N00109.AR.002633
NWS YORKTOWN
5090.3a

FINAL PHASE II REMEDIAL INVESTIGATION REPORT FOR SITE 1 AND SITE 3 VOLUME 4 OF 4 APPENDICES H THROUGH K NWS YORKTOWN VA

8/1/2012

CH2M HILL

Appendix H
Raw Laboratory Data

Station ID	YS01-DW001	YS01-DW002	YS01-DW003	YS01-DW004
Sample ID	YS01-DW001-0109	YS01-DW002-0109	YS01-DW003-0109	YS01-DW004-0209
Sample Date	01/29/09	01/29/09	01/30/09	02/02/09
Chemical Name				
Volatile Organic Compounds (UG/L)				
1,1,1-Trichloroethane	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	1.7	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	0.5 U	0.5 U	0.5 U	0.8
1,1-Dichloroethene	21	0.5 U	0.5 U	0.2 J
1,2-Dibromo-3-chloropropane	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromoethane	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	0.12 J	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	1,700	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U
2-Butanone	2.5 U	2.5 U	2.5 U	2.5 U
2-Hexanone	2.5 U	2.5 U	2.5 U	2.5 U
4-Methyl-2-pentanone	2.5 U	2.5 U	2.5 U	2.5 U
Acetone	26	1.5 L	2.5 R	4.4 L
Benzene	0.15 J	0.5 U	0.5 U	0.5 U
Bromodichloromethane	0.5 U	0.5 U	0.5 U	0.5 U
Bromoform	0.5 U	0.5 U	0.5 U	0.5 U
Bromomethane	0.5 U	0.5 U	0.5 U	0.5 U
Carbon disulfide	0.28 J	0.5 U	0.5 U	0.21 J
Carbon tetrachloride	0.5 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U
Chloroethane	0.61	0.5 U	0.5 U	0.5 U
Chloroform	0.5 U	8.5	0.5 U	0.5 U
Chloromethane	0.94	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	1,700	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	0.5 U	0.5 U	0.5 U	0.5 U
Cyclohexane	0.5 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	0.16 J	0.66	0.5	0.24 J
Isopropylbenzene	0.5 U	0.5 U	0.5 U	0.5 U
m- and p-Xylene	0.75 J	1 U	1 U	0.24 J
Methyl acetate	0.5 U	0.5 U	0.5 U	0.5 U
Methylcyclohexane	0.5 U	0.5 U	0.5 U	0.5 U
Methylene chloride	0.12 J	0.26 B	0.28 B	0.18 B
Methyl-tert-butyl ether (MTBE)	0.5 U	0.5 U	0.5 U	0.5 U
o-Xylene	0.31 J	0.5 U	0.5 U	0.5 U
Styrene	0.5 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene	0.52	0.5 U	0.5 U	0.5 U
Toluene	3.1	0.37 J	0.28 J	0.18 J
trans-1,2-Dichloroethene	14	0.5 U	0.5 U	0.5 U
trans-1,3-Dichloropropene	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	11,000 J	0.49 J	0.5 U	0.16 J
Trichlorofluoromethane(Freon-11)	0.5 U	0.5 U	0.5 U	0.5 U
Vinyl chloride	32 J	0.5 U	0.5 U	0.5 U

Station ID	YS01-DW001	YS01-DW002	YS01-DW003	YS01-DW004
Sample ID	YS01-DW001-0109	YS01-DW002-0109	YS01-DW003-0109	YS01-DW004-0209
Sample Date	01/29/09	01/29/09	01/30/09	02/02/09
Chemical Name				
Xylene, total	1.1	0.5 U	0.5 U	0.26 J
Semivolatile Organic Compounds (UG/L)				
1,2,4-Trichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	0.5 U	0.5 U	0.5 U	0.5 U

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

D - Compound identified in an analysis at a secondary dilution factor

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

CELLS/ML - Cells per milliliter

MG/L - Milligrams per liter

UG/L - Micrograms per liter

Station ID	YS01-DW001	YS01-DW002	YS01-DW003	YS01-DW004
Sample ID	YS01-DW001-0109	YS01-DW002-0109	YS01-DW003-0109	YS01-DW004-0209
Sample Date	01/29/09	01/29/09	01/30/09	02/02/09
Chemical Name				
Volatile Organic Compounds (UG/L)				
1,1,2-Trichloroethane	1.7	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	0.5 U	0.5 U	0.5 U	0.8
1,1-Dichloroethene	21	0.5 U	0.5 U	0.2 J
1,2-Dichloroethane	0.12 J	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	1,700	0.5 U	0.5 U	0.5 U
Acetone	26	1.5 L	2.5 R	4.4 L
Benzene	0.15 J	0.5 U	0.5 U	0.5 U
Carbon disulfide	0.28 J	0.5 U	0.5 U	0.21 J
Chloroethane	0.61	0.5 U	0.5 U	0.5 U
Chloroform	0.5 U	8.5	0.5 U	0.5 U
Chloromethane	0.94	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	1,700	0.5 U	0.5 U	0.5 U
Ethylbenzene	0.16 J	0.66	0.5	0.24 J
m- and p-Xylene	0.75 J	1 U	1 U	0.24 J
Methylene chloride	0.12 J	0.26 B	0.28 B	0.18 B
o-Xylene	0.31 J	0.5 U	0.5 U	0.5 U
Tetrachloroethene	0.52	0.5 U	0.5 U	0.5 U
Toluene	3.1	0.37 J	0.28 J	0.18 J
trans-1,2-Dichloroethene	14	0.5 U	0.5 U	0.5 U
Trichloroethene	11,000 J	0.49 J	0.5 U	0.16 J
Vinyl chloride	32 J	0.5 U	0.5 U	0.5 U
Xylene, total	1.1	0.5 U	0.5 U	0.26 J
Semivolatile Organic Compounds (UG/L)				
No Detections	NA	NA	NA	NA

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

D - Compound identified in an analysis at a secondary dilution factor

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UL - Analyte not detected, quantitation limit is probably higher

CELLS/ML - Cells per milliliter

MG/L - Milligrams per liter

UG/L - Micrograms per liter

Station ID	CLEAN MCL-Groundwater	CLEAN RSLs Tapwater Adjusted	YS01-DW001	YS01-DW002	YS01-DW003	YS01-DW004
Sample ID			YS01-DW001-0109	YS01-DW002-0109	YS01-DW003-0109	YS01-DW004-0209
Sample Date			01/29/09	01/29/09	01/30/09	02/02/09
Chemical Name						
Volatile Organic Compounds (UG/L)						
1,1,2-Trichloroethane	5	0.24	1.7	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	--	2.4	0.5 U	0.5 U	0.5 U	0.8
1,1-Dichloroethene	7	34	21	0.5 U	0.5 U	0.2 J
1,2-Dichloroethane	5	0.15	0.12 J	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	70	33	1,700	0.5 U	0.5 U	0.5 U
Acetone	--	2,200	26	1.5 L	2.5 R	4.4 L
Benzene	5	0.41	0.15 J	0.5 U	0.5 U	0.5 U
Carbon disulfide	--	100	0.28 J	0.5 U	0.5 U	0.21 J
Chloroethane	--	2,100	0.61	0.5 U	0.5 U	0.5 U
Chloroform	80	0.19	0.5 U	8.5	0.5 U	0.5 U
Chloromethane	--	19	0.94	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	70	37	1,700	0.5 U	0.5 U	0.5 U
Ethylbenzene	700	1.5	0.16 J	0.66	0.5	0.24 J
m- and p-Xylene	--	--	0.75 J	1 U	1 U	0.24 J
Methylene chloride	5	4.8	0.12 J	0.26 B	0.28 B	0.18 B
o-Xylene	--	140	0.31 J	0.5 U	0.5 U	0.5 U
Tetrachloroethene	5	0.11	0.52	0.5 U	0.5 U	0.5 U
Toluene	1,000	230	3.1	0.37 J	0.28 J	0.18 J
trans-1,2-Dichloroethene	100	11	14	0.5 U	0.5 U	0.5 U
Trichloroethene	5	1.7	11,000 J	0.49 J	0.5 U	0.16 J
Vinyl chloride	2	0.016	32 J	0.5 U	0.5 U	0.5 U
Xylene, total	10,000	20	1.1	0.5 U	0.5 U	0.26 J
Semivolatile Organic Compounds (UG/L)						
No Detections	--	--	NA	NA	NA	NA

Notes:

Shading indicates exceedance of MCL Groundwater

Bold indicates exceedance of RSLs

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

D - Compound identified in an analysis at a secondary dilution factor

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

CELLS/ML - Cells per milliliter

MG/L - Milligrams per liter

UG/L - Micrograms per liter

Station ID	YS03-DW001	YS03-DW002	YS03-DW003	YS03-DW004
Sample ID	YS03-DW001-0209	YS03-DW002-0209	YS03-DW003-0209	YS03-DW004-0209
Sample Date	02/02/09	02/02/09	02/02/09	02/02/09
Chemical Name				
Volatile Organic Compounds (UG/L)				
1,1,1-Trichloroethane	1.8 U	0.5 U	0.5 U	36 U
1,1,2,2-Tetrachloroethane	1.8 U	0.5 U	0.5 U	36 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	1.8 U	0.5 U	0.5 U	36 U
1,1,2-Trichloroethane	1.8 U	0.5 U	0.5 U	36 U
1,1-Dichloroethane	1.8 U	0.12 J	0.49 J	8.1 J
1,1-Dichloroethene	1.8 U	0.5 U	1.4	12 J
1,2-Dibromo-3-chloropropane	1.8 U	0.5 U	0.5 U	36 U
1,2-Dibromoethane	1.8 U	0.5 U	0.5 U	36 U
1,2-Dichlorobenzene	1.8 U	0.5 U	0.5 U	36 U
1,2-Dichloroethane	1.8 U	0.5 U	0.5 U	36 U
1,2-Dichloroethene (total)	64	0.25 J	12	1,100
1,2-Dichloropropane	1.8 U	0.5 U	0.5 U	36 U
1,3-Dichlorobenzene	1.8 U	0.5 U	0.5 U	36 U
1,4-Dichlorobenzene	1.8 U	0.5 U	0.14 J	36 U
2-Butanone	8.9 U	2.5 U	2.5 U	180 U
2-Hexanone	8.9 U	2.5 U	2.5 U	180 U
4-Methyl-2-pentanone	8.9 U	2.5 U	2.5 U	180 U
Acetone	15 L	3 L	1.8 L	180 R
Benzene	1.8 U	0.5 U	0.24 J	36 U
Bromodichloromethane	1.8 U	0.5 U	0.5 U	36 U
Bromoform	1.8 U	0.5 U	0.5 U	36 U
Bromomethane	1.8 U	0.5 U	0.5 U	36 U
Carbon disulfide	1.8 U	0.5 U	0.5 U	36 U
Carbon tetrachloride	1.8 U	0.5 U	0.5 U	36 U
Chlorobenzene	1.8 U	0.5 U	0.5 U	36 U
Chloroethane	1.8 U	0.5 U	0.41 J	36 U
Chloroform	1.8 U	0.5 U	0.5 U	36 U
Chloromethane	1.1 J	0.5 U	0.5 U	20 J
cis-1,2-Dichloroethene	65	0.25 J	12	1,100
cis-1,3-Dichloropropene	1.8 U	0.5 U	0.5 U	36 U
Cyclohexane	1.8 U	0.5 U	0.5 U	36 U
Dichlorodifluoromethane (Freon-12)	1.8 U	0.5 U	0.5 U	36 U
Ethylbenzene	0.61 J	0.82	0.54	36 U
Isopropylbenzene	1.8 U	0.5 U	0.5 U	36 U
m- and p-Xylene	3.6 U	0.24 J	1 U	71 U
Methyl acetate	1.8 U	0.5 U	0.5 U	36 U
Methylcyclohexane	1.8 U	0.5 U	0.12 J	36 U
Methylene chloride	0.66 B	0.25 B	0.23 B	13 B
Methyl-tert-butyl ether (MTBE)	1.8 U	0.5 U	0.5 U	36 U
o-Xylene	1.8 U	0.5 U	0.14 J	36 U
Styrene	1.8 U	0.5 U	0.5 U	36 U
Tetrachloroethene	1.8 U	0.5 U	0.5 U	36 U
Toluene	0.57 J	0.42 J	0.32 J	36 U
trans-1,2-Dichloroethene	1.8 U	0.5 U	0.5 U	36 U
trans-1,3-Dichloropropene	1.8 U	0.5 U	0.5 U	36 U
Trichloroethene	16 J	3.1 J	0.5 U	270 J
Trichlorofluoromethane(Freon-11)	1.8 U	0.5 U	0.5 U	36 U
Vinyl chloride	1.8	0.5 U	17	690

Station ID	YS03-DW001	YS03-DW002	YS03-DW003	YS03-DW004
Sample ID	YS03-DW001-0209	YS03-DW002-0209	YS03-DW003-0209	YS03-DW004-0209
Sample Date	02/02/09	02/02/09	02/02/09	02/02/09
Chemical Name				
Xylene, total	1.8 U	0.25 J	0.14 J	36 U
Semivolatile Organic Compounds (UG/L)				
1,2,4-Trichlorobenzene	1.8 U	0.5 U	0.5 U	36 U
Dibromochloromethane	1.8 U	0.5 U	0.5 U	36 U
Total Metals (UG/L)				
Aluminum	NA	NA	NA	NA
Antimony	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA
Barium	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA
Calcium	NA	NA	NA	NA
Chromium	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA
Copper	NA	NA	NA	NA
Iron	NA	NA	NA	NA
Lead	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA
Manganese	NA	NA	NA	NA
Mercury	NA	NA	NA	NA
Nickel	NA	NA	NA	NA
Potassium	NA	NA	NA	NA
Selenium	NA	NA	NA	NA
Silver	NA	NA	NA	NA
Sodium	NA	NA	NA	NA
Thallium	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA
Zinc	NA	NA	NA	NA
Dissolved Metals (UG/L)				
Aluminum, Dissolved	NA	NA	NA	NA
Antimony, Dissolved	NA	NA	NA	NA
Arsenic, Dissolved	NA	NA	NA	NA
Barium, Dissolved	NA	NA	NA	NA
Beryllium, Dissolved	NA	NA	NA	NA
Cadmium, Dissolved	NA	NA	NA	NA
Calcium, Dissolved	NA	NA	NA	NA
Chromium, Dissolved	NA	NA	NA	NA
Cobalt, Dissolved	NA	NA	NA	NA
Copper, Dissolved	NA	NA	NA	NA
Iron, Dissolved	NA	NA	NA	NA
Lead, Dissolved	NA	NA	NA	NA
Magnesium, Dissolved	NA	NA	NA	NA
Manganese, Dissolved	NA	NA	NA	NA
Mercury, Dissolved	NA	NA	NA	NA
Nickel, Dissolved	NA	NA	NA	NA
Potassium, Dissolved	NA	NA	NA	NA

Station ID	YS03-DW001	YS03-DW002	YS03-DW003	YS03-DW004
Sample ID	YS03-DW001-0209	YS03-DW002-0209	YS03-DW003-0209	YS03-DW004-0209
Sample Date	02/02/09	02/02/09	02/02/09	02/02/09
Chemical Name				
Selenium, Dissolved	NA	NA	NA	NA
Silver, Dissolved	NA	NA	NA	NA
Sodium, Dissolved	NA	NA	NA	NA
Thallium, Dissolved	NA	NA	NA	NA
Vanadium, Dissolved	NA	NA	NA	NA
Zinc, Dissolved	NA	NA	NA	NA
Wet Chemistry				
Alkalinity (MG/L)	NA	NA	NA	NA
Chloride (MG/L)	NA	NA	NA	NA
Ethane (UG/L)	NA	NA	NA	NA
Ethene (UG/L)	NA	NA	NA	NA
Methane (UG/L)	NA	NA	NA	NA
Sulfate (MG/L)	NA	NA	NA	NA
Total organic carbon (TOC) (MG/L)	NA	NA	NA	NA
Dechlorinating Bacteria (CELLS/ML)				
Dehalococcoides	NA	NA	NA	NA

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

BD

D - Compound identified in an analysis at a secondary dilution factor

J - Analyte present, value may or may not be accurate or precise

JB

JD

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UL - Analyte not detected, quantitation limit is probably higher

CELLS/ML - Cells per milliliter

MG/L - Milligrams per liter

UG/L - Micrograms per liter

Station ID	YS03-DW001	YS03-DW002	YS03-DW003	YS03-DW004
Sample ID	YS03-DW001-0209	YS03-DW002-0209	YS03-DW003-0209	YS03-DW004-0209
Sample Date	02/02/09	02/02/09	02/02/09	02/02/09
Chemical Name				
Volatile Organic Compounds (UG/L)				
1,1-Dichloroethane	1.8 U	0.12 J	0.49 J	8.1 J
1,1-Dichloroethene	1.8 U	0.5 U	1.4	12 J
1,2-Dichloroethene (total)	64	0.25 J	12	1,100
1,4-Dichlorobenzene	1.8 U	0.5 U	0.14 J	36 U
Acetone	15 L	3 L	1.8 L	180 R
Benzene	1.8 U	0.5 U	0.24 J	36 U
Chloroethane	1.8 U	0.5 U	0.41 J	36 U
Chloromethane	1.1 J	0.5 U	0.5 U	20 J
cis-1,2-Dichloroethene	65	0.25 J	12	1,100
Ethylbenzene	0.61 J	0.82	0.54	36 U
m- and p-Xylene	3.6 U	0.24 J	1 U	71 U
Methylcyclohexane	1.8 U	0.5 U	0.12 J	36 U
o-Xylene	1.8 U	0.5 U	0.14 J	36 U
Toluene	0.57 J	0.42 J	0.32 J	36 U
Trichloroethene	16 J	3.1 J	0.5 U	270 J
Vinyl chloride	1.8	0.5 U	17	690
Xylene, total	1.8 U	0.25 J	0.14 J	36 U
Semivolatile Organic Compounds (UG/L)				
No Detections	NA	NA	NA	NA

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

BD

D - Compound identified in an analysis at a secondary dilution factor

J - Analyte present, value may or may not be accurate or precise

JB

JD

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UL - Analyte not detected, quantitation limit is probably higher

CELLS/ML - Cells per milliliter

MG/L - Milligrams per liter

UG/L - Micrograms per liter

Station ID Sample ID Sample Date	CLEAN MCL-Groundwater	CLEAN RSLs Tapwater Adjusted	YS03-DW001 YS03-DW001-0209 02/02/09	YS03-DW002 YS03-DW002-0209 02/02/09	YS03-DW003 YS03-DW003-0209 02/02/09	YS03-DW004 YS03-DW004-0209 02/02/09
Chemical Name						
Volatile Organic Compounds (UG/L)						
1,1-Dichloroethane	--	2.4	1.8 U	0.12 J	0.49 J	8.1 J
1,1-Dichloroethene	7	34	1.8 U	0.5 U	1.4	12 J
1,2-Dichloroethene (total)	70	33	64	0.25 J	12	1,100
1,4-Dichlorobenzene	75	0.43	1.8 U	0.5 U	0.14 J	36 U
Acetone	--	2,200	15 L	3 L	1.8 L	180 R
Benzene	5	0.41	1.8 U	0.5 U	0.24 J	36 U
Chloroethane	--	2,100	1.8 U	0.5 U	0.41 J	36 U
Chloromethane	--	19	1.1 J	0.5 U	0.5 U	20 J
cis-1,2-Dichloroethene	70	37	65	0.25 J	12	1,100
Ethylbenzene	700	1.5	0.61 J	0.82	0.54	36 U
m- and p-Xylene	--	--	3.6 U	0.24 J	1 U	71 U
Methylcyclohexane	--	--	1.8 U	0.5 U	0.12 J	36 U
o-Xylene	--	140	1.8 U	0.5 U	0.14 J	36 U
Toluene	1,000	230	0.57 J	0.42 J	0.32 J	36 U
Trichloroethene	5	1.7	16 J	3.1 J	0.5 U	270 J
Vinyl chloride	2	0.016	1.8	0.5 U	17	690
Xylene, total	10,000	20	1.8 U	0.25 J	0.14 J	36 U
Semivolatile Organic Compounds (UG/L)						
No Detections	--	--	NA	NA	NA	NA

Notes:

Shading indicates exceedance of MCL

Bold box indicates exceedance of Adjusted RSL Tapwater

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

D - Compound identified in an analysis at a secondary dilution factor

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UL - Analyte not detected, quantitation limit is probably higher

