18540299	Chromium (VI)	ND		ND		ug/L		9/50	0.3-10	ND	N/A	1.10E+01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	7429905	Aluminum	2.38E+01	J	2.38E+01	J	ug/L	MW-1	0/50	0.08-200	2.38E+01	N/A	3.60E+03	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	NTX
	7440360	Antimony	ND		ND		ug/L		6/50	1-10	ND	N/A	1.50E+00	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	6.00E+00	EPA Maximum Contaminant Level	N	BSL
	7440382	Arsenic	ND		ND		ug/L		1/50	0.08-200	ND	N/A	4.50E-02	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	1.00E+01	EPA Maximum Contaminant Level	N	BSL
	7440393	Barium	1.53E+01	J	2.06E+01	J	ug/L	MW-1	13/50	1-10	2.20E+02	N/A	2.60E+02	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	2.00E+03	EPA Maximum Contaminant Level	N	BSL
	7440417	Beryllium	ND		ND		ug/L		4/50	0.08-200	ND	N/A	7.30E+00	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	4.00E+00	EPA Maximum Contaminant Level	N	BSL
	7440439	Cadmium	1.55E-01	J	1.55E-01	J	ug/L	MW-1	1/50	1-200	1.55E-01	N/A	1.80E+00	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	5.00E+00	EPA Maximum Contaminant Level	N	BSL
	7440702	Calcium	2.65E+04		3.77E+04		ug/L	MW-2	0/49	0.01-200	3.77E+04	N/A	4.00E+08	N Allowable Daily Intake	N/A	N/A	N	NUT
	7440473	Chromium	7.20E-01	J	7.20E-01	J	ug/L	MW-1	4/50	1-200	7.20E-01	N/A	5.50E+03	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	1.00E+02	EPA Maximum Contaminant Level	N	BSL
	7440484	Cobalt	1.33E+00	J	3.80E+00	J	ug/L	MW-2	0/50	0.08-200	3.80E+00	N/A	7.30E+01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	NTX
	7440508	Copper	2.00E+00	J	2.00E+00	J	ug/L	MW-2	0/50	0.08-200	2.00E+00	N/A	1.50E+02	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	1.30E+03	EPA Maximum Contaminant Level	N	BSL
	57125	Cyanide	3.00E+00		3.60E+00	J	ug/L	MW-1	1/50	0.1-200	3.60E+00	N/A	7.30E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	7439896	Iron	3.99E+01	J	5.44E+01		ug/L	MW-1	3/50	0.08-200	5.44E+01	N/A	1.10E+03	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	NTX
	7439921	Lead	ND		ND		ug/L		1/50	3-200	ND	N/A	0.00E+00	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	1.50E+01	EPA Maximum Contaminant Level	N	BSL
	7439954	Magnesium	4.10E+03		6.80E+03		ug/L	MW-2	0/50	1-200	6.80E+03	N/A	8.05E+08	N Allowable Daily Intake	N/A	N/A	N	NUT
	7439965	Manganese	3.50E+00	J	2.37E+01	J	ug/L	MW-1	0/50	5-200	2.37E+01	N/A	8.80E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	7439976	Mercury	2.00E-01		2.00E-01		ug/L	MW1	2/50	4-140	2.00E-01	N/A	1.10E+00	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	2.00E+00	EPA Maximum Contaminant Level	N	BSL
	7440020	Nickel	2.40E+00	J	2.40E+00	J	ug/L	MW-2	11/50	0.08-5	2.40E+00	N/A	7.30E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	2023695	Potassium	2.93E+03		7.44E+03		ug/L	MW-2	0/50	0.08-200	7.44E+03	N/A	1.00E+08	N Allowable Daily Intake	N/A	N/A	N	NUT
	7782492	Selenium	5.80E+00	J	5.80E+00	J	ug/L	MW-2	0/50	1-200	5.80E+00	N/A	1.80E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	5.00E+01	EPA Maximum Contaminant Level	N	BSL
	7440224	Silver	ND		ND		ug/L		3/50	0.1-200	ND	N/A	1.80E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	7440235	Sodium	4.10E+04		4.32E+04	J	ug/L	MW-2	1/50	0.1-200	4.32E+04	N/A	1.00E+08	N Allowable Daily Intake	N/A	N/A	N	NUT
	7440280	Thallium	4.10E-02	J	4.10E-02	J	ug/L	MW-1	0/50	0.08-200	4.10E-02	N/A	2.40E-01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	2.00E+00	EPA Maximum Contaminant Level	N	BSL
	7440622	Vanadium	ND		ND		ug/L		2/50	1-200	ND	N/A	2.60E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	7440666	Zinc	ND		ND		ug/L		5/50	0.08-200	ND	N/A	1.10E+03	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
		TEQ (no 170/193/180) Humans	ND		ND		ug/L	MW-2	5/50	0.2-10	ND	N/A	4.50E-07	C PRG Surrogate (2,3,7,8-TCDD)	N/A	N/A	N	BSL
	120821	1,2,4-Trichlorobenzene	ND		ND		ug/L		4/46	1-10	ND	N/A	1.90E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	7.00E+01	EPA Maximum Contaminant Level	N	BSL
	95501	1,2-Dichlorobenzene	ND		ND		ug/L		0/50	1-200	ND	N/A	3.70E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	6.00E+02	EPA Maximum Contaminant Level	N	BSL
	541731	1,3-Dichlorobenzene	ND		ND		ug/L		7/50	0.1-200	ND	N/A	5.50E-01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	106467	1,4-Dichlorobenzene	ND		ND		ug/L		6/50	0.6-15	ND	N/A	5.00E-01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	7.50E+01	EPA Maximum Contaminant Level	N	BSL
	100527	Benzaldehyde	ND		ND		ug/L		9/50	1-10	ND	N/A	3.60E+02	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	108952	Phenol	ND		ND		ug/L		0/50	0.08-200	ND	N/A	2.20E+03	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	95578	2-Chlorophenol	ND		ND		ug/L		15/50	0.1-200	ND	N/A	3.00E+00	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	111444	Bis(2-chloroethyl) ether	ND		ND		ug/L		11/50	0.08-10	ND	N/A	9.80E-03	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	95487	2-Methylphenol	ND		ND		ug/L		8/50	2-20	ND	N/A	1.80E+02	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	108601	2,2'-Oxybis(1-Chloropropane)	ND		ND		ug/L		0/33	10-11	ND	N/A	2.70E-01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	98862	Acetophenone	ND		ND		ug/L		2/33	10-11	ND	N/A	NO VALUE	N No value recommended, if necessary, use PRG Surrogate	N/A	N/A	N	NSL
	106445	4-Methylphenol	ND		ND		ug/L		0/33	10-11	ND	N/A	1.80E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	621647	N-Nitrosodi-n-propylamine	ND		ND		ug/L		0/33	10-11	ND	N/A	9.60E-03	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	67721	Hexachloroethane	ND		ND		ug/L		3/33	10-11	ND	N/A	4.80E+00	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	98953	Nitrobenzene	ND		ND		ug/L		0/33	10-11	ND	N/A	3.40E-01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	78591	Isophorone	ND		ND		ug/L		1/33	10-11	ND	N/A	7.10E+01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	88755	2-Nitrophenol	ND		ND		ug/L		4/33	10-11	ND	N/A	7.30E+00	N PRG Surrogate (2,4-Dinitrophenol)	N/A	N/A	N	BSL
	105679	2,4-Dimethylphenol	ND		ND		ug/L		0/33	10-11	ND	N/A	7.30E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	111911	Bis(2-chloroethoxy) methane	ND		ND		ug/L		0/33	10-11	ND	N/A	9.80E-03	C PRG Surrogate (bis(2-chloroethyl)ether)	N/A	N/A	N	BSL
	120832	2,4-Dichlorophenol	ND		ND		ug/L		0/33	10-11	ND	N/A	1.10E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	91203	Naphthalene	ND		ND		ug/L		0/33	10-11	ND	N/A	6.20E-01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	106478	4-Chloroaniline	ND		ND		ug/L		0/33	10-11	ND	N/A	1.50E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	87683	Hexachlorobutadiene	ND		ND		ug/L		3/33	10-11	ND	N/A	8.60E-01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	105602	Caprolactam	ND		ND		ug/L		0/33	10-11	ND	N/A	1.80E+03	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	59507	4-Chloro-3-Methylphenol	ND		ND		ug/L		1/33	10-11	ND	N/A	1.10E+01	N PRG Surrogate (2,4-Dichlorophenol)	N/A	N/A	N	BSL
	91576	2-Methylnaphthalene	ND		ND		ug/L		8/37	0.01-10	ND	N/A	6.20E-01	N PRG Surrogate (Naphthalene)	N/A	N/A	N	BSL
	77474	Hexachlorocyclopentadiene	ND		ND		ug/L		0/33	10-11	ND	N/A	2.20E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	5.00E+01	EPA Maximum Contaminant Level	N	BSL

BACKGROUND TABLE 3-2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Southwest Properties, Wells G&H Superfund Site Operable Unit 2 Woburn, Massachusetts

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
	88062	2,4,6-Trichlorophenol	ND	ND	ug/L		0/33	10-11	ND	N/A	3.60E-01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	95954	2,4,5-Trichlorophenol	ND	ND	ug/L		0/33	10-11	ND	N/A	3.60E+02	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	92524	1,1'-Biphenyl	ND	ND	ug/L		0/33	10-11	ND	N/A	3.00E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	91587	2-Chloronaphthalene	ND	ND	ug/L		1/37	1-11	ND	N/A	4.90E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	88744	2-Nitroaniline	ND	ND	ug/L		0/33	10-11	ND	N/A	1.00E-01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	131113	Dimethyl phthalate	ND	ND	ug/L		0/33	10-11	ND	N/A	3.60E+04	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	606202	2,6-Dinitrotoluene	ND	ND	ug/L		1/33	10-28	ND	N/A	3.60E+00	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	208968	Acenaphthylene	ND	ND	ug/L		2/33	10-11	ND	N/A	6.20E-01	N PRG Surrogate (Naphthalene)	N/A	N/A	N	BSL
	99092	3-Nitroaniline	ND	ND	ug/L		0/33	10-11	ND	N/A	1.00E-01	N PRG Surrogate (2-Nitroaniline)	N/A	N/A	N	BSL
	83329	Acenaphthene	ND	ND	ug/L		0/33	10-28	ND	N/A	3.70E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	51285	2,4-Dinitrophenol	ND	ND	ug/L		0/33	10-11	ND	N/A	7.30E+00	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	100027	4-Nitrophenol	ND	ND	ug/L		0/33	10-11	ND	N/A	1.10E+01	N PRG Surrogate (2,4-Dichlorophenol)	N/A	N/A	N	BSL
	132649	Dibenzofuran	ND	ND	ug/L		1/37	1-11	ND	N/A	2.40E+00	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	121142	2,4-Dinitrotoluene	ND	ND	ug/L		0/33	10-28	ND	N/A	7.30E+00	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	84662	Diethyl phthalate	ND	ND	ug/L		3/37	5-11	ND	N/A	2.90E+03	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	86737	Fluorene	ND	ND	ug/L		0/28	25-28	ND	N/A	2.40E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	7005723	4-Chlorophenyl phenyl ether	ND	ND	ug/L		0/33	10-28	ND	N/A	7.30E+00	N PRG Surrogate (Pentabromodiphenylether)	N/A	N/A	N	BSL
	100016	4-Nitroaniline	ND	ND	ug/L		0/33	10-11	ND	N/A	1.00E-01	N PRG Surrogate (2-Nitroaniline)	N/A	N/A	N	BSL
	534521	4,6-Dinitro-2-methylphenol	ND	ND	ug/L		0/33	10-11	ND	N/A	7.30E+00	N PRG Surrogate (4,6-Dinitro-o-cyclohexylphenol)	N/A	N/A	N	BSL
	86306	N-Nitrosodiphenylamine	ND	ND	ug/L		2/33	1-11	ND	N/A	1.40E+01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	101553	4-Bromophenyl phenyl ether	ND	ND	ug/L		2/37	5-11	ND	N/A	7.30E+00	N PRG Surrogate (Pentabromodiphenylether)	N/A	N/A	N	BSL
	118741	Hexachlorobenzene	ND	ND	ug/L		0/33	10-11	ND	N/A	4.20E-02	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	1.00E+00	EPA Maximum Contaminant Level	N	BSL
	1912249	Atrazine	ND	ND	ug/L		0/33	10-28	ND	N/A	3.00E-01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	3.00E+00	EPA Maximum Contaminant Level	N	BSL
	87865	Pentachlorophenol	ND	ND	ug/L		0/33	10-28	ND	N/A	5.60E-01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	1.00E+00	EPA Maximum Contaminant Level	N	BSL
	85018	Phenanthrene	ND	ND	ug/L		0/33	10-11	ND	N/A	6.20E-01	N PRG Surrogate (Naphthalene)	N/A	N/A	N	BSL
	120127	Anthracene	ND	ND	ug/L		0/33	10-11	ND	N/A	1.80E+02	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	86748	Carbazole	ND	ND	ug/L		0/33	10-11	ND	N/A	3.40E+00	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	84742	Di-n-butyl phthalate	ND	ND	ug/L		0/33	10-11	ND	N/A	3.60E+02	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	206440	Fluoranthene	ND	ND	ug/L		0/28	25-28	ND	N/A	1.50E+02	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	129000	Pyrene	ND	ND	ug/L		6/37	10-11	ND	N/A	1.80E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	85687	Butyl benzyl phthalate	ND	ND	ug/L		1/37	5-11	ND	N/A	7.30E+02	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	91941	3,3'-Dichlorobenzidine	ND	ND	ug/L		0/33	10-11	ND	N/A	1.50E-01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	56553	Benzo(a)Anthracene	ND	ND	ug/L		0/33	0.4-11	ND	N/A	9.20E-02	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	218019	Chrysene	ND	ND	ug/L		0/37	5-11	ND	N/A	9.20E+00	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	117817	Bis(2-ethylhexyl) phthalate	ND	ND	ug/L		3/37	5-11	ND	N/A	4.80E+00	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	6.00E+00	EPA Maximum Contaminant Level	N	BSL
	117840	Di-n-octyl phthalate	ND	ND	ug/L		0/33	10-11	ND	N/A	1.50E+02	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	205992	Benzo(b)Fluoranthene	ND	ND	ug/L		0/33	10-11	ND	N/A	9.20E-02	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	207089	Benzo(k)Fluoranthene	ND	ND	ug/L		3/37	0.01-11	ND	N/A	9.20E-01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	50328	Benzo(a)Pyrene	ND	ND	ug/L		2/37	0.01-11	ND	N/A	9.20E-03	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	2.00E-01	EPA Maximum Contaminant Level	N	BSL
	193395	Indeno(1,2,3-cd)pyrene	ND	ND	ug/L		1/33	0.5-11	ND	N/A	9.20E-02	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	53703	Dibenz(a,h) anthracene	ND	ND	ug/L		0/33	10-11	ND	N/A	9.20E-03	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	191242	Benzo(g,h,i)perylene	ND	ND	ug/L		3/37	0.01-11	ND	N/A	6.20E-01	N PRG Surrogate (Naphthalene)	N/A	N/A	N	BSL
	75718	Dichlorodifluoromethane	ND	ND	ug/L		0/37	5-11	ND	N/A	3.90E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	74873	Chloromethane	ND	ND	ug/L		4/32	50-68	ND	N/A	1.50E+00	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	75014	Vinyl chloride	ND	ND	ug/L		2/32	50-190	ND	N/A	2.00E-02	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	2.00E+00	EPA Maximum Contaminant Level	N	BSL
	74839	Bromomethane	ND	ND	ug/L		6/32	50-91	ND	N/A	8.70E-01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	75003	Chloroethane	ND	ND	ug/L		0/4	50-50	ND	N/A	4.60E+00	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	75694	Fluorotrichloromethane	ND	ND	ug/L		7/32	40-50	ND	N/A	1.30E+02	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	75354	1,1-Dichloroethene	ND	ND	ug/L		4/32	10-200	ND	N/A	3.40E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	7.00E+00	EPA Maximum Contaminant Level	N	BSL
	76131	1,1,2-Trichloro-1,2,2-trifluoroetha	ND	ND	ug/L		4/32	10-50	ND	N/A	5.90E+03	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	67641	Acetone	ND	ND	ug/L		1/4	50-50	ND	N/A	6.10E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	75150	Carbon disulfide	ND	ND	ug/L		1/4	50-50	ND	N/A	1.00E+02	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL

BACKGROUND TABLE 3-2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Southwest Properties, Wells G&H Superfund Site Operable Unit 2 Woburn, Massachusetts

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
	79209	Methyl acetate (acetic acid, meth	ND	ND	ug/L		0/44	10-10	ND	N/A	6.10E+02	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	75092	Methylene chloride	ND	ND	ug/L		5/27	3-3	ND	N/A	4.30E+00	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	5.00E+00	EPA Maximum Contaminant Level	N	BSL
	156605	trans-1,2-Dichloroethene	ND	ND	ug/L		18/27	18.299999-128	ND	N/A	1.20E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	1.00E+02	EPA Maximum Contaminant Level	N	BSL
	1634044	Methyl tert-butyl ether	ND	ND	ug/L		0/27	0.019-4.6	ND	N/A	1.30E+01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	75343	1,1-Dichloroethane	ND	ND	ug/L		10/48	0.15-4.6	ND	N/A	8.10E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	156592	cis-1,2-Dichloroethene	ND	ND	ug/L		27/27	N/A	ND	N/A	6.10E+00	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	7.00E+01	EPA Maximum Contaminant Level	N	BSL
	78933	2-Butanone (MEK)	ND	ND	ug/L		0/27	0.005-1.3	ND	N/A	1.90E+02	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	67663	Chloroform	ND	ND	ug/L		6/48	0.8-1.3	ND	N/A	6.20E+00	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	71556	1,1,1-Trichloroethane	ND	ND	ug/L		27/27	N/A	ND	N/A	3.20E+02	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	2.00E+02	EPA Maximum Contaminant Level	N	BSL
	110827	Cyclohexane	ND	ND	ug/L		19/48	0.9-9.7	ND	N/A	3.50E+03	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	56235	Carbon tetrachloride	ND	ND	ug/L		21/27	1.3-1.3	ND	N/A	1.70E-01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	5.00E+00	EPA Maximum Contaminant Level	N	BSL
	71432	Benzene	ND	ND	ug/L		6/27	0.59-15	ND	N/A	3.40E-01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	5.00E+00	EPA Maximum Contaminant Level	N	BSL
	107062	1,2-Dichloroethane	ND	ND	ug/L		22/27	31.799999-128	ND	N/A	1.20E-01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	5.00E+00	EPA Maximum Contaminant Level	N	BSL
	79016	Trichloroethene	ND	ND	ug/L		10/48	0.064-20	ND	N/A	2.80E-02	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	5.00E+00	EPA Maximum Contaminant Level	N	BSL
	108872	Methyl cyclohexane	ND	ND	ug/L		27/27	N/A	ND	N/A	5.20E+02	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	78875	1,2-Dichloropropane	ND	ND	ug/L		27/27	N/A	ND	N/A	1.60E-01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	5.00E+00	EPA Maximum Contaminant Level	N	BSL
	75274	Bromodichloromethane	ND	ND	ug/L		1/27	0.1-0.2	ND	N/A	1.80E-01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	10061015	cis-1,3-Dichloropropene	ND	ND	ug/L		20/27	0.93-7.91	ND	N/A	4.00E-01	C Region 9 PRG for Tap Water	N/A	N/A	N	BSL
	108101	4-Methyl-2-pentanone	ND	ND	ug/L		27/27	N/A	ND	N/A	1.60E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	108883	Toluene	ND	ND	ug/L		4/27	0.2-4.9	ND	N/A	7.20E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	1.00E+03	EPA Maximum Contaminant Level	N	BSL
	10061026	trans-1,3-Dichloropropene	ND	ND	ug/L		0/27	0.003-1.3	ND	N/A	4.00E-01	C Region 9 PRG for Tap Water	N/A	N/A	N	BSL
	79005	1,1,2-Trichloroethane	ND	ND	ug/L		27/27	N/A	ND	N/A	2.00E-01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	5.00E+00	EPA Maximum Contaminant Level	N	BSL
	127184	Tetrachloroethene	ND	ND	ug/L		3/27	0.003-10	ND	N/A	6.60E-01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	5.00E+00	EPA Maximum Contaminant Level	N	BSL
	591786	2-Hexanone	ND	ND	ug/L		10/27	0.6-1.5	ND	N/A	1.60E+01	N PRG Surrogate (4-Methyl-2-pentanone)	N/A	N/A	N	BSL
	124481	Chlorodibromomethane	ND	ND	ug/L		6/27	0.97-53	ND	N/A	1.30E-01	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	106934	Ethylenedibromide	ND	ND	ug/L		4/32	0.000035-0.011	ND	N/A	7.60E-04	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	5.00E-02	EPA Maximum Contaminant Level	N	BSL
	108907	Chlorobenzene	ND	ND	ug/L		2/32	0.000033-0.011	ND	N/A	1.10E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	1.00E+02	EPA Maximum Contaminant Level	N	BSL
	100414	Ethylbenzene	ND	ND	ug/L		4/32	0.00003-0.011	ND	N/A	2.90E+00	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	7.00E+02	EPA Maximum Contaminant Level	N	BSL
	1330207	Xylenes (total)	ND	ND	ug/L		2/32	0.000032-0.011	ND	N/A	2.10E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	1.00E+04	EPA Maximum Contaminant Level	N	BSL
	100425	Styrene	ND	ND	ug/L		0/32	0.00004-0.011	ND	N/A	1.60E+02	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	1.00E+02	EPA Maximum Contaminant Level	N	BSL
	75252	Bromoform	ND	ND	ug/L		2/32	0.000051-0.011	ND	N/A	8.50E+00	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	98828	Isopropylbenzene	ND	ND	ug/L		0/28	0.01-0.011	ND	N/A	6.60E+01	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	79345	1,1,2,2-Tetrachloroethane	ND	ND	ug/L		2/32	0.000046-0.011	ND	N/A	5.50E-02	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	53494705	Endrin Ketone	ND	ND	ug/L		0/0	N/A	ND	N/A	1.1	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	7421934	Endrin aldehyde	ND	ND	ug/L		0/3	0.01-0.2	ND	N/A	1.1	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	N/A	N/A	N	BSL
	8001352	Toxaphene	ND	ND	ug/L		0/3	0.5-10	ND	N/A	0.061	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	3	EPA Maximum Contaminant Level	N	BSL
	12674112	Aroclor 1016	ND	ND	ug/L		0/6	0.02-0.1	ND	N/A	0.96	N EPA Region 9 PRGs, Tap Water (Modified for Region 1)	0.5	EPA Maximum Contaminant Level	N	BSL
	11104282	Aroclor 1221	ND	ND	ug/L		0/6	0.02-0.1	ND	N/A	0.034	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	0.5	EPA Maximum Contaminant Level	N	BSL
	11141165	Aroclor 1232	ND	ND	ug/L		0/6	0.02-0.1	ND	N/A	0.034	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	0.5	EPA Maximum Contaminant Level	N	BSL
	53469219	Aroclor 1242	ND	ND	ug/L		0/6	0.02-0.1	ND	N/A	0.034	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	0.5	EPA Maximum Contaminant Level	N	BSL
	12672296	Aroclor 1248	ND	ND	ug/L		0/6	0.02-0.1	ND	N/A	0.034	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	0.5	EPA Maximum Contaminant Level	N	BSL
	11097691	Aroclor 1254	ND	ND	ug/L		0/6	0.02-0.1	ND	N/A	0.034	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	0.5	EPA Maximum Contaminant Level	N	BSL
	11096825	Aroclor 1260	ND	ND	ug/L		0/6	0.02-0.1	ND	N/A	0.034	C EPA Region 9 PRGs, Tap Water (Modified for Region 1)	0.5	EPA Maximum Contaminant Level	N	BSL

(a) Data presented are from groundwater samples MW-1,MW1,MW-2,MW2

(1) Minimum/maximum detected concentration.
(2) Maximum concentration used for screening.
(3) Refer to supporting information for background discussion.
(4) USEPA Region 9 PRGs for residential soil (adjusted to an hazard quotient = 0.1 for noncarcinogens), October 1, 2002.
PRG for chromium III used for total chromium.
PRG for chromium VI used for chromium VI.
PRG for mercury and compounds used for mercury.
PRG for free cyanide used for total cyanide.
(5) Rationale Codes:
Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)
Region 1 Exclusion (R1X)
Low Concentration, Low Frequency of Detection (LCF)

Definitions:
ug/L = micrograms per liter
CAS = Chemical Abstract Service
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
PRG = Preliminary Remedial Goal
N/A = Not Applicable or Not Available
ND = Not Detected
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
MCL = Maximum Contaminant Level
MADEP = Massachusetts Department of Environmental Protection
GW-1/GW-2 = MADEP Groundwater Cleanup Criteria
TEQ = Toxic Equivalent for PCB Dioxin-like congeners
* PCB Dioxin-like congeners
PCB = polychlorinated biphenyls

BACKGROUND TABLE 3-3.1.RME

EXPOSURE POINT CONCENTRATION SUMMARY

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Surface Soil

Exposure Point (1)	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution) (2)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (3)	Rationale (4)
Combined Data (a)	Arsenic	mg/kg	7.99E+00	9.46E+00 (N)	1.2E+01	9.46E+00	mg/kg	95% UCL-N	(b)

(1) Only COPCs selected on Table 3-2.1 and detected at each exposure point appear.
(2) T - Transformed; N - Normal; NP - Non-parametric; <4 - sample size too small to calculate 95% UCL
(3) Statistics: Maximum Detected Value (Max); 95% UCL of Transformed Data (95% UCL - T); 95% of Normal Data (95% UCL - N); 95% of Non-parametric Data (95% UCL - NP); Arithmatic Mean (Mean).
(4) Rationale
(a) Due to small sample size (<4), the maximum detected concentration is used.
(b) Shapiro-Wilk W Test indicates data are normally distributed.
(c) Shapiro-Wilk W Test indicates data are log-normally distributed.
(d) Shapiro-Wilk W Test indicates data are neither normally nor log-normally distributed.
(e) Recommended UCL exceeds maximum detected concentration. Therefore, maximum concentration is used for EPC.
(f) When the maximum detected concentration is selected as the RME EPC, the arithmetic mean concentration is selected as the CT EPC.
(g) If the arithmetic mean concentration equals or exceeds the maximum detected concentration, the maximum detected concentration is used as the CT EPC

J = Estimated concentration
Max = Maximum detected concentration
N/A = Not applicable
UCL = Upper confidence limit
EPC = Exposure point concentration
RME = Reasonable Maximum Exposure
CT = Central Tendency

BACKGROUND TABLE 3-3.1.CT

EXPOSURE POINT CONCENTRATION SUMMARY

CENTRAL TENDENCY

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Surface Soil

Exposure Point (1)	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution) (2)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (3)	Rationale (4)
Combined Data (a)	Arsenic	mg/kg	7.99E+00	9.46E+00 (N)	1.2E+01	9.46E+00	mg/kg	95% UCL-N	(b)

(1) Only COPCs selected on Table 3-2.1 and detected at each exposure point appear.

(2) T - Transformed; N - Normal; NP - Non-parametric; <4 - sample size too small to calculate 95% UCL

(3) Statistics: Maximum Detected Value (Max); 95% UCL of Transformed Data (95% UCL - T); 95% of Normal Data (95% UCL - N); 95% of Non-parametric Data (95% UCL - NP); Arithmatic Mean (Mean).

(4) Rationale

(a) Due to small sample size (<4), the maximum detected concentration is used.

(b) Shapiro-Wilk W Test indicates data are normally distributed.

(c) Shapiro-Wilk W Test indicates data are log-normally distributed.

(d) Shapiro-Wilk W Test indicates data are neither normally nor log-normally distributed.

(e) Recommended UCL exceeds maximum detected concentration. Therefore, maximum concentration is used for EPC.

(f) When the maximum detected concentration is selected as the RME EPC, the arithmetic mean concentration is selected as the CT EPC.

(g) If the arithmetic mean concentration equals or exceeds the maximum detected concentration, the maximum detected concentration is used as the CT E

J = Estimated concentration

Max = Maximum detected concentration

N/A = Not applicable

UCL = Upper confidence limit

EPC = Exposure point concentration

RME = Reasonable Maximum Exposure

CT = Central Tendency

BACKGROUND TABLE 3-3.2.RME

EXPOSURE POINT CONCENTRATION SUMMARY

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Subsurface Soil

Exposure Point (1)	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution) (2)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (3)	Rationale (4)
Combined Data (a)	Arsenic	mg/kg	5.75E+00	7.00E+00 (N)	7.4E+00	7.00E+00	mg/kg	95% UCL-N	(b)
	Manganese	mg/kg	1.33E+02	1.92E+02 (N)	2.6E+02	1.92E+02	mg/kg	95% UCL-N	(b)

(1) Only COPCs selected on Table 3-2.1 and detected at each exposure point appear.

(2) T - Transformed; N - Normal; NP - Non-parametric; <4 - sample size too small to calculate 95% UCL

(3) Statistics: Maximum Detected Value (Max); 95% UCL of Transformed Data (95% UCL - T); 95% of Normal Data (95% UCL - N); 95% of Non-parametric Data (95% UCL - NP); Arithmatic Mean (Mean).

(4) Rationale

(a) Due to small sample size (<4), the maximum detected concentration is used.

(b) Shapiro-Wilk W Test indicates data are normally distributed.

(c) Shapiro-Wilk W Test indicates data are log-normally distributed.

(d) Shapiro-Wilk W Test indicates data are neither normally nor log-normally distributed.

(e) Recommended UCL exceeds maximum detected concentration. Therefore, maximum concentration is used for EPC.

(f) When the maximum detected concentration is selected as the RME EPC, the arithmetic mean concentration is selected as the CT EPC.

(g) If the arithmetic mean concentration equals or exceeds the maximum detected concentration, the maximum detected concentration is used as the CT EPC

J = Estimated concentration

Max = Maximum detected concentration

N/A = Not applicable

UCL = Upper confidence limit

EPC = Exposure point concentration

RME = Reasonable Maximum Exposure

CT = Central Tendency

BACKGROUND TABLE 3-3.2.CT

EXPOSURE POINT CONCENTRATION SUMMARY

CENTRAL TENDENCY

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Subsurface Soil

Exposure Point (1)	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution) (2)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (3)	Rationale (4)
Combined Data (a)	Arsenic	mg/kg	5.75E+00	7.00E+00 (N)	7.4E+00	7.00E+00	mg/kg	95% UCL-N	(b)
	Manganese	mg/kg	1.33E+02	1.92E+02 (N)	2.6E+02	1.92E+02	mg/kg	95% UCL-N	(b)

(1) Only COPCs selected on Table 3-2.1 and detected at each exposure point appear.

(2) T - Transformed; N - Normal; NP - Non-parametric; <4 - sample size too small to calculate 95% UCL

(3) Statistics: Maximum Detected Value (Max); 95% UCL of Transformed Data (95% UCL - T); 95% of Normal Data (95% UCL - N); 95% of Non-parametric Data (95% UCL - NP); Arithmatic Mean (Mean).

(4) Rationale

(a) Due to small sample size (<4), the maximum detected concentration is used.

(b) Shapiro-Wilk W Test indicates data are normally distributed.

(c) Shapiro-Wilk W Test indicates data are log-normally distributed.

(d) Shapiro-Wilk W Test indicates data are neither normally nor log-normally distributed.

(e) Recommended UCL exceeds maximum detected concentration. Therefore, maximum concentration is used for EPC.

(f) When the maximum detected concentration is selected as the RME EPC, the arithmetic mean concentration is selected as the CT EPC.

(g) If the arithmetic mean concentration equals or exceeds the maximum detected concentration, the maximum detected concentration is used as the CT EPC

J = Estimated concentration

Max = Maximum detected concentration

N/A = Not applicable

UCL = Upper confidence limit

EPC = Exposure point concentration

RME = Reasonable Maximum Exposure

CT = Central Tendency

BACKGROUND TABLE 3-7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Current
Receptor Population: Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Combined Background	Ingestion	Arsenic	9E+00	mg/kg	8.3E-07	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	1.2E-06	2.3E-06	mg/kg-day	3.0E-04	mg/kg-day	7.7E-03
			Exp. Route Total								1E-06					8E-03
Surface Soil (Cont.)	Surface Soil (Cont.)	Combined Background	Dermal	Arsenic	9E+00	mg/kg	3.3E-07	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	4.9E-07	9.2E-07	mg/kg-day	3.0E-04	mg/kg-day	3.1E-03
			Exp. Route Total								5E-07					3E-03
		Exposure Point Total									2E-06					1E-02
	Exposure Medium Total										NA					NA
Medium Total											NA					NA
										Total of Receptor Risks Across All Media	NA				Total of Receptor Hazards Across All Media	NA

BACKGROUND TABLE 3-7.1.CT

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDANCY

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Current
Receptor Population: Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Aberjona Property	Ingestion	Arsenic	9E+00	mg/kg	1.4E-07	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	2.1E-07	1.1E-06	mg/kg-day	3.0E-04	mg/kg-day	3.7E-03
			Exp. Route Total								2E-07					4E-03
Surface Soil (Cont.)	Surface Soil (Cont.)	Aberjona Property	Dermal	Arsenic	9E+00	mg/kg	5.7E-08	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	8.5E-08	4.4E-07	mg/kg-day	3.0E-04	mg/kg-day	1.5E-03
			Exp. Route Total								8E-08					1E-03
		Exposure Point Total									3E-07					5E-03
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
										Total of Receptor Risks Across All Media	N/A				Total of Receptor Hazards Across All Media	N/A

BACKGROUND TABLE 3-7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Combined Data	Ingestion	Arsenic	9E+00	mg/kg	8.3E-07	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	1.2E-06	2.3E-06	mg/kg-day	3.0E-04	mg/kg-day	7.7E-03
			Exp. Route Total								1E-06					8E-03
Surface Soil (Cont.)	Surface Soil (Cont.)	Combined Data	Dermal	Arsenic	9E+00	mg/kg	3.3E-07	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	4.9E-07	9.2E-07	mg/kg-day	3.0E-04	mg/kg-day	3.1E-03
			Exp. Route Total								5E-07					3E-03
		Exposure Point Total									2E-06					1E-02
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
										Total of Receptor Risks Across All Media	NA				Total of Receptor Hazards Across All Media	NA

BACKGROUND TABLE 3-7.2.CT

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDANCY

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Combined Data	Ingestion	Arsenic	9E+00	mg/kg	1.4E-07	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	2.1E-07	1.1E-06	mg/kg-day	3.0E-04	mg/kg-day	3.7E-03
			Exp. Route Total								2E-07					4E-03
Surface Soil (Cont.)	Surface Soil (Cont.)	Combined Data	Dermal	Arsenic	9E+00	mg/kg	5.7E-08	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	8.5E-08	4.4E-07	mg/kg-day	3.0E-04	mg/kg-day	1.5E-03
			Exp. Route Total								8E-08					1E-03
		Exposure Point Total									3E-07					5E-03
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
										Total of Receptor Risks Across All Media	NA				Total of Receptor Hazards Across All Media	NA

BACKGROUND TABLE 3-7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Current
Receptor Population: Trespasser
Receptor Age: Older Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Combined Data	Ingestion	Arsenic	9.5E+00	mg/kg	5.1E-08	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	7.6E-08	5.9E-07	mg/kg-day	3.0E-04	mg/kg-day	2.0E-03
			Exp. Route Total								8E-08					2E-03
Surface Soil (Cont.)	Surface Soil (Cont.)	Combined Data	Dermal	Arsenic	9.5E+00	mg/kg	2.7E-08	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	4.1E-08	3.2E-07	mg/kg-day	3.0E-04	mg/kg-day	1.1E-03
			Exp. Route Total								4E-08					1E-03
		Exposure Point Total									1E-07					3E-03
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
										Total of Receptor Risks Across All Media	N/A				Total of Receptor Hazards Across All Media	N/A

BACKGROUND TABLE 3-7.3.CT

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDANCY

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Current
Receptor Population: Trespasser
Receptor Age: Older Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Combined Data	Ingestion	Arsenic	9E+00	mg/kg	8.4E-09	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	1.3E-08	3.0E-07	mg/kg-day	3.0E-04	mg/kg-day	9.9E-04
			Exp. Route Total								1E-08					1E-03
Surface Soil (Cont.)	Surface Soil (Cont.)	Combined Data	Dermal	Arsenic	9E+00	mg/kg	9.1E-09	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	1.4E-08	3.2E-07	mg/kg-day	3.0E-04	mg/kg-day	1.1E-03
			Exp. Route Total								1E-08					1E-03
		Exposure Point Total									3E-08					2E-03
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
										Total of Receptor Risks Across All Media	N/A				Total of Receptor Hazards Across All Media	N/A

BACKGROUND TABLE 3-7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Trespasser
Receptor Age: Older Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Aberjona Property	Ingestion	Arsenic	9.5E+00	mg/kg	1.0E-07	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	1.5E-07	1.2E-06	mg/kg-day	3.0E-04	mg/kg-day	3.9E-03
			Exp. Route Total								2E-07					4E-03
Surface Soil (Cont.)	Surface Soil (Cont.)	Aberjona Property	Dermal	Arsenic	9.5E+00	mg/kg	5.5E-08	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	8.2E-08	6.4E-07	mg/kg-day	3.0E-04	mg/kg-day	2.1E-03
			Exp. Route Total								8E-08					2E-03
		Exposure Point Total									2E-07					6E-03
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
										Total of Receptor Risks Across All Media	N/A				Total of Receptor Hazards Across All Media	N/A

BACKGROUND TABLE 3-7.4.CT

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDANCY

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Trespasser
Receptor Age: Older Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Aberjona Property	Ingestion	Arsenic	9E+00	mg/kg	8.4E-09	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	1.3E-08	3.0E-07	mg/kg-day	3.0E-04	mg/kg-day	9.9E-04
			Exp. Route Total								1E-08					1E-03
Surface Soil (Cont.)	Surface Soil (Cont.)	Aberjona Property	Dermal	Arsenic	9E+00	mg/kg	9.1E-09	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	1.4E-08	3.2E-07	mg/kg-day	3.0E-04	mg/kg-day	1.1E-03
			Exp. Route Total								1E-08					1E-03
		Exposure Point Total									3E-08					2E-03
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
										Total of Receptor Risks Across All Media	N/A				Total of Receptor Hazards Across All Media	N/A

BACKGROUND TABLE 3-7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Combined Data	Ingestion	Arsenic	9.5E+00	mg/kg	5.0E-07	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	7.4E-07	1.4E-06	mg/kg-day	3.0E-04	mg/kg-day	4.8E-03
			Exp. Route Total								7E-07					5E-03
Surface Soil (Cont.)	Surface Soil (Cont.)	Combined Data	Dermal	Arsenic	9.5E+00	mg/kg	1.2E-07	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	1.8E-07	3.5E-07	mg/kg-day	3.0E-04	mg/kg-day	1.2E-03
			Exp. Route Total								2E-07					1E-03
		Exposure Point Total									9E-07					6E-03
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
Subsurface Soil	Subsurface Soil	Combined Data	Ingestion	Arsenic	7E+00	mg/kg	3.7E-07	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	5.5E-07	1.1E-06	mg/kg-day	3.0E-04	mg/kg-day	3.6E-03
				Manganese	2E+02	mg/kg	1.0E-05	mg/kg-day	N/A	N/A	N/A	2.9E-05	mg/kg-day	7.0E-02	mg/kg-day	4.2E-04
			Exp. Route Total								5E-07					4E-03
Subsurface Soil (Cont.)	Subsurface Soil (Cont.)	Combined Data	Dermal	Arsenic	7E+00	mg/kg	8.8E-08	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	1.3E-07	2.6E-07	mg/kg-day	3.0E-04	mg/kg-day	8.5E-04
				Manganese	2E+02	mg/kg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.8E-03	mg/kg-day	N/A
			Exp. Route Total								1E-07					9E-04
		Exposure Point Total									7E-07					5E-03
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
										Total of Receptor Risks Across All Media	N/A				Total of Receptor Hazards Across All Media	N/A

BACKGROUND TABLE 3-7.5.CT

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDANCY

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Aberjona Property	Ingestion	Arsenic	9E+00	mg/kg	2.4E-08	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	3.6E-08	2.4E-07	mg/kg-day	3.0E-04	mg/kg-day	8.0E-04
			Exp. Route Total								4E-08					8E-04
Surface Soil (Cont.)	Surface Soil (Cont.)	Aberjona Property	Dermal	Arsenic	9E+00	mg/kg	1.2E-08	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	1.7E-08	1.2E-07	mg/kg-day	3.0E-04	mg/kg-day	3.8E-04
			Exp. Route Total								2E-08					4E-04
		Exposure Point Total									5E-08					1E-03
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
Subsurface Soil	Subsurface Soil	Aberjona Property	Ingestion	Arsenic	7E+00	mg/kg	1.8E-08	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	2.7E-08	1.8E-07	mg/kg-day	3.0E-04	mg/kg-day	5.9E-04
				Manganese	2E+02	mg/kg	4.9E-07	mg/kg-day	N/A	N/A	N/A	4.9E-06	mg/kg-day	7.0E-02	mg/kg-day	7.0E-05
			Exp. Route Total								3E-08					7E-04
Subsurface Soil (Cont.)	Subsurface Soil (Cont.)	Aberjona Property	Dermal	Arsenic	7E+00	mg/kg	8.5E-09	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	1.3E-08	8.5E-08	mg/kg-day	3.0E-04	mg/kg-day	2.8E-04
				Manganese	2E+02	mg/kg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.8E-03	mg/kg-day	N/A
			Exp. Route Total								1E-08					3E-04
		Exposure Point Total									4E-08					9E-04
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
										Total of Receptor Risks Across All Media	N/A				Total of Receptor Hazards Across All Media	N/A

BACKGROUND TABLE 3-7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Aberjona Property	Ingestion	Arsenic	9.5E+00	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	1.7E-06	1.3E-05	mg/kg-day	3.0E-04	mg/kg-day	4.5E-02
			Exp. Route Total								2E-06					4E-02
Surface Soil (Cont.)	Surface Soil (Cont.)	Aberjona Property	Dermal	Arsenic	9.5E+00	mg/kg	1.9E-07	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	2.9E-07	2.3E-06	mg/kg-day	3.0E-04	mg/kg-day	7.6E-03
			Exp. Route Total								3E-07					8E-03
		Exposure Point Total									2E-06					5E-02
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
Subsurface Soil	Subsurface Soil	Aberjona Property	Ingestion	Arsenic	7E+00	mg/kg	8.6E-07	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	1.3E-06	1.0E-05	mg/kg-day	3.0E-04	mg/kg-day	3.3E-02
				Manganese	2E+02	mg/kg	2.3E-05	mg/kg-day	N/A	N/A	N/A	2.7E-04	mg/kg-day	7.0E-02	mg/kg-day	3.9E-03
			Exp. Route Total								1E-06					4E-02
Subsurface Soil (Cont.)	Subsurface Soil (Cont.)		Dermal	Arsenic	7E+00	mg/kg	1.4E-07	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	2.2E-07	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	5.6E-03
				Manganese	2E+02	mg/kg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.8E-03	mg/kg-day	N/A
			Exp. Route Total								2E-07					6E-03
		Exposure Point Total									1E-06					4E-02
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
										Total of Receptor Risks Across All Media	N/A				Total of Receptor Hazards Across All Media	N/A