CELLS/ML - Cells per milliliter

MG/L - Milligrams per liter

UG/L - Micrograms per liter

CTO-166
Yorktown - Site 1
Groundwater Raw Analytical Results
March 2009

Station ID	YS01-GW004	YS01-GW004A	YS01-GW005	YS01-GW005A	YS01-GW012	YS01-GW012A		YS01-GW013	YS01-GW013A	YS01-GW014	YS01-GW017	YS01-GW018	YS01-GW019	YS01-GW021	YS01-GW022		YS01-GW023	YS01-GW024	YS01-GW025
Sample ID	YS01-GW04-0309	YS01-GW04A-0309	YS01-GW05-0309	YS01-GW05A-0309	YS01-GW12-0309	YS01-GW12A-0309	YS01-GW12AP-0309	YS01-GW13-0309	YS01-GW13A-0309	YS01-GW14-0309	YS01-GW17-0309	YS01-GW18-0309	YS01-GW19-0309	YS01-GW21-0309	YS01-GW22-0309	YS01-GW22P-0309	YS01-GW23-0309	YS01-GW24-0309	YS01-GW25-0309
Sample Date	03/16/09	03/16/09	03/10/09	03/10/09	03/13/09	03/12/09	03/12/09	03/09/09	03/09/09	03/13/09	03/12/09	03/11/09	03/11/09	03/12/09	03/16/09	03/16/09	03/10/09	03/10/09	03/10/09
Chemical Name																			
Volatile Organic Compounds (µg/l)																			
1,1,1-Trichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.7	1.6	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.26 J	0.26 J	0.5 U	0.5 U	0.6
1,1-Dichloroethene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3	8.6	0.5 U	0.5 U	0.5 U
1,2,4-Trichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromoethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	20	0.2 J	0.5 U	0.5 U	4.1	14 J	26 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3,000	2,800	0.5 U	0.42 J	0.5 U
1,2-Dichloropropane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-Butanone	2.5 R	2.5 R	2.5 U	2.5 U	2.5 U	13 R	21 R	2.5 U	2.5 U	2.5 R	2.5 R	2.5 U	2.5 U	2.5 R	2.5 R	2.5 R	2.5 U	2.5 U	2.5 U
2-Hexanone	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	13 U	21 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
4-Methyl-2-pentanone	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	13 U	21 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Acetone	3.1 B	12 B	2.1 B	2.5 R	2.5 R	6.7 B	21 U	2.1 B	1.5 B	1.7 B	1.9 B	2.5 R	2.5 R	2.5 U	2.5 U	1.5 B	1.9 B	6 B	4.8 B
Benzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.24 J	0.24 J	0.5 U	0.5 U	0.5 U
Bromodichloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromoform	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromomethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 UJ	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon disulfide	0.5 U	0.5 U	1.4	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.15 J	0.37 J	0.39 J	0.5 U	0.5 U	0.5 U
Carbon tetrachloride	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroform	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.35 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.74	0.73
Chloromethane	0.23 B	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.14 J	0.5 U
cis-1,2-Dichloroethene	20	0.21 J	0.5 U	0.5 U	4.3	15 J	28 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3,000	2,900	0.5 U	0.44 J	0.5 U
cis-1,3-Dichloropropene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Cyclohexane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	0.5 U	0.5 U	0.5 U	0.5 U	0.14 J	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.16 J	0.13 J
Isopropylbenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
m- and p-Xylene	1 U	1 U	1 U	1 U	1 U	5 U	8.3 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methyl acetate	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylcyclohexane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylene chloride	0.5 U	0.5 U	0.11 B	0.11 B	0.14 B	2.5 U	4.2 U	0.13 B	0.13 B	0.5 U	0.5 U	0.15 B	0.15 B	0.5 U	0.13 B	0.14 B	0.11 B	0.15 B	0.11 B
Methyl-tert-butyl ether (MTBE)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
o-Xylene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Styrene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.21 J	0.21 J	0.5 U	0.5 U	0.5 U
Toluene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.25 B	0.25 B	0.12 B	0.24 B	0.21 B
trans-1,2-Dichloroethene	0.15 J	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5.6	5.3	0.5 U	0.5 U	0.5 U
trans-1,3-Dichloropropene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	0.5 U	3.7	0.5 U	0.5 U	56	57 J	95 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.54	18,000	17,000	1.4	6.9	0.5 U
Trichlorofluoromethane(Freon-11)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Vinyl chloride	0.48 J	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.6	3.6	0.5 U	0.5 U	0.5 U
Xylene, total	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Total Metals (µg/l)																			
Aluminum	1,300	162 J	3,010	187 J	224	720	778	1,120	617	599	500	111 J	962	4,960	1,420 J	3,920 J	929	3,410	639
Antimony	5.1 B	5.2 B	6.8 J	9.3 J	3.5 B	10.1	7.7 J	6 J	7.6 J	4.5 B	6.7 J	9.9 J	8.8 J	8.3 J	5.3 B	4.4 B	7.1 J	8.8 J	6.4 J
Arsenic	5.2 J	2.2 U	4.9 B	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	26.6	9.7 B	23.4	2.2 U	14.7	2.2 U	2.2 U	3.4 B	19.1	2.2 U
Barium	46.7 J	10 J	30.6 J	11.2 J	101 J	37 J	33.7 J	167 J	38.2 J	104 J	2.8 J	43.6 J	28.2 J	58.1 J	27.7 J	31.9 J	21.2 J	38.6 J	32.9 J
Beryllium	0.42 U	0.42 U	0.73 J	0.42 U	0.42 UL	0.42 U	0.42 U	0.42 U	0.42 U	0.42 UL	0.42 U	0.42 U	0.42 U	0.42 U	0.42 UL	0.42 UL	0.42 U	0.42 U	0.42 U
Cadmium	0.64 U	0.64 U	0.64 U	0.64 U	11.4	0.64 U	0.66 J	0.64 U	0.64 U	0.64 U	0.64 U	1.4 J	5.8	2.9 J	0.64 U	0.64 U	0.64 U	1.4 J	0.99 J
Calcium	82,200	25,200	53,000	36,000	73,900	53,500	67,700	6,320	38,000	1,920 J	3,900 J	60,300	29,100	159,000	125,000	124,000	90,800	70,500	147,000
Chromium	2.2 J	4 J	2.3 J	35.2	0.7 U	2.5 J	3.7 J	1.6 J	29.3	1.8 J	1.7 J	1.8 J	2.9 J	25.1	9 J	11.5	4.9 J	25.8	8.4 J
Cobalt	1.6 U	1.6 U	11	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	4.1 J	1.6 U	1.6 U	1.6 U	5.5	1.6 U	1.6 U	1.6 U	2.5 J	1.6 U
Copper	0.85 J	0.91 J	1.2 J	4.6 J	6	2.9 J	2.9 J	0.84 U	1.3 J	1.8 J	0.84 U	0.97 J	3.3 J	9.1	2.7 J	3.3 J	1.5 J	3.7 J	0.84 U
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	2,170	320	5,850	555	375	669 J	954 J	1,610	871	9,910	6,690	11,800	1,970	13,500	3,960 J	5,280 J	2,060	11,200	1,800
Lead	1.4 UL	1.4 UL	2.2 L	3.5 L	1.6 L	2.7 L	3.8 L	2.6 L	3.4 L	6 L	2.4 L	2.4 L	4.9 L	6 L	1.4 UL	1.6 L	2.4 L	4.1 L	2.7 L
Magnesium	2,340 J	425 J	17,000	604 J	5,640	1,120 J	1,920 J	2,370 J	1,250 J	929 J	1,230 J	6,070	2,960 J	4,400 J	4,760 J	4,380 J	1,800 J	2,520 J	2,950 J
Manganese	72.3	26.9	59.9	50.7	37.3	59.8 J	110 J	66	80.9	26	23.6	238	20.6	705	103	103	80.9	200	65.7
Mercury	0.1 U	0.1 U	0.1 UL	0.1 UL	0.1 U	0.1 UL	0.1 UL	0.1 UL	0.1 UL	0.1 U	0.1 UL	0.1 UL	0.1 UL	0.1 UL	0.1 U	0.1 U	0.1 UL	0.1 UL	0.1 UL
Nickel	0.67 U	2.1 J	8.3 B	15.8 B	6.2 B	1.9 B	2.3 B	2.8 B	12.8 B	4.2 B	0.67 U	0.67 U	1.1 B	17.3 B	4.5 J	5.6 J	2.6 B	10.7 B	4 B
Potassium	1,130 J	1,070 J	1,830 J	727 J	2,300 J	19,200 J	9,080 J	1,910 J	1,160 J	911 J	124 J	815 J	1,940 J	3,250 J	2,500 J	2,830 J	1,380 J	3,300 J	2,240 J
Selenium	2.2 UL	2.2 UL	2.8 J	2.2 U	2.2 UL	2.2 U	2.2 U	2.2 U	2.2 U	2.2 UL	2.2 U	2.2 U	2.2 U	2.2 U	2.2 UL	2.2 UL	2.2 U	2.2 U	2.2 U
Silver	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Sodium	6,670	5,770	18,100	4,400 J	3,070 J	10,500 J	7,350 J	3,760 J	4,320 J	3,050 J	3,190 J	4,710 J	2,300 J	7,630	7,540	7,130	6,490	8,010	15,200
Thallium	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U
Vanadium	3.2 J	0.57 U	7.6 J	0.96 J	0.57 U	1.8 J	1.2 J	1.5 J	1.4 J	1 J	16.7 J	1.4 J	3.1 J	33.5	4.9 J	9.6 J	5.2 J	24.6	4.6 J
Zinc	6.3 J	5.2 U	34.6	15.1 J	2,210	13.7 J	18.7 J	49.8	5.2 U	14.5 J	5.2 U	14.2 J	281	33.9	14.9 J	20.8	10.6 J	21.2	5.8 J
Dissolved Metals (µg/l)																			
Aluminum, Dissolved	56.1 B	53.4 U	1,810	44.1 U	53.4 U	173 B	212 B	185 J	44.1 U	442	61.5 B	44.1 U	88.1 B	51.1 B	582 J	202 B	44.1 U	44.1 U	44.1 U
Antimony, Dissolved	2.4 U	2.8 B	2.7 U	2.7 U	2.4 U	2.7 U	2.7 U	2.7 U	2.7 U	2.4 U	2.7 U	2.7 U	2.7 U	2.7 U	2.4 U	2.4 U	2.7 U	2.7 U	2.7 U
Arsenic, Dissolved	5.4 J	2.2 U	5.7 J	2.8 U	2.2 U	2.8 U	3.3 B	2.8 U	2.8 U	2.2 U	2.8 U	28.6	9.6 B	6.8 B	2.9 J	2.2 U	2.8 U	2.8 U	5.2 J

CTO-166
Yorktown - Site 1
Groundwater Raw Analytical Results
March 2009

Station ID	YS01-GW004	YS01-GW004A	YS01-GW005	YS01-GW005A	YS01-GW012	YS01-GW012A		YS01-GW013	YS01-GW013A	YS01-GW014	YS01-GW017	YS01-GW018	YS01-GW019	YS01-GW021	YS01-GW022		YS01-GW023	YS01-GW024	YS01-GW025
Sample ID	YS01-GW04-0309	YS01-GW04A-0309	YS01-GW05-0309	YS01-GW05A-0309	YS01-GW12-0309	YS01-GW12A-0309	YS01-GW12AP-0309	YS01-GW13-0309	YS01-GW13A-0309	YS01-GW14-0309	YS01-GW17-0309	YS01-GW18-0309	YS01-GW19-0309	YS01-GW21-0309	YS01-GW22-0309	YS01-GW22P-0309	YS01-GW23-0309	YS01-GW24-0309	YS01-GW25-0309
Sample Date	03/16/09	03/16/09	03/10/09	03/10/09	03/13/09	03/12/09	03/12/09	03/09/09	03/09/09	03/13/09	03/12/09	03/11/09	03/11/09	03/12/09	03/16/09	03/16/09	03/10/09	03/10/09	03/10/09
Chemical Name																			
Barium, Dissolved	42 J	9.3 J	28.1 J	9.9 J	103 J	23.9 J	24.3 J	162 J	20.1 J	103 J	2.1 J	39.3 J	25.2 J	13.6 J	26.3 J	22.6 J	19.7 J	18.1 J	29.9 J
Beryllium, Dissolved	1 B	0.42 U	0.32 U	0.32 U	0.5 B	0.32 U	0.39 B	0.32 U	0.32 U	0.55 B	0.32 U	0.32 U	0.32 U	0.47 B	0.83 B	0.71 B	0.32 U	0.32 U	0.32 U
Cadmium, Dissolved	0.64 U	0.64 U	0.34 U	0.34 U	13	0.34 U	0.34 U	0.34 U	0.34 U	0.64 U	0.34 U	0.34 U	5.5	0.34 U	0.64 U	0.64 U	0.34 U	0.34 U	0.34 U
Calcium, Dissolved	91,500	27,200	55,700	36,400	81,200	34,300	33,400	6,930	33,400	2,040 J	4,180 J	56,700	28,900	91,500	138,000	129,000	96,700	48,800	146,000
Chromium, Dissolved	0.7 U	0.7 U	0.88 U	0.88 U	0.7 U	0.88 U	0.88 U	0.88 U	0.88 U	0.7 U	0.88 U	0.89 J	0.88 U	0.88 U	1.4 J	0.7 U	0.88 U	0.88 U	0.88 U
Cobalt, Dissolved	1.6 U	1.6 U	13.7	0.65 U	1.6 U	0.65 U	0.67 J	1.4 J	0.65 U	3.4 B	0.65 U	0.87 J	0.65 U	0.65 U	1.6 U	1.6 U	0.65 U	0.65 U	0.65 U
Copper, Dissolved	7.7 L	1.2 L	1.8 B	21.6	4.1 L	1.2 J	0.9 U	1.2 B	1.4 B	0.95 L	0.9 U	1.2 J	2.2 J	0.9 U	2.5 L	0.84 UL	1 B	1.4 B	1.5 B
Iron, Dissolved	596	31.1 B	3,420	19.9 U	24.6 U	26.1 B	19.9 U	19.9 U	19.9 U	24.6 U	19.9 U	8,000	103 B	19.9 U	1,500 J	382 J	33.6 B	19.9 U	19.9 U
Lead, Dissolved	5.3	1.4 U	2.6 U	2.6 U	1.4 U	2.6 U	2.6 U	2.6 U	2.6 U	1.4 U	2.6 U	2.6 U	2.6 U	2.6 U	2.9 J	1.4 U	2.6 U	2.6 U	2.6 U
Magnesium, Dissolved	2,720 J	470 J	18,200	597 J	6,550	516 J	464 J	2,570 J	639 J	1,040 J	1,290 J	6,100	3,110 J	2,760 J	5,200	4,800 J	1,730 J	1,460 J	2,900 J
Manganese, Dissolved	71	14.4	54.6	28.2	0.99 B	5.4 J	3.2 J	63.6	19.3	25.7	5.7 J	233	16.6	11	125	98.2	64.8	116	59.1
Mercury, Dissolved	0.1 U	0.1 U	0.1 UL	0.1 UL	0.1 U	0.15 L	0.1 UL	0.1 UL	0.1 UL	0.1 U	0.1 UL	0.1 UL	0.1 UL	0.1 UL	0.14 J	0.1 U	0.1 UL	0.1 UL	0.1 UL
Nickel, Dissolved	0.92 B	1 B	9 J	1.3 U	7.6 J	7.1 J	1.3 U	2.1 J	1.3 U	3.9 B	1.3 U	1.3 U	1.6 J	1.3 U	2.3 B	1.7 B	1.3 U	1.3 U	1.3 U
Potassium, Dissolved	1,540 J	1,390 J	2,700 B	1,290 B	3,190 J	11,300 J	13,300 J	2,520 B	1,660 B	1,260 J	710 B	1,420 B	2,480 B	1,860 B	2,810 J	2,740 J	1,600 B	2,260 B	2,360 B
Selenium, Dissolved	2.2 U	2.2 U	4.1 U	4.1 U	2.2 U	4.1 U	4.1 U	4.1 U	4.1 U	2.2 U	4.1 U	19.3 K	10.1 K	6.7 K	3.1 B	2.2 U	4.1 U	7.6 K	13.9 K
Silver, Dissolved	0.62 U	0.62 U	0.61 U	0.61 U	0.62 U	0.61 U	0.61 U	0.63 B	0.96 B	0.62 U	0.61 U	0.61 U	0.61 U	0.61 U	0.62 U	0.62 U	0.61 U	0.61 U	0.92 B
Sodium, Dissolved	7,910	6,250	19,300	4,110 J	3,270 J	7,020	7,530	3,660 J	4,110 J	3,150 J	2,680 J	3,660 J	1,330 B	6,470	8,320	8,370	6,580	7,740	15,100
Thallium, Dissolved	3.3 U	3.3 U	6.2 U	6.2 U	3.3 U	6.2 U	6.2 U	6.2 U	6.2 U	5.9 B	6.2 U	6.2 U	6.2 U	6.2 U	3.3 U	3.3 U	6.2 U	6.2 U	6.2 U
Vanadium, Dissolved	0.57 U	0.57 U	4.4 J	0.47 U	0.57 U	0.55 B	0.67 B	0.47 U	0.98 B	0.57 U	1.6 B	0.7 B	0.47 U	0.47 U	2.1 J	1 J	0.79 B	0.63 B	0.79 B
Zinc, Dissolved	11.5 B	11.1 B	33.8	1 B	2,470	3.7 B	2.6 B	44.8	1.6 J	11.8 B	2.6 B	11.5 J	257	1.5 B	15.6 B	8 B	2.2 B	0.74 U	1.4 J
Wet Chemistry																			
Alkalinity (mg/l)	198	62.7	10 U	93.3	156	32.3	NA	10 U	62.7	10 U	10 U	123	38	174	208	NA	204	116	301
Chloride (mg/l)	12 D	8.3 JD	35 D	7.4 JD	9 JD	10 D	NA	10 D	9.4 JD	8.5 JD	6.8 JD	6.5 JD	4.5 JD	12 D	50 D	NA	10 D	11 D	20 D
Ethane (ug/l)	2 U	2 U	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	NA	2 U	0.2 J	0.2 J
Ethene (ug/l)	2 U	2 U	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	NA	2 U	0.2 J	0.1 J
Methane (ug/l)	21 B	1 B	0.3 JB	0.3 JB	0.2 JB	5 B	NA	0.2 JB	0.3 JB	0.2 JB	0.2 JB	15 BD	0.4 JB	0.3 JB	0.4 JB	NA	0.3 JB	0.9 JB	0.6 JB
Nitrate (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	26 D	8.1 JD	190 D	14 JD	36 D	19 JD	NA	17 JD	13 JD	15 JD	13 JD	42 D	29 D	32 D	40 D	NA	36 D	21 JD	33 D
Total organic carbon (TOC) (mg/l)	2.2 J	0.79 J	11	1.4 J	3.4 J	1.5 J	NA	1.7 J	0.82 J	2.4 J	2.3 J	6.1	3.6 J	1.6 J	1.8 J	NA	2.9 J	8	5.1
Dechlorinating Bacteria (cells/ml)																			
Dehalococcoides	NA	NA	NA	NA	8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.3 J	NA	NA	NA	NA

Notes:

Shading indicates detections
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
D - Compound identified in an analysis at a secondary dilution factor
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
cells/ml - Cells per milliliter
mg/l - Milligrams per liter
µg/l - Micrograms per liter