BACKGROUND TABLE 3-7.6.CT

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDANCY

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Aberjona Property	Ingestion	Arsenic	9E+00	mg/kg	6.4E-08	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	9.6E-08	2.2E-06	mg/kg-day	3.0E-04	mg/kg-day	7.5E-03
			Exp. Route Total								1E-07					7E-03
Surface Soil (Cont.)	Surface Soil (Cont.)	Aberjona Property	Dermal	Arsenic	9E+00	mg/kg	2.2E-08	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	3.2E-08	7.6E-07	mg/kg-day	3.0E-04	mg/kg-day	2.5E-03
			Exp. Route Total								3E-08					3E-03
		Exposure Point Total									1E-07					1E-02
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
Subsurface Soil	Subsurface Soil	Aberjona Property	Ingestion	Arsenic	7E+00	mg/kg	4.8E-08	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	7.1E-08	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	5.5E-03
				Manganese	2E+02	mg/kg	1.3E-06	mg/kg-day	N/A	N/A	N/A	4.6E-05	mg/kg-day	7.0E-02	mg/kg-day	6.5E-04
			Exp. Route Total								7E-08					6E-03
Subsurface Soil (Cont.)	Subsurface Soil (Cont.)	Aberjona Property	Dermal	Arsenic	7E+00	mg/kg	1.6E-08	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	2.4E-08	5.6E-07	mg/kg-day	3.0E-04	mg/kg-day	1.9E-03
				Manganese	2E+02	mg/kg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.8E-03	mg/kg-day	N/A
			Exp. Route Total								2E-08					2E-03
		Exposure Point Total									1E-07					8E-03
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
										Total of Receptor Risks Across All Media	N/A				Total of Receptor Hazards Across All Media	N/A

BACKGROUND TABLE 3-7.7.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Combined Data	Ingestion	Arsenic	9.5E+00	mg/kg	1.3E-07	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	2.0E-07	9.3E-06	mg/kg-day	3.0E-04	mg/kg-day	3.1E-02
			Exp. Route Total								2E-07					3E-02
Surface Soil (Cont.)	Surface Soil (Cont.)	Combined Data	Dermal	Arsenic	9.5E+00	mg/kg	1.3E-08	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	2.0E-08	9.2E-07	mg/kg-day	3.0E-04	mg/kg-day	3.1E-03
			Exp. Route Total								2E-08					3E-03
Surface Soil (Cont.)	Surface Soil (Cont.)	Combined Data	Inhalation	Arsenic	9.5E+00	mg/kg	2.2E-08	ug/m3	4.3E-03	(ug/m3)-1	9.6E-11	1.6E-09	mg/m3	N/A	N/A	N/A
			Exp. Route Total								1E-10					0E+00
		Exposure Point Total									2E-07					3E-02
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
Subsurface Soil	Subsurface Soil	Combined Data	Ingestion	Arsenic	7E+00	mg/kg	9.8E-08	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	1.5E-07	6.9E-06	mg/kg-day	3.0E-04	mg/kg-day	2.3E-02
				Manganese	2E+02	mg/kg	2.7E-06	mg/kg-day	N/A	N/A	N/A	1.9E-04	mg/kg-day	7.0E-02	mg/kg-day	2.7E-03
			Exp. Route Total								1E-07					3E-02
Subsurface Soil (Cont.)	Subsurface Soil (Cont.)	Combined Data	Dermal	Arsenic	7E+00	mg/kg	9.7E-09	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	1.5E-08	6.8E-07	mg/kg-day	3.0E-04	mg/kg-day	2.3E-03
				Manganese	2E+02	mg/kg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.8E-03	mg/kg-day	N/A
			Exp. Route Total								1E-08					2E-03
Subsurface Soil (Cont.)	Subsurface Soil (Cont.)	Combined Data	Inhalation	Arsenic	7E+00	mg/kg	1.6E-08	ug/m3	4.3E-03	(ug/m3)-1	7.1E-11	1.2E-09	mg/m3	N/A	N/A	N/A
				Manganese	2E+02	mg/kg	4.5E-07	ug/m3	N/A	N/A	N/A	3.2E-08	mg/m3	5.0E-05	mg/m3	6.3E-04
			Exp. Route Total								7E-11					6E-04
		Exposure Point Total									2E-07					3E-02
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
										Total of Receptor Risks Across All Media	N/A				Total of Receptor Risks Across All Media	N/A

BACKGROUND TABLE 3-7.7.CT

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDANCY

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Aberjona Property	Ingestion	Arsenic	9E+00	mg/kg	4.2E-08	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	6.3E-08	3.0E-06	mg/kg-day	3.0E-04	mg/kg-day	9.9E-03
			Exp. Route Total								6E-08					1E-02
Surface Soil (Cont.)	Surface Soil (Cont.)	Aberjona Property	Dermal	Arsenic	9E+00	mg/kg	4.2E-09	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	6.3E-09	2.9E-07	mg/kg-day	3.0E-04	mg/kg-day	9.8E-04
			Exp. Route Total								6E-09					1E-03
Surface Soil (Cont.)	Surface Soil (Cont.)	Aberjona Property	Inhalation	Arsenic	9E+00	mg/kg	1.1E-09	ug/m3	4.3E-03	(ug/m3)-1	4.6E-12	7.5E-11	mg/m3	N/A	N/A	N/A
			Exp. Route Total								5E-12					0E+00
		Exposure Point Total									7E-08					1E-02
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
Subsurface Soil	Subsurface Soil	Aberjona Property	Ingestion	Arsenic	7E+00	mg/kg	3.1E-08	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	4.7E-08	2.2E-06	mg/kg-day	3.0E-04	mg/kg-day	7.3E-03
				Manganese	2E+02	mg/kg	8.6E-07	mg/kg-day	N/A	N/A	N/A	6.0E-05	mg/kg-day	7.0E-02	mg/kg-day	8.6E-04
			Exp. Route Total								5E-08					8E-03
Subsurface Soil (Cont.)	Subsurface Soil (Cont.)	Aberjona Property	Dermal	Arsenic	7E+00	mg/kg	3.1E-09	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	4.7E-09	2.2E-07	mg/kg-day	3.0E-04	mg/kg-day	7.2E-04
				Manganese	2E+02	mg/kg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.8E-03	mg/kg-day	N/A
			Exp. Route Total								5E-09					7E-04
Subsurface Soil (Cont.)	Subsurface Soil (Cont.)	Aberjona Property	Inhalation	Arsenic	7E+00	mg/kg	7.9E-10	ug/m3	4.3E-03	(ug/m3)-1	3.4E-12	5.5E-11	mg/m3	N/A	N/A	N/A
				Manganese	2E+02	mg/kg	2.2E-08	ug/m3	N/A	N/A	N/A	1.5E-09	mg/m3	5.0E-05	mg/m3	3.0E-05
			Exp. Route Total								3E-12					3E-05
		Exposure Point Total									5E-08					9E-03
	Exposure Medium Total										N/A					N/A
Medium Total											N/A					N/A
										Total of Receptor Risks Across All Media	N/A				Total of Receptor Risks Across All Media	N/A

BACKGROUND TABLE 3-9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Current
Receptor Population: Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Commercial Worker					Non-Carcinogenic Hazard Quotient Commercial Worker				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Combined Data	Arsenic	1E-06	- -	5E-07	- -	2E-06	Skin	8E-03	- -	3E-03	1E-02
			Chemical Total	1E-06	- -	5E-07	- -	2E-06		8E-03	- -	3E-03	1E-02
			Radionuclide Total										
		Exposure Point Total						2E-06					1E-02
	Exposure Medium Total							2E-06					1E-02
Medium Total								2E-06					1E-02
Receptor Total								2E-06					1E-02

- - = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media: 2E-06

Total Hazard Across All Media: 1E-02

Total Skin HI =	1E-02
Total Immune System HI =	N/A
Total Kidney HI =	N/A
Total Blood HI =	N/A
Total Nervous System HI =	N/A
Total Liver HI =	N/A
Total Endocrine HI =	N/A
Total Cardiovascular HI =	N/A
Total Developmental HI =	N/A
Total General Toxicity HI =	N/A
Total GI System HI =	N/A
Total Reproductive System HI =	N/A
Total Respiratory System HI =	N/A

BACKGROUND TABLE 3-9.1.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Current
Receptor Population: Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Commercial Worker					Non-Carcinogenic Hazard Quotient Commercial Worker				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Combined Data	Arsenic	2E-07	- -	8E-08	- -	3E-07	Skin	4E-03	- -	1E-03	5E-03
			Chemical Total	2E-07	- -	8E-08	- -	3E-07		4E-03	- -	1E-03	5E-03
			Radionuclide Total										
		Exposure Point Total						3E-07					5E-03
	Exposure Medium Total							3E-07					5E-03
Medium Total								3E-07					5E-03
Receptor Total								3E-07					5E-03

- - = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media: 3E-07

Total Hazard Across All Media: 5E-03

Total Skin HI =	5E-03
Total Immune System HI =	N/A
Total Kidney HI =	N/A
Total Blood HI =	N/A
Total Nervous System HI =	N/A
Total Liver HI =	N/A
Total Endocrine HI =	N/A
Total Cardiovascular HI =	N/A
Total Developmental HI =	N/A
Total General Toxicity HI =	N/A
Total GI System HI =	N/A
Total Reproductive System HI =	N/A
Total Respiratory System HI =	N/A

BACKGROUND TABLE 3-9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Current
Receptor Population: Trespasser
Receptor Age: Older Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Trespasser (Older Child)					Non-Carcinoge Trespass	
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion
Surface Soil	Surface Soil	Combined Data	Arsenic	8E-08	- -	4E-08	- -	1E-07	Skin	2E-03
			Chemical Total	8E-08	- -	4E-08	- -	1E-07		2E-03
			Radionuclide Total							
		Exposure Point Total						1E-07		
	Exposure Medium Total							1E-07		
Medium Total								1E-07		
Receptor Total								1E-07		

- - = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media 1E-07

To

To

T

BACKGROUND TABLE 3-9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Current
Receptor Population: Trespasser
Receptor Age: Older Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Trespasser (Older Child)					Non-Carcinoge Trespass	
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion
Surface Soil	Surface Soil	Combined Data	Arsenic	1E-08	- -	1E-08	- -	3E-08	Skin	1E-03
			Chemical Total	1E-08	- -	1E-08	- -	3E-08		1E-03
			Radionuclide Total							
		Exposure Point Total						3E-08		
	Exposure Medium Total							3E-08		
Medium Total								3E-08		
Receptor Total								3E-08		

- - = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media 3E-08

To

Tot

T

BACKGROUND TABLE 3-9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Commercial Worker					Non-Carcinogenic Hazard Quotient Commercial Worker				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Combined Data	Arsenic	1E-06	- -	5E-07	- -	2E-06	Skin	8E-03	- -	3E-03	1E-02
			Chemical Total	1E-06	- -	5E-07	- -	2E-06		8E-03	- -	3E-03	1E-02
			Radionuclide Total										
		Exposure Point Total						2E-06					1E-02
	Exposure Medium Total							2E-06					1E-02
Medium Total								2E-06					1E-02
Receptor Total								2E-06					1E-02

- - = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media: 2E-06

Total Hazard Across All Media: 1E-02

Total Skin HI =	1E-02
Total Immune System HI =	N/A
Total Kidney HI =	N/A
Total Blood HI =	N/A
Total Nervous System HI =	N/A
Total Liver HI =	N/A
Total Endocrine HI =	N/A
Total Cardiovascular HI =	N/A
Total Developmental HI =	N/A
Total General Toxicity HI =	N/A
Total GI System HI =	N/A
Total Reproductive System HI =	N/A
Total Respiratory System HI =	N/A

BACKGROUND TABLE 3-9.3.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Commercial Worker					Non-Carcinogenic Hazard Quotient Commercial Worker				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Combined Data	Arsenic	2E-07	- -	8E-08	- -	3E-07	Skin	4E-03	- -	1E-03	5E-03
			Chemical Total	2E-07	- -	8E-08	- -	3E-07		4E-03	- -	1E-03	5E-03
			Radionuclide Total										
		Exposure Point Total						3E-07					5E-03
	Exposure Medium Total							3E-07					5E-03
Medium Total								3E-07					5E-03
Receptor Total								3E-07					5E-03

- - = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media: 3E-07

Total Hazard Across All Media: 5E-03

Total Skin HI =	5E-03
Total Immune System HI =	N/A
Total Kidney HI =	N/A
Total Blood HI =	N/A
Total Nervous System HI =	N/A
Total Liver HI =	N/A
Total Endocrine HI =	N/A
Total Cardiovascular HI =	N/A
Total Developmental HI =	N/A
Total General Toxicity HI =	N/A
Total GI System HI =	N/A
Total Reproductive System HI =	N/A
Total Respiratory System HI =	N/A

BACKGROUND TABLE 3-9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Trespasser
Receptor Age: Older Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Trespasser (Older Child)					Non-Carcinoge Trespass	
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion
Surface Soil	Surface Soil	Aberjona	Arsenic	2E-07	- -	8E-08	- -	2E-07	Skin	4E-03
			Chemical Total	2E-07	- -	8E-08	- -	2E-07		4E-03
			Radionuclide Total							
		Exposure Point Total						2E-07		
	Exposure Medium Total							2E-07		
Medium Total								2E-07		
Receptor Total								2E-07		

- - = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media 2E-07

To

Tot

T

BACKGROUND TABLE 3-9.4.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Trespasser
Receptor Age: Older Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Trespasser (Older Child)					Non-Carcinoge Trespasse	
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion
Surface Soil	Surface Soil	Aberjona	Arsenic	1E-08	- -	1E-08	- -	3E-08	Skin	1E-03
			Chemical Total	1E-08	- -	1E-08	- -	3E-08		1E-03
			Radionuclide Total							
		Exposure Point Total						3E-08		
	Exposure Medium Total							3E-08		
Medium Total								3E-08		
Receptor Total								3E-08		

- - = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media 3E-08

To

Tot

T

BACKGROUND TABLE 3-9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Young Child + Adult					Non-Carcinogenic Hazard Quotient Young Child				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Combined Data	Arsenic	2E-06	- -	5E-07	- -	3E-06	Skin	4E-02	- -	8E-03	5E-02
			Chemical Total	2E-06	- -	5E-07	- -	3E-06		4E-02	- -	8E-03	5E-02
			Radionuclide Total										
		Exposure Point Total						3E-06					5E-02
	Exposure Medium Total							3E-06					5E-02
Medium Total								3E-06					5E-02
Receptor Total								3E-06					5E-02

- - = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media: 3E-06

Total Hazard Across All Media: 5E-02

Total Skin HI =	5E-02
Total Immune System HI =	N/A
Total Kidney HI =	N/A
Total Blood HI =	N/A
Total Nervous System HI =	N/A
Total Liver HI =	N/A
Total Endocrine HI =	N/A
Total Cardiovascular HI =	N/A
Total Developmental HI =	N/A
Total General Toxicity HI =	N/A
Total GI System HI =	N/A
Total Reproductive System HI =	N/A
Total Respiratory System HI =	N/A

BACKGROUND TABLE 3-9.5.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Young Child + Adult					Non-Carcinogenic Hazard Quotient Young Child				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Combined Data	Arsenic	1E-07	- -	5E-08	- -	2E-07	Skin	7E-03	- -	3E-03	1E-02
			Chemical Total	1E-07	- -	5E-08	- -	2E-07		7E-03	- -	3E-03	1E-02
			Radionuclide Total										
		Exposure Point Total						2E-07					1E-02
	Exposure Medium Total							2E-07					1E-02
Medium Total								2E-07					1E-02
Receptor Total								2E-07					1E-02

- - = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media: 2E-07

Total Hazard Across All Media: 1E-02

Total Skin HI =	1E-02
Total Immune System HI =	N/A
Total Kidney HI =	N/A
Total Blood HI =	N/A
Total Nervous System HI =	N/A
Total Liver HI =	N/A
Total Endocrine HI =	N/A
Total Cardiovascular HI =	N/A
Total Developmental HI =	N/A
Total General Toxicity HI =	N/A
Total GI System HI =	N/A
Total Reproductive System HI =	N/A
Total Respiratory System HI =	N/A

BACKGROUND TABLE 3-9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Young Child + Adult					Non-Carcinogenic Hazard Quotient Young Child				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Combined Data	Arsenic	2E-06	- -	3E-07	- -	2E-06	Skin	3E-02	- -	6E-03	4E-02
			Manganese	N/A	- -	N/A	- -	N/A	Nervous System	4E-03	- -	N/A	4E-03
			Chemical Total	2E-06	- -	3E-07	- -	2E-06		4E-02	- -	6E-03	4E-02
			Radionuclide Total										
		Exposure Point Total						2E-06					4E-02
	Exposure Medium Total							2E-06					4E-02
Medium Total								2E-06					4E-02
Receptor Total								2E-06					4E-02

- - = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media: 2E-06

Total Hazard Across All Media: 4E-02

Total Skin HI =	4E-02
Total Immune System HI =	N/A
Total Kidney HI =	N/A
Total Blood HI =	N/A
Total Nervous System HI =	4E-03
Total Liver HI =	N/A
Total Endocrine HI =	N/A
Total Cardiovascular HI =	N/A
Total Developmental HI =	N/A
Total General Toxicity HI =	N/A
Total GI System HI =	N/A
Total Reproductive System HI =	N/A
Total Respiratory System HI =	N/A

BACKGROUND TABLE 3-9.6.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Young Child + Adult					Non-Carcinogenic Hazard Quotient Young Child				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Combined Data	Arsenic	1E-07	- -	4E-08	- -	1E-07	Skin	6E-03	- -	2E-03	7E-03
			Manganese	N/A	- -	N/A	- -	N/A	Nervous System	7E-04	- -	N/A	7E-04
			Chemical Total	1E-07	- -	4E-08	- -	1E-07		6E-03	- -	2E-03	8E-03
			Radionuclide Total										
		Exposure Point Total						1E-07					8E-03
	Exposure Medium Total							1E-07					8E-03
Medium Total								1E-07					8E-03
Receptor Total								1E-07					8E-03

- - = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media: 1E-07

Total Hazard Across All Media: 8E-03

Total Skin HI =	7E-03
Total Immune System HI =	N/A
Total Kidney HI =	N/A
Total Blood HI =	N/A
Total Nervous System HI =	7E-04
Total Liver HI =	N/A
Total Endocrine HI =	N/A
Total Cardiovascular HI =	N/A
Total Developmental HI =	N/A
Total General Toxicity HI =	N/A
Total GI System HI =	N/A
Total Reproductive System HI =	N/A
Total Respiratory System HI =	N/A

BACKGROUND TABLE 3-9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Adult					Non-Carcinogenic Hazard Quotient Adult				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exp Route
Surface Soil	Surface Soil	Combined Data	Arsenic	2E-07	1E-10	2E-08	- -	2E-07	Skin	3E-02	N/A	3E-03	3E
			Chemical Total	2E-07	1E-10	2E-08	- -	2E-07		3E-02	- -	3E-03	3E
			Radionuclide Total										
		Exposure Point Total						2E-07					3E
	Exposure Medium Total							2E-07					3E
Medium Total								2E-07					3E
Receptor Total								2E-07					3E

- - = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media: 2E-07

Total Hazard Across All Media: 3E

Total Skin HI =	3E
Total Immune System HI =	N
Total Kidney HI =	N
Total Blood HI =	N
Total Nervous System HI =	N
Total Liver HI =	N
Total Endocrine HI =	N
Total Cardiovascular HI =	N
Total Developmental HI =	N
Total General Toxicity HI =	N
Total GI System HI =	N
Total Reproductive System HI =	N
Total Respiratory System HI =	N

BACKGROUND TABLE 3-9.7.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Adult					Non-Carcinogenic Hazard Quotient Adult				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exp Route
Surface Soil	Surface Soil	Combined Data	Arsenic	6E-08	5E-12	6E-09	- -	7E-08	Skin	1E-02	N/A	1E-03	1E
			Chemical Total	6E-08	5E-12	6E-09	- -	7E-08		1E-02	- -	1E-03	1E
			Radionuclide Total										
		Exposure Point Total						7E-08					1E
	Exposure Medium Total							7E-08					1E
Medium Total								7E-08					1E
Receptor Total								7E-08					1E

- - = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media: 7E-08

Total Hazard Across All Media: 1E

Total Skin HI =	1E
Total Immune System HI =	N
Total Kidney HI =	N
Total Blood HI =	N
Total Nervous System HI =	N
Total Liver HI =	N
Total Endocrine HI =	N
Total Cardiovascular HI =	N
Total Developmental HI =	N
Total General Toxicity HI =	N
Total GI System HI =	N
Total Reproductive System HI =	N
Total Respiratory System HI =	N

BACKGROUND TABLE 3-9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Adult					Non-Carcinogenic Hazard Quotient Adult				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exp Route
Subsurface Soil	Subsurface Soil	Combined Data	Arsenic	1E-07	7E-11	1E-08	- -	2E-07	Skin	2E-02	N/A	2E-03	3E
			Manganese	N/A	N/A	N/A	- -	N/A	Nervous System	3E-03	6E-04	N/A	3E
			Chemical Total	1E-07	7E-11	1E-08	- -	2E-07		3E-02	6E-04	2E-03	3E
			Radionuclide Total										
		Exposure Point Total						2E-07					3E
	Exposure Medium Total							2E-07					3E
Medium Total								2E-07					3E
Receptor Total								2E-07					3E

- - = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media: 2E-07

Total Hazard Across All Media: 3E

Total Skin HI =	3E
Total Immune System HI =	N
Total Kidney HI =	N
Total Blood HI =	N
Total Nervous System HI =	3E
Total Liver HI =	N
Total Endocrine HI =	N
Total Cardiovascular HI =	N
Total Developmental HI =	N
Total General Toxicity HI =	N
Total GI System HI =	N
Total Reproductive System HI =	N
Total Respiratory System HI =	N

BACKGROUND TABLE 3-9.8.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Southwest Properties, Wells G & H Superfund Site Operable Unit 2, Woburn, Massachusetts

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk Adult					Non-Carcinogenic Hazard Quotient Adult				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ	Ingestion	Inhalation	Dermal	Exp Route
Subsurface Soil	Subsurface Soil	Combined Data	Arsenic	5E-08	3E-12	5E-09	- -	5E-08	Skin	7E-03	N/A	7E-04	8E
			Manganese	N/A	N/A	N/A	- -	N/A	Nervous System	9E-04	3E-05	N/A	9E
			Chemical Total	5E-08	3E-12	5E-09	- -	5E-08		8E-03	3E-05	7E-04	9E
			Radionuclide Total										
		Exposure Point Total						5E-08					9E
	Exposure Medium Total							5E-08					9E
Medium Total								5E-08					9E
Receptor Total								5E-08					9E

- - = Not Evaluated
N/A = Not Applicable

Total Risk Across All Media: 5E-08

Total Hazard Across All Media: 9E

Total Skin HI =	8E
Total Immune System HI =	1
Total Kidney HI =	1
Total Blood HI =	1
Total Nervous System HI =	9E
Total Liver HI =	1
Total Endocrine HI =	1
Total Cardiovascular HI =	1
Total Developmental HI =	1
Total General Toxicity HI =	1
Total GI System HI =	1
Total Reproductive System HI =	1
Total Respiratory System HI =	1

Appendix C.5

Shower Model Documentation

Inhalation Exposure while Showering [1]

		Estimation of Gas-Phase Mass Transfer Coefficient (cm/hour) $k_{g(VOC)}$			Estimation of Liquid-Phase Mass Transfer Coefficient (cm/hour) $k_{l(VOC)}$			Estimation of Overall Mass Transfer Coefficient (cm/hour) K_L					Temperature Adjusted Overall Mass Transfer Coefficient (cm/hour) -- K'_L						Concentration Leaving the Shower Droplet C_{wd}				
		$k_{g(VOC)} = k_{g(H20)} (18 / MW_{VOC})^{0.5}$			$k_{l(VOC)} = k_{l(CO2)} (44 / MW_{VOC})^{0.5}$			$K_L = (1/k_{l(VOC)} + RT / H\ k_{g(VOC)})^{-1}$					$K'_L = K_L (T_l\ u_s / T_s\ u_l)^{-0.5}$						$C_{wd} = C_{wo} (1 - \exp [-K_{al} t_s / 60\ d])$				
		$k_{g(H20)}$	MW_{VOC}	$k_{g(VOC)}$	$k_{l(CO2)}$	MW_{VOC}	$k_{l(VOC)}$	H	RT	$k_{g(VOC)}$	$k_{l(VOC)}$	K_L	T_l	Ts	u_l	u_s	K_L	K'_L	C_{wo}	t_s	d	K'_L	C_{wd}
		cm/hour	g/mole	cm/hour	cm/hour	g/mole	cm/hour	atm-m^3/mole	atm-m^3/mole	cm/hour	cm/hour	cm/hour	kelvin (K)	kelvin (K)	centipoise (cp)	centipoise (cp)	cm/hour	cm/hour	ug/L	seconds	mm	cm/hr	ug/L
71556	1,1,1-Trichloroethane	3000	133.41	1101.953618	20	133.41	11.48582359	1.69E-02	2.40E-02	1101.95	11.49	11.32	293	318	1.002	0.596	11.32	15.25808033	150	2	1	15.26	59.79971233
76131	1,1,2-Trichloro-1,2,2-trifluoroethane	3000	187.38	929.8135911	20	187.38	9.691582936	5.17E-01	2.40E-02	929.81	9.69	9.69	293	318	1.002	0.596	9.69	13.05891845	15	2	1	13.06	5.293915862
79005	1,1,2-Trichloroethane	3000	133.41	1101.953618	20	133.41	11.48582359	8.10E-04	2.40E-02	1101.95	11.49	8.77	293	318	1.002	0.596	8.77	11.82930873	0.4	2	1	11.83	0.130342065
75343	1,1-Dichloroethane	3000	98.96	1279.462802	20	98.96	13.33602775	5.53E-03	2.40E-02	1279.46	13.34	12.76	293	318	1.002	0.596	12.76	17.19971241	220	2	1	17.20	95.997243
75354	1,1-Dichloroethene	3000	96.94	1292.724559	20	96.94	13.47425699	2.57E-02	2.40E-02	1292.72	13.47	13.34	293	318	1.002	0.596	13.34	17.98962115	9	2	1	17.99	4.05898617
120821	1,2,4-Trichlorobenzene	3000	181.45	944.8851444	20	181.45	9.848675939	1.40E-03	2.40E-02	944.89	9.85	8.35	293	318	1.002	0.596	8.35	11.25928829	23	2	1	11.26	7.197240031
95501	1,2-Dichlorobenzene	3000	147	1049.781318	20	147	10.94202409	1.89E-03	2.40E-02	1049.78	10.94	9.66	293	318	1.002	0.596	9.66	13.02357917	10	2	1	13.02	3.521650396
541731	1,3-Dichlorobenzene	3000	147	1049.781318	20	147	10.94202409	2.59E-03	2.40E-02	1049.78	10.94	9.98	293	318	1.002	0.596	9.98	13.4539235	19	2	1	13.45	6.866443696
106467	1,4-Dichlorobenzene	3000	147	1049.781318	20	147	10.94202409	2.37E-03	2.40E-02	1049.78	10.94	9.90	293	318	1.002	0.596	9.90	13.34078714	197	2	1	13.34	70.71884323
78933	2-Butanone (MEK)	3000	72.11	1498.855476	20	72.11	15.62278968	5.60E-05	2.40E-02	1498.86	15.62	2.86	293	318	1.002	0.596	2.86	3.851272176	6	2	1	3.85	0.722862925
67641	Acetone	3000	58.08	1670.106643	20	58.08	17.4077656	3.89E-05	2.40E-02	1670.11	17.41	2.34	293	318	1.002	0.596	2.34	3.159714151	35	2	1	3.16	3.498843594
71432	Benzene	3000	78.11	1440.13826	20	78.11	15.01077153	5.45E-03	2.40E-02	1440.14	15.01	14.35	293	318	1.002	0.596	14.35	19.34858496	86	2	1	19.35	40.87689306
74839	Bromomethane	3000	94.94	1306.269822	20	94.94	13.61544124	6.13E-03	2.40E-02	1306.27	13.62	13.08	293	318	1.002	0.596	13.08	17.63495369	1	2	1	17.63	0.444469513
75150	Carbon disulfide	3000	76.13	1458.745712	20	76.13	15.20471972	1.42E-02	2.40E-02	1458.75	15.20	14.94	293	318	1.002	0.596	14.94	20.14146873	3	2	1	20.14	1.466994791
108907	Chlorobenzene	3000	112.56	1199.680128	20	112.56	12.50444129	3.05E-03	2.40E-02	1199.68	12.50	11.56	293	318	1.002	0.596	11.56	15.57996697	18	2	1	15.58	7.291481722
75003	Chloroethane	3000	64.52	1584.565981	20	64.52	16.51616278	1.09E-02	2.40E-02	1584.57	16.52	16.15	293	318	1.002	0.596	16.15	21.76629237	50	2	1	21.77	25.7969193
67663	Chloroform	3000	119.38	1164.908247	20	119.38	12.14200889	3.60E-03	2.40E-02	1164.91	12.14	11.35	293	318	1.002	0.596	11.35	15.30622427	0.107	2	1	15.31	0.042760303
156592	cis-1,2-Dichloroethene	3000	96.94	1292.724559	20	96.94	13.47425699	4.01E-03	2.40E-02	1292.72	13.47	12.68	293	318	1.002	0.596	12.68	17.09863302	1900	2	1	17.10	825.4527046
110827	Cyclohexane	3000	84.2	1387.079846	20	84.2	14.45773593	2.00E+00	2.40E-02	1387.08	14.46	14.46	293	318	1.002	0.596	14.46	19.48806548	8	2	1	19.49	3.821972024
75718	Dichlorodifluoromethane	3000	120.91	1157.514384	20	120.91	12.06494158	3.36E-01	2.40E-02	1157.51	12.06	12.06	293	318	1.002	0.596	12.06	16.25268491	1	2	1	16.25	0.418274251
100414	Ethylbenzene	3000	106.17	1235.254938	20	106.17	12.87524273	7.74E-03	2.40E-02	1235.25	12.88	12.47	293	318	1.002	0.596	12.47	16.81347711	40	2	1	16.81	17.16189947
98828	Isopropylbenzene	3000	120.2	1160.927967	20	120.2	12.10052185	1.13E-02	2.40E-02	1160.93	12.10	11.84	293	318	1.002	0.596	11.84	15.95919535	3	2	1	15.96	1.237665924
108872	Methyl cyclohexane	3000	98.19	1284.469739	20	98.19	13.3882158	4.23E-01	2.40E-02	1284.47	13.39	13.38	293	318	1.002	0.596	13.38	18.03800976	7	2	1	18.04	3.163182845
1634044	Methyl tert-butyl ether	3000	88.15	1355.646162	20	88.15	14.13009805	5.77E-04	2.40E-02	1355.65	14.13	9.85	293	318	1.002	0.596	9.85	13.28528715	540	2	1	13.29	193.2076331
75092	Methylene chloride	3000	84.93	1381.105788	20	84.93	14.39546745	3.20E-03	2.40E-02	1381.11	14.40	13.35	293	318	1.002	0.596	13.35	17.99762023	90	2	1	18.00	40.60303446
127184	Tetrachloroethene	3000	165.83	988.3845701	20	165.83	10.30207681	1.74E-02	2.40E-02	988.38	10.30	10.16	293	318	1.002	0.596	10.16	13.69135475	36	2	1	13.69	13.19133639
108883	Toluene	3000	92.14	1325.969099	20	92.14	13.82076969	6.51E-03	2.40E-02	1325.97	13.82	13.31	293	318	1.002	0.596	13.31	17.94245531	1200	2	1	17.94	540.1615765
156605	trans-1,2-Dichloroethene	3000	96.94	1292.724559	20	96.94	13.47425699	9.20E-03	2.40E-02	1292.72	13.47	13.12	293	318	1.002	0.596	13.12	17.68393475	28	2	1	17.68	12.47052209
79016	Trichloroethene	3000	131.39	1110.392068	20	131.39	11.57377879	9.68E-03	2.40E-02	1110.39	11.57	11.28	293	318	1.002	0.596	11.28	15.20967886	160	2	1	15.21	63.63100513
75014	Vinyl chloride	3000	62.5	1609.968944	20	62.5	16.78094157	2.74E-02	2.40E-02	1609.97	16.78	16.63	293	318	1.002	0.596	16.63	22.41767573	600	2	1	22.42	315.8012557
1330207	Xylenes (total)	3000	106.17	1235.254938	20	106.17	12.87524273	6.51E-03	2.40E-02	1235.25	12.88	12.40	293	318	1.002	0.596	12.40	16.71494948	110	2	1	16.71	46.98861761
98862	Acetophenone	3000	120.15	1161.1695	20	120.15	12.10303938	1.02E-05	2.40E-02	1161.17	12.10	0.47	293	318	1.002	0.596	0.47	0.639885704	1.2	2	1	0.64	0.025324391
91203	Naphthalene	3000	128.18	1124.209818	20	128.18	11.71780321	4.32E-04	2.40E-02	1124.21	11.72	7.42	293	318	1.002	0.596	7.42	10.00787097	25	2	1	10.01	7.091416451
91576	2-Methylnaphthalene	3000	142.2	1067.3521	20	142.2	11.12516692	5.09E-04	2.40E-02	1067.35	11.13	7.46	293	318	1.002	0.596	7.46	10.05807837	11	2	1	10.06	3.133399645
92524	1,1'-Biphenyl	3000	154.21	1024.946599	20	154.21	10.68316818	3.03E-04	2.40E-02	1024.95	10.68	5.85	293	318	1.002	0.596	5.85	7.885723073	7	2	1	7.89	1.618039498
208968	Acenaphthylene	3000	152.2	1031.692281	20	152.2	10.75347941	1.23E-04	2.40E-02	1031.69	10.75	3.54	293	318	1.002	0.596	3.54	4.772530583	3.2	2	1	4.77	0.470641897
83329	Acenaphthene	3000	154.21	1024.946599	20	154.21	10.68316818	1.79E-04	2.40E-02	1024.95	10.68	4.45	293	318	1.002	0.596	4.45	6.002223003	3.90000001	2	1	6.00	0.707186677
86737	Fluorene	3000	166.22	987.2243717	20	166.22	10.28998389	9.44E-05	2.40E-02	987.22	10.29	2.82	293	318	1.002	0.596	2.82	3.801231553	5.5	2	1	3.80	0.654548772
85018	Phenanthrene	3000	178.24	953.3555969	20	178.24	9.936964703	4.16E-05	2.40E-02	953.36	9.94	1.42	293	318	1.002	0.596	1.42	1.908697708	10	2	1	1.91	0.61641547
120127	Anthracene	3000	178.24	953.3555969	20	178.24	9.936964703	5.45E-05	2.40E-02	953.36	9.94	1.78	293	318	1.002	0.596	1.78	2.397834379	0.2	2	1	2.40	0.015363403
C9-C18	C9-C18 Aliphatic	3000	170	976.1870602	20	170	10.17494038	1.66E+00	2.40E-02	976.19	10.17	10.17	293	318	1.002	0.596	10.17	13.71479091	3100	2	1	13.71	1137.454383
C11-C22	C11-C22 Aromatic	3000	150	1039.230485	20	150	10.83205121	7.32E-04	2.40E-02	1039.23	10.83	8.07	293	318	1.002	0.596	8.07	10.88339241	1200	2	1	10.88	365.1124136
C5-C8	C5-C8 Aliphatic	3000	93	1319.824035	20	93	13.75671879	1.30E+00	2.40E-02	1319.82	13.76	13.75	293	318	1.002	0.596	13.75	18.54189241	448	2	1	18.54	206.5336437
C9-C10	C9-C10 Aromatic	3000	120	1161.895004	20	120	12.11060142	7.92E-03	2.40E-02	1161.90	12.11	11.74	293	318	1.002	0.596	11.74	15.8264434	200	2	1	15.83	81.99001338
C9-C12	C9-C12 Aliphatic	3000	149	1042.712003	20	149	10.86833959	1.96E+00	2.40E-02	1042.71	10.87	10.87	293	318	1.002	0.596	10.87	14.64976079	95.900002	2	1	14.65	37.05066038

Assumptions:

???

Notes:

MW_{VOC} = Molecular weight of the VOC (g/mole)
$k_{g(H20)}$ = Gas phase mass transfer coefficient for H_20 (cm/hour)
$k_{g(VOC)}$ = Gas-phase mass-transfer coefficient for the VOC (cm/hour)
$k_{l(CO2)}$ = Liquid phase mass transfer coefficient for CO_2 (cm/hour)
$k_{l(VOC)}$ = Liquid-phase mass-transfer coefficient for the VOC (cm/hour)
H = Henry's Law Constant (atm-m^3/mole)
RT = Gas constant-temp factor (atm-m^3/mole)

K_L = Overall Mass-Transfer Coefficient (cm/hour)
T_l = Calibration water temperature of K (K)
Ts = Shower water temperature (range 300-320 K)
u_l = Water viscosity at T_l (at 20 C), centipoise (cp)
u_s = Water viscosity at T_s (at 45 C), centipoise (cp)
K'_L = Temp adjusted mass-transfer coefficient (cm/hour)
C_{wo} = Shower water concentration (tap water conc. - ug/L)

t_s = Shower droplet drop time (sec)
d = Shower droplet diameter (millimeters, mm)
C_{wd} = Concentration leaving shower droplet after time t_s t(ug/L)
FR = Shower water flow rate (liters/minute, l/m)
SV = Shower room air volume (m^3)
S = VOC generation rate in the shower room (ug/m^3-min)
R = Air exchange rate (min-1)

D_s = Shower duration (min)
t = time (min)
$C_a(t)$ = Time dependent indoor concentration
VR = Ventilation rate (l/min)
BW = Body weight (kg)
D_t = Total duration in shower room (min)
E_{inh} = Inhalation exposure per shower (mg/kg/shower)

g references

a. June 198
and
2. June 198

Inhalation Exposure while Showering [1]

		VOC Generation Rate in the Shower Room S				VOC Air Concentration in the Shower Roomn (for t <= D_s) $C_a(t)$									Inhalation Exposure per Shower (shower and afterwards) E_{inh}						
		$S = C_{wd}$ (FR) / SV				$C_a(t) = (S/R)$ (1 - exp[-R t])									E_{inh} = (Vr) (S) / [(BW) (R) (106)] x (DS + exp (-RDt)/R-exp [R(Ds-Dt)]/R)						
		C_{wd}	FR	SV	S	S	R	D_s	t	$C_a(t)$	ET	EF	ED	AT	CF	VR	S	BW	D_t	R	D_s	E_{inh}
		ug/L	l/min	m^3	ug/m^3-min	ug/m^3-min	min^{-1}	min	min	ug/m^3						l/min	ug/m^3-min	kg	min	min^{-1}	min	mg/kg/shower
71556	1,1,1-Trichloroethane	59.80	10	6	99.66619	99.67	0.008333	15	5	4.88E+02						15	99.67	15	20	0.00833	15	1.76E-02
76131	1,1,2-Trichloro-1,2,2-trifluoroethane	5.29	10	6	8.823193	8.82	0.008333	15	5	4.32E+01						15	8.82	15	20	0.00833	15	1.56E-03
79005	1,1,2-Trichloroethane	0.13	10	6	0.217237	0.22	0.008333	15	5	1.06E+00						15	0.22	15	20	0.00833	15	3.85E-05
75343	1,1-Dichloroethane	96.00	10	6	159.9954	160.00	0.008333	15	5	7.84E+02						15	160.00	15	20	0.00833	15	2.83E-02
75354	1,1-Dichloroethene	4.06	10	6	6.764977	6.76	0.008333	15	5	3.31E+01						15	6.76	70	20	0.00833	15	2.57E-04
120821	1,2,4-Trichlorobenzene	7.20	10	6	11.9954	12.00	0.008333	15	5	5.87E+01						15	12.00	70	20	0.00833	15	4.55E-04
95501	1,2-Dichlorobenzene	3.52	10	6	5.869417	5.87	0.008333	15	5	2.87E+01						15	5.87	70	20	0.00833	15	2.23E-04
541731	1,3-Dichlorobenzene	6.87	10	6	11.44407	11.44	0.008333	15	5	5.60E+01						15	11.44	70	20	0.00833	15	4.34E-04
106467	1,4-Dichlorobenzene	70.72	10	6	117.8647	117.86	0.008333	15	5	5.77E+02						15	117.86	70	20	0.00833	15	4.47E-03
78933	2-Butanone (MEK)	0.72	10	6	1.204772	1.20	0.008333	15	5	5.90E+00						15	1.20	70	20	0.00833	15	4.57E-05
67641	Acetone	3.50	10	6	5.831406	5.83	0.008333	15	5	2.86E+01						15	5.83	70	20	0.00833	15	2.21E-04
71432	Benzene	40.88	10	6	68.12816	68.13	0.008333	15	5	3.34E+02						15	68.13	70	20	0.00833	15	2.58E-03
74839	Bromomethane	0.44	10	6	0.740783	0.74	0.008333	15	5	3.63E+00						15	0.74	70	20	0.00833	15	2.81E-05
75150	Carbon disulfide	1.47	10	6	2.444991	2.44	0.008333	15	5	1.20E+01						15	2.44	70	20	0.00833	15	9.27E-05
108907	Chlorobenzene	7.29	10	6	12.15247	12.15	0.008333	15	5	5.95E+01						15	12.15	70	20	0.00833	15	4.61E-04
75003	Chloroethane	25.80	10	6	42.99487	42.99	0.008333	15	5	2.11E+02						15	42.99	70	20	0.00833	15	1.63E-03
67663	Chloroform	0.04	10	6	0.071267	0.07	0.008333	15	5	3.49E-01						15	0.07	70	20	0.00833	15	2.70E-06
156592	cis-1,2-Dichloroethene	825.45	10	6	1375.755	1375.75	0.008333	15	5	6.74E+03						15	1375.75	70	20	0.00833	15	5.22E-02
110827	Cyclohexane	3.82	10	6	6.369953	6.37	0.008333	15	5	3.12E+01						15	6.37	70	20	0.00833	15	2.42E-04
75718	Dichlorodifluoromethane	0.42	10	6	0.697124	0.70	0.008333	15	5	3.41E+00						15	0.70	70	20	0.00833	15	2.64E-05
100414	Ethylbenzene	17.16	10	6	28.60317	28.60	0.008333	15	5	1.40E+02						15	28.60	70	20	0.00833	15	1.08E-03
98828	Isopropylbenzene	1.24	10	6	2.062777	2.06	0.008333	15	5	1.01E+01						15	2.06	70	20	0.00833	15	7.82E-05
108872	Methyl cyclohexane	3.16	10	6	5.271971	5.27	0.008333	15	5	2.58E+01						15	5.27	70	20	0.00833	15	2.00E-04
1634044	Methyl tert-butyl ether	193.21	10	6	322.0127	322.01	0.008333	15	5	1.58E+03						15	322.01	70	20	0.00833	15	1.22E-02
75092	Methylene chloride	40.60	10	6	67.67172	67.67	0.008333	15	5	3.31E+02						15	67.67	70	20	0.00833	15	2.57E-03
127184	Tetrachloroethene	13.19	10	6	21.98556	21.99	0.008333	15	5	1.08E+02						15	21.99	70	20	0.00833	15	8.34E-04
108883	Toluene	540.16	10	6	900.2693	900.27	0.008333	15	5	4.41E+03						15	900.27	70	20	0.00833	15	3.41E-02
156605	trans-1,2-Dichloroethene	12.47	10	6	20.7842	20.78	0.008333	15	5	1.02E+02						15	20.78	70	20	0.00833	15	7.88E-04
79016	Trichloroethene	63.63	10	6	106.0517	106.05	0.008333	15	5	5.19E+02						15	106.05	70	20	0.00833	15	4.02E-03
75014	Vinyl chloride	315.80	10	6	526.3354	526.34	0.008333	15	5	2.58E+03						15	526.34	70	20	0.00833	15	2.00E-02
1330207	Xylenes (total)	46.99	10	6	78.31436	78.31	0.008333	15	5	3.84E+02						15	78.31	70	20	0.00833	15	2.97E-03
98862	Acetophenone	0.03	10	6	0.042207	0.04	0.008333	15	5	2.07E-01						15	0.04	70	20	0.00833	15	1.60E-06
91203	Naphthalene	7.09	10	6	11.81903	11.82	0.008333	15	5	5.79E+01						15	11.82	70	20	0.00833	15	4.48E-04
91576	2-Methylnaphthalene	3.13	10	6	5.222333	5.22	0.008333	15	5	2.56E+01						15	5.22	70	20	0.00833	15	1.98E-04
92524	1,1'-Biphenyl	1.62	10	6	2.696732	2.70	0.008333	15	5	1.32E+01						15	2.70	70	20	0.00833	15	1.02E-04
208968	Acenaphthylene	0.47	10	6	0.784403	0.78	0.008333	15	5	3.84E+00						15	0.78	70	20	0.00833	15	2.98E-05
83329	Acenaphthene	0.71	10	6	1.178644	1.18	0.008333	15	5	5.77E+00						15	1.18	70	20	0.00833	15	4.47E-05
86737	Fluorene	0.65	10	6	1.090915	1.09	0.008333	15	5	5.34E+00						15	1.09	70	20	0.00833	15	4.14E-05
85018	Phenanthrene	0.62	10	6	1.027359	1.03	0.008333	15	5	5.03E+00						15	1.03	70	20	0.00833	15	3.90E-05
120127	Anthracene	0.02	10	6	0.025606	0.03	0.008333	15	5	1.25E-01						15	0.03	70	20	0.00833	15	9.71E-07
C9-C18	C9-C18 Aliphatic	1137.45	10	6	1895.757	1895.76	0.008333	15	5	9.28E+03						15	1895.76	70	20	0.00833	15	7.19E-02
C11-C22	C11-C22 Aromatic	365.11	10	6	608.5207	608.52	0.008333	15	5	2.98E+03						15	608.52	70	20	0.00833	15	2.31E-02
C5-C8	C5-C8 Aliphatic	206.53	10	6	344.2227	344.22	0.008333	15	5	1.69E+03						15	344.22	70	20	0.00833	15	1.31E-02
C9-C10	C9-C10 Aromatic	81.99	10	6	136.65	136.65	0.008333	15	5	6.69E+02						15	136.65	70	20	0.00833	15	5.18E-03
C9-C12	C9-C12 Aliphatic	37.05	10	6	61.7511	61.75	0.008333	15	5	3.02E+02						15	61.75	70	20	0.00833	15	2.34E-03