CTO-166
Yorktown - Site 1
Groundwater Detected Analytical Results
March 2009

Station ID	YS01-GW004	YS01-GW004A	YS01-GW005	YS01-GW005A	YS01-GW012	YS01-GW012A		YS01-GW013	YS01-GW013A	YS01-GW014	YS01-GW017	YS01-GW018	YS01-GW019	YS01-GW021	YS01-GW022		YS01-GW023	YS01-GW024	YS01-GW025
Sample ID	YS01-GW04-0309	YS01-GW04A-0309	YS01-GW05-0309	YS01-GW05A-0309	YS01-GW12-0309	YS01-GW12A-0309	YS01-GW12AP-0309	YS01-GW13-0309	YS01-GW13A-0309	YS01-GW14-0309	YS01-GW17-0309	YS01-GW18-0309	YS01-GW19-0309	YS01-GW21-0309	YS01-GW22-0309	YS01-GW22P-0309	YS01-GW23-0309	YS01-GW24-0309	YS01-GW25-0309
Sample Date	03/16/09	03/16/09	03/10/09	03/10/09	03/13/09	03/12/09	03/12/09	03/09/09	03/09/09	03/13/09	03/12/09	03/11/09	03/11/09	03/12/09	03/16/09	03/16/09	03/10/09	03/10/09	03/10/09
Chemical Name																			
Volatile Organic Compounds (µg/l)																			
1,1,2-Trichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.7	1.6	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.26 J	0.26 J	0.5 U	0.5 U	0.6
1,1-Dichloroethene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3	8.6	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	20	0.2 J	0.5 U	0.5 U	4.1	14 J	26 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3,000	2,800	0.5 U	0.42 J	0.5 U
Benzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.24 J	0.24 J	0.5 U	0.5 U	0.5 U
Carbon disulfide	0.5 U	0.5 U	1.4	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.15 J	0.37 J	0.39 J	0.5 U	0.5 U	0.5 U
Chloroform	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.35 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.74	0.73
Chloromethane	0.23 B	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.14 J	0.5 U
cis-1,2-Dichloroethene	20	0.21 J	0.5 U	0.5 U	4.3	15 J	28 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3,000	2,900	0.5 U	0.44 J	0.5 U
Dichlorodifluoromethane (Freon-12)	0.5 U	0.5 U	0.5 U	0.5 U	0.14 J	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.16 J	0.13 J
Tetrachloroethene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.21 J	0.21 J	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	0.15 J	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5.6	5.3	0.5 U	0.5 U	0.5 U
Trichloroethene	0.5 U	3.7	0.5 U	0.5 U	56	57 J	95 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.54	18,000	17,000	1.4	6.9	0.5 U
Vinyl chloride	0.48 J	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.6	3.6	0.5 U	0.5 U	0.5 U
Total Metals (µg/l)																			
Aluminum	1,300	162 J	3,010	187 J	224	720	778	1,120	617	599	500	111 J	962	4,960	1,420 J	3,920 J	929	3,410	639
Antimony	5.1 B	5.2 B	6.8 J	9.3 J	3.5 B	10.1	7.7 J	6 J	7.6 J	4.5 B	6.7 J	9.9 J	8.8 J	8.3 J	5.3 B	4.4 B	7.1 J	8.8 J	6.4 J
Arsenic	5.2 J	2.2 U	4.9 B	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	26.6	9.7 B	23.4	2.2 U	14.7	2.2 U	2.2 U	3.4 B	19.1	2.2 U
Barium	46.7 J	10 J	30.6 J	11.2 J	101 J	37 J	33.7 J	167 J	38.2 J	104 J	2.8 J	43.6 J	28.2 J	58.1 J	27.7 J	31.9 J	21.2 J	38.6 J	32.9 J
Beryllium	0.42 U	0.42 U	0.73 J	0.42 U	0.42 UL	0.42 U	0.42 U	0.42 U	0.42 U	0.42 UL	0.42 U	0.42 U	0.42 U	0.42 U	0.42 UL	0.42 UL	0.42 U	0.42 U	0.42 U
Cadmium	0.64 U	0.64 U	0.64 U	0.64 U	11.4	0.64 U	0.66 J	0.64 U	0.64 U	0.64 U	0.64 U	1.4 J	5.8	2.9 J	0.64 U	0.64 U	0.64 U	1.4 J	0.99 J
Calcium	82,200	25,200	53,000	36,000	73,900	53,500	67,700	6,320	38,000	1,920 J	3,900 J	60,300	29,100	159,000	125,000	124,000	90,800	70,500	147,000
Chromium	2.2 J	4 J	2.3 J	35.2	0.7 U	2.5 J	3.7 J	1.6 J	29.3	1.8 J	1.7 J	1.8 J	2.9 J	25.1	9 J	11.5	4.9 J	25.8	8.4 J
Cobalt	1.6 U	1.6 U	11	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	4.1 J	1.6 U	1.6 U	1.6 U	5.5	1.6 U	1.6 U	1.6 U	2.5 J	1.6 U
Copper	0.85 J	0.91 J	1.2 J	4.6 J	6	2.9 J	2.9 J	0.84 U	1.3 J	1.8 J	0.84 U	0.97 J	3.3 J	9.1	2.7 J	3.3 J	1.5 J	3.7 J	0.84 U
Iron	2,170	320	5,850	555	375	669 J	954 J	1,610	871	9,910	6,690	11,800	1,970	13,500	3,960 J	5,280 J	2,060	11,200	1,800
Lead	1.4 UL	1.4 UL	2.2 L	3.5 L	1.6 L	2.7 L	3.8 L	2.6 L	3.4 L	6 L	2.4 L	2.4 L	4.9 L	6 L	1.4 UL	1.6 L	2.4 L	4.1 L	2.7 L
Magnesium	2,340 J	425 J	17,000	604 J	5,640	1,120 J	1,920 J	2,370 J	1,250 J	929 J	1,230 J	6,070	2,960 J	4,400 J	4,760 J	4,380 J	1,800 J	2,520 J	2,950 J
Manganese	72.3	26.9	59.9	50.7	37.3	59.8 J	110 J	66	80.9	26	23.6	238	20.6	705	103	103	80.9	200	65.7
Nickel	0.67 U	2.1 J	8.3 B	15.8 B	6.2 B	1.9 B	2.3 B	2.8 B	12.8 B	4.2 B	0.67 U	0.67 U	1.1 B	17.3 B	4.5 J	5.6 J	2.6 B	10.7 B	4 B
Potassium	1,130 J	1,070 J	1,830 J	727 J	2,300 J	19,200 J	9,080 J	1,910 J	1,160 J	911 J	124 J	815 J	1,940 J	3,250 J	2,500 J	2,830 J	1,380 J	3,300 J	2,240 J
Selenium	2.2 UL	2.2 UL	2.8 J	2.2 U	2.2 UL	2.2 U	2.2 U	2.2 U	2.2 U	2.2 UL	2.2 U	2.2 U	2.2 U	2.2 U	2.2 UL	2.2 UL	2.2 U	2.2 U	2.2 U
Sodium	6,670	5,770	18,100	4,400 J	3,070 J	10,500 J	7,350 J	3,760 J	4,320 J	3,050 J	3,190 J	4,710 J	2,300 J	7,630	7,540	7,130	6,490	8,010	15,200
Vanadium	3.2 J	0.57 U	7.6 J	0.96 J	0.57 U	1.8 J	1.2 J	1.5 J	1.4 J	1 J	16.7 J	1.4 J	3.1 J	33.5	4.9 J	9.6 J	5.2 J	24.6	4.6 J
Zinc	6.3 J	5.2 U	34.6	15.1 J	2,210	13.7 J	18.7 J	49.8	5.2 U	14.5 J	5.2 U	14.2 J	281	33.9	14.9 J	20.8	10.6 J	21.2	5.8 J
Dissolved Metals (µg/l)																			
Aluminum, Dissolved	56.1 B	53.4 U	1,810	44.1 U	53.4 U	173 B	212 B	185 J	44.1 U	442	61.5 B	44.1 U	88.1 B	51.1 B	582 J	202 B	44.1 U	44.1 U	44.1 U
Arsenic, Dissolved	5.4 J	2.2 U	5.7 J	2.8 U	2.2 U	2.8 U	3.3 B	2.8 U	2.8 U	2.2 U	2.8 U	28.6	9.6 B	6.8 B	2.9 J	2.2 U	2.8 U	2.8 U	5.2 J
Barium, Dissolved	42 J	9.3 J	28.1 J	9.9 J	103 J	23.9 J	24.3 J	162 J	20.1 J	103 J	2.1 J	39.3 J	25.2 J	13.6 J	26.3 J	22.6 J	19.7 J	18.1 J	29.9 J
Cadmium, Dissolved	0.64 U	0.64 U	0.34 U	0.34 U	13	0.34 U	0.34 U	0.34 U	0.34 U	0.64 U	0.34 U	0.34 U	5.5	0.34 U	0.64 U	0.64 U	0.34 U	0.34 U	0.34 U
Calcium, Dissolved	91,500	27,200	55,700	36,400	81,200	34,300	33,400	6,930	33,400	2,040 J	4,180 J	56,700	28,900	91,500	138,000	129,000	96,700	48,800	146,000
Chromium, Dissolved	0.7 U	0.7 U	0.88 U	0.88 U	0.7 U	0.88 U	0.88 U	0.88 U	0.88 U	0.7 U	0.88 U	0.89 J	0.88 U	0.88 U	1.4 J	0.7 U	0.88 U	0.88 U	0.88 U
Cobalt, Dissolved	1.6 U	1.6 U	13.7	0.65 U	1.6 U	0.65 U	0.67 J	1.4 J	0.65 U	3.4 B	0.65 U	0.87 J	0.65 U	0.65 U	1.6 U	1.6 U	0.65 U	0.65 U	0.65 U
Copper, Dissolved	7.7 L	1.2 L	1.8 B	21.6	4.1 L	1.2 J	0.9 U	1.2 B	1.4 B	0.95 L	0.9 U	1.2 J	2.2 J	0.9 U	2.5 L	0.84 UL	1 B	1.4 B	1.5 B
Iron, Dissolved	596	31.1 B	3,420	19.9 U	24.6 U	26.1 B	19.9 U	19.9 U	19.9 U	24.6 U	19.9 U	8,000	103 B	19.9 U	1,500 J	382 J	33.6 B	19.9 U	19.9 U
Lead, Dissolved	5.3	1.4 U	2.6 U	2.6 U	1.4 U	2.6 U	2.6 U	2.6 U	2.6 U	1.4 U	2.6 U	2.6 U	2.6 U	2.6 U	2.9 J	1.4 U	2.6 U	2.6 U	2.6 U
Magnesium, Dissolved	2,720 J	470 J	18,200	597 J	6,550	516 J	464 J	2,570 J	639 J	1,040 J	1,290 J	6,100	3,110 J	2,760 J	5,200	4,800 J	1,730 J	1,460 J	2,900 J
Manganese, Dissolved	71	14.4	54.6	28.2	0.99 B	5.4 J	3.2 J	63.6	19.3	25.7	5.7 J	233	16.6	11	125	98.2	64.8	116	59.1
Mercury, Dissolved	0.1 U	0.1 U	0.1 UL	0.1 UL	0.1 U	0.15 L	0.1 UL	0.1 UL	0.1 UL	0.1 U	0.1 UL	0.1 UL	0.1 UL	0.1 UL	0.14 J	0.1 U	0.1 UL	0.1 UL	0.1 UL
Nickel, Dissolved	0.92 B	1 B	9 J	1.3 U	7.6 J	7.1 J	1.3 U	2.1 J	1.3 U	3.9 B	1.3 U	1.3 U	1.6 J	1.3 U	2.3 B	1.7 B	1.3 U	1.3 U	1.3 U
Potassium, Dissolved	1,540 J	1,390 J	2,700 B	1,290 B	3,190 J	11,300 J	13,300 J	2,520 B	1,660 B	1,260 J	710 B	1,420 B	2,480 B	1,860 B	2,810 J	2,740 J	1,600 B	2,260 B	2,360 B
Selenium, Dissolved	2.2 U	2.2 U	4.1 U	4.1 U	2.2 U	4.1 U	4.1 U	4.1 U	4.1 U	2.2 U	4.1 U	19.3 K	10.1 K	6.7 K	3.1 B	2.2 U	4.1 U	7.6 K	13.9 K
Sodium, Dissolved	7,910	6,250	19,300	4,110 J	3,270 J	7,020	7,530	3,660 J	4,110 J	3,150 J	2,680 J	3,660 J	1,330 B	6,470	8,320	8,370	6,580	7,740	15,100
Vanadium, Dissolved	0.57 U	0.57 U	4.4 J	0.47 U	0.57 U	0.55 B	0.67 B	0.47 U	0.98 B	0.57 U	1.6 B	0.7 B	0.47 U	0.47 U	2.1 J	1 J	0.79 B	0.63 B	0.79 B
Zinc, Dissolved	11.5 B	11.1 B	33.8	1 B	2,470	3.7 B	2.6 B	44.8	1.6 J	11.8 B	2.6 B	11.5 J	257	1.5 B	15.6 B	8 B	2.2 B	0.74 U	1.4 J
Wet Chemistry																			
Alkalinity (mg/l)	198	62.7	10 U	93.3	156	32.3	NA	10 U	62.7	10 U	10 U	123	38	174	208	NA	204	116	301
Chloride (mg/l)	12 D	8.3 JD	35 D	7.4 JD	9 JD	10 D	NA	10 D	9.4 JD	8.5 JD	6.8 JD	6.5 JD	4.5 JD	12 D	50 D	NA	10 D	11 D	20 D
Ethane (ug/l)	2 U	2 U	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	NA	2 U	0.2 J	0.2 J
Ethene (ug/l)	2 U	2 U	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	NA	2 U	0.2 J	0.1 J
Sulfate (mg/l)	26 D	8.1 JD	190 D	14 JD	36 D	19 JD	NA	17 JD	13 JD	15 JD	13 JD	42 D	29 D	32 D	40 D	NA	36 D	21 JD	33 D
Total organic carbon (TOC) (mg/l)	2.2 J	0.79 J	11	1.4 J	3.4 J	1.5 J	NA	1.7 J	0.82 J	2.4 J	2.3 J	6.1	3.6 J	1.6 J	1.8 J	NA	2.9 J	8	5.1
Dechlorinating Bacteria (cells/ml)																			
Dehalococcoides	NA	NA	NA	NA	8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.3 J	NA	NA	NA	NA

Notes:

Shading indicates detections

NA - Not analyzed
B - Analyte not detected above the level reported in blanks
D - Compound identified in an analysis at a secondary dilution factor
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
cells/ml - Cells per milliliter
mg/l - Milligrams per liter
µg/l - Micrograms per liter

CTO-166
Yorktown - Site 1
Groundwater Exceedance Results
March 2009

Station ID	Yorktown Background Criteria - Yorktown-Eastover Aquifer	Yorktown Background Criteria - Columbia Aquifer	CLEAN MCL-Groundwater	Adjusted Tap Water RSLs	YS01-GW004	YS01-GW004A	YS01-GW005	YS01-GW005A	YS01-GW012	YS01-GW012A		YS01-GW013	YS01-GW013A	YS01-GW014	YS01-GW017	YS01-GW018	YS01-GW019
Aquifer					Columbia	Yorktown-Eastover	Columbia	Yorktown-Eastover	Columbia	Yorktown-Eastover		Columbia	Yorktown-Eastover	Columbia	Columbia	Columbia	Columbia
Sample ID					YS01-GW04-0309	YS01-GW04A-0309	YS01-GW05-0309	YS01-GW05A-0309	YS01-GW12-0309	YS01-GW12A-0309	YS01-GW12AP-0309	YS01-GW13-0309	YS01-GW13A-0309	YS01-GW14-0309	YS01-GW17-0309	YS01-GW18-0309	YS01-GW19-0309
Sample Date					03/16/09	03/16/09	03/10/09	03/10/09	03/13/09	03/12/09	03/12/09	03/09/09	03/09/09	03/13/09	03/12/09	03/11/09	03/11/09
Chemical Name																	
Volatile Organic Compounds (µg/l)																	
1,1,2-Trichloroethane	--	--	5	0.24	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	--	--	--	2.4	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	--	--	7	34	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	--	--	70	33	20	0.2 J	0.5 U	0.5 U	4.1	14 J	26 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Benzene	--	--	5	0.41	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon disulfide	--	--	--	100	0.5 U	0.5 U	1.4	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroform	--	--	80	0.19	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.35 J	0.5 U	0.5 U	0.5 U
Chloromethane	--	--	--	19	0.23 B	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	--	--	70	37	20	0.21 J	0.5 U	0.5 U	4.3	15 J	28 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	--	--	--	40	0.5 U	0.5 U	0.5 U	0.5 U	0.14 J	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	--	--	700	1.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene	--	--	5	0.11	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	--	--	100	11	0.15 J	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	--	--	5	2	0.5 U	3.7	0.5 U	0.5 U	56	57 J	95 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Vinyl chloride	--	--	2	0.016	0.48 J	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	4.2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Total Metals (µg/l)																	
Aluminum	1,160	3,170	--	3,700	1,300	162 J	3,010	187 J	224	720	778	1,120	617	599	500	111 J	962
Antimony	ND	ND	6	1.5	5.1 B	5.2 B	6.8 J	9.3 J	3.5 B	10.1	7.7 J	6 J	7.6 J	4.5 B	6.7 J	9.9 J	8.8 J
Arsenic	3.5 J	5.2 L	10	0.045	5.2 J	2.2 U	4.9 B	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	26.6	9.7 B	23.4	2.2 U
Barium	43.6 J	53 J	2,000	730	46.7 J	10 J	30.6 J	11.2 J	101 J	37 J	33.7 J	167 J	38.2 J	104 J	2.8 J	43.6 J	28.2 J
Beryllium	ND	0.38 K	4	7.3	0.42 U	0.42 U	0.73 J	0.42 U	0.42 UL	0.42 U	0.42 U	0.42 U	0.42 U	0.42 UL	0.42 U	0.42 U	0.42 U
Cadmium	ND	ND	5	1.8	0.64 U	0.64 U	0.64 U	0.64 U	11.4	0.64 U	0.66 J	0.64 U	0.64 U	0.64 U	0.64 U	1.4 J	5.8
Chromium	4.7 L	12.8 L	100	0.043	2.2 J	4 J	2.3 J	35.2	0.7 U	2.5 J	3.7 J	1.6 J	29.3	1.8 J	1.7 J	1.8 J	2.9 J
Cobalt	ND	5 J	--	1.1	1.6 U	1.6 U	11	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	4.1 J	1.6 U	1.6 U	1.6 U
Copper	4.5 J	4.7 J	1,300	150	0.85 J	0.91 J	1.2 J	4.6 J	6	2.9 J	2.9 J	0.84 U	1.3 J	1.8 J	0.84 U	0.97 J	3.3 J
Iron	2,350	11,600	--	2,600	2,170	320	5,850	555	375	669 J	954 J	1,610	871	9,910	6,690	11,800	1,970
Lead	ND	2.5 L	15	--	1.4 UL	1.4 UL	2.2 L	3.5 L	1.6 L	2.7 L	3.8 L	2.6 L	3.4 L	6 L	2.4 L	2.4 L	4.9 L
Manganese	18.4	105	--	88	72.3	26.9	59.9	50.7	37.3	59.8 J	110 J	66	80.9	26	23.6	238	20.6
Nickel	ND	ND	--	73	0.67 U	2.1 J	8.3 B	15.8 B	6.2 B	1.9 B	2.3 B	2.8 B	12.8 B	4.2 B	0.67 U	0.67 U	1.1 B
Selenium	2.9 J	ND	50	18	2.2 UL	2.2 UL	2.8 J	2.2 U	2.2 UL	2.2 U	2.2 U	2.2 U	2.2 U	2.2 UL	2.2 U	2.2 U	2.2 U
Vanadium	7.5 J	16 J	--	18	3.2 J	0.57 U	7.6 J	0.96 J	0.57 U	1.8 J	1.2 J	1.5 J	1.4 J	1 J	16.7 J	1.4 J	3.1 J
Zinc	14.9 J	30.2 J	--	1,100	6.3 J	5.2 U	34.6	15.1 J	2,210	13.7 J	18.7 J	49.8	5.2 U	14.5 J	5.2 U	14.2 J	281
Dissolved Metals (µg/l)																	
Aluminum, Dissolved	146 J	20.9 J	--	3,700	56.1 B	53.4 U	1,810	44.1 U	53.4 U	173 B	212 B	185 J	44.1 U	442	61.5 B	44.1 U	88.1 B
Arsenic, Dissolved	ND	ND	10	0.045	5.4 J	2.2 U	5.7 J	2.8 U	2.2 U	2.8 U	3.3 B	2.8 U	2.8 U	2.2 U	2.8 U	28.6	9.6 B
Barium, Dissolved	30.9 J	37.2 J	2,000	730	42 J	9.3 J	28.1 J	9.9 J	103 J	23.9 J	24.3 J	162 J	20.1 J	103 J	2.1 J	39.3 J	25.2 J
Cadmium, Dissolved	ND	ND	5	1.8	0.64 U	0.64 U	0.34 U	0.34 U	13	0.34 U	0.34 U	0.34 U	0.34 U	0.64 U	0.34 U	0.34 U	5.5
Chromium, Dissolved	ND	ND	100	0.043	0.7 U	0.7 U	0.88 U	0.88 U	0.7 U	0.88 U	0.88 U	0.88 U	0.88 U	0.7 U	0.88 U	0.89 J	0.88 U
Cobalt, Dissolved	ND	4.6 J	--	1.1	1.6 U	1.6 U	13.7	0.65 U	1.6 U	0.65 U	0.67 J	1.4 J	0.65 U	3.4 B	0.65 U	0.87 J	0.65 U
Copper, Dissolved	4 J	2.3 J	1,300	150	7.7 L	1.2 L	1.8 B	21.6	4.1 L	1.2 J	0.9 U	1.2 B	1.4 B	0.95 L	0.9 U	1.2 J	2.2 J
Iron, Dissolved	5.8 J	17.7 J	--	2,600	596	31.1 B	3,420	19.9 U	24.6 U	26.1 B	19.9 U	19.9 U	19.9 U	24.6 U	19.9 U	8,000	103 B
Lead, Dissolved	ND	ND	15	--	5.3	1.4 U	2.6 U	2.6 U	1.4 U	2.6 U	2.6 U	2.6 U	2.6 U	1.4 U	2.6 U	2.6 U	2.6 U
Manganese, Dissolved	12.2 J	50.4	--	88	71	14.4	54.6	28.2	0.99 B	5.4 J	3.2 J	63.6	19.3	25.7	5.7 J	233	16.6
Mercury, Dissolved	ND	ND	2	1.1	0.1 U	0.1 U	0.1 UL	0.1 UL	0.1 U	0.15 L	0.1 UL	0.1 UL	0.1 UL	0.1 U	0.1 UL	0.1 UL	0.1 UL
Nickel, Dissolved	ND	ND	--	73	0.92 B	1 B	9 J	1.3 U	7.6 J	7.1 J	1.3 U	2.1 J	1.3 U	3.9 B	1.3 U	1.3 U	1.6 J
Selenium, Dissolved	3.9 K	ND	50	18	2.2 U	2.2 U	4.1 U	4.1 U	2.2 U	4.1 U	4.1 U	4.1 U	4.1 U	2.2 U	4.1 U	19.3 K	10.1 K
Vanadium, Dissolved	6.3 J	2.7 J	--	18	0.57 U	0.57 U	4.4 J	0.47 U	0.57 U	0.55 B	0.67 B	0.47 U	0.98 B	0.57 U	1.6 B	0.7 B	0.47 U
Zinc, Dissolved	5.9 J	15.6 J	--	1,100	11.5 B	11.1 B	33.8	1 B	2,470	3.7 B	2.6 B	44.8	1.6 J	11.8 B	2.6 B	11.5 J	257
Wet Chemistry																	
Alkalinity (mg/l)	--	--	--	--	198	62.7	10 U	93.3	156	32.3	NA	10 U	62.7	10 U	10 U	123	38
Chloride (mg/l)	--	--	--	--	12 D	8.3 JD	35 D	7.4 JD	9 JD	10 D	NA	10 D	9.4 JD	8.5 JD	6.8 JD	6.5 JD	4.5 JD
Ethane (ug/l)	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U	2 U
Ethene (ug/l)	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U	2 U
Sulfate (mg/l)	--	--	--	--	26 D	8.1 JD	190 D	14 JD	36 D	19 JD	NA	17 JD	13 JD	15 JD	13 JD	42 D	29 D
Total organic carbon (TOC) (mg/l)	--	--	--	--	2.2 J	0.79 J	11	1.4 J	3.4 J	1.5 J	NA	1.7 J	0.82 J	2.4 J	2.3 J	6.1	3.6 J
Dechlorinating Bacteria (cells/ml)																	
Dehalococcoides	--	--	--	--	NA	NA	NA	NA	8.5	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Concentrations shaded blue exceed MCLs

Concentrations shaded green exceed RSLs

Concentrations shaded red exceed both MCLs and RSLs

RSLs were adjusted for noncarcinogens to account for exposure to multiple constituents

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

D - Compound identified in an analysis at a secondary dilution factor

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

cells/ml - Cells per milliliter

mg/l - Milligrams per liter

µg/l - Micrograms per liter

CTO-166
Yorktown - Site 1
Groundwater Exceedance Results
March 2009

Station ID	Yorktown Background Criteria - Yorktown-Eastover Aquifer	Yorktown Background Criteria - Columbia Aquifer	CLEAN MCL-Groundwater	Adjusted Tap Water RSLs	YS01-GW021	YS01-GW022		YS01-GW023	YS01-GW024	YS01-GW025
Aquifer					Columbia	Columbia		Columbia	Columbia	Columbia
Sample ID					YS01-GW21-0309	YS01-GW22-0309	YS01-GW22P-0309	YS01-GW23-0309	YS01-GW24-0309	YS01-GW25-0309
Sample Date					03/12/09	03/16/09	03/16/09	03/10/09	03/10/09	03/10/09
Chemical Name										
Volatile Organic Compounds (µg/l)										
1,1,2-Trichloroethane	--	--	5	0.24	0.5 U	1.7	1.6	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	--	--	--	2.4	0.5 U	0.26 J	0.26 J	0.5 U	0.5 U	0.6
1,1-Dichloroethene	--	--	7	34	0.5 U	8.3	8.6	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	--	--	70	33	0.5 U	3,000	2,800	0.5 U	0.42 J	0.5 U
Benzene	--	--	5	0.41	0.5 U	0.24 J	0.24 J	0.5 U	0.5 U	0.5 U
Carbon disulfide	--	--	--	100	0.15 J	0.37 J	0.39 J	0.5 U	0.5 U	0.5 U
Chloroform	--	--	80	0.19	0.5 U	0.5 U	0.5 U	0.5 U	0.74	0.73
Chloromethane	--	--	--	19	0.5 U	0.5 U	0.5 U	0.5 U	0.14 J	0.5 U
cis-1,2-Dichloroethene	--	--	70	37	0.5 U	3,000	2,900	0.5 U	0.44 J	0.5 U
Dichlorodifluoromethane (Freon-12)	--	--	--	40	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	--	--	700	1.5	0.5 U	0.5 U	0.5 U	0.5 U	0.16 J	0.13 J
Tetrachloroethene	--	--	5	0.11	0.5 U	0.21 J	0.21 J	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	--	--	100	11	0.5 U	5.6	5.3	0.5 U	0.5 U	0.5 U
Trichloroethene	--	--	5	2	0.54	18,000	17,000	1.4	6.9	0.5 U
Vinyl chloride	--	--	2	0.016	0.5 U	3.6	3.6	0.5 U	0.5 U	0.5 U
Total Metals (µg/l)										
Aluminum	1,160	3,170	--	3,700	4,960	1,420 J	3,920 J	929	3,410	639
Antimony	ND	ND	6	1.5	8.3 J	5.3 B	4.4 B	7.1 J	8.8 J	6.4 J
Arsenic	3.5 J	5.2 L	10	0.045	14.7	2.2 U	2.2 U	3.4 B	19.1	2.2 U
Barium	43.6 J	53 J	2,000	730	58.1 J	27.7 J	31.9 J	21.2 J	38.6 J	32.9 J
Beryllium	ND	0.38 K	4	7.3	0.42 U	0.42 UL	0.42 UL	0.42 U	0.42 U	0.42 U
Cadmium	ND	ND	5	1.8	2.9 J	0.64 U	0.64 U	0.64 U	1.4 J	0.99 J
Chromium	4.7 L	12.8 L	100	0.043	25.1	9 J	11.5	4.9 J	25.8	8.4 J
Cobalt	ND	5 J	--	1.1	5.5	1.6 U	1.6 U	1.6 U	2.5 J	1.6 U
Copper	4.5 J	4.7 J	1,300	150	9.1	2.7 J	3.3 J	1.5 J	3.7 J	0.84 U
Iron	2,350	11,600	--	2,600	13,500	3,960 J	5,280 J	2,060	11,200	1,800
Lead	ND	2.5 L	15	--	6 L	1.4 UL	1.6 L	2.4 L	4.1 L	2.7 L
Manganese	18.4	105	--	88	705	103	103	80.9	200	65.7
Nickel	ND	ND	--	73	17.3 B	4.5 J	5.6 J	2.6 B	10.7 B	4 B
Selenium	2.9 J	ND	50	18	2.2 U	2.2 UL	2.2 UL	2.2 U	2.2 U	2.2 U
Vanadium	7.5 J	16 J	--	18	33.5	4.9 J	9.6 J	5.2 J	24.6	4.6 J
Zinc	14.9 J	30.2 J	--	1,100	33.9	14.9 J	20.8	10.6 J	21.2	5.8 J
Dissolved Metals (µg/l)										
Aluminum, Dissolved	146 J	20.9 J	--	3,700	51.1 B	582 J	202 B	44.1 U	44.1 U	44.1 U
Arsenic, Dissolved	ND	ND	10	0.045	6.8 B	2.9 J	2.2 U	2.8 U	2.8 U	5.2 J
Barium, Dissolved	30.9 J	37.2 J	2,000	730	13.6 J	26.3 J	22.6 J	19.7 J	18.1 J	29.9 J
Cadmium, Dissolved	ND	ND	5	1.8	0.34 U	0.64 U	0.64 U	0.34 U	0.34 U	0.34 U
Chromium, Dissolved	ND	ND	100	0.043	0.88 U	1.4 J	0.7 U	0.88 U	0.88 U	0.88 U
Cobalt, Dissolved	ND	4.6 J	--	1.1	0.65 U	1.6 U	1.6 U	0.65 U	0.65 U	0.65 U
Copper, Dissolved	4 J	2.3 J	1,300	150	0.9 U	2.5 L	0.84 UL	1 B	1.4 B	1.5 B
Iron, Dissolved	5.8 J	17.7 J	--	2,600	19.9 U	1,500 J	382 J	33.6 B	19.9 U	19.9 U
Lead, Dissolved	ND	ND	15	--	2.6 U	2.9 J	1.4 U	2.6 U	2.6 U	2.6 U
Manganese, Dissolved	12.2 J	50.4	--	88	11	125	98.2	64.8	116	59.1
Mercury, Dissolved	ND	ND	2	1.1	0.1 UL	0.14 J	0.1 U	0.1 UL	0.1 UL	0.1 UL
Nickel, Dissolved	ND	ND	--	73	1.3 U	2.3 B	1.7 B	1.3 U	1.3 U	1.3 U
Selenium, Dissolved	3.9 K	ND	50	18	6.7 K	3.1 B	2.2 U	4.1 U	7.6 K	13.9 K
Vanadium, Dissolved	6.3 J	2.7 J	--	18	0.47 U	2.1 J	1 J	0.79 B	0.63 B	0.79 B
Zinc, Dissolved	5.9 J	15.6 J	--	1,100	1.5 B	15.6 B	8 B	2.2 B	0.74 U	1.4 J
Wet Chemistry										
Alkalinity (mg/l)	--	--	--	--	174	208	NA	204	116	301
Chloride (mg/l)	--	--	--	--	12 D	50 D	NA	10 D	11 D	20 D
Ethane (ug/l)	--	--	--	--	2 U	2 U	NA	2 U	0.2 J	0.2 J
Ethene (ug/l)	--	--	--	--	2 U	2 U	NA	2 U	0.2 J	0.1 J
Sulfate (mg/l)	--	--	--	--	32 D	40 D	NA	36 D	21 JD	33 D
Total organic carbon (TOC) (mg/l)	--	--	--	--	1.6 J	1.8 J	NA	2.9 J	8	5.1
Dechlorinating Bacteria (cells/ml)										
Dehalococcoides	--	--	--	--	NA	5.3 J	NA	NA	NA	NA