Assumptions:
???

Notes:

MW_{VOC} = Molecular weight of the VOC (g/mole)
$k_{g\ (H20)}$ = Gas phase mass transfer coefficient for H_20
$k_{g(VOC)}$ = Gas-phase mass-transfer coefficient for the VOC (
$k_{l\ (CO2)}$ = Liquid phase mass transfer coefficient for CO_2 (cm
$k_{l(VOC)}$ = Liquid-phase mass-transfer coefficient for the VOC
H = Henry's Law Constant (atm-m^3/mole)
RT = Gas constant-temp factor (atm-m^3/mole)

g references

a. June 198
and
2. June 198

Inhalation of Volatiles From Groundwater While Showering[1]
Future Off-Site Adult Residential Scenario - RME
Southwest Prperties, Wells G&H Superfund Site, Operable Unit 2
Aberjona Auto Parts

		Estimation of Gas-Phase Mass Transfer Coefficient (cm/hour) $k_{g(VOC)}$			Estimation of Liquid-Phase Mass Transfer Coefficient (cm/hour) $k_{l(VOC)}$			Estimation of Overall Mass Transfer Coefficient (cm/hour) K_L					Temperature Adjusted Overall Mass Transfer Coefficient (cm/hour) -- K'_L						Maximum Concentration Leaving the Shower Droplet C_{wd}				
				$k_{g(VOC)} = k_{g(H20)} (18 / MW_{VOC})^{0.5}$			$k_{l(VOC)} = k_{l(CO2)} (44 / MW_{VOC})^{0.5}$			$K_L = (1/k_{l(VOC)} + RT / H k_{g(VOC)})^{-1}$						$K'_L = K_L (T_i u_s / T_s u_i)^{-0.5}$					$C_{wd} = C_{wo} (1 - \exp [-K_{al} t_s / 60 d])$				
		$k_{g(H20)}$	MW_{VOC}	$k_{g(VOC)}$	$k_{l(CO2)}$	MW_{VOC}	$k_{l(VOC)}$	H	RT	$k_{g(VOC)}$	$k_{l(VOC)}$	K_L	T_i	Ts	u_i	u_s	K_L	K'_L	C_{wo}	t_s	d	K'_L	C_{wd}
		cm/hour	g/mole	cm/hour	cm/hour	g/mole	cm/hour	atm-m^3/mole	atm-m^3/mole	cm/hour	cm/hour	cm/hour	kelvin (K)	kelvin (K)	centipoise (cp)	centipoise (cp)	cm/hour	cm/hour	ug/L	seconds	mm	cm/hr	ug/L
71556	1,1,1-Trichloroethane	3000	133.41	1101.953618	20	133.41	11.48582359	1.69E-02	2.40E-02	1101.95	11.49	11.32	293	318	1.002	0.596	11.32	15.25808033	150	2	1	15.26	59.79971233
79005	1,1,2-Trichloroethane	3000	133.41	1101.953618	20	133.41	11.48582359	8.10E-04	2.40E-02	1101.95	11.49	8.77	293	318	1.002	0.596	8.77	11.82930873	0.4	2	1	11.83	0.130342065
75343	1,1-Dichloroethane	3000	98.96	1279.462802	20	98.96	13.33602775	5.53E-03	2.40E-02	1279.46	13.34	12.76	293	318	1.002	0.596	12.76	17.19971241	220	2	1	17.20	95.997243
75354	1,1-Dichloroethene	3000	96.94	1292.724559	20	96.94	13.47425699	2.57E-02	2.40E-02	1292.72	13.47	13.34	293	318	1.002	0.596	13.34	17.98962115	9	2	1	17.99	4.05898617
120821	1,2,4-Trichlorobenzene	3000	181.45	944.8851444	20	181.45	9.848675939	1.40E-03	2.40E-02	944.89	9.85	8.35	293	318	1.002	0.596	8.35	11.25928829	23	2	1	11.26	7.197240031
95501	1,2-Dichlorobenzene	3000	147	1049.781318	20	147	10.94202409	1.89E-03	2.40E-02	1049.78	10.94	9.66	293	318	1.002	0.596	9.66	13.02357917	10	2	1	13.02	3.521650396
541731	1,3-Dichlorobenzene	3000	147	1049.781318	20	147	10.94202409	2.59E-03	2.40E-02	1049.78	10.94	9.98	293	318	1.002	0.596	9.98	13.4539235	19	2	1	13.45	6.866443696
106467	1,4-Dichlorobenzene	3000	147	1049.781318	20	147	10.94202409	2.37E-03	2.40E-02	1049.78	10.94	9.90	293	318	1.002	0.596	9.90	13.34078714	197	2	1	13.34	70.71884323
71432	Benzene	3000	78.11	1440.13826	20	78.11	15.01077153	5.45E-03	2.40E-02	1440.14	15.01	14.35	293	318	1.002	0.596	14.35	19.34858496	86	2	1	19.35	40.87689306
74839	Bromomethane	3000	94.94	1306.269822	20	94.94	13.61544124	6.13E-03	2.40E-02	1306.27	13.62	13.08	293	318	1.002	0.596	13.08	17.63495369	1	2	1	17.63	0.444469513
108907	Chlorobenzene	3000	112.56	1199.680128	20	112.56	12.50444129	3.05E-03	2.40E-02	1199.68	12.50	11.56	293	318	1.002	0.596	11.56	15.57996697	18	2	1	15.58	7.291481722
75003	Chloroethane	3000	64.52	1584.565981	20	64.52	16.51616278	1.09E-02	2.40E-02	1584.57	16.52	16.15	293	318	1.002	0.596	16.15	21.76629237	50	2	1	21.77	25.7969193
67663	Chloroform	3000	119.38	1164.908247	20	119.38	12.14200889	3.60E-03	2.40E-02	1164.91	12.14	11.35	293	318	1.002	0.596	11.35	15.30622427	0.107	2	1	15.31	0.042760303
156592	cis-1,2-Dichloroethene	3000	96.94	1292.724559	20	96.94	13.47425699	4.01E-03	2.40E-02	1292.72	13.47	12.68	293	318	1.002	0.596	12.68	17.09863302	1900	2	1	17.10	825.4527046
100414	Ethylbenzene	3000	106.17	1235.254938	20	106.17	12.87524273	7.74E-03	2.40E-02	1235.25	12.88	12.47	293	318	1.002	0.596	12.47	16.81347711	40	2	1	16.81	17.16189947
1634044	Methyl tert-butyl ether	3000	88.15	1355.646162	20	88.15	14.13009805	5.77E-04	2.40E-02	1355.65	14.13	9.85	293	318	1.002	0.596	9.85	13.28528715	540	2	1	13.29	193.2076331
75092	Methylene chloride	3000	84.93	1381.105788	20	84.93	14.39546745	3.20E-03	2.40E-02	1381.11	14.40	13.35	293	318	1.002	0.596	13.35	17.99762023	90	2	1	18.00	40.60303446
127184	Tetrachloroethene	3000	165.83	988.3845701	20	165.83	10.30207681	1.74E-02	2.40E-02	988.38	10.30	10.16	293	318	1.002	0.596	10.16	13.69135475	36	2	1	13.69	13.19133639
108883	Toluene	3000	92.14	1325.969099	20	92.14	13.82076969	6.51E-03	2.40E-02	1325.97	13.82	13.31	293	318	1.002	0.596	13.31	17.94245531	1200	2	1	17.94	540.1615765
156605	trans-1,2-Dichloroethene	3000	96.94	1292.724559	20	96.94	13.47425699	9.20E-03	2.40E-02	1292.72	13.47	13.12	293	318	1.002	0.596	13.12	17.68393475	28	2	1	17.68	12.47052209
79016	Trichloroethene	3000	131.39	1110.392068	20	131.39	11.57377879	9.68E-03	2.40E-02	1110.39	11.57	11.28	293	318	1.002	0.596	11.28	15.20967886	160	2	1	15.21	63.63100513
75014	Vinyl chloride	3000	62.5	1609.968944	20	62.5	16.78094157	2.74E-02	2.40E-02	1609.97	16.78	16.63	293	318	1.002	0.596	16.63	22.41767573	600	2	1	22.42	315.8012557
1330207	Xylenes (total)	3000	106.17	1235.254938	20	106.17	12.87524273	6.51E-03	2.40E-02	1235.25	12.88	12.40	293	318	1.002	0.596	12.40	16.71494948	110	2	1	16.71	46.98861761
98862	Acetophenone	3000	120.15	1161.1695	20	120.15	12.10303938	1.02E-05	2.40E-02	1161.17	12.10	0.47	293	318	1.002	0.596	0.47	0.639885704	1.2	2	1	0.64	0.025324391
91203	Naphthalene	3000	128.18	1124.209818	20	128.18	11.71780321	4.32E-04	2.40E-02	1124.21	11.72	7.42	293	318	1.002	0.596	7.42	10.00787097	25	2	1	10.01	7.091416451
91576	2-Methylnaphthalene	3000	142.2	1067.3521	20	142.2	11.12516692	5.09E-04	2.40E-02	1067.35	11.13	7.46	293	318	1.002	0.596	7.46	10.05807837	11	2	1	10.06	3.133399645
208968	Acenaphthylene	3000	152.2	1031.692281	20	152.2	10.75347941	1.23E-04	2.40E-02	1031.69	10.75	3.54	293	318	1.002	0.596	3.54	4.772530583	3.2	2	1	4.77	0.470641897
85018	Phenanthrene	3000	178.24	953.3555969	20	178.24	9.936964703	4.16E-05	2.40E-02	953.36	9.94	1.42	293	318	1.002	0.596	1.42	1.908697708	10	2	1	1.91	0.61641547
C9-C18	C9-C18 Aliphatic	3000	170	976.1870602	20	170	10.17494038	1.66E+00	2.40E-02	976.19	10.17	10.17	293	318	1.002	0.596	10.17	13.71479091	3100	2	1	13.71	1137.454383
C11-C22	C11-C22 Aromatic	3000	150	1039.230485	20	150	10.83205121	7.32E-04	2.40E-02	1039.23	10.83	8.07	293	318	1.002	0.596	8.07	10.88339241	1200	2	1	10.88	365.1124136
C5-C8	C5-C8 Aliphatic	3000	93	1319.824035	20	93	13.75671879	1.30E+00	2.40E-02	1319.82	13.76	13.75	293	318	1.002	0.596	13.75	18.54189241	448	2	1	18.54	206.5336437
C9-C10	C9-C10 Aromatic	3000	120	1161.895004	20	120	12.11060142	7.92E-03	2.40E-02	1161.90	12.11	11.74	293	318	1.002	0.596	11.74	15.8264434	200	2	1	15.83	81.99001338
C9-C12	C9-C12 Aliphatic	3000	149	1042.712003	20	149	10.86833959	1.96E+00	2.40E-02	1042.71	10.87	10.87	293	318	1.002	0.596	10.87	14.64976079	95.900002	2	1	14.65	37.05066038

Notes:

MW_{VOC} = Molecular weight of the VOC (g/mole)
$k_{g(H20)}$ = Gas phase mass transfer coefficient for H_20 (cm/hour)
$k_{g(VOC)}$ = Gas-phase mass-transfer coefficient for the VOC (cm/hour)
$k_{l(CO2)}$ = Liquid phase mass transfer coefficient for CO_2 (cm/hour)
$k_{l(VOC)}$ = Liquid-phase mass-transfer coefficient for the VOC (cm/hour)
H = Henry's Law Constant (atm-m^3/mole)
RT = Gas constant-temp factor (atm-m^3/mole)

K_L = Overall Mass-Transfer Coefficient (cm/hour)
T_i = Calibration water temperature of k_l (K)
Ts = Shower water temperature (range 300-320 K)
u_i = Water viscosity at T_i (at 20 C), centipoise (cp)
u_s = Water viscosity at T_s (at 45 C), centipoise (cp)
K'_L = Temp adjusted mass-transfer coefficient (cm/hour)
C_{wo} = Shower water concentration (tap water conc. - ug/L)

t_s = Shower droplet drop time (sec)
d = Shower droplet diameter (millimeters, mm)
C_{wd} = Concentration leaving shower droplet after time$_s$t(ug/L)
FR = Shower water flow rate (liters/minute, l/m)
SV = Shower room air volume (m^3)
S = VOC generation rate in the shower room (ug/m^3-min)
R = Air exchange rate (min-1)

D_s = Shower duration (min)
t = time (min)
$C_a(t)$ = Time dependent indoor concentration
VR = Ventilation rate (l/min)
BW = Body weight (kg)
D_t = Total duration in shower room (min)
E_{inh} = Inhalation exposure per shower (mg/kg/shower)

Inhalation of Volatiles From Groundwater While Showering[1]
Future Off-Site Adult Residential Scenario - RME
Southwest Prperties, Wells G&H Superfund Site, Operable Unit 2
Aberjona Auto Parts

		VOC Generation Rate in the Shower Room S				**VOC Air Concentration in the Shower Roomn (for t <= D_s) $C_a(t)$**													
		$S = C_{wd}$ (FR) / SV				$C_a(t) = (S/R)$ (1 - exp[-R t])													
		C_{wd}	FR	SV	S	S	R	D_s	t	$C_a(t)$	ET	EF	ED	AT_{cancer}	$AT_{noncancer}$	CF	CDI_{cancer}	$CDI_{noncancer}$
		ug/L	l/min	m^3	ug/m^3-min	ug/m^3-min	min^{-1}	min	min	mg/m^3	hours/day	dayss/year	years	days	days	hrs/day	mg/kg-day	mg/kg-day
71556	1,1,1-Trichloroethane	59.80	10	6	99.66619	99.67	0.008333	15	5	4.88E-01	0.33	350	24	25550	8760	24	2.21E-03	6.44E-03
79005	1,1,2-Trichloroethane	0.13	10	6	0.217237	0.22	0.008333	15	5	1.06E-03	0.33	350	24	25550	8760	24	4.81E-06	1.40E-05
75343	1,1-Dichloroethane	96.00	10	6	159.9954	160.00	0.008333	15	5	7.84E-01	0.33	350	24	25550	8760	24	3.54E-03	1.03E-02
75354	1,1-Dichloroethene	4.06	10	6	6.764977	6.76	0.008333	15	5	3.31E-02	0.33	350	24	25550	8760	24	1.50E-04	4.37E-04
120821	1,2,4-Trichlorobenzene	7.20	10	6	11.9954	12.00	0.008333	15	5	5.87E-02	0.33	350	24	25550	8760	24	2.66E-04	7.75E-04
95501	1,2-Dichlorobenzene	3.52	10	6	5.869417	5.87	0.008333	15	5	2.87E-02	0.33	350	24	25550	8760	24	1.30E-04	3.79E-04
541731	1,3-Dichlorobenzene	6.87	10	6	11.44407	11.44	0.008333	15	5	5.60E-02	0.33	350	24	25550	8760	24	2.53E-04	7.39E-04
106467	1,4-Dichlorobenzene	70.72	10	6	117.8647	117.86	0.008333	15	5	5.77E-01	0.33	350	24	25550	8760	24	2.61E-03	7.61E-03
71432	Benzene	40.88	10	6	68.12816	68.13	0.008333	15	5	3.34E-01	0.33	350	24	25550	8760	24	1.51E-03	4.40E-03
74839	Bromomethane	0.44	10	6	0.740783	0.74	0.008333	15	5	3.63E-03	0.33	350	24	25550	8760	24	1.64E-05	4.78E-05
108907	Chlorobenzene	7.29	10	6	12.15247	12.15	0.008333	15	5	5.95E-02	0.33	350	24	25550	8760	24	2.69E-04	7.85E-04
75003	Chloroethane	25.80	10	6	42.99487	42.99	0.008333	15	5	2.11E-01	0.33	350	24	25550	8760	24	9.52E-04	2.78E-03
67663	Chloroform	0.04	10	6	0.071267	0.07	0.008333	15	5	3.49E-04	0.33	350	24	25550	8760	24	1.58E-06	4.60E-06
156592	cis-1,2-Dichloroethene	825.45	10	6	1375.755	1375.75	0.008333	15	5	6.74E+00	0.33	350	24	25550	8760	24	3.05E-02	8.88E-02
100414	Ethylbenzene	17.16	10	6	28.60317	28.60	0.008333	15	5	1.40E-01	0.33	350	24	25550	8760	24	6.33E-04	1.85E-03
1634044	Methyl tert-butyl ether	193.21	10	6	322.0127	322.01	0.008333	15	5	1.58E+00	0.33	350	24	25550	8760	24	7.13E-03	2.08E-02
75092	Methylene chloride	40.60	10	6	67.67172	67.67	0.008333	15	5	3.31E-01	0.33	350	24	25550	8760	24	1.50E-03	4.37E-03
127184	Tetrachloroethene	13.19	10	6	21.98556	21.99	0.008333	15	5	1.08E-01	0.33	350	24	25550	8760	24	4.87E-04	1.42E-03
108883	Toluene	540.16	10	6	900.2693	900.27	0.008333	15	5	4.41E+00	0.33	350	24	25550	8760	24	1.99E-02	5.81E-02
156605	trans-1,2-Dichloroethene	12.47	10	6	20.7842	20.78	0.008333	15	5	1.02E-01	0.33	350	24	25550	8760	24	4.60E-04	1.34E-03
79016	Trichloroethene	63.63	10	6	106.0517	106.05	0.008333	15	5	5.19E-01	0.33	350	24	25550	8760	24	2.35E-03	6.85E-03
75014	Vinyl chloride	315.80	10	6	526.3354	526.34	0.008333	15	5	2.58E+00	0.33	350	24	25550	8760	24	1.17E-02	3.40E-02
1330207	Xylenes (total)	46.99	10	6	78.31436	78.31	0.008333	15	5	3.84E-01	0.33	350	24	25550	8760	24	1.73E-03	5.06E-03
98862	Acetophenone	0.03	10	6	0.042207	0.04	0.008333	15	5	2.07E-04	0.33	350	24	25550	8760	24	9.34E-07	2.73E-06
91203	Naphthalene	7.09	10	6	11.81903	11.82	0.008333	15	5	5.79E-02	0.33	350	24	25550	8760	24	2.62E-04	7.63E-04
91576	2-Methylnaphthalene	3.13	10	6	5.222333	5.22	0.008333	15	5	2.56E-02	0.33	350	24	25550	8760	24	1.16E-04	3.37E-04
208968	Acenaphthylene	0.47	10	6	0.784403	0.78	0.008333	15	5	3.84E-03	0.33	350	24	25550	8760	24	1.74E-05	5.06E-05
85018	Phenanthrene	0.62	10	6	1.027359	1.03	0.008333	15	5	5.03E-03	0.33	350	24	25550	8760	24	2.27E-05	6.63E-05
C9-C18	C9-C18 Aliphatic	1137.45	10	6	1895.757	1895.76	0.008333	15	5	9.28E+00	0.33	350	24	25550	8760	24	4.20E-02	1.22E-01
C11-C22	C11-C22 Aromatic	365.11	10	6	608.5207	608.52	0.008333	15	5	2.98E+00	0.33	350	24	25550	8760	24	1.35E-02	3.93E-02
C5-C8	C5-C8 Aliphatic	206.53	10	6	344.2227	344.22	0.008333	15	5	1.69E+00	0.33	350	24	25550	8760	24	7.62E-03	2.22E-02
C9-C10	C9-C10 Aromatic	81.99	10	6	136.65	136.65	0.008333	15	5	6.69E-01	0.33	350	24	25550	8760	24	3.03E-03	8.82E-03
C9-C12	C9-C12 Aliphatic	37.05	10	6	61.7511	61.75	0.008333	15	5	3.02E-01	0.33	350	24	25550	8760	24	1.37E-03	3.99E-03

Notes:

MW_{VOC} = Molecular weight of the VOC (g/mole)
$k_{g\ (H20)}$ = Gas phase mass transfer coefficient for H_20 (cm/hour)
$k_{g(VOC)}$ = Gas-phase mass-transfer coefficient for the VOC (cm/hour)
$k_{l\ (CO2)}$ = Liquid phase mass transfer coefficient for CO_2 (cm/hour)
$k_{l(VOC)}$ = Liquid-phase mass-transfer coefficient for the VOC (cm/hour)
H = Henry's Law Constant (atm-m^3/mole)
RT = Gas constant-temp factor (atm-m^3/mole)

Inhalation of Volatiles From Groundwater While Showering 1
Future Off-Site Adult Residential Scenario - CT
Southwest Prperties, Wells G&H Superfund Site, Operable Unit 2
Aberjona Auto Parts

		Estimation of Gas-Phase Mass Transfer Coefficient (cm/hour) $k_{g(VOC)}$			Estimation of Liquid-Phase Mass Transfer Coefficient (cm/hour) $k_{l(VOC)}$			Estimation of Overall Mass Transfer Coefficient (cm/hour) K_L					Temperature Adjusted Overall Mass Transfer Coefficient (cm/hour) -- K'_L						Mean Concentration Leaving the Shower Droplet C_{wd}				
				$k_{g(VOC)} = k_{g\,(H20)}\,(18 / MW_{VOC})^{0.5}$			$k_{l(VOC)} = k_{l(CO2)}\,(44 / MW_{VOC})^{0.5}$						$K'_L = K_L\,(T_l\,u_s / T_s\,u_l)^{-0.5}$						$C_{wd} = C_{wo}\,(1 - \exp[-K_{sl}\,t_s / 60\,d])$				
		$k_{g\,(H20)}$	MW_{VOC}	$k_{g(VOC)}$	$k_{l\,(CO2)}$	MW_{VOC}	$k_{l(VOC)}$	H	RT	$k_{g(VOC)}$	$k_{l(VOC)}$	K_L	T_l	Ts	u_l	u_s	K_L	K'_L	C_{wo}	t_s	d	K'_L	C_{wd}
		cm/hour	g/mole	cm/hour	cm/hour	g/mole	cm/hour	atm-m^3/mole	atm-m^3/mole	cm/hour	cm/hour	cm/hour	kelvin (K)	kelvin (K)	centipoise (cp)	centipoise (cp)	cm/hour	cm/hour	ug/L	seconds	mm	cm/hr	ug/L
71556	1,1,1-Trichloroethane	3000	133.41	1101.953618	20	133.41	11.48582359	1.69E-02	2.40E-02	1101.95	11.49	11.32	293	318	1.002	0.596	11.32	15.25808033	9.39E+00	2	1	15.26	3.744259321
79005	1,1,2-Trichloroethane	3000	133.41	1101.953618	20	133.41	11.48582359	8.10E-04	2.40E-02	1101.95	11.49	8.77	293	318	1.002	0.596	8.77	11.82930873	5.64E+00	2	1	11.83	1.83932202
75343	1,1-Dichloroethane	3000	98.96	1279.462802	20	98.96	13.33602775	5.53E-03	2.40E-02	1279.46	13.34	12.76	293	318	1.002	0.596	12.76	17.19971241	1.96E+01	2	1	17.20	8.530664094
75354	1,1-Dichloroethene	3000	96.94	1292.724559	20	96.94	13.47425699	2.57E-02	2.40E-02	1292.72	13.47	13.34	293	318	1.002	0.596	13.34	17.98962115	4.75E+00	2	1	17.99	2.14236898
120821	1,2,4-Trichlorobenzene	3000	181.45	944.8851444	20	181.45	9.848675939	1.40E-03	2.40E-02	944.89	9.85	8.35	293	318	1.002	0.596	8.35	11.25928829	6.63E+00	2	1	11.26	2.07468267
95501	1,2-Dichlorobenzene	3000	147	1049.781318	20	147	10.94202409	1.89E-03	2.40E-02	1049.78	10.94	9.66	293	318	1.002	0.596	9.66	13.02357917	6.24E+00	2	1	13.02	2.196805517
541731	1,3-Dichlorobenzene	3000	147	1049.781318	20	147	10.94202409	2.59E-03	2.40E-02	1049.78	10.94	9.98	293	318	1.002	0.596	9.98	13.4539235	6.17E+00	2	1	13.45	2.230871418
106467	1,4-Dichlorobenzene	3000	147	1049.781318	20	147	10.94202409	2.37E-03	2.40E-02	1049.78	10.94	9.90	293	318	1.002	0.596	9.90	13.34078714	9.67E+00	2	1	13.34	3.470421333
71432	Benzene	3000	78.11	1440.13826	20	78.11	15.01077153	5.45E-03	2.40E-02	1440.14	15.01	14.35	293	318	1.002	0.596	14.35	19.34858496	3.94E+00	2	1	19.35	1.874728391
74839	Bromomethane	3000	94.94	1306.269822	20	94.94	13.61544124	6.13E-03	2.40E-02	1306.27	13.62	13.08	293	318	1.002	0.596	13.08	17.63495369	5.55E+00	2	1	17.63	2.467250268
108907	Chlorobenzene	3000	112.56	1199.680128	20	112.56	12.50444129	3.05E-03	2.40E-02	1199.68	12.50	11.56	293	318	1.002	0.596	11.56	15.57996697	6.45E+00	2	1	15.58	2.61278095
75003	Chloroethane	3000	64.52	1584.565981	20	64.52	16.51616278	1.09E-02	2.40E-02	1584.57	16.52	16.15	293	318	1.002	0.596	16.15	21.76629237	6.88E+00	2	1	21.77	3.549656096
67663	Chloroform	3000	119.38	1164.908247	20	119.38	12.14200889	3.60E-03	2.40E-02	1164.91	12.14	11.35	293	318	1.002	0.596	11.35	15.30622427	5.64E+00	2	1	15.31	2.254163303
156592	cis-1,2-Dichloroethene	3000	96.94	1292.724559	20	96.94	13.47425699	4.01E-03	2.40E-02	1292.72	13.47	12.68	293	318	1.002	0.596	12.68	17.09863302	1.10E+02	2	1	17.10	47.84584545
100414	Ethylbenzene	3000	106.17	1235.254938	20	106.17	12.87524273	7.74E-03	2.40E-02	1235.25	12.88	12.47	293	318	1.002	0.596	12.47	16.81347711	3.02E+00	2	1	16.81	1.29572341
1634044	Methyl tert-butyl ether	3000	88.15	1355.646162	20	88.15	14.13009805	5.77E-04	2.40E-02	1355.65	14.13	9.85	293	318	1.002	0.596	9.85	13.28528715	1.65E+01	2	1	13.29	5.88925489
75092	Methylene chloride	3000	84.93	1381.105788	20	84.93	14.39546745	3.20E-03	2.40E-02	1381.11	14.40	13.35	293	318	1.002	0.596	13.35	17.99762023	3.89E+00	2	1	18.00	1.753148799
127184	Tetrachloroethene	3000	165.83	988.3845701	20	165.83	10.30207681	1.74E-02	2.40E-02	988.38	10.30	10.16	293	318	1.002	0.596	10.16	13.69135475	7.35E+00	2	1	13.69	2.693363092
108883	Toluene	3000	92.14	1325.969099	20	92.14	13.82076969	6.51E-03	2.40E-02	1325.97	13.82	13.31	293	318	1.002	0.596	13.31	17.94245531	2.88E+01	2	1	17.94	12.9620773
156605	trans-1,2-Dichloroethene	3000	96.94	1292.724559	20	96.94	13.47425699	9.20E-03	2.40E-02	1292.72	13.47	13.12	293	318	1.002	0.596	13.12	17.68393475	4.80E+00	2	1	17.68	2.136467659
79016	Trichloroethene	3000	131.39	1110.392068	20	131.39	11.57377879	9.68E-03	2.40E-02	1110.39	11.57	11.28	293	318	1.002	0.596	11.28	15.20967886	1.18E+01	2	1	15.21	4.70551283
75014	Vinyl chloride	3000	62.5	1609.968944	20	62.5	16.78094157	2.74E-02	2.40E-02	1609.97	16.78	16.63	293	318	1.002	0.596	16.63	22.41767573	3.38E+01	2	1	22.42	17.7853267
1330207	Xylenes (total)	3000	106.17	1235.254938	20	106.17	12.87524273	6.51E-03	2.40E-02	1235.25	12.88	12.40	293	318	1.002	0.596	12.40	16.71494948	6.81E+00	2	1	16.71	2.909022599
98862	Acetophenone	3000	120.15	1161.1695	20	120.15	12.10303938	1.02E-05	2.40E-02	1161.17	12.10	0.47	293	318	1.002	0.596	0.47	0.639885704	5.07E+00	2	1	0.64	0.1069252
91203	Naphthalene	3000	128.18	1124.209818	20	128.18	11.71780321	4.32E-04	2.40E-02	1124.21	11.72	7.42	293	318	1.002	0.596	7.42	10.00787097	4.64E+00	2	1	10.01	1.315952234
91576	2-Methylnaphthalene	3000	142.2	1067.3521	20	142.2	11.12516692	5.09E-04	2.40E-02	1067.35	11.13	7.46	293	318	1.002	0.596	7.46	10.05807837	4.82E+00	2	1	10.06	1.37346068
208968	Acenaphthylene	3000	152.2	1031.692281	20	152.2	10.75347941	1.23E-04	2.40E-02	1031.69	10.75	3.54	293	318	1.002	0.596	3.54	4.772530583	4.63E+00	2	1	4.77	0.680522733
85018	Phenanthrene	3000	178.24	953.3555969	20	178.24	9.936964703	4.16E-05	2.40E-02	953.36	9.94	1.42	293	318	1.002	0.596	1.42	1.908697708	4.74E+00	2	1	1.91	0.292214253
C9-C18	C9-C18 Aliphatic	3000	170	976.1870602	20	170	10.17494038	1.66E+00	2.40E-02	976.19	10.17	10.17	293	318	1.002	0.596	10.17	13.71479091	1.32E+02	2	1	13.71	48.50233913
C11-C22	C11-C22 Aromatic	3000	150	1039.230485	20	150	10.83205121	7.32E-04	2.40E-02	1039.23	10.83	8.07	293	318	1.002	0.596	8.07	10.88339241	1.18E+02	2	1	10.88	35.94075322
C5-C8	C5-C8 Aliphatic	3000	93	1319.824035	20	93	13.75671879	1.30E+00	2.40E-02	1319.82	13.76	13.75	293	318	1.002	0.596	13.75	18.54189241	6.08E+01	2	1	18.54	28.04541324
C9-C10	C9-C10 Aromatic	3000	120	1161.895004	20	120	12.11060142	7.92E-03	2.40E-02	1161.90	12.11	11.74	293	318	1.002	0.596	11.74	15.8264434	1.93E+01	2	1	15.83	7.891538787
C9-C12	C9-C12 Aliphatic	3000	149	1042.712003	20	149	10.86833959	1.96E+00	2.40E-02	1042.71	10.87	10.87	293	318	1.002	0.596	10.87	14.64976079	1.17E+01	2	1	14.65	4.508184425

Notes:

MW_{VOC} = Molecular weight of the VOC (g/mole)
$k_{g\,(H20)}$ = Gas phase mass transfer coefficient for H_20 (cm/hour)
$k_{g(VOC)}$ = Gas-phase mass-transfer coefficient for the VOC (cm/hour)
$k_{l\,(CO2)}$ = Liquid phase mass transfer coefficient for CO_2 (cm/hour)
$k_{l(VOC)}$ = Liquid-phase mass-transfer coefficient for the VOC (cm/hour)
H = Henry's Law Constant (atm-m^3/mole)
RT = Gas constant-temp factor (atm-m^3/mole)

K_L = Overall Mass-Transfer Coefficient (cm/hour)
T_l = Calibration water temperature of k (K)
Ts = Shower water temperature (range 300-320 K)
u_l = Water viscosity at T_l (at 20 C), centipoise (cp)
u_s = Water viscosity at T_s (at 45 C), centipoise (cp)
K'_L = Temp adjusted mass-transfer coefficient (cm/hour)
C_{wo} = Shower water concentration (tap water conc. - ug/L)

t_s = Shower droplet drop time (sec)
d = Shower droplet diameter (millimeters, mm)
C_{wd} = Concentration leaving shower droplet after time t_s (ug/L)
FR = Shower water flow rate (liters/minute, l/m)
SV = Shower room air volume (m^3)
S = VOC generation rate in the shower room (ug/m^3-min)
R = Air exchange rate (min-1)

D_s = Shower duration (min)
t = time (min)
$C_a(t)$ = Time dependent indoor concentration
VR = Ventilation rate (l/min)
BW = Body weight (kg)
D_t = Total duration in shower room (min)
E_{inh} = Inhalation exposure per shower (mg/kg/shower)

Inhalation of Volatiles From Groundwater While Showering 1
Future Off-Site Adult Residential Scenario - CT
Southwest Prperties, Wells G&H Superfund Site, Operable Unit 2
Aberjona Auto Parts

		VOC Generation Rate in the Shower Room S $S = C_{wd}(FR) / SV$				VOC Air Concentration in the Shower Roomn (for t <= D_s) $C_a(t)$ $C_a(t) = (S/R)(1 - \exp[-R\ t])$												
		C_{wd} ug/L	FR l/min	SV m^3	S ug/m^3-min	S ug/m^3-min	R min^{-1}	D_s min	t min	$C_a(t)$ mg/m^3	ET hours/day	EF dayss/year	ED years	AT_{cancer} days	$AT_{noncancer}$ days	CF hrs/day	CDI_{cancer} mg/kg-day	$CDI_{noncancer}$ mg/kg-day
71556	1,1,1-Trichloroethane	3.74	10	6	6.240432	6.24	0.008333	15	5	3.06E-02	0.33	350	7	25550	2555	24	4.03E-05	4.03E-04
79005	1,1,2-Trichloroethane	1.84	10	6	3.065537	3.07	0.008333	15	5	1.50E-02	0.33	350	7	25550	2555	24	1.98E-05	1.98E-04
75343	1,1-Dichloroethane	8.53	10	6	14.21777	14.22	0.008333	15	5	6.96E-02	0.33	350	7	25550	2555	24	9.18E-05	9.18E-04
75354	1,1-Dichloroethene	2.14	10	6	3.570615	3.57	0.008333	15	5	1.75E-02	0.33	350	7	25550	2555	24	2.31E-05	2.31E-04
120821	1,2,4-Trichlorobenzene	2.07	10	6	3.457804	3.46	0.008333	15	5	1.69E-02	0.33	350	7	25550	2555	24	2.23E-05	2.23E-04
95501	1,2-Dichlorobenzene	2.20	10	6	3.661343	3.66	0.008333	15	5	1.79E-02	0.33	350	7	25550	2555	24	2.36E-05	2.36E-04
541731	1,3-Dichlorobenzene	2.23	10	6	3.718119	3.72	0.008333	15	5	1.82E-02	0.33	350	7	25550	2555	24	2.40E-05	2.40E-04
106467	1,4-Dichlorobenzene	3.47	10	6	5.784036	5.78	0.008333	15	5	2.83E-02	0.33	350	7	25550	2555	24	3.73E-05	3.73E-04
71432	Benzene	1.87	10	6	3.124547	3.12	0.008333	15	5	1.53E-02	0.33	350	7	25550	2555	24	2.02E-05	2.02E-04
74839	Bromomethane	2.47	10	6	4.112084	4.11	0.008333	15	5	2.01E-02	0.33	350	7	25550	2555	24	2.66E-05	2.66E-04
108907	Chlorobenzene	2.61	10	6	4.354635	4.35	0.008333	15	5	2.13E-02	0.33	350	7	25550	2555	24	2.81E-05	2.81E-04
75003	Chloroethane	3.55	10	6	5.916093	5.92	0.008333	15	5	2.90E-02	0.33	350	7	25550	2555	24	3.82E-05	3.82E-04
67663	Chloroform	2.25	10	6	3.756939	3.76	0.008333	15	5	1.84E-02	0.33	350	7	25550	2555	24	2.43E-05	2.43E-04
156592	cis-1,2-Dichloroethene	47.85	10	6	79.74308	79.74	0.008333	15	5	3.91E-01	0.33	350	7	25550	2555	24	5.15E-04	5.15E-03
100414	Ethylbenzene	1.30	10	6	2.159539	2.16	0.008333	15	5	1.06E-02	0.33	350	7	25550	2555	24	1.39E-05	1.39E-04
1634044	Methyl tert-butyl ether	5.89	10	6	9.815425	9.82	0.008333	15	5	4.81E-02	0.33	350	7	25550	2555	24	6.34E-05	6.34E-04
75092	Methylene chloride	1.75	10	6	2.921915	2.92	0.008333	15	5	1.43E-02	0.33	350	7	25550	2555	24	1.89E-05	1.89E-04
127184	Tetrachloroethene	2.69	10	6	4.488938	4.49	0.008333	15	5	2.20E-02	0.33	350	7	25550	2555	24	2.90E-05	2.90E-04
108883	Toluene	12.96	10	6	21.60346	21.60	0.008333	15	5	1.06E-01	0.33	350	7	25550	2555	24	1.39E-04	1.39E-03
156605	trans-1,2-Dichloroethene	2.14	10	6	3.560779	3.56	0.008333	15	5	1.74E-02	0.33	350	7	25550	2555	24	2.30E-05	2.30E-04
79016	Trichloroethene	4.71	10	6	7.842521	7.84	0.008333	15	5	3.84E-02	0.33	350	7	25550	2555	24	5.06E-05	5.06E-04
75014	Vinyl chloride	17.79	10	6	29.64221	29.64	0.008333	15	5	1.45E-01	0.33	350	7	25550	2555	24	1.91E-04	1.91E-03
1330207	Xylenes (total)	2.91	10	6	4.848371	4.85	0.008333	15	5	2.37E-02	0.33	350	7	25550	2555	24	3.13E-05	3.13E-04
98862	Acetophenone	0.11	10	6	0.178209	0.18	0.008333	15	5	8.73E-04	0.33	350	7	25550	2555	24	1.15E-06	1.15E-05
91203	Naphthalene	1.32	10	6	2.193254	2.19	0.008333	15	5	1.07E-02	0.33	350	7	25550	2555	24	1.42E-05	1.42E-04
91576	2-Methylnaphthalene	1.37	10	6	2.289101	2.29	0.008333	15	5	1.12E-02	0.33	350	7	25550	2555	24	1.48E-05	1.48E-04
208968	Acenaphthylene	0.68	10	6	1.134205	1.13	0.008333	15	5	5.55E-03	0.33	350	7	25550	2555	24	7.32E-06	7.32E-05
85018	Phenanthrene	0.29	10	6	0.487024	0.49	0.008333	15	5	2.39E-03	0.33	350	7	25550	2555	24	3.14E-06	3.14E-05
C9-C18	C9-C18 Aliphatic	48.50	10	6	80.83723	80.84	0.008333	15	5	3.96E-01	0.33	350	7	25550	2555	24	5.22E-04	5.22E-03
C11-C22	C11-C22 Aromatic	35.94	10	6	59.90126	59.90	0.008333	15	5	2.93E-01	0.33	350	7	25550	2555	24	3.87E-04	3.87E-03
C5-C8	C5-C8 Aliphatic	28.05	10	6	46.74236	46.74	0.008333	15	5	2.29E-01	0.33	350	7	25550	2555	24	3.02E-04	3.02E-03
C9-C10	C9-C10 Aromatic	7.89	10	6	13.15256	13.15	0.008333	15	5	6.44E-02	0.33	350	7	25550	2555	24	8.49E-05	8.49E-04
C9-C12	C9-C12 Aliphatic	4.51	10	6	7.513641	7.51	0.008333	15	5	3.68E-02	0.33	350	7	25550	2555	24	4.85E-05	4.85E-04