Notes:

Concentrations shaded blue exceed MCLs

Concentrations shaded green exceed RSLs

Concentrations shaded red exceed both MCLs and RSLs

RSLs were adjusted for noncarcinogens to account for exposure to multiple constituents

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

D - Compound identified in an analysis at a secondary dilution factor

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

cells/ml - Cells per milliliter

mg/l - Milligrams per liter

µg/l - Micrograms per liter

CTO-166
Yorktown - Site 3
Groundwater Raw Analytical Results
March and July 2009

Station ID	YS03-GW006	YS03-GW008A	YS03-GW008B		YS03-GW015	YS03-GW015A	YS03-GW018	YS03-GW019	YS03-GW019A	YS03-GW020	YS03-GW020A	YS03-GW021	YS03-GW022	YS03-GW023	YS03-GW024	YS03-GW025		YS03-GW026	YS03-GW027
Sample ID	YS03-GW06-0309	YS03-GW08A-0309	YS03-GW08B-0309	YS03-GW08BP-0309	YS03-GW15-0309	YS03-GW15A-0309	YS03-GW18-0309	YS03-GW19-0309	YS03-GW19A-0409	YS03-GW20-0309	YS03-GW20A-0309	YS03-GW21-0309	YS03-GW22-0309	YS03-GW23-0309	YS03-GW24-0309	YS03-GW25-0309	YS03-GW25P-0309	YS03-GW26-0309	YS03-GW27-0309
Sample Date	03/19/09	03/18/09	03/18/09	03/18/09	03/17/09	03/17/09	03/17/09	03/19/09	04/06/09	03/20/09	03/20/09	03/18/09	03/19/09	03/18/09	03/30/09	03/20/09	03/20/09	03/17/09	03/20/09
Chemical Name																			
Volatile Organic Compounds (µg/l)																			
1,1,1-Trichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
1,1,2-Trichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
1,1-Dichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	8.2 J	1.3 U	1 U	10 U	31 U
1,1-Dichloroethene	0.5 U	0.5 U	0.5 U	0.5 U	0.35 J	0.5 U	0.5 U	3.4 J	0.5 U	0.5 U	0.5 U	0.5 U	0.68 J	0.5 U	12 J	0.47 J	0.43 J	10 U	31 U
1,2,4-Trichlorobenzene	0.5 U	0.5 U	0.16 B	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
1,2-Dibromo-3-chloropropane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
1,2-Dibromoethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
1,2-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
1,2-Dichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
1,2-Dichloroethene (total)	0.15 J	0.5 U	0.12 J	0.13 J	3.7	0.18 J	0.5 U	330	6.4	0.5 U	0.5 U	2.5	100	5.9	1,400	51	51	330	880
1,2-Dichloropropane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
1,3-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
1,4-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.11 J	2.5 U	0.5 U	36 U	0.55 J	0.56 J	10 U	31 U
2-Butanone	2.5 U	2.5 U	2.5 U	2.5 U	2.5 R	2.5 R	2.5 R	42 U	2.5 R	0.71 B	2.5 R	2.7 B	13 U	2.5 R	180 R	6.3 R	5.2 R	50 R	160 R
2-Hexanone	2.5 U	2.5 U	0.58 B	2.5 U	2.5 U	2.5 U	2.5 U	42 U	2.5 U	2.5 U	2.5 U	2.5 U	13 U	2.5 U	180 U	6.3 U	5.2 U	50 U	160 U
4-Methyl-2-pentanone	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	42 U	2.5 U	2.5 U	2.5 U	2.5 U	13 U	2.5 U	180 U	6.3 U	5.2 U	50 U	160 U
Acetone	3 B	3.6 B	2.7 B	2.3 B	2.9 B	2.7 B	2.5 R	42 U	3.3 B	10 B	2.4 B	8.2 B	8.6 B	12 B	96 B	4.7 B	2.8 B	50 R	160 U
Benzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Bromodichloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Bromoform	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Bromomethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Carbon disulfide	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.13 J	0.5 U	0.5 U	1.6	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Carbon tetrachloride	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Chlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Chloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Chloroform	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Chloromethane	0.21 B	0.17 B	0.25 B	0.16 B	0.23 B	0.23 B	0.16 B	2.6 B	0.5 U	0.22 B	0.21 B	0.91 B	0.76 B	0.21 B	36 U	0.49 B	0.44 B	3.5 B	9.3 B
cis-1,2-Dichloroethene	0.15 J	0.5 U	0.12 J	0.14 J	3.7	0.18 J	0.5 U	330	6.5	0.5 U	0.5 U	2.5	110	5.9	1,400	52	52	330	890
cis-1,3-Dichloropropene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Cyclohexane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Dibromochloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Dichlorodifluoromethane (Freon-12)	0.5 U	0.5 U	0.15 J	0.15 J	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Ethylbenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.19 J	0.5 U	0.5 U	0.17 J	2.5 U	0.15 J	36 U	1.3 U	1 U	10 U	31 U
Isopropylbenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
m- and p-Xylene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	17 U	1 U	1 U	1 U	1 U	5 U	1 U	71 U	2.5 U	2.1 U	20 U	63 U
Methyl acetate	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.4 J	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Methylcyclohexane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Methylene chloride	0.5 U	0.5 U	0.12 B	0.5 U	0.5 U	0.5 U	0.5 U	1.9 B	0.5 U	0.5 U	0.5 U	0.32 B	0.88 B	0.5 U	36 U	0.47 B	1 U	10 U	14 B
Methyl-tert-butyl ether (MTBE)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
o-Xylene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Styrene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Tetrachloroethene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Toluene	0.5 U	0.12 B	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.32 B	0.2 B	0.13 B	0.58 B	2.5 U	0.1 B	36 U	1.3 U	1 U	10 U	31 U
trans-1,2-Dichloroethene	0.5 U	0.5 U	0.5 U	0.5 U	0.1 J	0.5 U	0.5 U	2.2 J	0.5 U	0.5 U	0.5 U	0.5 U	0.73 J	0.5 U	8.8 J	1.3 U	0.27 J	10 U	31 U
trans-1,3-Dichloropropene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Trichloroethene	0.49 J	0.5 U	4.9	5	3.8	0.5 U	0.91	190	3.1	0.5 U	0.5 U	2.9	63	9.9	400	9.6	9.5	130	130
Trichlorofluoromethane(Freon-11)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Vinyl chloride	0.5 U	0.5 U	0.5 U	0.5 U	2.3	0.5 U	0.5 U	58	0.26 J	0.5 U	0.5 U	0.5 U	9.8	0.19 J	1,200	4.3	4.9	10 U	1,100
Xylene, total	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U	31 U
Total Metals (µg/l)																			
Aluminum	134 J	119 J	107 J	116 J	309	53.4 U	181 J	149 J	19,300	532	190 J	4,290	162 J	193 J	13,000	900	746	713	5,670
Antimony	9.2 B	10.3 B	4.7 B	6 B	5 B	5.4 B	5.3 B	8.2 B	11.4 B	8.5 B	8.3 B	7.3 B	7.8 B	3.9 B	12.1 B	9.2 B	9 B	4.5 B	10.8 B
Arsenic	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	60.7	2.2 U	2.2 U	45	2.2 U	2.7 J	32.3	3.6 J	2.2 U	2.2 U	17.2
Barium	26 J	22.9 J	31.6 J	32.4 J	49.5 J	22.8 J	39.7 J	38.5 J	101 J	22.1 J	13.5 J	66 J	61.8 J	38.4 J	132 J	38.8 J	38.1 J	35.4 J	69.8 J
Beryllium	0.83 B	1.2 B	0.42 U	0.42 U	0.42 UL	0.42 UL	0.42 UL	1.1 B	0.69 J	0.93 B	0.5 B	0.45 B	1.2 B	0.42 U	0.42 U	1.3 B	1 B	0.42 UL	1.3 B
Cadmium	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U
Calcium	88,600	90,000	121,000	121,000	159,000	74,900	31,500	134,000	201,000	74,300	47,500	126,000	174,000	106,000	336,000	146,000	148,000	115,000	161,000
Chromium	3.6 B	2.5 B	1.2 B	12.7	1.9 J	1.4 J	0.7 U	4.1 B	123	11.7	3 B	20.8	2.2 B	2.8 B	524	6.1 J	4.9 J	5.6 J	18.2
Cobalt	1.6 U	1.6 U	1.6 U	1.6 U	2.6 J	1.6 U	1.6 U	1.6 U	6.2	1.6 U	1.6 U	2.7 J	1.6 U	1.6 U	10.9	1.8 J	2.7 J	1.6 U	5.3
Copper	0.84 UL	0.84 UL	0.84 U	0.84 U	1.7 J	0.84 U	0.84 U	54.9	25.2	0.84 UL	0.84 UL	3.1 J	0.84 UL	0.84 U	28.9	0.84 UL	0.84 UL	0.84 U	1.9 L
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	419	1,160	280	306	1,410	1,340	35.1 B	402	49,600	2,700	1,410	11,000	384	2,190	36,000	2,220	1,730	2,930	7,250
Lead	1.8 L	1.4 UL	1.4 UL	1.4 UL	1.4 UL	1.4 UL	1.4 UL	2.1 L	17	2.7 L	2 L	2.5 L	1.4 UL	1.4 UL	13.7	2.1 L	1.8 L	1.4 UL	4.7 L
Magnesium	2,630 J	1,390 J	2,530 J	2,580 J	2,180 J	1,040 J	502 J	4,220 J	8,180	1,130 J	1,280 J	4,500 J	3,180 J	2,650 J	11,500	3,540 J	3,520 J	3,810 J	6,340
Manganese	41.7	77.5	39.2	39	219	47.6	0.42 B	33.3	1,320	25.6	80.2	1,260	102	147	523	147	155	79.1	500
Mercury	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.28	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 J
Nickel	2.8 B	0.86 B	1.4 J	5.8 J	3.4 J	0.67 U	0.67 U	3.1 B	32.4 J	5.4 J	2 B	9.3 J	2.6 B	1.4 B	250	3.4 B	3.1 B	2.1 J	15 J
Potassium	1,080 J	1,120 J	1,040 J	1,090 J	1,060 J	751 J	1,480 J	894 J	8,350	951 J	1,860 J	2,950 J	1,220 J	1,910 J	7,000	1,250 J	1,130 J	1,350 J	2,510 J
Selenium	2.2 U	2.2 U	2.2 UL	2.2 UL	2.2 UL	2.2 UL	2.2 UL	2.2 U	3.5 J	2.2 U	2.2 U	2.2 UL	2.2 U	2.2 UL	2.2 U	2.2 U	2.2 U	2.2 UL	2.2 U
Silver	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Sodium	6,700	6,830	8,660	8,950	14,200	5,490	9,620	8,640	6,600	5,180	14,700	10,600	10,600	35,600	17,500	7,410	7,340	12,900	13,600
Thallium	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U
Vanadium	1.1 B	0.98 B	1.3 J	1.4 J	1.5 J	0.57 U	2.4 J	1.1 B	77.6	3.4 J	0.95 J	29	1.6 B	1 J	62	4.5 J	4 J	2.3 J	26.1
Zinc	5.2 U	5.2 U	6.6 J	20.6	19 J	5.8 J	5.2 U	5.5 J	2,780	10.4 J	6.2 J	21.7	5.2 U	5.2 U	64.6	7 J	6.1 J	5.2 U	34.8

CTO-166
Yorktown - Site 3
Groundwater Raw Analytical Results
March and July 2009

Station ID	YS03-GW006	YS03-GW008A	YS03-GW008B		YS03-GW015	YS03-GW015A	YS03-GW018	YS03-GW019	YS03-GW019A	YS03-GW020	YS03-GW020A	YS03-GW021	YS03-GW022	YS03-GW023	YS03-GW024	YS03-GW025		YS03-GW026	YS03-GW027
Sample ID	YS03-GW06-0309	YS03-GW08A-0309	YS03-GW08B-0309	YS03-GW08BP-0309	YS03-GW15-0309	YS03-GW15A-0309	YS03-GW18-0309	YS03-GW19-0309	YS03-GW19A-0409	YS03-GW20-0309	YS03-GW20A-0309	YS03-GW21-0309	YS03-GW22-0309	YS03-GW23-0309	YS03-GW24-0309	YS03-GW25-0309	YS03-GW25P-0309	YS03-GW26-0309	YS03-GW27-0309
Sample Date	03/19/09	03/18/09	03/18/09	03/18/09	03/17/09	03/17/09	03/17/09	03/19/09	04/06/09	03/20/09	03/20/09	03/18/09	03/19/09	03/18/09	03/30/09	03/20/09	03/20/09	03/17/09	03/20/09
Chemical Name																			
Dissolved Metals (µg/l)																			
Aluminum, Dissolved	44.1 U	44.1 U	73.5 B	69.6 B	70.2 B	53.4 U	264 B	44.4 B	2,040	66.2 B	44.1 U	108 B	44.1 U	69.6 B	53.4 UL	114 B	78.8 B	68.1 B	113 B
Antimony, Dissolved	2.7 U	2.7 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.7 U	2.4 U	2.7 U	2.7 U	2.4 U	2.7 U	2.4 U	2.4 U	2.7 U	2.7 U	2.4 U	2.7 U
Arsenic, Dissolved	4.9 J	4.7 J	3.5 J	3.7 J	3.1 J	2.2 U	2.2 U	4.8 J	5.6 J	2.8 J	2.9 J	34.7	6.5 J	6 J	6.4 J	7.9 J	5.2 J	3.1 J	5.7 J
Barium, Dissolved	27.4 J	24.6 J	32.4 J	31.2 J	48.5 J	19.7 J	37.4 J	41.7 J	35.2 J	19.4 J	13.5 J	44.5 J	65.1 J	37.5 J	67 J	37.7 J	37.8 J	33.5 J	60.4 J
Beryllium, Dissolved	0.32 U	0.32 U	1.9 B	1.8 B	1.3 B	1.2 B	1.6 B	0.32 U	0.42 UL	0.64 B	0.32 U	2.3 B	0.32 U	1.5 B	0.42 UL	0.74 B	0.42 B	1.4 B	0.5 B
Cadmium, Dissolved	0.34 U	0.34 U	0.86 B	0.75 B	0.64 U	0.64 U	0.64 U	0.34 U	0.64 U	0.34 U	0.34 U	0.93 B	0.34 U	0.75 B	0.64 U	0.34 U	0.34 U	0.64 U	0.44 J
Calcium, Dissolved	97,600	91,500	134,000	132,000	175,000	81,900	31,000	147,000	77,500	71,700	49,200	116,000	183,000	114,000	217,000	148,000	150,000	127,000	176,000
Chromium, Dissolved	0.88 U	0.88 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.88 U	6.9 B	0.88 U	0.88 U	0.7 U	0.88 U	0.7 U	7.2 B	0.94 B	0.88 U	0.7 U	0.88 U
Cobalt, Dissolved	0.65 U	0.65 U	2.6 B	1.9 B	2.7 B	1.6 U	1.6 U	0.65 U	1.6 U	0.85 B	0.65 U	3.1 B	0.65 U	2 B	1.6 U	1.6 B	1.3 B	1.6 U	3.5 B
Copper, Dissolved	0.9 U	0.9 U	0.84 UL	0.84 UL	0.84 UL	0.84 UL	0.84 UL	0.9 U	4.3 B	0.9 U	0.9 U	0.84 UL	0.9 U	0.84 UL	3.7 B	0.9 U	0.9 U	0.84 UL	1.5 J
Iron, Dissolved	63.5 B	810	24.6 U	24.6 U	956	119	24.6 U	100 B	1,540	181	172	2,010	140 B	1,800	107 B	49.1 B	43 B	1,960	19.9 U
Lead, Dissolved	2.6 U	2.6 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	2.6 U	1.4 U	2.6 U	2.6 U	1.4 U	2.6 U	1.4 U	1.4 U	2.6 U	2.6 U	1.4 U	2.6 U
Magnesium, Dissolved	2,920 J	1,460 J	3,050 J	2,970 J	2,550 J	1,220 J	590 J	4,640 J	1,500 J	1,020 J	1,310 J	4,090 J	3,520 J	3,050 J	8,040	3,540 J	3,550 J	4,330 J	6,500
Manganese, Dissolved	28.5	77.3	32.8	34.9	226	25.5	0.37 U	32.8	448	13.5	59.2	1,260	121	152	225	148	153	76.5	482
Mercury, Dissolved	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 UL	0.1 U	0.11 J	0.1 U	0.13 J	0.1 U	0.1 UL	0.1 U	0.1 U	0.1 U	0.1 U
Nickel, Dissolved	2.2 B	1.3 U	1.3 B	1.6 B	2.2 B	1.1 B	1.2 B	1.3 U	2.6 B	1.4 B	1.3 U	1.7 B	2.4 B	0.97 B	15 J	1.4 B	1.9 B	0.67 U	4.4 B
Potassium, Dissolved	1,710 B	1,770 B	1,480 B	1,450 B	1,440 B	1,090 B	2,110 B	1,460 B	2,120 J	1,290 B	2,470 B	1,660 B	1,820 B	2,550 B	1,720 J	1,440 B	1,430 B	1,580 B	2,090 B
Selenium, Dissolved	6.8 L	7.7 L	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	9.7 L	2.2 U	4.1 UL	4.4 L	2.3 J	8.4 L	2.2 U	2.9 J	8.7 L	6.4 L	2.2 U	11.2 L
Silver, Dissolved	0.93 J	0.67 B	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.61 U	0.62 U	0.61 U	0.61 U	0.62 U	0.83 J	0.62 U	0.62 U	0.61 U	0.61 U	0.62 U	0.61 U
Sodium, Dissolved	6,900	6,940	10,400	10,100	16,900	6,300	11,300	8,790	5,730	4,750 J	14,600	12,000	11,900	41,800	17,600	6,900	7,070	14,700	15,100
Thallium, Dissolved	6.2 U	6.2 U	3.3 U	4.1 J	3.3 U	3.3 U	3.3 U	6.2 U	3.3 U	6.2 U	6.2 U	3.3 U	6.2 U	3.3 U	3.3 U	6.2 U	6.2 U	3.3 U	6.2 U
Vanadium, Dissolved	0.57 B	0.47 U	0.57 U	0.57 U	0.57 U	0.57 U	2 J	0.47 U	5.7 J	0.47 U	0.47 U	0.57 U	1.1 B	0.57 U	1 B	0.47 U	0.47 U	0.57 U	0.84 B
Zinc, Dissolved	4.8 B	0.79 B	24.1 B	12 B	8.5 B	8.7 B	5.2 U	1 B	112	0.74 U	1.3 B	5.2 U	2 B	5.2 U	9 B	1.6 B	3.7 B	5.2 U	33.8
Wet Chemistry																			
Alkalinity (mg/l)	10 U	178	300	NA	399	176	10 U	356	160	124	117	293	428	236	536 D	362	NA	270	386
Chloride (mg/l)	12 D	10 D	15 D	NA	7.2 JD	8.9 JD	7.9 JD	14 D	10 D	11 D	12 D	17 D	19 D	12 D	56 D	10 D	NA	16 D	33 D
Ethane (ug/l)	2 U	2 U	2 U	NA	0.4 J	2 U	2 U	1 J	2 U	2 U	2 U	0.3 J	0.7 J	0.3 J	21	0.5 J	NA	0.1 J	15
Ethene (ug/l)	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	0.2 J	2 U	0.2 J	1 J	2 U	NA	0.3 J	1 J
Methane (ug/l)	2 B	0.5 JB	5 B	NA	16 B	0.2 JB	0.2 JB	40 B	1 B	3 B	1 B	9 B	12 B	4 B	52 BD	17 B	NA	1 B	39 BD
Nitrate (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	62 D	47 D	29 D	NA	18 JD	24 JD	26 D	24 JD	39 D	49 D	25 JD	18 JD	19 JD	95 D	11 JD	18 JD	NA	43 D	20 JD
Total organic carbon (TOC) (mg/l)	0.44 J	1.3 J	0.54 J	NA	1.8 J	1.1 J	1.9 J	1.4 J	1.8 J	1.3 J	1.6 J	17	2.7 J	1.5 J	6.8	2.9 J	NA	2 J	1 J
Dechlorinating Bacteria (cells/ml)																			
Dehalococcoides	NA	NA	NA	NA	NA	NA	NA	6.1	NA	NA	NA	NA	NA	NA	26.2	NA	NA	NA	NA