Notes:

MW_{VOC} = Molecular weight of the VOC (g/mole)
$k_{g\ (H20)}$ = Gas phase mass transfer coefficient for H_20 (cm/hour)
$k_{g(VOC)}$ = Gas-phase mass-transfer coefficient for the VOC (cm/hour)
$k_{l\ (CO2)}$ = Liquid phase mass transfer coefficient for CO_2 (cm/hour)
$k_{l(VOC)}$ = Liquid-phase mass-transfer coefficient for the VOC (cm/hour)
H = Henry's Law Constant (atm-m^3/mole)
RT = Gas constant-temp factor (atm-m^3/mole)

Inhalation of Volatiles From Groundwater While Showering 1
Future Off-Site Child Residential Scenario - RME
Southwest Prperties, Wells G&H Superfund Site, Operable Unit 2
Aberjona Auto Parts

		Estimation of Gas-Phase Mass Transfer Coefficient (cm/hour) $k_{g(VOC)}$			Estimation of Liquid-Phase Mass Transfer Coefficient (cm/hour) $k_{l(VOC)}$			Estimation of Overall Mass Transfer Coefficient (cm/hour) K_L					Temperature Adjusted Overall Mass Transfer Coefficient (cm/hour) -- K'_L						Maximum Concentration Leaving the Shower Droplet C_{wd}				
		$k_{g(VOC)} = k_{g(H20)} (18 / MW_{VOC})^{0.5}$			$k_{l(VOC)} = k_{l(CO2)} (44 / MW_{VOC})^{0.5}$			$K_L = (1/k_{l(VOC)} + RT / H\ k_{g(VOC)})^{-1}$					$K'_L = K_L (T_i\ u_s / T_s\ u_i)^{-0.5}$						$C_{wd} = C_{wo} (1 - \exp [-K_{al} t_s / 60\ d])$				
		$k_{g(H20)}$	MW_{VOC}	$k_{g(VOC)}$	$k_{l(CO2)}$	MW_{VOC}	$k_{l(VOC)}$	H	RT	$k_{g(VOC)}$	$k_{l(VOC)}$	K_L	T_i	Ts	u_i	u_s	K_L	K'_L	C_{wo}	t_s	d	K'_L	C_{wd}
		cm/hour	g/mole	cm/hour	cm/hour	g/mole	cm/hour	atm-m^3/mole	atm-m^3/mole	cm/hour	cm/hour	cm/hour	kelvin (K)	kelvin (K)	centipoise (cp)	centipoise (cp)	cm/hour	cm/hour	ug/L	seconds	mm	cm/hr	ug/L
71556	1,1,1-Trichloroethane	3000	133.41	1101.953618	20	133.41	11.48582359	1.69E-02	2.40E-02	1101.95	11.49	11.32	293	318	1.002	0.596	11.32	15.25808033	150	2	1	15.26	59.79971233
79005	1,1,2-Trichloroethane	3000	133.41	1101.953618	20	133.41	11.48582359	8.10E-04	2.40E-02	1101.95	11.49	8.77	293	318	1.002	0.596	8.77	11.82930873	0.4	2	1	11.83	0.130342065
75343	1,1-Dichloroethane	3000	98.96	1279.462802	20	98.96	13.33602775	5.53E-03	2.40E-02	1279.46	13.34	12.76	293	318	1.002	0.596	12.76	17.19971241	220	2	1	17.20	95.997243
75354	1,1-Dichloroethene	3000	96.94	1292.724559	20	96.94	13.47425699	2.57E-02	2.40E-02	1292.72	13.47	13.34	293	318	1.002	0.596	13.34	17.98962115	9	2	1	17.99	4.05898617
120821	1,2,4-Trichlorobenzene	3000	181.45	944.8851444	20	181.45	9.848675939	1.40E-03	2.40E-02	944.89	9.85	8.35	293	318	1.002	0.596	8.35	11.25928829	23	2	1	11.26	7.197240031
95501	1,2-Dichlorobenzene	3000	147	1049.781318	20	147	10.94202409	1.89E-03	2.40E-02	1049.78	10.94	9.66	293	318	1.002	0.596	9.66	13.02357917	10	2	1	13.02	3.521650396
541731	1,3-Dichlorobenzene	3000	147	1049.781318	20	147	10.94202409	2.59E-03	2.40E-02	1049.78	10.94	9.98	293	318	1.002	0.596	9.98	13.4539235	19	2	1	13.45	6.866443696
106467	1,4-Dichlorobenzene	3000	147	1049.781318	20	147	10.94202409	2.37E-03	2.40E-02	1049.78	10.94	9.90	293	318	1.002	0.596	9.90	13.34078714	197	2	1	13.34	70.71884323
71432	Benzene	3000	78.11	1440.13826	20	78.11	15.01077153	5.45E-03	2.40E-02	1440.14	15.01	14.35	293	318	1.002	0.596	14.35	19.34858496	86	2	1	19.35	40.87689306
74839	Bromomethane	3000	94.94	1306.269822	20	94.94	13.61544124	6.13E-03	2.40E-02	1306.27	13.62	13.08	293	318	1.002	0.596	13.08	17.63495369	11	2	1	17.63	0.444469513
108907	Chlorobenzene	3000	112.56	1199.680128	20	112.56	12.50444129	3.05E-03	2.40E-02	1199.68	12.50	11.56	293	318	1.002	0.596	11.56	15.57996697	18	2	1	15.58	7.291481722
75003	Chloroethane	3000	64.52	1584.565981	20	64.52	16.51616278	1.09E-02	2.40E-02	1584.57	16.52	16.15	293	318	1.002	0.596	16.15	21.76629237	50	2	1	21.77	25.7969193
67663	Chloroform	3000	119.38	1164.908247	20	119.38	12.14200889	3.60E-03	2.40E-02	1164.91	12.14	11.35	293	318	1.002	0.596	11.35	15.30622427	0.107	2	1	15.31	0.042760303
156592	cis-1,2-Dichloroethene	3000	96.94	1292.724559	20	96.94	13.47425699	4.01E-03	2.40E-02	1292.72	13.47	12.68	293	318	1.002	0.596	12.68	17.09863302	1900	2	1	17.10	825.4527046
100414	Ethylbenzene	3000	106.17	1235.254938	20	106.17	12.87524273	7.74E-03	2.40E-02	1235.25	12.88	12.47	293	318	1.002	0.596	12.47	16.81347711	40	2	1	16.81	17.16189947
1634044	Methyl tert-butyl ether	3000	88.15	1355.646162	20	88.15	14.13009805	5.77E-04	2.40E-02	1355.65	14.13	9.85	293	318	1.002	0.596	9.85	13.28528715	540	2	1	13.29	193.2076331
75092	Methylene chloride	3000	84.93	1381.105788	20	84.93	14.39546745	3.20E-03	2.40E-02	1381.11	14.40	13.35	293	318	1.002	0.596	13.35	17.99762023	90	2	1	18.00	40.60303446
127184	Tetrachloroethene	3000	165.83	988.3845701	20	165.83	10.30207681	1.74E-02	2.40E-02	988.38	10.30	10.16	293	318	1.002	0.596	10.16	13.69135475	36	2	1	13.69	13.19133639
108883	Toluene	3000	92.14	1325.969099	20	92.14	13.82076969	6.51E-03	2.40E-02	1325.97	13.82	13.31	293	318	1.002	0.596	13.31	17.94245531	1200	2	1	17.94	540.1615765
156605	trans-1,2-Dichloroethene	3000	96.94	1292.724559	20	96.94	13.47425699	9.20E-03	2.40E-02	1292.72	13.47	13.12	293	318	1.002	0.596	13.12	17.68393475	28	2	1	17.68	12.47052209
79016	Trichloroethene	3000	131.39	1110.392068	20	131.39	11.57377879	9.68E-03	2.40E-02	1110.39	11.57	11.28	293	318	1.002	0.596	11.28	15.20967886	160	2	1	15.21	63.63100513
75014	Vinyl chloride	3000	62.5	1609.968944	20	62.5	16.78094157	2.74E-02	2.40E-02	1609.97	16.78	16.63	293	318	1.002	0.596	16.63	22.41767573	600	2	1	22.42	315.8012557
1330207	Xylenes (total)	3000	106.17	1235.254938	20	106.17	12.87524273	6.51E-03	2.40E-02	1235.25	12.88	12.40	293	318	1.002	0.596	12.40	16.71494948	110	2	1	16.71	46.98861761
98862	Acetophenone	3000	120.15	1161.1695	20	120.15	12.10303938	1.02E-05	2.40E-02	1161.17	12.10	0.47	293	318	1.002	0.596	0.47	0.639885704	1.2	2	1	0.64	0.025324391
91203	Naphthalene	3000	128.18	1124.209818	20	128.18	11.71780321	4.32E-04	2.40E-02	1124.21	11.72	7.42	293	318	1.002	0.596	7.42	10.00787097	25	2	1	10.01	7.091416451
91576	2-Methylnaphthalene	3000	142.2	1067.3521	20	142.2	11.12516692	5.09E-04	2.40E-02	1067.35	11.13	7.46	293	318	1.002	0.596	7.46	10.05807837	11	2	1	10.06	3.133399645
208968	Acenaphthylene	3000	152.2	1031.692281	20	152.2	10.75347941	1.23E-04	2.40E-02	1031.69	10.75	3.54	293	318	1.002	0.596	3.54	4.772530583	3.2	2	1	4.77	0.470641897
85018	Phenanthrene	3000	178.24	953.3555969	20	178.24	9.936964703	4.16E-05	2.40E-02	953.36	9.94	1.42	293	318	1.002	0.596	1.42	1.908697708	10	2	1	1.91	0.61641547
C9-C18	C9-C18 Aliphatic	3000	170	976.1870602	20	170	10.17494038	1.66E+00	2.40E-02	976.19	10.17	10.17	293	318	1.002	0.596	10.17	13.71479091	3100	2	1	13.71	1137.454383
C11-C22	C11-C22 Aromatic	3000	150	1039.230485	20	150	10.83205121	7.32E-04	2.40E-02	1039.23	10.83	8.07	293	318	1.002	0.596	8.07	10.88339241	1200	2	1	10.88	365.1124136
C5-C8	C5-C8 Aliphatic	3000	93	1319.824035	20	93	13.75671879	1.30E+00	2.40E-02	1319.82	13.76	13.75	293	318	1.002	0.596	13.75	18.54189241	448	2	1	18.54	206.5336437
C9-C10	C9-C10 Aromatic	3000	120	1161.895004	20	120	12.11060142	7.92E-03	2.40E-02	1161.90	12.11	11.74	293	318	1.002	0.596	11.74	15.8264434	200	2	1	15.83	81.99001338
C9-C12	C9-C12 Aliphatic	3000	149	1042.712003	20	149	10.86833959	1.96E+00	2.40E-02	1042.71	10.87	10.87	293	318	1.002	0.596	10.87	14.64976079	95.900002	2	1	14.65	37.05066038

Notes:

MW_{VOC} = Molecular weight of the VOC (g/mole)
$k_{g(H20)}$ = Gas phase mass transfer coefficient for H_20 (cm/hour)
$k_{g(VOC)}$ = Gas-phase mass-transfer coefficient for the VOC (cm/hour)
$k_{l(CO2)}$ = Liquid phase mass transfer coefficient for CO_2 (cm/hour)
$k_{l(VOC)}$ = Liquid-phase mass-transfer coefficient for the VOC (cm/hour)
H = Henry's Law Constant (atm-m^3/mole)
RT = Gas constant-temp factor (atm-m^3/mole)

K_L = Overall Mass-Transfer Coefficient (cm/hour)
T_i = Calibration water temperature of K (K)
Ts = Shower water temperature (range 300-320 K)
u_i = Water viscosity at T_i (at 20 C), centipoise (cp)
u_s = Water viscosity at T_s (at 45 C), centipoise (cp)
K'_L = Temp adjusted mass-transfer coefficient (cm/hour)
C_{wo} = Shower water concentration (tap water conc. - ug/L)

t_s = Shower droplet drop time (sec)
d = Shower droplet diameter (millimeters, mm)
C_{wd} = Concentration leaving shower droplet after time t_s t(ug/L)
FR = Shower water flow rate (liters/minute, l/m)
SV = Shower room air volume (m^3)
S = VOC generation rate in the shower room (ug/r^3-min)
R = Air exchange rate (min-1)

D_s = Shower duration (min)
t = time (min)
$C_a(t)$ = Time dependent indoor concentration
VR = Ventilation rate (l/min)
BW = Body weight (kg)
D_t = Total duration in shower room (min)
E_{inh} = Inhalation exposure per shower (mg/kg/shower)

Inhalation of Volatiles From Groundwater While Showering 1
Future Off-Site Child Residential Scenario - RME
Southwest Prperties, Wells G&H Superfund Site, Operable Unit 2
Aberjona Auto Parts

		VOC Generation Rate in the Shower Room S $S = C_{wd}$ (FR) / SV				VOC Air Concentration in the Shower Roomn (for t <= D_s) $C_a(t)$ $C_a(t) = (S/R)(1 - \exp[-R\ t])$										
		C_{wd}	FR	SV	S	S	R	D_s	t	$C_a(t)$	ET	EF	ED	AT_{cancer}	$AT_{noncancer}$	CF
		ug/L	l/min	m^3	ug/m^3-min	ug/m^3-min	min^{-1}	min	min	mg/m^3	hours/day	dayss/year	years	days	days	hrs/day
71556	1,1,1-Trichloroethane	59.80	10	6	99.66619	99.67	0.008333	15	5	4.88E-01	0.33	350	6	25550	2190	24
79005	1,1,2-Trichloroethane	0.13	10	6	0.217237	0.22	0.008333	15	5	1.06E-03	0.33	350	6	25550	2190	24
75343	1,1-Dichloroethane	96.00	10	6	159.9954	160.00	0.008333	15	5	7.84E-01	0.33	350	6	25550	2190	24
75354	1,1-Dichloroethene	4.06	10	6	6.764977	6.76	0.008333	15	5	3.31E-02	0.33	350	6	25550	2190	24
120821	1,2,4-Trichlorobenzene	7.20	10	6	11.9954	12.00	0.008333	15	5	5.87E-02	0.33	350	6	25550	2190	24
95501	1,2-Dichlorobenzene	3.52	10	6	5.869417	5.87	0.008333	15	5	2.87E-02	0.33	350	6	25550	2190	24
541731	1,3-Dichlorobenzene	6.87	10	6	11.44407	11.44	0.008333	15	5	5.60E-02	0.33	350	6	25550	2190	24
106467	1,4-Dichlorobenzene	70.72	10	6	117.8647	117.86	0.008333	15	5	5.77E-01	0.33	350	6	25550	2190	24
71432	Benzene	40.88	10	6	68.12816	68.13	0.008333	15	5	3.34E-01	0.33	350	6	25550	2190	24
74839	Bromomethane	0.44	10	6	0.740783	0.74	0.008333	15	5	3.63E-03	0.33	350	6	25550	2190	24
108907	Chlorobenzene	7.29	10	6	12.15247	12.15	0.008333	15	5	5.95E-02	0.33	350	6	25550	2190	24
75003	Chloroethane	25.80	10	6	42.99487	42.99	0.008333	15	5	2.11E-01	0.33	350	6	25550	2190	24
67663	Chloroform	0.04	10	6	0.071267	0.07	0.008333	15	5	3.49E-04	0.33	350	6	25550	2190	24
156592	cis-1,2-Dichloroethene	825.45	10	6	1375.755	1375.75	0.008333	15	5	6.74E+00	0.33	350	6	25550	2190	24
100414	Ethylbenzene	17.16	10	6	28.60317	28.60	0.008333	15	5	1.40E-01	0.33	350	6	25550	2190	24
1634044	Methyl tert-butyl ether	193.21	10	6	322.0127	322.01	0.008333	15	5	1.58E+00	0.33	350	6	25550	2190	24
75092	Methylene chloride	40.60	10	6	67.67172	67.67	0.008333	15	5	3.31E-01	0.33	350	6	25550	2190	24
127184	Tetrachloroethene	13.19	10	6	21.98556	21.99	0.008333	15	5	1.08E-01	0.33	350	6	25550	2190	24
108883	Toluene	540.16	10	6	900.2693	900.27	0.008333	15	5	4.41E+00	0.33	350	6	25550	2190	24
156605	trans-1,2-Dichloroethene	12.47	10	6	20.7842	20.78	0.008333	15	5	1.02E-01	0.33	350	6	25550	2190	24
79016	Trichloroethene	63.63	10	6	106.0517	106.05	0.008333	15	5	5.19E-01	0.33	350	6	25550	2190	24
75014	Vinyl chloride	315.80	10	6	526.3354	526.34	0.008333	15	5	2.58E+00	0.33	350	6	25550	2190	24
1330207	Xylenes (total)	46.99	10	6	78.31436	78.31	0.008333	15	5	3.84E-01	0.33	350	6	25550	2190	24
98862	Acetophenone	0.03	10	6	0.042207	0.04	0.008333	15	5	2.07E-04	0.33	350	6	25550	2190	24
91203	Naphthalene	7.09	10	6	11.81903	11.82	0.008333	15	5	5.79E-02	0.33	350	6	25550	2190	24
91576	2-Methylnaphthalene	3.13	10	6	5.222333	5.22	0.008333	15	5	2.56E-02	0.33	350	6	25550	2190	24
208968	Acenaphthylene	0.47	10	6	0.784403	0.78	0.008333	15	5	3.84E-03	0.33	350	6	25550	2190	24
85018	Phenanthrene	0.62	10	6	1.027359	1.03	0.008333	15	5	5.03E-03	0.33	350	6	25550	2190	24
C9-C18	C9-C18 Aliphatic	1137.45	10	6	1895.757	1895.76	0.008333	15	5	9.28E+00	0.33	350	6	25550	2190	24
C11-C22	C11-C22 Aromatic	365.11	10	6	608.5207	608.52	0.008333	15	5	2.98E+00	0.33	350	6	25550	2190	24
C5-C8	C5-C8 Aliphatic	206.53	10	6	344.2227	344.22	0.008333	15	5	1.69E+00	0.33	350	6	25550	2190	24
C9-C10	C9-C10 Aromatic	81.99	10	6	136.65	136.65	0.008333	15	5	6.69E-01	0.33	350	6	25550	2190	24
C9-C12	C9-C12 Aliphatic	37.05	10	6	61.7511	61.75	0.008333	15	5	3.02E-01	0.33	350	6	25550	2190	24

Notes:

MW_{VOC} = Molecular weight of the VOC (g/mole)
$k_{g\ (H20)}$ = Gas phase mass transfer coefficient for H_20 (cm/hour)
$k_{g(VOC)}$ = Gas-phase mass-transfer coefficient for the VOC (cm/hour)
$k_{l\ (CO2)}$ = Liquid phase mass transfer coefficient for CO_2 (cm/hour)
$k_{l(VOC)}$ = Liquid-phase mass-transfer coefficient for the VOC (cm/hour)
H = Henry's Law Constant (atm-m^3/mole)
RT = Gas constant-temp factor (atm-m^3/mole)

Inhalation of Volatiles From Groundwater While Showering 1
Future Off-Site Child Residential Scenario - CT
Southwest Prperties, Wells G&H Superfund Site, Operable Unit 2
Aberjona Auto Parts