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

D - Compound identified in an analysis at a secondary dilution factor

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

cells/ml - Cells per milliliter

mg/l - Milligrams per liter

µg/l - Micrograms per liter

CTO-166
Yorktown - Site 3
Groundwater Raw Analytical Results
March and July 2009

Station ID	YS03-GW028	YS03-GW029		
Sample ID	YS03-GW28-0309	YS03-GW29-0309	YS03-GW29-0709	YS03-GW29P-0709
Sample Date	03/19/09	03/30/09	07/13/09	07/13/09
Chemical Name				
Volatile Organic Compounds (µg/l)				
1,1,1-Trichloroethane	3.1 UL	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	3.1 UL	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	3.1 UL	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	3.1 UL	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	3.1 UL	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	3.1 UL	0.5 U	0.5 U	0.5 U
1,2,4-Trichlorobenzene	3.1 UL	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	3.1 UL	0.5 U	0.5 U	0.5 U
1,2-Dibromoethane	3.1 UL	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	3.1 UL	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	3.1 UL	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	120 L	0.29 J	0.5 U	0.5 U
1,2-Dichloropropane	3.1 UL	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	3.1 UL	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	3.1 UL	0.5 U	0.5 U	0.5 U
2-Butanone	16 UL	2.1 B	0.53 B	0.69 B
2-Hexanone	16 UL	2.5 U	2.5 U	2.5 U
4-Methyl-2-pentanone	16 UL	2.5 U	2.5 U	2.5 U
Acetone	16 B	25 B	4.4 B	5.8 B
Benzene	3.1 UL	0.5 U	0.5 U	0.5 U
Bromodichloromethane	3.1 UL	0.5 U	0.5 U	0.5 U
Bromoform	3.1 UL	0.5 U	0.5 U	0.5 U
Bromomethane	3.1 UL	0.5 U	0.5 U	0.5 U
Carbon disulfide	3.1 UL	0.27 J	0.5 U	0.5 U
Carbon tetrachloride	3.1 UL	0.5 U	0.5 U	0.5 U
Chlorobenzene	3.1 UL	0.5 U	0.5 U	0.5 U
Chloroethane	3.1 UL	0.5 U	0.5 U	0.5 U
Chloroform	3.1 UL	0.11 B	0.5 U	0.5 U
Chloromethane	0.97 B	0.27 B	0.5 U	0.5 U
cis-1,2-Dichloroethene	120 L	0.29 J	0.5 U	0.5 U
cis-1,3-Dichloropropene	3.1 UL	0.5 U	0.5 U	0.5 U
Cyclohexane	3.1 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	3.1 UL	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	3.1 UL	0.5 U	0.5 U	0.5 U
Ethylbenzene	3.1 UL	0.59	0.79	0.87
Isopropylbenzene	3.1 UL	0.5 U	0.5 U	0.5 U
m- and p-Xylene	6.3 UL	1 U	1 U	1 U
Methyl acetate	3.1 UL	0.5 U	0.5 U	0.5 U
Methylcyclohexane	3.1 U	0.5 U	0.5 U	0.5 U
Methylene chloride	1.6 B	0.27 B	0.15 B	0.21 B
Methyl-tert-butyl ether (MTBE)	3.1 UL	0.5 U	0.5 U	0.5 U
o-Xylene	3.1 UL	0.5 U	0.5 U	0.5 U
Styrene	3.1 UL	0.5 U	0.5 U	0.5 U
Tetrachloroethene	3.1 UL	0.5 U	0.5 U	0.5 U
Toluene	3.1 UL	0.44 B	0.47 B	0.51 B
trans-1,2-Dichloroethene	1.1 L	0.5 U	0.5 U	0.5 U
trans-1,3-Dichloropropene	3.1 UL	0.5 U	0.5 U	0.5 U
Trichloroethene	36 L	0.24 J	0.5 U	0.5 U
Trichlorofluoromethane(Freon-11)	3.1 UL	0.5 U	0.5 U	0.5 U
Vinyl chloride	5.2 L	0.24 J	0.5 U	0.5 U
Xylene, total	3.1 U	0.5 U	0.5 U	0.5 U
Total Metals (µg/l)				
Aluminum	122 J	369	NA	NA
Antimony	10.4 B	8.2 B	NA	NA
Arsenic	2.2 U	18.5	NA	NA
Barium	13.3 J	17.6 J	NA	NA
Beryllium	1.3 B	0.42 U	NA	NA
Cadmium	0.64 U	0.64 U	NA	NA
Calcium	85,400	72,900	NA	NA
Chromium	1.5 B	40.4	NA	NA
Cobalt	1.6 U	1.6 U	NA	NA
Copper	0.84 UL	2 J	NA	NA
Cyanide	NA	NA	NA	NA
Iron	160	1,310	NA	NA
Lead	1.4 UL	1.4 U	NA	NA
Magnesium	1,780 J	2,300 J	NA	NA
Manganese	30.5	42.7	NA	NA
Mercury	0.1 U	0.1 U	NA	NA
Nickel	1.3 B	19.4 J	NA	NA
Potassium	872 J	1,340 J	NA	NA
Selenium	2.2 U	2.2 U	NA	NA
Silver	0.62 U	0.62 U	NA	NA
Sodium	6,980	7,180	NA	NA
Thallium	3.3 U	3.3 U	NA	NA
Vanadium	1.7 B	3.2 B	NA	NA
Zinc	8.4 J	5.2 U	NA	NA

CTO-166
Yorktown - Site 3
Groundwater Raw Analytical Results
March and July 2009

Station ID	YS03-GW028	YS03-GW029		
Sample ID	YS03-GW28-0309	YS03-GW29-0309	YS03-GW29-0709	YS03-GW29P-0709
Sample Date	03/19/09	03/30/09	07/13/09	07/13/09
Chemical Name				
Dissolved Metals (µg/l)				
Aluminum, Dissolved	44.1 U	53.4 UL	NA	NA
Antimony, Dissolved	2.7 U	2.4 U	NA	NA
Arsenic, Dissolved	3.2 J	25.8	NA	NA
Barium, Dissolved	13.8 J	17.3 J	NA	NA
Beryllium, Dissolved	0.32 U	0.42 UL	NA	NA
Cadmium, Dissolved	0.34 U	0.64 U	NA	NA
Calcium, Dissolved	91,900	78,300	NA	NA
Chromium, Dissolved	0.88 U	1.9 B	NA	NA
Cobalt, Dissolved	0.65 U	1.6 U	NA	NA
Copper, Dissolved	0.9 U	3.7 B	NA	NA
Iron, Dissolved	19.9 U	171 B	NA	NA
Lead, Dissolved	2.6 U	1.4 U	NA	NA
Magnesium, Dissolved	1,950 J	2,380 J	NA	NA
Manganese, Dissolved	28.2	40.7	NA	NA
Mercury, Dissolved	0.1 J	0.1 UL	NA	NA
Nickel, Dissolved	1.3 U	2.3 B	NA	NA
Potassium, Dissolved	1,490 B	1,370 J	NA	NA
Selenium, Dissolved	5.8 L	4.4 J	NA	NA
Silver, Dissolved	0.61 U	0.62 U	NA	NA
Sodium, Dissolved	6,770	7,890	NA	NA
Thallium, Dissolved	6.2 U	3.3 U	NA	NA
Vanadium, Dissolved	1.2 B	0.7 B	NA	NA
Zinc, Dissolved	1 B	5.2 U	NA	NA
Wet Chemistry				
Alkalinity (mg/l)	214	194	NA	NA
Chloride (mg/l)	12 D	10 JD	NA	NA
Ethane (ug/l)	0.2 J	0.1 J	NA	NA
Ethene (ug/l)	2 U	0.05 J	NA	NA
Methane (ug/l)	5 B	0.8 JB	NA	NA
Nitrate (ug/l)	NA	NA	NA	NA
Sulfate (mg/l)	24 JD	21 JD	NA	NA
Total organic carbon (TOC) (mg/l)	2.1 J	4 J	NA	NA
Dechlorinating Bacteria (cells/ml)				
Dehalococcoides	NA	NA	NA	NA

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

D - Compound identified in an analysis at a secondary dilution factor

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

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UL - Analyte not detected, quantitation limit is probably higher

cells/ml - Cells per milliliter

mg/l - Milligrams per liter

µg/l - Micrograms per liter

CTO-166
Yorktown - Site 3
Groundwater Detected Analytical Results
March and July 2009

Station ID	YS03-GW006	YS03-GW008A	YS03-GW008B		YS03-GW015	YS03-GW015A	YS03-GW018	YS03-GW019	YS03-GW019A	YS03-GW020	YS03-GW020A	YS03-GW021	YS03-GW022	YS03-GW023	YS03-GW024	YS03-GW025		YS03-GW026
Sample ID	YS03-GW06-0309	YS03-GW08A-0309	YS03-GW08B-0309	YS03-GW08BP-0309	YS03-GW15-0309	YS03-GW15A-0309	YS03-GW18-0309	YS03-GW19-0309	YS03-GW19A-0409	YS03-GW20-0309	YS03-GW20A-0309	YS03-GW21-0309	YS03-GW22-0309	YS03-GW23-0309	YS03-GW24-0309	YS03-GW25-0309	YS03-GW25P-0309	YS03-GW26-0309
Sample Date	03/19/09	03/18/09	03/18/09	03/18/09	03/17/09	03/17/09	03/17/09	03/19/09	04/06/09	03/20/09	03/20/09	03/18/09	03/19/09	03/18/09	03/30/09	03/20/09	03/20/09	03/17/09
Chemical Name																		
Volatile Organic Compounds (µg/l)																		
1,1-Dichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	8.2 J	1.3 U	1 U	10 U
1,1-Dichloroethene	0.5 U	0.5 U	0.5 U	0.5 U	0.35 J	0.5 U	0.5 U	3.4 J	0.5 U	0.5 U	0.5 U	0.5 U	0.68 J	0.5 U	12 J	0.47 J	0.43 J	10 U
1,2-Dichloroethene (total)	0.15 J	0.5 U	0.12 J	0.13 J	3.7	0.18 J	0.5 U	330	6.4	0.5 U	0.5 U	2.5	100	5.9	1,400	51	51	330
1,4-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.11 J	2.5 U	0.5 U	36 U	0.55 J	0.56 J	10 U
Carbon disulfide	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.13 J	0.5 U	0.5 U	1.6	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U
cis-1,2-Dichloroethene	0.15 J	0.5 U	0.12 J	0.14 J	3.7	0.18 J	0.5 U	330	6.5	0.5 U	0.5 U	2.5	110	5.9	1,400	52	52	330
Dichlorodifluoromethane (Freon-12)	0.5 U	0.5 U	0.15 J	0.15 J	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U
Ethylbenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.19 J	0.5 U	0.5 U	0.17 J	2.5 U	0.15 J	36 U	1.3 U	1 U	10 U
Methyl acetate	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.4 J	2.5 U	0.5 U	36 U	1.3 U	1 U	10 U
trans-1,2-Dichloroethene	0.5 U	0.5 U	0.5 U	0.5 U	0.1 J	0.5 U	0.5 U	2.2 J	0.5 U	0.5 U	0.5 U	0.5 U	0.73 J	0.5 U	8.8 J	1.3 U	0.27 J	10 U
Trichloroethene	0.49 J	0.5 U	4.9	5	3.8	0.5 U	0.91	190	3.1	0.5 U	0.5 U	2.9	63	9.9	400	9.6	9.5	130
Vinyl chloride	0.5 U	0.5 U	0.5 U	0.5 U	2.3	0.5 U	0.5 U	58	0.26 J	0.5 U	0.5 U	0.5 U	9.8	0.19 J	1,200	4.3	4.9	10 U
Total Metals (µg/l)																		
Aluminum	134 J	119 J	107 J	116 J	309	53.4 U	181 J	149 J	19,300	532	190 J	4,290	162 J	193 J	13,000	900	746	713
Arsenic	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	60.7	2.2 U	2.2 U	45	2.2 U	2.7 J	32.3	3.6 J	2.2 U	2.2 U
Barium	26 J	22.9 J	31.6 J	32.4 J	49.5 J	22.8 J	39.7 J	38.5 J	101 J	22.1 J	13.5 J	66 J	61.8 J	38.4 J	132 J	38.8 J	38.1 J	35.4 J
Beryllium	0.83 B	1.2 B	0.42 U	0.42 U	0.42 UL	0.42 UL	0.42 UL	1.1 B	0.69 J	0.93 B	0.5 B	0.45 B	1.2 B	0.42 U	0.42 U	1.3 B	1 B	0.42 UL
Calcium	88,600	90,000	121,000	121,000	159,000	74,900	31,500	134,000	201,000	74,300	47,500	126,000	174,000	106,000	336,000	146,000	148,000	115,000
Chromium	3.6 B	2.5 B	1.2 B	12.7	1.9 J	1.4 J	0.7 U	4.1 B	123	11.7	3 B	20.8	2.2 B	2.8 B	524	6.1 J	4.9 J	5.6 J
Cobalt	1.6 U	1.6 U	1.6 U	1.6 U	2.6 J	1.6 U	1.6 U	1.6 U	6.2	1.6 U	1.6 U	2.7 J	1.6 U	1.6 U	10.9	1.8 J	2.7 J	1.6 U
Copper	0.84 UL	0.84 UL	0.84 U	0.84 U	1.7 J	0.84 U	0.84 U	54.9	25.2	0.84 UL	0.84 UL	3.1 J	0.84 UL	0.84 U	28.9	0.84 UL	0.84 UL	0.84 U
Iron	419	1,160	280	306	1,410	1,340	35.1 B	402	49,600	2,700	1,410	11,000	384	2,190	36,000	2,220	1,730	2,930
Lead	1.8 L	1.4 UL	1.4 UL	1.4 UL	1.4 UL	1.4 UL	1.4 UL	2.1 L	17	2.7 L	2 L	2.5 L	1.4 UL	1.4 UL	13.7	2.1 L	1.8 L	1.4 UL
Magnesium	2,630 J	1,390 J	2,530 J	2,580 J	2,180 J	1,040 J	502 J	4,220 J	8,180	1,130 J	1,280 J	4,500 J	3,180 J	2,650 J	11,500	3,540 J	3,520 J	3,810 J
Manganese	41.7	77.5	39.2	39	219	47.6	0.42 B	33.3	1,320	25.6	80.2	1,260	102	147	523	147	155	79.1
Mercury	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.28	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nickel	2.8 B	0.86 B	1.4 J	5.8 J	3.4 J	0.67 U	0.67 U	3.1 B	32.4 J	5.4 J	2 B	9.3 J	2.6 B	1.4 B	250	3.4 B	3.1 B	2.1 J
Potassium	1,080 J	1,120 J	1,040 J	1,090 J	1,060 J	751 J	1,480 J	894 J	8,350	951 J	1,860 J	2,950 J	1,220 J	1,910 J	7,000	1,250 J	1,130 J	1,350 J
Selenium	2.2 U	2.2 U	2.2 UL	2.2 UL	2.2 UL	2.2 UL	2.2 UL	2.2 U	3.5 J	2.2 U	2.2 U	2.2 UL	2.2 U	2.2 UL	2.2 U	2.2 U	2.2 U	2.2 UL
Sodium	6,700	6,830	8,660	8,950	14,200	5,490	9,620	8,640	6,600	5,180	14,700	10,600	10,600	35,600	17,500	7,410	7,340	12,900
Vanadium	1.1 B	0.98 B	1.3 J	1.4 J	1.5 J	0.57 U	2.4 J	1.1 B	77.6	3.4 J	0.95 J	29	1.6 B	1 J	62	4.5 J	4 J	2.3 J
Zinc	5.2 U	5.2 U	6.6 J	20.6	19 J	5.8 J	5.2 U	5.5 J	2,780	10.4 J	6.2 J	21.7	5.2 U	5.2 U	64.6	7 J	6.1 J	5.2 U
Dissolved Metals (µg/l)																		
Aluminum, Dissolved	44.1 U	44.1 U	73.5 B	69.6 B	70.2 B	53.4 U	264 B	44.4 B	2,040	66.2 B	44.1 U	108 B	44.1 U	69.6 B	53.4 UL	114 B	78.8 B	68.1 B
Arsenic, Dissolved	4.9 J	4.7 J	3.5 J	3.7 J	3.1 J	2.2 U	2.2 U	4.8 J	5.6 J	2.8 J	2.9 J	34.7	6.5 J	6 J	6.4 J	7.9 J	5.2 J	3.1 J
Barium, Dissolved	27.4 J	24.6 J	32.4 J	31.2 J	48.5 J	19.7 J	37.4 J	41.7 J	35.2 J	19.4 J	13.5 J	44.5 J	65.1 J	37.5 J	67 J	37.7 J	37.8 J	33.5 J
Cadmium, Dissolved	0.34 U	0.34 U	0.86 B	0.75 B	0.64 U	0.64 U	0.64 U	0.34 U	0.64 U	0.34 U	0.34 U	0.93 B	0.34 U	0.75 B	0.64 U	0.34 U	0.34 U	0.64 U
Calcium, Dissolved	97,600	91,500	134,000	132,000	175,000	81,900	31,000	147,000	77,500	71,700	49,200	116,000	183,000	114,000	217,000	148,000	150,000	127,000
Copper, Dissolved	0.9 U	0.9 U	0.84 UL	0.84 UL	0.84 UL	0.84 UL	0.84 UL	0.9 U	4.3 B	0.9 U	0.9 U	0.84 UL	0.9 U	0.84 UL	3.7 B	0.9 U	0.9 U	0.84 UL
Iron, Dissolved	63.5 B	810	24.6 U	24.6 U	956	119	24.6 U	100 B	1,540	181	172	2,010	140 B	1,800	107 B	49.1 B	43 B	1,960
Magnesium, Dissolved	2,920 J	1,460 J	3,050 J	2,970 J	2,550 J	1,220 J	590 J	4,640 J	1,500 J	1,020 J	1,310 J	4,090 J	3,520 J	3,050 J	8,040	3,540 J	3,550 J	4,330 J
Manganese, Dissolved	28.5	77.3	32.8	34.9	226	25.5	0.37 U	32.8	448	13.5	59.2	1,260	121	152	225	148	153	76.5
Mercury, Dissolved	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 UL	0.1 U	0.11 J	0.1 U	0.13 J	0.1 U	0.1 UL	0.1 U	0.1 U	0.1 U
Nickel, Dissolved	2.2 B	1.3 U	1.3 B	1.6 B	2.2 B	1.1 B	1.2 B	1.3 U	2.6 B	1.4 B	1.3 U	1.7 B	2.4 B	0.97 B	15 J	1.4 B	1.9 B	0.67 U
Potassium, Dissolved	1,710 B	1,770 B	1,480 B	1,450 B	1,440 B	1,090 B	2,110 B	1,460 B	2,120 J	1,290 B	2,470 B	1,660 B	1,820 B	2,550 B	1,720 J	1,440 B	1,430 B	1,580 B
Selenium, Dissolved	6.8 L	7.7 L	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	9.7 L	2.2 U	4.1 UL	4.4 L	2.3 J	8.4 L	2.2 U	2.9 J	8.7 L	6.4 L	2.2 U
Silver, Dissolved	0.93 J	0.67 B	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.61 U	0.62 U	0.61 U	0.61 U	0.62 U	0.83 J	0.62 U	0.62 U	0.61 U	0.61 U	0.62 U
Sodium, Dissolved	6,900	6,940	10,400	10,100	16,900	6,300	11,300	8,790	5,730	4,750 J	14,600	12,000	11,900	41,800	17,600	6,900	7,070	14,700
Thallium, Dissolved	6.2 U	6.2 U	3.3 U	4.1 J	3.3 U	3.3 U	3.3 U	6.2 U	3.3 U	6.2 U	6.2 U	3.3 U	6.2 U	3.3 U	3.3 U	6.2 U	6.2 U	3.3 U
Vanadium, Dissolved	0.57 B	0.47 U	0.57 U	0.57 U	0.57 U	0.57 U	2 J	0.47 U	5.7 J	0.47 U	0.47 U	0.57 U	1.1 B	0.57 U	1 B	0.47 U	0.47 U	0.57 U
Zinc, Dissolved	4.8 B	0.79 B	24.1 B	12 B	8.5 B	8.7 B	5.2 U	1 B	112	0.74 U	1.3 B	5.2 U	2 B	5.2 U	9 B	1.6 B	3.7 B	5.2 U
Wet Chemistry																		
Alkalinity (mg/l)	10 U	178	300	NA	399	176	10 U	356	160	124	117	293	428	236	536 D	362	NA	270
Chloride (mg/l)	12 D	10 D	15 D	NA	7.2 JD	8.9 JD	7.9 JD	14 D	10 D	11 D	12 D	17 D	19 D	12 D	56 D	10 D	NA	16 D
Ethane (ug/l)	2 U	2 U	2 U	NA	0.4 J	2 U	2 U	1 J	2 U	2 U	2 U	0.3 J	0.7 J	0.3 J	21	0.5 J	NA	0.1 J
Ethene (ug/l)	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	0.2 J	2 U	0.2 J	1 J	2 U	NA	0.3 J
Nitrate (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	62 D	47 D	29 D	NA	18 JD	24 JD	26 D	24 JD	39 D	49 D	25 JD	18 JD	19 JD	95 D	11 JD	18 JD	NA	43 D
Total organic carbon (TOC) (mg/l)	0.44 J	1.3 J	0.54 J	NA	1.8 J	1.1 J	1.9 J	1.4 J	1.8 J	1.3 J	1.6 J	17	2.7 J	1.5 J	6.8	2.9 J	NA	2 J
Dechlorinating Bacteria (cells/ml)																		
Dehalococcoides	NA	NA	NA	NA	NA	NA	NA	6.1	NA	NA	NA	NA	NA	NA	26.2	NA	NA	NA

Notes:

Shading indicates detections

NA - Not analyzed
B - Analyte not detected above the level reported in blanks
D - Compound identified in an analysis at a secondary dilution factor
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
cells/ml - Cells per milliliter
mg/l - Milligrams per liter
µg/l - Micrograms per liter

CTO-166
Yorktown - Site 3
Groundwater Detected Analytical Results
March and July 2009

Station ID	YS03-GW027	YS03-GW028	YS03-GW029		
Sample ID	YS03-GW27-0309	YS03-GW28-0309	YS03-GW29-0309	YS03-GW29-0709	YS03-GW29P-0709
Sample Date	03/20/09	03/19/09	03/30/09	07/13/09	07/13/09
Chemical Name					
Volatile Organic Compounds (µg/l)					
1,1-Dichloroethane	31 U	3.1 UL	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	31 U	3.1 UL	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	880	120 L	0.29 J	0.5 U	0.5 U
1,4-Dichlorobenzene	31 U	3.1 UL	0.5 U	0.5 U	0.5 U
Carbon disulfide	31 U	3.1 UL	0.27 J	0.5 U	0.5 U
cis-1,2-Dichloroethene	890	120 L	0.29 J	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	31 U	3.1 UL	0.5 U	0.5 U	0.5 U
Ethylbenzene	31 U	3.1 UL	0.59	0.79	0.87
Methyl acetate	31 U	3.1 UL	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	31 U	1.1 L	0.5 U	0.5 U	0.5 U
Trichloroethene	130	36 L	0.24 J	0.5 U	0.5 U
Vinyl chloride	1,100	5.2 L	0.24 J	0.5 U	0.5 U
Total Metals (µg/l)					
Aluminum	5,670	122 J	369	NA	NA
Arsenic	17.2	2.2 U	18.5	NA	NA
Barium	69.8 J	13.3 J	17.6 J	NA	NA
Beryllium	1.3 B	1.3 B	0.42 U	NA	NA
Calcium	161,000	85,400	72,900	NA	NA
Chromium	18.2	1.5 B	40.4	NA	NA
Cobalt	5.3	1.6 U	1.6 U	NA	NA
Copper	1.9 L	0.84 UL	2 J	NA	NA
Iron	7,250	160	1,310	NA	NA
Lead	4.7 L	1.4 UL	1.4 U	NA	NA
Magnesium	6,340	1,780 J	2,300 J	NA	NA
Manganese	500	30.5	42.7	NA	NA
Mercury	0.1 J	0.1 U	0.1 U	NA	NA
Nickel	15 J	1.3 B	19.4 J	NA	NA
Potassium	2,510 J	872 J	1,340 J	NA	NA
Selenium	2.2 U	2.2 U	2.2 U	NA	NA
Sodium	13,600	6,980	7,180	NA	NA
Vanadium	26.1	1.7 B	3.2 B	NA	NA
Zinc	34.8	8.4 J	5.2 U	NA	NA
Dissolved Metals (µg/l)					
Aluminum, Dissolved	113 B	44.1 U	53.4 UL	NA	NA
Arsenic, Dissolved	5.7 J	3.2 J	25.8	NA	NA
Barium, Dissolved	60.4 J	13.8 J	17.3 J	NA	NA
Cadmium, Dissolved	0.44 J	0.34 U	0.64 U	NA	NA
Calcium, Dissolved	176,000	91,900	78,300	NA	NA
Copper, Dissolved	1.5 J	0.9 U	3.7 B	NA	NA
Iron, Dissolved	19.9 U	19.9 U	171 B	NA	NA
Magnesium, Dissolved	6,500	1,950 J	2,380 J	NA	NA
Manganese, Dissolved	482	28.2	40.7	NA	NA
Mercury, Dissolved	0.1 U	0.1 J	0.1 UL	NA	NA
Nickel, Dissolved	4.4 B	1.3 U	2.3 B	NA	NA
Potassium, Dissolved	2,090 B	1,490 B	1,370 J	NA	NA
Selenium, Dissolved	11.2 L	5.8 L	4.4 J	NA	NA
Silver, Dissolved	0.61 U	0.61 U	0.62 U	NA	NA
Sodium, Dissolved	15,100	6,770	7,890	NA	NA
Thallium, Dissolved	6.2 U	6.2 U	3.3 U	NA	NA
Vanadium, Dissolved	0.84 B	1.2 B	0.7 B	NA	NA
Zinc, Dissolved	33.8	1 B	5.2 U	NA	NA
Wet Chemistry					
Alkalinity (mg/l)	386	214	194	NA	NA
Chloride (mg/l)	33 D	12 D	10 JD	NA	NA
Ethane (ug/l)	15	0.2 J	0.1 J	NA	NA
Ethene (ug/l)	1 J	2 U	0.05 J	NA	NA
Nitrate (ug/l)	NA	NA	NA	NA	NA
Sulfate (mg/l)	20 JD	24 JD	21 JD	NA	NA
Total organic carbon (TOC) (mg/l)	1 J	2.1 J	4 J	NA	NA
Dechlorinating Bacteria (cells/ml)					
Dehalococcoides	NA	NA	NA	NA	NA

Notes:

Shading indicates detections

NA - Not analyzed
B - Analyte not detected above the level reported in blanks
D - Compound identified in an analysis at a secondary dilution factor
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
cells/ml - Cells per milliliter
mg/l - Milligrams per liter
µg/l - Micrograms per liter

CTO-166
Yorktown - Site 3
Groundwater Exceedance Results
March and July 2009

Station ID	Yorktown Background Criteria - Yorktown-Eastover Aquifer	CLEAN MCL-Groundwater	Adjusted Tap Water RSLs	YS03-GW006	YS03-GW008A	YS03-GW008B		YS03-GW015	YS03-GW015A	YS03-GW018	YS03-GW019	YS03-GW019A	YS03-GW020	YS03-GW020A	YS03-GW021	YS03-GW022	YS03-GW023
				Yorktown-Eastover													
Sample ID				YS03-GW06-0309	YS03-GW08A-0309	YS03-GW08B-0309	YS03-GW08BP-0309	YS03-GW15-0309	YS03-GW15A-0309	YS03-GW18-0309	YS03-GW19-0309	YS03-GW19A-0409	YS03-GW20-0309	YS03-GW20A-0309	YS03-GW21-0309	YS03-GW22-0309	YS03-GW23-0309
Sample Date				03/19/09	03/18/09	03/18/09	03/18/09	03/17/09	03/17/09	03/17/09	03/19/09	04/06/09	03/20/09	03/20/09	03/18/09	03/19/09	03/18/09
Chemical Name																	
Volatile Organic Compounds (µg/l)																	
1,1-Dichloroethane	--	--	2.4	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U
1,1-Dichloroethene	--	7	34	0.5 U	0.5 U	0.5 U	0.5 U	0.35 J	0.5 U	0.5 U	3.4 J	0.5 U	0.5 U	0.5 U	0.5 U	0.68 J	0.5 U
1,2-Dichloroethene (total)	--	70	33	0.15 J	0.5 U	0.12 J	0.13 J	3.7	0.18 J	0.5 U	330	6.4	0.5 U	0.5 U	2.5	100	5.9
1,4-Dichlorobenzene	--	75	0.43	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.11 J	2.5 U	0.5 U
Carbon disulfide	--	--	100	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.13 J	0.5 U	0.5 U	1.6	2.5 U	0.5 U
cis-1,2-Dichloroethene	--	70	37	0.15 J	0.5 U	0.12 J	0.14 J	3.7	0.18 J	0.5 U	330	6.5	0.5 U	0.5 U	2.5	110	5.9
Dichlorodifluoromethane (Freon-12)	--	--	40	0.5 U	0.5 U	0.15 J	0.15 J	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	0.5 U
Ethylbenzene	--	700	1.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.19 J	0.5 U	0.5 U	0.17 J	2.5 U	0.15 J
Methyl acetate	--	--	3,700	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	0.5 U	0.5 U	0.5 U	0.4 J	2.5 U	0.5 U
trans-1,2-Dichloroethene	--	100	11	0.5 U	0.5 U	0.5 U	0.5 U	0.1 J	0.5 U	0.5 U	2.2 J	0.5 U	0.5 U	0.5 U	0.5 U	0.73 J	0.5 U
Trichloroethene	--	5	2	0.49 J	0.5 U	4.9	5	3.8	0.5 U	0.91	190	3.1	0.5 U	0.5 U	2.9	63	9.9
Vinyl chloride	--	2	0.016	0.5 U	0.5 U	0.5 U	0.5 U	2.3	0.5 U	0.5 U	58	0.26 J	0.5 U	0.5 U	0.5 U	9.8	0.19 J
Total Metals (µg/l)																	
Aluminum	1,160	--	3,700	134 J	119 J	107 J	116 J	309	53.4 U	181 J	149 J	19,300	532	190 J	4,290	162 J	193 J
Arsenic	3.5 J	10	0.045	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	60.7	2.2 U	2.2 U	45	2.2 U	2.7 J
Barium	43.6 J	2,000	730	26 J	22.9 J	31.6 J	32.4 J	49.5 J	22.8 J	39.7 J	38.5 J	101 J	22.1 J	13.5 J	66 J	61.8 J	38.4 J
Beryllium	ND	4	7.3	0.83 B	1.2 B	0.42 U	0.42 U	0.42 UL	0.42 UL	0.42 UL	1.1 B	0.69 J	0.93 B	0.5 B	0.45 B	1.2 B	0.42 U
Chromium	4.7 L	100	0.043	3.6 B	2.5 B	1.2 B	12.7	1.9 J	1.4 J	0.7 U	4.1 B	123	11.7	3 B	20.8	2.2 B	2.8 B
Cobalt	ND	--	1.1	1.6 U	1.6 U	1.6 U	1.6 U	2.6 J	1.6 U	1.6 U	1.6 U	6.2	1.6 U	1.6 U	2.7 J	1.6 U	1.6 U
Copper	4.5 J	1,300	150	0.84 UL	0.84 UL	0.84 U	0.84 U	1.7 J	0.84 U	0.84 U	54.9	25.2	0.84 UL	0.84 UL	3.1 J	0.84 UL	0.84 U
Iron	2,350	--	2,600	419	1,160	280	306	1,410	1,340	35.1 B	402	49,600	2,700	1,410	11,000	384	2,190
Lead	ND	15	--	1.8 L	1.4 UL	1.4 UL	1.4 UL	1.4 UL	1.4 UL	1.4 UL	2.1 L	17	2.7 L	2 L	2.5 L	1.4 UL	1.4 UL
Manganese	18.4	--	88	41.7	77.5	39.2	39	219	47.6	0.42 B	33.3	1,320	25.6	80.2	1,260	102	147
Mercury	ND	2	1.1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.28	0.1 U	0.1 U	0.1 U
Nickel	ND	--	73	2.8 B	0.86 B	1.4 J	5.8 J	3.4 J	0.67 U	0.67 U	3.1 B	32.4 J	5.4 J	2 B	9.3 J	2.6 B	1.4 B
Selenium	2.9 J	50	18	2.2 U	2.2 U	2.2 UL	2.2 UL	2.2 UL	2.2 UL	2.2 UL	2.2 U	3.5 J	2.2 U	2.2 U	2.2 UL	2.2 U	2.2 UL
Vanadium	7.5 J	--	18	1.1 B	0.98 B	1.3 J	1.4 J	1.5 J	0.57 U	2.4 J	1.1 B	77.6	3.4 J	0.95 J	29	1.6 B	1 J
Zinc	14.9 J	--	1,100	5.2 U	5.2 U	6.6 J	20.6	19 J	5.8 J	5.2 U	5.5 J	2,780	10.4 J	6.2 J	21.7	5.2 U	5.2 U
Dissolved Metals (µg/l)																	
Aluminum, Dissolved	146 J	--	3,700	44.1 U	44.1 U	73.5 B	69.6 B	70.2 B	53.4 U	264 B	44.4 B	2,040	66.2 B	44.1 U	108 B	44.1 U	69.6 B
Arsenic, Dissolved	ND	10	0.045	4.9 J	4.7 J	3.5 J	3.7 J	3.1 J	2.2 U	2.2 U	4.8 J	5.6 J	2.8 J	2.9 J	34.7	6.5 J	6 J
Barium, Dissolved	30.9 J	2,000	730	27.4 J	24.6 J	32.4 J	31.2 J	48.5 J	19.7 J	37.4 J	41.7 J	35.2 J	19.4 J	13.5 J	44.5 J	65.1 J	37.5 J
Cadmium, Dissolved	ND	5	1.8	0.34 U	0.34 U	0.86 B	0.75 B	0.64 U	0.64 U	0.64 U	0.34 U	0.64 U	0.34 U	0.34 U	0.93 B	0.34 U	0.75 B
Copper, Dissolved	4 J	1,300	150	0.9 U	0.9 U	0.84 UL	0.84 UL	0.84 UL	0.84 UL	0.84 UL	0.9 U	4.3 B	0.9 U	0.9 U	0.84 UL	0.9 U	0.84 UL
Iron, Dissolved	5.8 J	--	2,600	63.5 B	810	24.6 U	24.6 U	956	119	24.6 U	100 B	1,540	181	172	2,010	140 B	1,800
Manganese, Dissolved	12.2 J	--	88	28.5	77.3	32.8	34.9	226	25.5	0.37 U	32.8	448	13.5	59.2	1,260	121	152
Mercury, Dissolved	ND	2	1.1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 UL	0.1 U	0.11 J	0.1 U	0.13 J	0.1 U
Nickel, Dissolved	ND	--	73	2.2 B	1.3 U	1.3 B	1.6 B	2.2 B	1.1 B	1.2 B	1.3 U	2.6 B	1.4 B	1.3 U	1.7 B	2.4 B	0.97 B
Selenium, Dissolved	3.9 K	50	18	6.8 L	7.7 L	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	9.7 L	2.2 U	4.1 UL	4.4 L	2.3 J	8.4 L	2.2 U
Silver, Dissolved	ND	--	18	0.93 J	0.67 B	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.61 U	0.62 U	0.61 U	0.61 U	0.62 U	0.83 J	0.62 U
Thallium, Dissolved	ND	2	0.24	6.2 U	6.2 U	3.3 U	4.1 J	3.3 U	3.3 U	3.3 U	6.2 U	3.3 U	6.2 U	6.2 U	3.3 U	6.2 U	3.3 U
Vanadium, Dissolved	6.3 J	--	18	0.57 B	0.47 U	0.57 U	0.57 U	0.57 U	0.57 U	2 J	0.47 U	5.7 J	0.47 U	0.47 U	0.57 U	1.1 B	0.57 U
Zinc, Dissolved	5.9 J	--	1,100	4.8 B	0.79 B	24.1 B	12 B	8.5 B	8.7 B	5.2 U	1 B	112	0.74 U	1.3 B	5.2 U	2 B	5.2 U
Wet Chemistry																	
Alkalinity (mg/l)	--	--	--	10 U	178	300	NA	399	176	10 U	356	160	124	117	293	428	236
Chloride (mg/l)	--	--	--	12 D	10 D	15 D	NA	7.2 JD	8.9 JD	7.9 JD	14 D	10 D	11 D	12 D	17 D	19 D	12 D
Ethane (ug/l)	--	--	--	2 U	2 U	2 U	NA	0.4 J	2 U	2 U	1 J	2 U	2 U	2 U	0.3 J	0.7 J	0.3 J
Ethene (ug/l)	--	--	--	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	0.2 J	2 U	0.2 J
Nitrate (ug/l)	--	10,000	5,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	--	--	--	62 D	47 D	29 D	NA	18 JD	24 JD	26 D	24 JD	39 D	49 D	25 JD	18 JD	19 JD	95 D
Total organic carbon (TOC) (mg/l)	--	--	--	0.44 J	1.3 J	0.54 J	NA	1.8 J	1.1 J	1.9 J	1.4 J	1.8 J	1.3 J	1.6 J	17	2.7 J	1.5 J
Dechlorinating Bacteria (cells/ml)																	
Dehalococcoides	--	--	--	NA	NA	NA	NA	NA	NA	NA	6.1	NA	NA	NA	NA	NA	NA

Notes:

Concentrations shaded blue exceed MCLs

Concentrations shaded green exceed RSLs

Concentrations shaded red exceed both MCLs and RSLs

RSLs were adjusted for noncarcinogens to account for exposure to multiple constituents

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

D - Compound identified in an analysis at a secondary dilution factor

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be

L - Analyte present, value may be

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation

UL - Analyte not detected,

cells/ml - Cells per milliliter

mg/l - Milligrams per liter

µg/l - Micrograms per liter

CTO-166
Yorktown - Site 3
Groundwater Exceedance Results
March and July 2009

Station ID	Yorktown Background Criteria - Yorktown-Eastover Aquifer	CLEAN MCL-Groundwater	Adjusted Tap Water RSLs	YS03-GW024	YS03-GW025		YS03-GW026	YS03-GW027	YS03-GW028	YS03-GW029		
				Yorktown-Eastover								
Sample ID				YS03-GW24-0309	YS03-GW25-0309	YS03-GW25P-0309	YS03-GW26-0309	YS03-GW27-0309	YS03-GW28-0309	YS03-GW29-0309	YS03-GW29-0709	YS03-GW29P-0709
Sample Date				03/30/09	03/20/09	03/20/09	03/17/09	03/20/09	03/19/09	03/30/09	07/13/09	07/13/09
Chemical Name												
Volatile Organic Compounds (µg/l)												
1,1-Dichloroethane	--	--	2.4	8.2 J	1.3 U	1 U	10 U	31 U	3.1 UL	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	--	7	34	12 J	0.47 J	0.43 J	10 U	31 U	3.1 UL	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	--	70	33	1,400	51	51	330	880	120 L	0.29 J	0.5 U	0.5 U
1,4-Dichlorobenzene	--	75	0.43	36 U	0.55 J	0.56 J	10 U	31 U	3.1 UL	0.5 U	0.5 U	0.5 U
Carbon disulfide	--	--	100	36 U	1.3 U	1 U	10 U	31 U	3.1 UL	0.27 J	0.5 U	0.5 U
cis-1,2-Dichloroethene	--	70	37	1,400	52	52	330	890	120 L	0.29 J	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	--	--	40	36 U	1.3 U	1 U	10 U	31 U	3.1 UL	0.5 U	0.5 U	0.5 U
Ethylbenzene	--	700	1.5	36 U	1.3 U	1 U	10 U	31 U	3.1 UL	0.59	0.79	0.87
Methyl acetate	--	--	3,700	36 U	1.3 U	1 U	10 U	31 U	3.1 UL	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	--	100	11	8.8 J	1.3 U	0.27 J	10 U	31 U	1.1 L	0.5 U	0.5 U	0.5 U
Trichloroethene	--	5	2	400	9.6	9.5	130	130	36 L	0.24 J	0.5 U	0.5 U
Vinyl chloride	--	2	0.016	1,200	4.3	4.9	10 U	1,100	5.2 L	0.24 J	0.5 U	0.5 U
Total Metals (µg/l)												
Aluminum	1,160	--	3,700	13,000	900	746	713	5,670	122 J	369	NA	NA
Arsenic	3.5 J	10	0.045	32.3	3.6 J	2.2 U	2.2 U	17.2	2.2 U	18.5	NA	NA
Barium	43.6 J	2,000	730	132 J	38.8 J	38.1 J	35.4 J	69.8 J	13.3 J	17.6 J	NA	NA
Beryllium	ND	4	7.3	0.42 U	1.3 B	1 B	0.42 UL	1.3 B	1.3 B	0.42 U	NA	NA
Chromium	4.7 L	100	0.043	524	6.1 J	4.9 J	5.6 J	18.2	1.5 B	40.4	NA	NA
Cobalt	ND	--	1.1	10.9	1.8 J	2.7 J	1.6 U	5.3	1.6 U	1.6 U	NA	NA
Copper	4.5 J	1,300	150	28.9	0.84 UL	0.84 UL	0.84 U	1.9 L	0.84 UL	2 J	NA	NA
Iron	2,350	--	2,600	36,000	2,220	1,730	2,930	7,250	160	1,310	NA	NA
Lead	ND	15	--	13.7	2.1 L	1.8 L	1.4 UL	4.7 L	1.4 UL	1.4 U	NA	NA
Manganese	18.4	--	88	523	147	155	79.1	500	30.5	42.7	NA	NA
Mercury	ND	2	1.1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 J	0.1 U	0.1 U	NA	NA
Nickel	ND	--	73	250	3.4 B	3.1 B	2.1 J	15 J	1.3 B	19.4 J	NA	NA
Selenium	2.9 J	50	18	2.2 U	2.2 U	2.2 U	2.2 UL	2.2 U	2.2 U	2.2 U	NA	NA
Vanadium	7.5 J	--	18	62	4.5 J	4 J	2.3 J	26.1	1.7 B	3.2 B	NA	NA
Zinc	14.9 J	--	1,100	64.6	7 J	6.1 J	5.2 U	34.8	8.4 J	5.2 U	NA	NA
Dissolved Metals (µg/l)												
Aluminum, Dissolved	146 J	--	3,700	53.4 UL	114 B	78.8 B	68.1 B	113 B	44.1 U	53.4 UL	NA	NA
Arsenic, Dissolved	ND	10	0.045	6.4 J	7.9 J	5.2 J	3.1 J	5.7 J	3.2 J	25.8	NA	NA
Barium, Dissolved	30.9 J	2,000	730	67 J	37.7 J	37.8 J	33.5 J	60.4 J	13.8 J	17.3 J	NA	NA
Cadmium, Dissolved	ND	5	1.8	0.64 U	0.34 U	0.34 U	0.64 U	0.44 J	0.34 U	0.64 U	NA	NA
Copper, Dissolved	4 J	1,300	150	3.7 B	0.9 U	0.9 U	0.84 UL	1.5 J	0.9 U	3.7 B	NA	NA
Iron, Dissolved	5.8 J	--	2,600	107 B	49.1 B	43 B	1,960	19.9 U	19.9 U	171 B	NA	NA
Manganese, Dissolved	12.2 J	--	88	225	148	153	76.5	482	28.2	40.7	NA	NA
Mercury, Dissolved	ND	2	1.1	0.1 UL	0.1 U	0.1 U	0.1 U	0.1 U	0.1 J	0.1 UL	NA	NA
Nickel, Dissolved	ND	--	73	15 J	1.4 B	1.9 B	0.67 U	4.4 B	1.3 U	2.3 B	NA	NA
Selenium, Dissolved	3.9 K	50	18	2.9 J	8.7 L	6.4 L	2.2 U	11.2 L	5.8 L	4.4 J	NA	NA
Silver, Dissolved	ND	--	18	0.62 U	0.61 U	0.61 U	0.62 U	0.61 U	0.61 U	0.62 U	NA	NA
Thallium, Dissolved	ND	2	0.24	3.3 U	6.2 U	6.2 U	3.3 U	6.2 U	6.2 U	3.3 U	NA	NA
Vanadium, Dissolved	6.3 J	--	18	1 B	0.47 U	0.47 U	0.57 U	0.84 B	1.2 B	0.7 B	NA	NA
Zinc, Dissolved	5.9 J	--	1,100	9 B	1.6 B	3.7 B	5.2 U	33.8	1 B	5.2 U	NA	NA
Wet Chemistry												
Alkalinity (mg/l)	--	--	--	536 D	362	NA	270	386	214	194	NA	NA
Chloride (mg/l)	--	--	--	56 D	10 D	NA	16 D	33 D	12 D	10 JD	NA	NA
Ethane (ug/l)	--	--	--	21	0.5 J	NA	0.1 J	15	0.2 J	0.1 J	NA	NA
Ethene (ug/l)	--	--	--	1 J	2 U	NA	0.3 J	1 J	2 U	0.05 J	NA	NA
Nitrate (ug/l)	--	10,000	5,800	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	--	--	--	11 JD	18 JD	NA	43 D	20 JD	24 JD	21 JD	NA	NA
Total organic carbon (TOC) (mg/l)	--	--	--	6.8	2.9 J	NA	2 J	1 J	2.1 J	4 J	NA	NA
Dechlorinating Bacteria (cells/ml)												
Dehalococcoides	--	--	--	26.2	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Concentrations shaded blue exceed MCLs

Concentrations shaded green exceed RSLs

Concentrations shaded red exceed both MCLs and RSLs

RSLs were adjusted for noncarcinogens to account for exposure to multiple constituents