		Estimation of Gas-Phase Mass Transfer Coefficient (cm/hour) $k_{g(VOC)}$			Estimation of Liquid-Phase Mass Transfer Coefficient (cm/hour) $k_{l(VOC)}$			Estimation of Overall Mass Transfer Coefficient (cm/hour) K_L					Temperature Adjusted Overall Mass Transfer Coefficient (cm/hour) -- K'_L						Mean Concentration Leaving the Shower Droplet C_{wd}					VOC Genera the Show S	
				$k_{g(VOC)} = k_{g(H20)} (18 / MW_{VOC})^{0.5}$			$k_{l(VOC)} = k_{l(CO2)} (44 / MW_{VOC})^{0.5}$			$K_L = (1/k_{l(VOC)} + RT / H\ k_{g(VOC)})^{-1}$						$K'_L = K_L (T_i\ u_s / T_s\ u_i)^{-0.5}$					$C_{wd} = C_{wd} (1 - exp [-K_{ol} t_s / 60\ d])$					$S = C_{wd} ($	
		$k_{g(H20)}$	MW_{VOC}	$k_{g(VOC)}$	$k_{l(CO2)}$	MW_{VOC}	$k_{l(VOC)}$	H	RT	$k_{g(VOC)}$	$k_{l(VOC)}$	K_L	T_i	Ts	u_i	u_s	K_L	K'_L	C_{wo}	t_s	d	K'_L	C_{wd}	C_{wd}	FR	
		cm/hour	g/mole	cm/hour	cm/hour	g/mole	cm/hour	atm-m^3/mole	atm-m^3/mole	cm/hour	cm/hour	cm/hour	kelvin (K)	kelvin (K)	centipoise (cp)	centipoise (cp)	cm/hour	cm/hour	ug/L	seconds	mm	cm/hr	ug/L	ug/L	l/min	
71556	1,1,1-Trichloroethane	3000	133.41	1101.953618	20	133.41	11.48582359	1.69E-02	2.40E-02	1101.95	11.49	11.32	293	318	1.002	0.596	11.32	15.25808033	9.39E+00	2	1	15.26	3.744259321	3.74	10	
79005	1,1,2-Trichloroethane	3000	133.41	1101.953618	20	133.41	11.48582359	8.10E-04	2.40E-02	1101.95	11.49	8.77	293	318	1.002	0.596	8.77	11.82930873	5.64E+00	2	1	11.83	1.83932202	1.84	10	
75343	1,1-Dichloroethane	3000	98.96	1279.462802	20	98.96	13.33602775	5.53E-03	2.40E-02	1279.46	13.34	12.76	293	318	1.002	0.596	12.76	17.19971241	1.96E+01	2	1	17.20	8.530664094	8.53	10	
75354	1,1-Dichloroethene	3000	96.94	1292.724559	20	96.94	13.47425699	2.57E-02	2.40E-02	1292.72	13.47	13.34	293	318	1.002	0.596	13.34	17.98962115	4.75E+00	2	1	17.99	2.14236898	2.14	10	
120821	1,2,4-Trichlorobenzene	3000	181.45	944.8851444	20	181.45	9.848675939	1.40E-03	2.40E-02	944.89	9.85	8.35	293	318	1.002	0.596	8.35	11.25928829	6.63E+00	2	1	11.26	2.07468267	2.07	10	
95501	1,2-Dichlorobenzene	3000	147	1049.781318	20	147	10.94202409	1.89E-03	2.40E-02	1049.78	10.94	9.66	293	318	1.002	0.596	9.66	13.02357917	6.24E+00	2	1	13.02	2.196805517	2.20	10	
541731	1,3-Dichlorobenzene	3000	147	1049.781318	20	147	10.94202409	2.59E-03	2.40E-02	1049.78	10.94	9.98	293	318	1.002	0.596	9.98	13.4539235	6.17E+00	2	1	13.45	2.230871418	2.23	10	
106467	1,4-Dichlorobenzene	3000	147	1049.781318	20	147	10.94202409	2.37E-03	2.40E-02	1049.78	10.94	9.90	293	318	1.002	0.596	9.90	13.34078714	9.67E+00	2	1	13.34	3.470421333	3.47	10	
71432	Benzene	3000	78.11	1440.13826	20	78.11	15.01077153	5.45E-03	2.40E-02	1440.14	15.01	14.35	293	318	1.002	0.596	14.35	19.34858496	3.94E+00	2	1	19.35	1.874728391	1.87	10	
74839	Bromomethane	3000	94.94	1306.269822	20	94.94	13.61544124	6.13E-03	2.40E-02	1306.27	13.62	13.08	293	318	1.002	0.596	13.08	17.63495369	5.55E+00	2	1	17.63	2.467250268	2.47	10	
108907	Chlorobenzene	3000	112.56	1199.680128	20	112.56	12.50444129	3.05E-03	2.40E-02	1199.68	12.50	11.56	293	318	1.002	0.596	11.56	15.57996697	6.45E+00	2	1	15.58	2.61278095	2.61	10	
75003	Chloroethane	3000	64.52	1584.565981	20	64.52	16.51616278	1.09E-02	2.40E-02	1584.57	16.52	16.15	293	318	1.002	0.596	16.15	21.76629237	6.88E+00	2	1	21.77	3.549656096	3.55	10	
67663	Chloroform	3000	119.38	1164.908247	20	119.38	12.14200889	3.60E-03	2.40E-02	1164.91	12.14	11.35	293	318	1.002	0.596	11.35	15.30622427	5.64E+00	2	1	15.31	2.254163303	2.25	10	
156592	cis-1,2-Dichloroethene	3000	96.94	1292.724559	20	96.94	13.47425699	4.01E-03	2.40E-02	1292.72	13.47	12.68	293	318	1.002	0.596	12.68	17.09863302	1.10E+02	2	1	17.10	47.84584545	47.85	10	
100414	Ethylbenzene	3000	106.17	1235.254938	20	106.17	12.87524273	7.74E-03	2.40E-02	1235.25	12.88	12.47	293	318	1.002	0.596	12.47	16.81347711	3.02E+00	2	1	16.81	1.29572341	1.30	10	
1634044	Methyl tert-butyl ether	3000	88.15	1355.646162	20	88.15	14.13009805	5.77E-04	2.40E-02	1355.65	14.13	9.85	293	318	1.002	0.596	9.85	13.28528715	1.65E+01	2	1	13.29	5.88925489	5.89	10	
75092	Methylene chloride	3000	84.93	1381.105788	20	84.93	14.39546745	3.20E-03	2.40E-02	1381.11	14.40	13.35	293	318	1.002	0.596	13.35	17.99762023	3.89E+00	2	1	18.00	1.753148799	1.75	10	
127184	Tetrachloroethene	3000	165.83	988.3845701	20	165.83	10.30207681	1.74E-02	2.40E-02	988.38	10.30	10.16	293	318	1.002	0.596	10.16	13.69135475	7.35E+00	2	1	13.69	2.693363092	2.69	10	
108883	Toluene	3000	92.14	1325.969099	20	92.14	13.82076969	6.51E-03	2.40E-02	1325.97	13.82	13.31	293	318	1.002	0.596	13.31	17.94245531	2.88E+01	2	1	17.94	12.9620773	12.96	10	
156605	trans-1,2-Dichloroethene	3000	96.94	1292.724559	20	96.94	13.47425699	9.20E-03	2.40E-02	1292.72	13.47	13.12	293	318	1.002	0.596	13.12	17.68393475	4.80E+00	2	1	17.68	2.136467659	2.14	10	
79016	Trichloroethene	3000	131.39	1110.392068	20	131.39	11.57377879	9.68E-03	2.40E-02	1110.39	11.57	11.28	293	318	1.002	0.596	11.28	15.20967886	1.18E+01	2	1	15.21	4.70551283	4.71	10	
75014	Vinyl chloride	3000	62.5	1609.968944	20	62.5	16.78094157	2.74E-02	2.40E-02	1609.97	16.78	16.63	293	318	1.002	0.596	16.63	22.41767573	3.38E+01	2	1	22.42	17.7853267	17.79	10	
1330207	Xylenes (total)	3000	106.17	1235.254938	20	106.17	12.87524273	6.51E-03	2.40E-02	1235.25	12.88	12.40	293	318	1.002	0.596	12.40	16.71494948	6.81E+00	2	1	16.71	2.909022599	2.91	10	
98862	Acetophenone	3000	120.15	1161.1695	20	120.15	12.10303938	1.02E-05	2.40E-02	1161.17	12.10	0.47	293	318	1.002	0.596	0.47	0.639885704	5.07E+00	2	1	0.64	0.1069252	0.11	10	
91203	Naphthalene	3000	128.18	1124.209818	20	128.18	11.71780321	4.32E-04	2.40E-02	1124.21	11.72	7.42	293	318	1.002	0.596	7.42	10.00787097	4.64E+00	2	1	10.01	1.315952234	1.32	10	
91576	2-Methylnaphthalene	3000	142.2	1067.3521	20	142.2	11.12516692	5.09E-04	2.40E-02	1067.35	11.13	7.46	293	318	1.002	0.596	7.46	10.05807837	4.82E+00	2	1	10.06	1.37346068	1.37	10	
208968	Acenaphthylene	3000	152.2	1031.692281	20	152.2	10.75347941	1.23E-04	2.40E-02	1031.69	10.75	3.54	293	318	1.002	0.596	3.54	4.772530583	4.63E+00	2	1	4.77	0.680522733	0.68	10	
85018	Phenanthrene	3000	178.24	953.3555969	20	178.24	9.936964703	4.16E-05	2.40E-02	953.36	9.94	1.42	293	318	1.002	0.596	1.42	1.908697708	4.74E+00	2	1	1.91	0.292214253	0.29	10	
C9-C18	C9-C18 Aliphatic	3000	170	976.1870602	20	170	10.17494038	1.66E+00	2.40E-02	976.19	10.17	10.17	293	318	1.002	0.596	10.17	13.71479091	1.32E+02	2	1	13.71	48.50233913	48.50	10	
C11-C22	C11-C22 Aromatic	3000	150	1039.230485	20	150	10.83205121	7.32E-04	2.40E-02	1039.23	10.83	8.07	293	318	1.002	0.596	8.07	10.88339241	1.18E+02	2	1	10.88	35.94075322	35.94	10	
C5-C8	C5-C8 Aliphatic	3000	93	1319.824035	20	93	13.75671879	1.30E+00	2.40E-02	1319.82	13.76	13.75	293	318	1.002	0.596	13.75	18.54189241	6.08E+01	2	1	18.54	28.04541324	28.05	10	
C9-C10	C9-C10 Aromatic	3000	120	1161.895004	20	120	12.11060142	7.92E-03	2.40E-02	1161.90	12.11	11.74	293	318	1.002	0.596	11.74	15.8264434	1.93E+01	2	1	15.83	7.891538787	7.89	10	
C9-C12	C9-C12 Aliphatic	3000	149	1042.712003	20	149	10.86833959	1.96E+00	2.40E-02	1042.71	10.87	10.87	293	318	1.002	0.596	10.87	14.64976079	1.17E+01	2	1	14.65	4.508184425	4.51	10	

Notes:

MW_{VOC} = Molecular weight of the VOC (g/mole)
$k_{g(H20)}$ = Gas phase mass transfer coefficient for H_20 (cm/hour)
$k_{g(VOC)}$ = Gas-phase mass-transfer coefficient for the VOC (cm/hour)
$k_{l(CO2)}$ = Liquid phase mass transfer coefficient for CO_2 (cm/hour)
$k_{l(VOC)}$ = Liquid-phase mass-transfer coefficient for the VOC (cm/hour)
H = Henry's Law Constant (atm-m^3/mole)
RT = Gas constant-temp factor (atm-m^3/mole)

K_L = Overall Mass-Transfer Coefficient (cm/hour)
T_i = Calibration water temperature of k_l (K)
Ts = Shower water temperature (range 300-320 K)
u_i = Water viscosity at T_i (at 20 C), centipoise (cp)
u_s = Water viscosity at T_s (at 45 C), centipoise (cp)
K'_L = Temp adjusted mass-transfer coefficient (cm/hour)
C_{wo} = Shower water concentration (tap water conc. - ug/L)

t_s = Shower droplet drop time (sec)
d = Shower droplet diameter (millimeters, mm)
C_{wd} = Concentration leaving shower droplet after time$_s$t(ug/L)
FR = Shower water flow rate (liters/minute, l/m)
SV = Shower room air volume (m^3)
S = VOC generation rate in the shower room (ug/r^3-min)
R = Air exchange rate (min-1)

D_s = Shower duration (min)
t = time (min)
$C_a(t)$ = Time dependent indoor concentration
VR = Ventilation rate (l/min)
BW = Body weight (kg)
D_t = Total duration in shower room (min)
E_{inh} = Inhalation exposure per shower (mg/kg/shower)

Inhalation of Volatiles From Groundwater While Showering 1
Future Off-Site Child Residential Scenario - CT
Southwest Prperties, Wells G&H Superfund Site, Operable Unit 2
Aberjona Auto Parts

		ation Rate in ver Room S						VOC Air Concentration in the Shower Roomn (for t <= D_s) $C_a(t)$					
		(FR) / SV						$C_a(t) = (S/R)(1 - \exp[-R\ t])$					
		SV	S	S	R	D_s	t	$C_a(t)$	ET	EF	ED	AT_{cancer}	$AT_{noncancer}$	CF
		m^3	ug/m^3-min	ug/m^3-min	min^{-1}	min	min	mg/m^3	hours/day	dayss/year	years	days	days	hrs/day
71556	1,1,1-Trichloroethane	6	6.240432	6.24	0.008333	15	5	3.06E-02	0.33	350	2	25550	730	24
79005	1,1,2-Trichloroethane	6	3.065537	3.07	0.008333	15	5	1.50E-02	0.33	350	2	25550	730	24
75343	1,1-Dichloroethane	6	14.21777	14.22	0.008333	15	5	6.96E-02	0.33	350	2	25550	730	24
75354	1,1-Dichloroethene	6	3.570615	3.57	0.008333	15	5	1.75E-02	0.33	350	2	25550	730	24
120821	1,2,4-Trichlorobenzene	6	3.457804	3.46	0.008333	15	5	1.69E-02	0.33	350	2	25550	730	24
95501	1,2-Dichlorobenzene	6	3.661343	3.66	0.008333	15	5	1.79E-02	0.33	350	2	25550	730	24
541731	1,3-Dichlorobenzene	6	3.718119	3.72	0.008333	15	5	1.82E-02	0.33	350	2	25550	730	24
106467	1,4-Dichlorobenzene	6	5.784036	5.78	0.008333	15	5	2.83E-02	0.33	350	2	25550	730	24
71432	Benzene	6	3.124547	3.12	0.008333	15	5	1.53E-02	0.33	350	2	25550	730	24
74839	Bromomethane	6	4.112084	4.11	0.008333	15	5	2.01E-02	0.33	350	2	25550	730	24
108907	Chlorobenzene	6	4.354635	4.35	0.008333	15	5	2.13E-02	0.33	350	2	25550	730	24
75003	Chloroethane	6	5.916093	5.92	0.008333	15	5	2.90E-02	0.33	350	2	25550	730	24
67663	Chloroform	6	3.756939	3.76	0.008333	15	5	1.84E-02	0.33	350	2	25550	730	24
156592	cis-1,2-Dichloroethene	6	79.74308	79.74	0.008333	15	5	3.91E-01	0.33	350	2	25550	730	24
100414	Ethylbenzene	6	2.159539	2.16	0.008333	15	5	1.06E-02	0.33	350	2	25550	730	24
1634044	Methyl tert-butyl ether	6	9.815425	9.82	0.008333	15	5	4.81E-02	0.33	350	2	25550	730	24
75092	Methylene chloride	6	2.921915	2.92	0.008333	15	5	1.43E-02	0.33	350	2	25550	730	24
127184	Tetrachloroethene	6	4.488938	4.49	0.008333	15	5	2.20E-02	0.33	350	2	25550	730	24
108883	Toluene	6	21.60346	21.60	0.008333	15	5	1.06E-01	0.33	350	2	25550	730	24
156605	trans-1,2-Dichloroethene	6	3.560779	3.56	0.008333	15	5	1.74E-02	0.33	350	2	25550	730	24
79016	Trichloroethene	6	7.842521	7.84	0.008333	15	5	3.84E-02	0.33	350	2	25550	730	24
75014	Vinyl chloride	6	29.64221	29.64	0.008333	15	5	1.45E-01	0.33	350	2	25550	730	24
1330207	Xylenes (total)	6	4.848371	4.85	0.008333	15	5	2.37E-02	0.33	350	2	25550	730	24
98862	Acetophenone	6	0.178209	0.18	0.008333	15	5	8.73E-04	0.33	350	2	25550	730	24
91203	Naphthalene	6	2.193254	2.19	0.008333	15	5	1.07E-02	0.33	350	2	25550	730	24
91576	2-Methylnaphthalene	6	2.289101	2.29	0.008333	15	5	1.12E-02	0.33	350	2	25550	730	24
208968	Acenaphthylene	6	1.134205	1.13	0.008333	15	5	5.55E-03	0.33	350	2	25550	730	24
85018	Phenanthrene	6	0.487024	0.49	0.008333	15	5	2.39E-03	0.33	350	2	25550	730	24
C9-C18	C9-C18 Aliphatic	6	80.83723	80.84	0.008333	15	5	3.96E-01	0.33	350	2	25550	730	24
C11-C22	C11-C22 Aromatic	6	59.90126	59.90	0.008333	15	5	2.93E-01	0.33	350	2	25550	730	24
C5-C8	C5-C8 Aliphatic	6	46.74236	46.74	0.008333	15	5	2.29E-01	0.33	350	2	25550	730	24
C9-C10	C9-C10 Aromatic	6	13.15256	13.15	0.008333	15	5	6.44E-02	0.33	350	2	25550	730	24
C9-C12	C9-C12 Aliphatic	6	7.513641	7.51	0.008333	15	5	3.68E-02	0.33	350	2	25550	730	24

Notes:

MW_{VOC} = Molecular weight of the VOC (g/mole)
$k_{g\ (H20)}$ = Gas phase mass transfer coefficient for H_20 (cm/hour)
$k_{g(VOC)}$ = Gas-phase mass-transfer coefficient for the VOC (cm/hour)
$k_{l\ (CO2)}$ = Liquid phase mass transfer coefficient for CO_2 (cm/hour)
$k_{l(VOC)}$ = Liquid-phase mass-transfer coefficient for the VOC (cm/hour)
H = Henry's Law Constant (atm-m^3/mole)
RT = Gas constant-temp factor (atm-m^3/mole)

Appendix C.7

Derivation of Allowable Daily Intake

Sodium

The recommended intake of sodium is 2,300 mg/day, according to some authorities (Luft, 1990). This number was rounded to 2,000 and divided by 10 to insure to add a ten-fold measure of safety since no official RDA was available. Back calculations were then done as follows to determine acceptable daily intakes in water, soil, and fish, using 2 l/day as the ingestion rate of water, 200 mg/kg as the soil ingestion rate (for a child) (USEPA, 1989), and 16 g/day as the fish consumption rate (for a child) (USEPA, 1994).

Water:

$$X \text{ mg/l} * 2 \text{ l/day} = 200 \text{ mg/day}$$

$$X = 100 \text{ mg/l } (100{,}000\ \mu\text{g/l})$$

Soil:

$$X \text{ mg/kg} * 200 \text{ mg/day} * \text{kg}/10^6\text{mg} = 200 \text{ mg/day}$$

$$X = 1{,}000{,}000 \text{ mg/kg soil}$$

Fish:

$$X \text{ mg/kg} * 16{,}000 \text{ mg/day} * \text{kg}/10^6\text{mg} = 200 \text{ mg/day}$$

$$X = 12{,}500 \text{ mg/kg fish}$$

Calcium

The recommended daily allowance of calcium is 800 mg/day for adults (NRC, 1989). This number was selected as acceptable and back calculations done as follows to determine acceptable daily intakes in water, soil, and fish, using 2 l/day as the ingestion rate of water, 200 mg/kg as the soil ingestion rate (for a child) (USEPA, 1989), and 16 g/day as the fish consumption rate (for a child) (USEPA, 1994).

Water:

$$X \text{ mg/l} * 2 \text{ l/day} = 800 \text{ mg/day}$$

$$X = 400 \text{ mg/l } (400{,}000\ \mu\text{g/l})$$

Soil:

$$X \text{ mg/kg} * 200 \text{ mg/day} * \text{kg}/10^6 \text{ mg} = 800 \text{ mg/day}$$

$$X = 4{,}000{,}000 \text{ mg/kg soil}$$

Fish:

$$X \text{ mg/kg} * 16{,}000 \text{ mg/day} * \text{kg}/10^6 \text{ mg} = 800 \text{ mg/day}$$

$$X = 50{,}000 \text{ mg/kg fish}$$

Magnesium

Average daily magnesium intake in the United States reportedly ranges from 230 to 310 mg/kg (Shils, 1990). Therefore, 230 mg/kg was chosen as the acceptable level and that number divided by 10 to insure to add a ten-fold measure of safety since no official RDA was available. Back calculations were done as follows to determine acceptable daily intakes in water, soil, and fish, using 2 l/day as the ingestion rate of water, 200 mg/kg as the soil ingestion rate (for a child) (USEPA, 1989), and 16 g/day as the fish consumption rate (for a child) (USEPA, 1994).

Water:

$$\frac{X \text{ mg/l} * 2 \text{ l/day}}{70 \text{ kg}} = 23 \text{ mg/kg/day}$$

$$X = 805 \text{ mg/l } (805{,}000 \ \mu\text{g/l})$$

Soil:

$$\frac{X \text{ mg/kg} * 200 \text{ mg/day} * \text{kg}/10^6 \text{ mg}}{70 \text{ kg}} = 23 \text{ mg/kg/day}$$

$$X = 8{,}050{,}000 \text{ mg/kg soil}$$

Fish:

$$\frac{X \text{ mg/kg} * 16{,}000 \text{ mg/day} * \text{kg}/10^6 \text{ mg}}{70 \text{ kg}} = 23 \text{ mg/kg/day}$$

$$X = 100{,}630 \text{ mg/kg fish}$$

Potassium

The NRC has determined that the estimated adequate and safe intake level for potassium is between 1,875 and 5,600 mg/day (NRC, 1989). However, acute poisoning in children has been observed at levels as low as 2,000 mg/day (NRC, 1980). Therefore, 2,000 mg/day was chosen as the acceptable level and that number divided by 10 to insure to add a ten-fold measure of safety since no official RDA was available. Back calculations were done as follows to determine acceptable daily intakes in water, soil, and fish, using 2 l/day as the ingestion rate of water, 200 mg/kg as the soil ingestion rate (for a child) (USEPA, 1989), and 16 g/day as the fish consumption rate (for a child) (USEPA, 1994).

Water:

$$X \text{ mg/l} * 2 \text{ l/day} = 200 \text{ mg/day}$$

$$X = 100 \text{ mg/l } (100{,}000\ \mu\text{g/l})$$

Soil:

$$X \text{ mg/kg} * 200 \text{ mg/day} * \text{kg}/10^6 \text{ mg} = 200 \text{ mg/day}$$

$$X = 1{,}000{,}000 \text{ mg/kg soil}$$

Fish:

$$X \text{ mg/kg} * 16{,}000 \text{ mg/day} * \text{kg}/10^6 \text{ mg} = 200 \text{ mg/day}$$

$$X = 12{,}500 \text{ mg/kg fish}$$

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