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

D - Compound identified in an analysis at a secondary dilution factor

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be

L - Analyte present, value may be

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation

UL - Analyte not detected,

cells/ml - Cells per milliliter

mg/l - Milligrams per liter

µg/l - Micrograms per liter

CTO-166
Yorktown - Site 1
Validated Sediment Raw Analytical Results
March 2009

Station ID	YS01-SD030	YS01-SD031		YS01-SD032	YS01-SD033
Sample ID	YS01-SD30-0709	YS01-SD31-0709	YS01-SD31P-0709	YS01-SD32-0709	YS01-SD33-0709
Sample Date	07/23/09	07/23/09	07/23/09	07/21/09	07/21/09
Chemical Name					
Volatile Organic Compounds (µg/kg)					
1,1,1-Trichloroethane	6.3 U	6.7 U	7 U	33 UL	17 UL
1,1,2,2-Tetrachloroethane	6.3 U	6.7 U	7 U	33 UL	17 UL
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	6.3 U	6.7 U	7 U	33 UL	17 UL
1,1,2-Trichloroethane	6.3 U	6.7 U	7 U	33 UL	17 UL
1,1-Dichloroethane	6.3 U	6.7 U	7 U	33 UL	17 UL
1,1-Dichloroethene	6.3 U	6.7 U	7 U	33 UL	17 UL
1,2,4-Trichlorobenzene	6.3 U	6.7 U	7 U	33 UL	17 UL
1,2-Dibromo-3-chloropropane	6.3 U	6.7 U	7 U	33 UL	17 UL
1,2-Dibromoethane	6.3 U	6.7 U	7 U	33 UL	17 UL
1,2-Dichlorobenzene	6.3 U	6.7 U	7 U	33 UL	17 UL
1,2-Dichloroethane	6.3 U	6.7 U	7 U	33 UL	17 UL
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA
1,2-Dichloropropane	6.3 U	6.7 U	7 U	33 UL	17 UL
1,3-Dichlorobenzene	6.3 U	6.7 U	7 U	33 UL	17 UL
1,4-Dichlorobenzene	6.3 U	6.7 U	7 U	33 UL	17 UL
2-Butanone	6.6 J	13 B	17 B	84 UL	15 B
2-Hexanone	16 U	17 U	17 U	84 UL	43 UL
4-Methyl-2-pentanone	16 U	17 U	17 U	84 UL	43 UL
Acetone	57 B	67 B	120 B	190 B	79 B
Benzene	6.3 U	6.7 U	7 U	33 UL	17 UL
Bromodichloromethane	6.3 U	6.7 U	7 U	33 UL	17 UL
Bromoform	6.3 U	6.7 U	7 U	33 UL	17 UL
Bromomethane	6.3 U	6.7 U	7 U	33 UL	17 UL
Carbon disulfide	4.4 J	13	13	10 L	4.9 L
Carbon tetrachloride	6.3 U	6.7 U	7 U	33 UL	17 UL
Chlorobenzene	6.3 U	6.7 U	7 U	33 UL	17 UL
Chloroethane	6.3 U	6.7 U	7 U	33 UL	17 UL
Chloroform	6.3 U	6.7 U	7 U	33 UL	17 UL
Chloromethane	6.3 U	6.7 U	7 U	33 UL	17 UL
cis-1,2-Dichloroethene	6.3 U	6.7 U	7 U	33 UL	17 UL
cis-1,3-Dichloropropene	6.3 U	6.7 U	7 U	33 UL	17 UL
Cyclohexane	6.3 U	6.7 U	7 U	33 UL	17 UL
Dibromochloromethane	6.3 U	6.7 U	7 U	33 UL	17 UL
Dichlorodifluoromethane (Freon-12)	6.3 U	6.7 U	7 U	33 UL	17 UL
Ethylbenzene	6.3 U	6.7 U	7 U	33 UL	17 UL
Isopropylbenzene	6.3 U	6.7 U	7 U	33 UL	17 UL
m- and p-Xylene	13 U	13 U	14 U	67 UL	34 UL
Methyl acetate	6.3 U	6.7 U	7 U	33 UL	17 UL
Methylcyclohexane	6.3 U	6.7 U	7 U	33 UL	17 UL
Methylene chloride	6.3 U	6.7 U	7 U	33 UL	17 UL
Methyl-tert-butyl ether (MTBE)	6.3 U	6.7 U	7 U	33 UL	17 UL
o-Xylene	6.3 U	6.7 U	7 U	33 UL	17 UL
Styrene	6.3 U	6.7 U	7 U	33 UL	17 UL
Tetrachloroethene	6.3 U	6.7 U	7 U	33 UL	17 UL
Toluene	6.3 U	6.7 U	7 U	33 UL	17 UL
trans-1,2-Dichloroethene	6.3 U	6.7 U	7 U	33 UL	17 UL
trans-1,3-Dichloropropene	6.3 U	6.7 U	7 U	33 UL	17 UL
Trichloroethene	6.3 U	6.7 U	7 U	33 UL	17 UL
Trichlorofluoromethane(Freon-11)	6.3 U	6.7 U	7 U	33 UL	17 UL
Vinyl chloride	6.3 U	6.7 U	7 U	33 UL	17 UL
Xylene, total	6.3 U	6.7 U	7 U	33 UL	17 UL
Total Metals (mg/kg)					
Aluminum	395	716 J	478 J	25,600	22,600
Antimony	1.2 UL	1.3 UL	1.3 UL	3.2 UL	2.6 UL
Arsenic	1.2 UL	1.3 UL	1.3 UL	7.3 L	11.6 L
Barium	2.1 J	5.3 J	4.4 J	47.6 J	42.7 J
Beryllium	0.13 B	0.17 B	0.15 B	1.5 J	1.3
Cadmium	0.58 UL	0.65 UL	0.64 UL	1.6 UL	1.3 UL
Calcium	182 J	895	604 J	2,500	2,720
Chromium	0.88 L	1.6 L	1.2 L	51.6 L	45.8 L
Cobalt	0.11 J	0.57 J	0.44 J	8.9	8
Copper	0.47 L	1.8	0.64 L	28.9	26.8
Cyanide	NA	NA	NA	NA	NA
Iron	471	1,760	1,300	40,000	40,000
Lead	1.6 J	2.1 J	1.9 J	29.6 J	27.2 J
Magnesium	37.4 J	206 J	138 J	8,030	7,110
Manganese	1.6 L	15.5 L	13.1 L	316 L	250 L
Mercury	0.037 U	0.043 U	0.04 U	0.064 J	0.069 J
Nickel	0.23 J	0.88 J	0.54 J	23	21.1
Potassium	29.2 J	90.1 J	67 J	5,150	4,300
Selenium	0.58 R	0.65 R	0.64 R	2.6 B	3 B
Silver	0.58 UL	0.65 UL	0.64 UL	1.6 UL	1.3 UL
Sodium	142 B	657	499 B	12,100	7,430
Thallium	1.2 U	1.3 U	1.3 U	3.2 U	2.6 U
Vanadium	0.79 L	1.9 L	1.2 L	61.1 L	62.3 L
Zinc	2.5 L	5.1 L	3.6 L	125 L	114 L

CTO-166
Yorktown - Site 1
Validated Sediment Raw Analytical Results
March 2009

Station ID	YS01-SD030	YS01-SD031		YS01-SD032	YS01-SD033
Sample ID	YS01-SD30-0709	YS01-SD31-0709	YS01-SD31P-0709	YS01-SD32-0709	YS01-SD33-0709
Sample Date	07/23/09	07/23/09	07/23/09	07/21/09	07/21/09
Chemical Name					
Acid Volatile Sulfide/Simultaneously Extractable Metals (µmol/g)					
Zinc, SEM	0.043 K	0.038 K	0.065 K	0.853 K	0.518 K
Acid volatile sulfide	0.1 UJ	0.11 UJ	2.4 J	2.5 J	1.9 J
Cadmium, SEM	8.60E-04	5.30E-04 U	6.30E-04 U	0.0022	0.0014
Copper, SEM	0.0108	0.0078	0.0044 U	0.0208	0.0566
Lead, SEM	0.005 J	0.0034 J	0.0048 J	0.0217 J	0.0403 J
Nickel, SEM	0.0079 U	0.0082 U	0.0096 U	0.038	0.031
Silver, SEM	0.0011 U	0.0011 U	0.0013 U	0.0029 U	0.0022 U
Wet Chemistry					
Alkalinity (mg/kg)	200 U	200 U	NA	173 J	200 U
pH (ph)	6.3	7.4	NA	7.3	6.8
Total organic carbon (TOC) (mg/kg)	3,556	8,950	NA	22,910	19,210
Grain Size (pct/p)					
Sieve No. 004 (4.75 mm)	99	99.8	NA	98.1	94.9
Sieve No. 010 (2.00 mm)	95.2	97.7	NA	67.1	63.5
Sieve No. 020 (850 um)	63.6	72	NA	39.5	37.6
Sieve No. 040 (425 um)	33.1	39.3	NA	25.6	23.2
Sieve No. 060 (250 um)	14.3	18.6	NA	17.4	15.8
Sieve No. 080 (180 um)	7	8.5	NA	13.4	12.3
Sieve No. 100 (150 um)	4.4	5	NA	11.6	11.3
Sieve No. 230 (63-UM)	1.7	2.1	NA	3.1	5.1
Sieve No. 200 (75 um)	2.1	2.3	NA	5.6	6.4

Notes:

Shading indicates detections

NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
mg/kg - Milligrams per kilogram
pct/p - Percent Passed
ph - pH units
µg/kg - Micrograms per kilogram
µmol/g - Micromoles per gram

CTO-166
Yorktown - Site 1
Validated Sediment Detected Analytical Results
July 2009

Station ID	YS01-SD030	YS01-SD031		YS01-SD032	YS01-SD033
Sample ID	YS01-SD30-0709	YS01-SD31-0709	YS01-SD31P-0709	YS01-SD32-0709	YS01-SD33-0709
Sample Date	07/23/09	07/23/09	07/23/09	07/21/09	07/21/09
Chemical Name					
Volatile Organic Compounds (µg/kg)					
2-Butanone	6.6 J	13 B	17 B	84 UL	15 B
Carbon disulfide	4.4 J	13	13	10 L	4.9 L
Total Metals (mg/kg)					
Aluminum	395	716 J	478 J	25,600	22,600
Arsenic	1.2 UL	1.3 UL	1.3 UL	7.3 L	11.6 L
Barium	2.1 J	5.3 J	4.4 J	47.6 J	42.7 J
Beryllium	0.13 B	0.17 B	0.15 B	1.5 J	1.3
Calcium	182 J	895	604 J	2,500	2,720
Chromium	0.88 L	1.6 L	1.2 L	51.6 L	45.8 L
Cobalt	0.11 J	0.57 J	0.44 J	8.9	8
Copper	0.47 L	1.8	0.64 L	28.9	26.8
Iron	471	1,760	1,300	40,000	40,000
Lead	1.6 J	2.1 J	1.9 J	29.6 J	27.2 J
Magnesium	37.4 J	206 J	138 J	8,030	7,110
Manganese	1.6 L	15.5 L	13.1 L	316 L	250 L
Mercury	0.037 U	0.043 U	0.04 U	0.064 J	0.069 J
Nickel	0.23 J	0.88 J	0.54 J	23	21.1
Potassium	29.2 J	90.1 J	67 J	5,150	4,300
Sodium	142 B	657	499 B	12,100	7,430
Vanadium	0.79 L	1.9 L	1.2 L	61.1 L	62.3 L
Zinc	2.5 L	5.1 L	3.6 L	125 L	114 L
Acid Volatile Sulfide/Simultaneously Extractable Metals (µmol/g)					
Zinc, SEM	0.043 K	0.038 K	0.065 K	0.853 K	0.518 K
Acid volatile sulfide	0.1 UJ	0.11 UJ	2.4 J	2.5 J	1.9 J
Cadmium, SEM	8.60E-04	5.30E-04 U	6.30E-04 U	0.0022	0.0014
Copper, SEM	0.0108	0.0078	0.0044 U	0.0208	0.0566
Lead, SEM	0.005 J	0.0034 J	0.0048 J	0.0217 J	0.0403 J
Nickel, SEM	0.0079 U	0.0082 U	0.0096 U	0.038	0.031
Wet Chemistry					
Alkalinity (mg/kg)	200 U	200 U	NA	173 J	200 U
pH (ph)	6.3	7.4	NA	7.3	6.8
Total organic carbon (TOC) (mg/kg)	3,556	8,950	NA	22,910	19,210
Grain Size (pct/p)					
Sieve No. 004 (4.75 mm)	99	99.8	NA	98.1	94.9
Sieve No. 010 (2.00 mm)	95.2	97.7	NA	67.1	63.5
Sieve No. 020 (850 um)	63.6	72	NA	39.5	37.6
Sieve No. 040 (425 um)	33.1	39.3	NA	25.6	23.2
Sieve No. 060 (250 um)	14.3	18.6	NA	17.4	15.8
Sieve No. 080 (180 um)	7	8.5	NA	13.4	12.3
Sieve No. 100 (150 um)	4.4	5	NA	11.6	11.3
Sieve No. 230 (63-UM)	1.7	2.1	NA	3.1	5.1
Sieve No. 200 (75 um)	2.1	2.3	NA	5.6	6.4

Notes:

Shading indicates detections

NA - Not analyzed
B - Analyte not detected above the level reported in blanks
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U - The material was analyzed for, but not detected
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UL - Analyte not detected, quantitation limit is probably higher
mg/kg - Milligrams per kilogram
pct/p - Percent Passed
ph - pH units
µg/kg - Micrograms per kilogram
µmol/g - Micromoles per gram

CTO-166
Yorktown - Site 1
Validated Sediment Exceedance Results
July 2009

Station ID	ERA Marine SD Screening Value	CLEAN RSLs Res Soil X 10 for SD Adjusted	YS01-SD030	YS01-SD031		YS01-SD032	YS01-SD033
Sample ID			YS01-SD30-0709	YS01-SD31-0709	YS01-SD31P-0709	YS01-SD32-0709	YS01-SD33-0709
Sample Date			07/23/09	07/23/09	07/23/09	07/21/09	07/21/09
Chemical Name							
Volatile Organic Compounds (µg/kg)							
2-Butanone	--	28,000,000	6.6 J	13 B	17 B	84 UL	15 B
Carbon disulfide	--	740,000	4.4 J	13	13	10 L	4.9 L
Total Metals (mg/kg)							
Aluminum	18,000	77,000	395	716 J	478 J	**25,600**	**22,600**
Arsenic	8.2	3.9	1.2 UL	1.3 UL	1.3 UL	**7.3 L**	**11.6 L**
Barium	48	15,000	2.1 J	5.3 J	4.4 J	47.6 J	42.7 J
Beryllium	--	160	0.13 B	0.17 B	0.15 B	1.5 J	1.3
Chromium	81	2.9	0.88 L	1.6 L	1.2 L	**51.6 L**	**45.8 L**
Cobalt	10	23	0.11 J	0.57 J	0.44 J	8.9	8
Copper	34	3,100	0.47 L	1.8	0.64 L	28.9	26.8
Iron	220,000	55,000	471	1,760	1,300	40,000	40,000
Lead	47	4,000	1.6 J	2.1 J	1.9 J	29.6 J	27.2 J
Manganese	260	1,800	1.6 L	15.5 L	13.1 L	**316 L**	250 L
Mercury	0.15	24	0.037 U	0.043 U	0.04 U	0.064 J	0.069 J
Nickel	21	1,600	0.23 J	0.88 J	0.54 J	**23**	**21.1**
Vanadium	57	390	0.79 L	1.9 L	1.2 L	**61.1 L**	**62.3 L**
Zinc	150	24,000	2.5 L	5.1 L	3.6 L	125 L	114 L
Acid Volatile Sulfide/Simultaneously Extractable Metals (µmol/g)							
Zinc, SEM	--	--	0.043 K	0.038 K	0.065 K	0.853 K	0.518 K
Acid volatile sulfide	--	--	0.1 UJ	0.11 UJ	2.4 J	2.5 J	1.9 J
Cadmium, SEM	--	--	0.00086	0.00053 U	0.00063 U	0.0022	0.0014
Copper, SEM	--	--	0.0108	0.0078	0.0044 U	0.0208	0.0566
Lead, SEM	--	--	0.005 J	0.0034 J	0.0048 J	0.0217 J	0.0403 J
Nickel, SEM	--	--	0.0079 U	0.0082 U	0.0096 U	0.038	0.031
Wet Chemistry							
Alkalinity (mg/kg)	--	--	200 U	200 U	NA	173 J	200 U
pH (ph)	--	--	6.3	7.4	NA	7.3	6.8
Total organic carbon (TOC) (mg/kg)	--	--	3,556	8,950	NA	22,910	19,210
Grain Size (pct/p)							
Sieve No. 004 (4.75 mm)	--	--	99	99.8	NA	98.1	94.9
Sieve No. 010 (2.00 mm)	--	--	95.2	97.7	NA	67.1	63.5
Sieve No. 020 (850 um)	--	--	63.6	72	NA	39.5	37.6
Sieve No. 040 (425 um)	--	--	33.1	39.3	NA	25.6	23.2
Sieve No. 060 (250 um)	--	--	14.3	18.6	NA	17.4	15.8
Sieve No. 080 (180 um)	--	--	7	8.5	NA	13.4	12.3
Sieve No. 100 (150 um)	--	--	4.4	5	NA	11.6	11.3
Sieve No. 230 (63-UM)	--	--	1.7	2.1	NA	3.1	5.1
Sieve No. 200 (75 um)	--	--	2.1	2.3	NA	5.6	6.4

Notes:

Concentrations shaded blue exceed ERA Marine SD SVs

Concentrations shaded green exceed RSLs

Concentrations shaded red exceed both ERA Marine SD SVs and RSLs

RSLs were adjusted for noncarcinogens to account for exposure to multiple constituents

NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
mg/kg - Milligrams per kilogram
pct/p - Percent Passed
ph - pH units
µg/kg - Micrograms per kilogram
µmol/g - Micromoles per gram

CTO-166
Yorktown - Site 3
Validated Sediment Raw Analytical Results
July 2009

Station ID	YS03-SD003	YS03-SD004	YS03-SD005		YS03-SD006	YS03-SD007	YS03-SD008	YS03-SD009	YS03-SD010	YS03-SD011	YS03-SD012
Sample ID	YS03-SD03-0709	YS03-SD04-0709	YS03-SD05-0709	YS03-SD05P-0709	YS03-SD06-0709	YS03-SD07-0709	YS03-SD08-0709	YS03-SD09-0709	YS03-SD10-0709	YS03-SD11-0709	YS03-SD12-0709
Sample Date	07/24/09	07/24/09	07/23/09	07/23/09	07/22/09	07/22/09	07/22/09	07/22/09	07/22/09	07/21/09	07/21/09
Chemical Name											
Volatile Organic Compounds (µg/kg)											
1,1,1-Trichloroethane	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
1,1,2,2-Tetrachloroethane	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
1,1,2-Trichloroethane	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
1,1-Dichloroethane	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
1,1-Dichloroethene	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
1,2,4-Trichlorobenzene	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	9 B
1,2-Dibromo-3-chloropropane	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
1,2-Dibromoethane	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
1,2-Dichlorobenzene	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
1,2-Dichloroethane	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
1,2-Dichloropropane	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
1,3-Dichlorobenzene	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
1,4-Dichlorobenzene	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
2-Butanone	61 B	14 B	17 B	30 U	53 U	24 B	89 U	26 B	50 U	20 B	36 B
2-Hexanone	84 U	24 U	29 U	30 U	53 U	51 U	89 U	60 U	50 U	50 UL	52 UL
4-Methyl-2-pentanone	84 U	24 U	29 U	30 U	53 U	51 U	89 U	60 U	50 U	50 UL	52 UL
Acetone	510 B	95 B	98 B	80 B	120 B	120 B	130 B	84 B	68 B	150 B	200 B
Benzene	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Bromodichloromethane	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Bromoform	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Bromomethane	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Carbon disulfide	11 J	3 J	5.7 J	7 J	6.8 J	9.8 J	38	16 J	13 J	11 L	16 L
Carbon tetrachloride	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Chlorobenzene	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Chloroethane	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Chloroform	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Chloromethane	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
cis-1,2-Dichloroethene	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
cis-1,3-Dichloropropene	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Cyclohexane	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Dibromochloromethane	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Dichlorodifluoromethane (Freon-12)	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Ethylbenzene	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Isopropylbenzene	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
m- and p-Xylene	67 U	19 U	23 U	24 U	43 U	41 U	71 U	48 U	40 U	40 UL	42 UL
Methyl acetate	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Methylcyclohexane	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Methylene chloride	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Methyl-tert-butyl ether (MTBE)	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
o-Xylene	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Styrene	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	4.6 L
Tetrachloroethene	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Toluene	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
trans-1,2-Dichloroethene	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
trans-1,3-Dichloropropene	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Trichloroethene	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Trichlorofluoromethane(Freon-11)	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Vinyl chloride	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Xylene, total	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	21 UL
Total Metals (mg/kg)											
Aluminum	5,520	2,350	5,480 J	4,860 J	20,900	22,400	27,800	24,400	20,600	20,800	18,800
Antimony	4.1 UL	1.4 UL	1.8 UL	1.6 UL	2.8 UL	2.8 UL	3.9 UL	3.2 UL	2.5 UL	2.7 UL	2.8 UL
Arsenic	1.7 L	1.6 L	2.4 L	2 L	7.7 L	9.7 L	9.4 L	10.6 L	8.9 L	10.3 L	7.4 L
Barium	16.7 J	12.3 J	11.1 J	9.9 J	39.4 J	41.5 J	51.4 J	45 J	38.1 J	40.3 J	37 J
Beryllium	1 B	0.34 B	0.46 B	0.42 B	1.3 J	1.3 J	1.6 B	1.4 B	1.2 J	1.3 J	1.2 J
Cadmium	2.1 UL	0.69 UL	0.89 UL	0.82 UL	1.4 UL	1.4 UL	2 UL	1.6 UL	1.2 UL	1.3 UL	1.4 UL
Calcium	8,890	621 J	1,480	1,190	2,500	2,660	2,870	2,620	2,200	2,410	2,450
Chromium	10.1 L	5.1 L	11.4 L	10.5 L	42.4 L	44.8 L	55.1 L	50.9 L	41.6 L	42.8 L	38.9 L
Cobalt	2.2	1.1	2.2	2	7.7	7.8	10	8.3	7.4	7.6	6.9
Copper	12.3	3.5	6.4	5.4	23.5	28	29.7	27.4	22.9	25.5	20.9
Iron	8,280	3,380	9,900	8,460	35,000	39,500	40,900	42,300	35,400	38,400	31,900
Lead	23.2 J	6.5 J	8.8 J	7.3 J	24.8 J	25.1 J	35.5 J	28.7 J	23.3 J	26.1 J	23.1 J
Magnesium	5,520	618 J	1,840	1,600	6,690	6,820	8,680	7,980	6,410	7,270	6,530
Manganese	73.2 L	9.7 L	61.8 L	53.2 L	238 L	274 L	308 L	349 L	254 L	238 L	201 L
Mercury	0.12 J	0.03 J	0.056 U	0.03 J	0.054 J	0.083 J	0.067 J	0.08 J	0.083 U	0.081	0.062 J
Nickel	7.6 J	2.5 J	5.4 J	4.7 J	19.2	20	26.6	24	21.5	19.4	17.4
Potassium	1,330 J	372 J	976	867	4,260	4,430	5,420	5,010	4,160	4,370	3,920
Selenium	2 B	0.5 B	1.2 B	0.97 B	2.3 B	3.6 B	3.1 B	2.8 B	2.7 B	2.4 B	1.7 B
Silver	2.1 UL	0.69 UL	0.89 UL	0.82 UL	1.4 UL	1.4 UL	2 UL	1.6 UL	1.2 UL	1.3 UL	1.4 UL
Sodium	13,600	1,770	3,040	2,440	9,560	8,520	15,000	14,400	7,970	10,300	9,490
Thallium	4.1 U	1.4 U	1.8 U	1.6 U	2.8 U	2.8 U	3.9 U	3.2 U	2.5 U	2.7 U	2.8 U
Vanadium	20.9 L	8.4 L	16.6 L	14.1 L	52.2 L	51.1 L	73.8 L	61.6 L	50.6 L	54.4 L	48.6 L
Zinc	36 L	29.7 L	27 L	23.3 L	105 L	110 L	114 L	113 L	98.8 L	108 L	103 L
Acid Volatile Sulfide/Simultaneously Extractable Metals (µmol/g)											

CTO-166
Yorktown - Site 3
Validated Sediment Raw Analytical Results
July 2009

Station ID	YS03-SD003	YS03-SD004	YS03-SD005		YS03-SD006	YS03-SD007	YS03-SD008	YS03-SD009	YS03-SD010	YS03-SD011	YS03-SD012
Sample ID	YS03-SD03-0709	YS03-SD04-0709	YS03-SD05-0709	YS03-SD05P-0709	YS03-SD06-0709	YS03-SD07-0709	YS03-SD08-0709	YS03-SD09-0709	YS03-SD10-0709	YS03-SD11-0709	YS03-SD12-0709
Sample Date	07/24/09	07/24/09	07/23/09	07/23/09	07/22/09	07/22/09	07/22/09	07/22/09	07/22/09	07/21/09	07/21/09
Chemical Name											
Zinc, SEM	0.36 K	0.207 K	0.253 K	0.247 K	0.738 K	0.757 K	0.83 K	0.548 K	0.8 K	0.66 K	0.556 K
Acid volatile sulfide	0.38 UJ	0.13 UJ	0.17 UJ	0.15 UJ	0.47 J	0.26 J	0.35 UJ	1.6 J	0.89 J	1.7 J	1.59 J
Cadmium, SEM	0.0019 U	0.00118	8.40E-04 U	7.40E-04 U	0.0025	0.0023	0.0022	0.0014 U	0.0021	0.0017	0.0014
Copper, SEM	0.058	0.0291	0.0218	0.0169	0.0332	0.0119	0.012 U	0.0099 U	0.0359	0.0584	0.0475
Lead, SEM	0.07 J	0.0192 J	0.0173 J	0.0169 J	0.0324 J	0.0188 J	0.0304 J	0.013 J	0.0305 J	0.0438 J	0.0394 J
Nickel, SEM	0.041	0.0201	0.018	0.017	0.039	0.042	0.052	0.03	0.048	0.035	0.032
Silver, SEM	0.0039 U	0.0013 U	0.0018 U	0.0015 U	0.0022 U	0.0023 U	0.0036 U	0.0029 U	0.0026 U	0.0022 U	0.0024 U
Wet Chemistry											
Alkalinity (mg/kg)	200 U	200 U	200 U	NA	187 J	200 U	200 U	286	200 U	200 U	200 U
pH (ph)	6.6	4.9	6.3	NA	7.5	7.4	6.8	7.2	6.8	7.6	7.5
Total organic carbon (TOC) (mg/kg)	159,100	21,400	22,560	NA	36,820	71,570	59,350	27,340	21,030	22,430	20,110
Grain Size (pct/p)											
Sieve No. 004 (4.75 mm)	87.3	99.4	98.1	NA	91.4	97.8	93	93.9	97.1	98.2	98.7
Sieve No. 010 (2.00 mm)	62	93.2	90.8	NA	56.5	62.5	60.7	59.8	65.4	69.1	69.6
Sieve No. 020 (850 um)	38.6	73	68.1	NA	33.7	38.2	34.4	35	38.1	40.3	45.3
Sieve No. 040 (425 um)	25.3	46.7	43.2	NA	21.8	24.7	21.9	21.5	24.1	25.5	31
Sieve No. 060 (250 um)	16.4	25.3	21.1	NA	15.4	23.7	14.7	16.6	16.7	16.9	22.4
Sieve No. 080 (180 um)	11.9	13.3	10.9	NA	11.9	13.9	11.4	11.1	13	13.2	17.3
Sieve No. 100 (150 um)	10.1	9.7	7.9	NA	10.5	12.5	10.3	10.4	11.5	11.7	15.8
Sieve No. 230 (63-UM)	5.1	3.3	3.3	NA	3.9	4.9	3.1	4.1	3.5	2.7	4.8
Sieve No. 200 (75 um)	5.7	3.7	3.5	NA	5.3	7.1	5.6	5.5	5.1	4.5	6.6

Notes:

Shading indicates detections
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
mg/kg - Milligrams per kilogram
pct/p - Percent Passed
ph - pH units
µg/kg - Micrograms per kilogram
µmol/g - Micromoles per gram

CTO-166
Yorktown - Site 3
Validated Sediment Detected Analytical Results
July 2009

Station ID	YS03-SD003	YS03-SD004	YS03-SD005		YS03-SD006	YS03-SD007	YS03-SD008	YS03-SD009	YS03-SD010	YS03-SD011	YS03-SD012
Sample ID	YS03-SD03-0709	YS03-SD04-0709	YS03-SD05-0709	YS03-SD05P-0709	YS03-SD06-0709	YS03-SD07-0709	YS03-SD08-0709	YS03-SD09-0709	YS03-SD10-0709	YS03-SD11-0709	YS03-SD12-0709
Sample Date	07/24/09	07/24/09	07/23/09	07/23/09	07/22/09	07/22/09	07/22/09	07/22/09	07/22/09	07/21/09	07/21/09
Chemical Name											
Volatile Organic Compounds (µg/kg)											
Carbon disulfide	11 J	3 J	5.7 J	7 J	6.8 J	9.8 J	38	16 J	13 J	11 L	16 L
Styrene	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	4.6 L
Total Metals (mg/kg)											
Aluminum	5,520	2,350	5,480 J	4,860 J	20,900	22,400	27,800	24,400	20,600	20,800	18,800
Arsenic	1.7 L	1.6 L	2.4 L	2 L	7.7 L	9.7 L	9.4 L	10.6 L	8.9 L	10.3 L	7.4 L
Barium	16.7 J	12.3 J	11.1 J	9.9 J	39.4 J	41.5 J	51.4 J	45 J	38.1 J	40.3 J	37 J
Beryllium	1 B	0.34 B	0.46 B	0.42 B	1.3 J	1.3 J	1.6 B	1.4 B	1.2 J	1.3 J	1.2 J
Calcium	8,890	621 J	1,480	1,190	2,500	2,660	2,870	2,620	2,200	2,410	2,450
Chromium	10.1 L	5.1 L	11.4 L	10.5 L	42.4 L	44.8 L	55.1 L	50.9 L	41.6 L	42.8 L	38.9 L
Cobalt	2.2	1.1	2.2	2	7.7	7.8	10	8.3	7.4	7.6	6.9
Copper	12.3	3.5	6.4	5.4	23.5	28	29.7	27.4	22.9	25.5	20.9
Iron	8,280	3,380	9,900	8,460	35,000	39,500	40,900	42,300	35,400	38,400	31,900
Lead	23.2 J	6.5 J	8.8 J	7.3 J	24.8 J	25.1 J	35.5 J	28.7 J	23.3 J	26.1 J	23.1 J
Magnesium	5,520	618 J	1,840	1,600	6,690	6,820	8,680	7,980	6,410	7,270	6,530
Manganese	73.2 L	9.7 L	61.8 L	53.2 L	238 L	274 L	308 L	349 L	254 L	238 L	201 L
Mercury	0.12 J	0.03 J	0.056 U	0.03 J	0.054 J	0.083 J	0.067 J	0.08 J	0.083 U	0.081	0.062 J
Nickel	7.6 J	2.5 J	5.4 J	4.7 J	19.2	20	26.6	24	21.5	19.4	17.4
Potassium	1,330 J	372 J	976	867	4,260	4,430	5,420	5,010	4,160	4,370	3,920
Sodium	13,600	1,770	3,040	2,440	9,560	8,520	15,000	14,400	7,970	10,300	9,490
Vanadium	20.9 L	8.4 L	16.6 L	14.1 L	52.2 L	51.1 L	73.8 L	61.6 L	50.6 L	54.4 L	48.6 L
Zinc	36 L	29.7 L	27 L	23.3 L	105 L	110 L	114 L	113 L	98.8 L	108 L	103 L
Acid Volatile Sulfide/Simultaneously Extractable Metals (µmol/g)											
Zinc, SEM	0.36 K	0.207 K	0.253 K	0.247 K	0.738 K	0.757 K	0.83 K	0.548 K	0.8 K	0.66 K	0.556 K
Acid volatile sulfide	0.38 UJ	0.13 UJ	0.17 UJ	0.15 UJ	0.47 J	0.26 J	0.35 UJ	1.6 J	0.89 J	1.7 J	1.59 J
Cadmium, SEM	0.0019 U	0.00118	8.40E-04 U	7.40E-04 U	0.0025	0.0023	0.0022	0.0014 U	0.0021	0.0017	0.0014
Copper, SEM	0.058	0.0291	0.0218	0.0169	0.0332	0.0119	0.012 U	0.0099 U	0.0359	0.0584	0.0475
Lead, SEM	0.07 J	0.0192 J	0.0173 J	0.0169 J	0.0324 J	0.0188 J	0.0304 J	0.013 J	0.0305 J	0.0438 J	0.0394 J
Nickel, SEM	0.041	0.0201	0.018	0.017	0.039	0.042	0.052	0.03	0.048	0.035	0.032
Wet Chemistry											
Alkalinity (mg/kg)	200 U	200 U	200 U	NA	187 J	200 U	200 U	286	200 U	200 U	200 U
pH (ph)	6.6	4.9	6.3	NA	7.5	7.4	6.8	7.2	6.8	7.6	7.5
Total organic carbon (TOC) (mg/kg)	159,100	21,400	22,560	NA	36,820	71,570	59,350	27,340	21,030	22,430	20,110
Grain Size (pct/p)											
Sieve No. 004 (4.75 mm)	87.3	99.4	98.1	NA	91.4	97.8	93	93.9	97.1	98.2	98.7
Sieve No. 010 (2.00 mm)	62	93.2	90.8	NA	56.5	62.5	60.7	59.8	65.4	69.1	69.6
Sieve No. 020 (850 um)	38.6	73	68.1	NA	33.7	38.2	34.4	35	38.1	40.3	45.3
Sieve No. 040 (425 um)	25.3	46.7	43.2	NA	21.8	24.7	21.9	21.5	24.1	25.5	31
Sieve No. 060 (250 um)	16.4	25.3	21.1	NA	15.4	23.7	14.7	16.6	16.7	16.9	22.4
Sieve No. 080 (180 um)	11.9	13.3	10.9	NA	11.9	13.9	11.4	11.1	13	13.2	17.3
Sieve No. 100 (150 um)	10.1	9.7	7.9	NA	10.5	12.5	10.3	10.4	11.5	11.7	15.8
Sieve No. 230 (63-UM)	5.1	3.3	3.3	NA	3.9	4.9	3.1	4.1	3.5	2.7	4.8
Sieve No. 200 (75 um)	5.7	3.7	3.5	NA	5.3	7.1	5.6	5.5	5.1	4.5	6.6

Notes:

Shading indicates detections

NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
mg/kg - Milligrams per kilogram
pct/p - Percent Passed
ph - pH units
µg/kg - Micrograms per kilogram
µmol/g - Micromoles per gram

CTO-166
Yorktown - Site 3
Validated Sediment Exceedance Results
July 2009

Station ID	ERA Marine SD Screening Value	CLEAN RSLs Res Soil X 10 for SD Adjusted	YS03-SD003	YS03-SD004	YS03-SD005		YS03-SD006	YS03-SD007	YS03-SD008	YS03-SD009	YS03-SD010	YS03-SD011	YS03-SD012
Sample ID			YS03-SD03-0709	YS03-SD04-0709	YS03-SD05-0709	YS03-SD05P-0709	YS03-SD06-0709	YS03-SD07-0709	YS03-SD08-0709	YS03-SD09-0709	YS03-SD10-0709	YS03-SD11-0709	YS03-SD12-0709
Sample Date			07/24/09	07/24/09	07/23/09	07/23/09	07/22/09	07/22/09	07/22/09	07/22/09	07/22/09	07/21/09	07/21/09
Chemical Name													
Volatile Organic Compounds (µg/kg)													
Carbon disulfide	--	740,000	11 J	3 J	5.7 J	7 J	6.8 J	9.8 J	38	16 J	13 J	11 L	16 L
Styrene	7,069	870,000	34 U	9.4 U	12 U	12 U	21 U	20 U	35 U	24 U	20 U	20 UL	4.6 L
Total Metals (mg/kg)													
Aluminum	18,000	77,000	5,520	2,350	5,480 J	4,860 J	**20,900**	**22,400**	**27,800**	**24,400**	**20,600**	**20,800**	**18,800**
Arsenic	8.2	3.9	1.7 L	1.6 L	2.4 L	2 L	**7.7 L**	**9.7 L**	**9.4 L**	**10.6 L**	**8.9 L**	**10.3 L**	**7.4 L**
Barium	48	15,000	16.7 J	12.3 J	11.1 J	9.9 J	39.4 J	41.5 J	**51.4 J**	45 J	38.1 J	40.3 J	37 J
Beryllium	--	160	1 B	0.34 B	0.46 B	0.42 B	1.3 J	1.3 J	1.6 B	1.4 B	1.2 J	1.3 J	1.2 J
Chromium	81	2.9	**10.1 L**	**5.1 L**	**11.4 L**	**10.5 L**	**42.4 L**	**44.8 L**	**55.1 L**	**50.9 L**	**41.6 L**	**42.8 L**	**38.9 L**
Cobalt	10	23	2.2	1.1	2.2	2	7.7	7.8	10	8.3	7.4	7.6	6.9
Copper	34	3,100	12.3	3.5	6.4	5.4	23.5	28	29.7	27.4	22.9	25.5	20.9
Iron	220,000	55,000	8,280	3,380	9,900	8,460	35,000	39,500	40,900	42,300	35,400	38,400	31,900
Lead	46.7	4,000	23.2 J	6.5 J	8.8 J	7.3 J	24.8 J	25.1 J	35.5 J	28.7 J	23.3 J	26.1 J	23.1 J
Manganese	260	1,800	73.2 L	9.7 L	61.8 L	53.2 L	238 L	**274 L**	**308 L**	**349 L**	254 L	238 L	201 L
Mercury	0.15	24	0.12 J	0.03 J	0.056 U	0.03 J	0.054 J	0.083 J	0.067 J	0.08 J	0.083 U	0.081	0.062 J
Nickel	21	1,600	7.6 J	2.5 J	5.4 J	4.7 J	19.2	20	**26.6**	**24**	**21.5**	19.4	17.4
Vanadium	57	390	20.9 L	8.4 L	16.6 L	14.1 L	52.2 L	51.1 L	**73.8 L**	**61.6 L**	50.6 L	54.4 L	48.6 L
Zinc	150	24,000	36 L	29.7 L	27 L	23.3 L	105 L	110 L	114 L	113 L	98.8 L	108 L	103 L
Acid Volatile Sulfide/Simultaneously Extractable Metals (µmol/g)													
Zinc, SEM	--	--	0.36 K	0.207 K	0.253 K	0.247 K	0.738 K	0.757 K	0.83 K	0.548 K	0.8 K	0.66 K	0.556 K
Acid volatile sulfide	--	--	0.38 UJ	0.13 UJ	0.17 UJ	0.15 UJ	0.47 J	0.26 J	0.35 UJ	1.6 J	0.89 J	1.7 J	1.59 J
Cadmium, SEM	--	--	0.0019 U	0.00118	8.40E-04 U	7.40E-04 U	0.0025	0.0023	0.0022	0.0014 U	0.0021	0.0017	0.0014
Copper, SEM	--	--	0.058	0.0291	0.0218	0.0169	0.0332	0.0119	0.012 U	0.0099 U	0.0359	0.0584	0.0475
Lead, SEM	--	--	0.07 J	0.0192 J	0.0173 J	0.0169 J	0.0324 J	0.0188 J	0.0304 J	0.013 J	0.0305 J	0.0438 J	0.0394 J
Nickel, SEM	--	--	0.041	0.0201	0.018	0.017	0.039	0.042	0.052	0.03	0.048	0.035	0.032
Wet Chemistry													
Alkalinity (mg/kg)	--	--	200 U	200 U	200 U	NA	187 J	200 U	200 U	286	200 U	200 U	200 U
pH (ph)	--	--	6.6	4.9	6.3	NA	7.5	7.4	6.8	7.2	6.8	7.6	7.5
Total organic carbon (TOC) (mg/kg)	--	--	159,100	21,400	22,560	NA	36,820	71,570	59,350	27,340	21,030	22,430	20,110
Grain Size (pct/p)													
Sieve No. 004 (4.75 mm)	--	--	87.3	99.4	98.1	NA	91.4	97.8	93	93.9	97.1	98.2	98.7
Sieve No. 010 (2.00 mm)	--	--	62	93.2	90.8	NA	56.5	62.5	60.7	59.8	65.4	69.1	69.6
Sieve No. 020 (850 um)	--	--	38.6	73	68.1	NA	33.7	38.2	34.4	35	38.1	40.3	45.3
Sieve No. 040 (425 um)	--	--	25.3	46.7	43.2	NA	21.8	24.7	21.9	21.5	24.1	25.5	31
Sieve No. 060 (250 um)	--	--	16.4	25.3	21.1	NA	15.4	23.7	14.7	16.6	16.7	16.9	22.4
Sieve No. 080 (180 um)	--	--	11.9	13.3	10.9	NA	11.9	13.9	11.4	11.1	13	13.2	17.3
Sieve No. 100 (150 um)	--	--	10.1	9.7	7.9	NA	10.5	12.5	10.3	10.4	11.5	11.7	15.8
Sieve No. 230 (63-UM)	--	--	5.1	3.3	3.3	NA	3.9	4.9	3.1	4.1	3.5	2.7	4.8
Sieve No. 200 (75 um)	--	--	5.7	3.7	3.5	NA	5.3	7.1	5.6	5.5	5.1	4.5	6.6

Notes:

Concentrations shaded blue exceed ERA Marine SD SVs

Concentrations shaded green exceed RSLs

Concentrations shaded red exceed both ERA Marine SD SVs and RSLs

RSLs were adjusted for noncarcinogens to account for exposure to multiple constituents

NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
mg/kg - Milligrams per kilogram
pct/p - Percent Passed
ph - pH units
µg/kg - Micrograms per kilogram
µmol/g - Micromoles per gram

CTO-166
Yorktown - Site 1
Unvalidated Soil Raw Analytical Results
January 2009

Station ID	YS01-SO01
Sample ID	YS01-SO01-0109
Sample Date	01/29/09
Chemical Name	
Volatile Organic Compounds (µg/kg)	
1,1,1-Trichloroethane	6 U
1,1,2,2-Tetrachloroethane	6 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	6 U
1,1,2-Trichloroethane	6 U
1,1-Dichloroethane	6 U
1,1-Dichloroethene	6 U
1,2,4-Trichlorobenzene	6 U
1,2-Dibromo-3-chloropropane	6 U
1,2-Dibromoethane	6 U
1,2-Dichlorobenzene	6 U
1,2-Dichloroethane	6 U
1,2-Dichloropropane	6 U
1,3-Dichlorobenzene	6 U
1,4-Dichlorobenzene	6 U
2-Butanone	15 U
2-Hexanone	15 U
4-Methyl-2-pentanone	15 U
Acetone	15 R
Benzene	6 U
Bromodichloromethane	6 U
Bromoform	6 U
Bromomethane	6 U
Carbon disulfide	6 U
Carbon tetrachloride	6 U
Chlorobenzene	6 U
Chloroethane	6 U
Chloroform	6 U
Chloromethane	6 U
cis-1,2-Dichloroethene	6 U
cis-1,3-Dichloropropene	6 U
Cyclohexane	6 U
Dibromochloromethane	6 U
Dichlorodifluoromethane (Freon-12)	6 U
Ethylbenzene	6 U
Isopropylbenzene	6 U
m- and p-Xylene	12 U
Methyl acetate	6 U
Methylcyclohexane	6 U
Methylene chloride	1.2 B
Methyl-tert-butyl ether (MTBE)	6 U
o-Xylene	6 U
Styrene	6 U
Tetrachloroethene	6 U
Toluene	6 U
trans-1,2-Dichloroethene	6 U
trans-1,3-Dichloropropene	6 U
Trichloroethene	6 U
Trichlorofluoromethane(Freon-11)	6 U
Vinyl chloride	6 U
Xylene, total	6 U

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

R - Unreliable Result

U - The material was analyzed for, but not detected

µg/kg - Micrograms per kilogram

CTO-166
Yorktown - Site 1
Unvalidated Soil Detected Analytical Results
January 2009

Station ID	YS01-SO01
Sample ID	YS01-SO01-0109
Sample Date	01/29/09
Chemical Name	
Volatile Organic Compounds (µg/kg)	
Methylene chloride	1.2 B

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

µg/kg - Micrograms per kilogram

CTO-166
Yorktown - Site 1
Unvalidated Soil Exceedance Results
January 2009

Station ID	**Adjusted Industrial Soil RSLs**	**Adjusted Residential Soil RSLs**	YS01-SO01
Sample ID			YS01-SO01-0109
Sample Date			01/29/09
Chemical Name			
Volatile Organic Compounds (µg/kg)			
Methylene chloride	53,000	11,000	1.2 B

Notes:

Bold text indicates exceedance of Adjusted Industrial Soil RSLs

Underline indicates exceedance of Adjusted Residential Soil RSLs

RSLs were adjusted for noncarcinogens to account for exposure to multiple constituents

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

R - Unreliable Result

U - The material was analyzed for, but not detected

µg/kg - Micrograms per kilogram

CTO-166
Yorktown - Site 3
Unvalidated Soil Raw Analytical Results
February and June 2009

Station ID	YS03-SO01	
Sample ID	YS03-SO01-0209	YS03-SO01-0609
Sample Date	02/02/09	06/24/09
Chemical Name		
Volatile Organic Compounds (µg/kg)		
1,1,1-Trichloroethane	6.8 U	NA
1,1,2,2-Tetrachloroethane	6.8 U	NA
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	6.8 U	NA
1,1,2-Trichloroethane	6.8 U	NA
1,1-Dichloroethane	6.8 U	NA
1,1-Dichloroethene	6.8 U	NA
1,2,4-Trichlorobenzene	6.8 U	NA
1,2-Dibromo-3-chloropropane	6.8 U	NA
1,2-Dibromoethane	6.8 U	NA
1,2-Dichlorobenzene	6.8 U	NA
1,2-Dichloroethane	6.8 U	NA
1,2-Dichloropropane	6.8 U	NA
1,3-Dichlorobenzene	6.8 U	NA
1,4-Dichlorobenzene	6.8 U	NA
2-Butanone	17 U	NA
2-Hexanone	17 U	NA
4-Methyl-2-pentanone	17 U	NA
Acetone	28 L	NA
Benzene	6.8 U	NA
Bromodichloromethane	6.8 U	NA
Bromoform	6.8 U	NA
Bromomethane	6.8 U	NA
Carbon disulfide	6.8 U	NA
Carbon tetrachloride	6.8 U	NA
Chlorobenzene	6.8 U	NA
Chloroethane	6.8 U	NA
Chloroform	6.8 U	NA
Chloromethane	6.8 U	NA
cis-1,2-Dichloroethene	11	NA
cis-1,3-Dichloropropene	6.8 U	NA
Cyclohexane	6.8 U	NA
Dibromochloromethane	6.8 U	NA
Dichlorodifluoromethane (Freon-12)	6.8 U	NA
Ethylbenzene	6.8 U	NA
Isopropylbenzene	4.5 J	NA
m- and p-Xylene	14 U	NA
Methyl acetate	6.8 U	NA
Methylcyclohexane	8.8	NA
Methylene chloride	6.8 U	NA
Methyl-tert-butyl ether (MTBE)	6.8 U	NA
o-Xylene	6.8 U	NA
Styrene	6.8 U	NA
Tetrachloroethene	6.8 U	NA
Toluene	6.8 U	NA
trans-1,2-Dichloroethene	6.8 U	NA
trans-1,3-Dichloropropene	6.8 U	NA
Trichloroethene	14	NA
Trichlorofluoromethane(Freon-11)	6.8 U	NA
Vinyl chloride	6.8 U	NA
Xylene, total	6.8 U	NA
Semivolatile Organic Compounds (µg/kg)		
1,1-Biphenyl	NA	400
2,2'-Oxybis(1-chloropropane)	NA	250 U
2,4,5-Trichlorophenol	NA	250 U
2,4,6-Trichlorophenol	NA	250 U
2,4-Dichlorophenol	NA	250 U
2,4-Dimethylphenol	NA	250 U
2,4-Dinitrophenol	NA	490 U
2,4-Dinitrotoluene	NA	250 U
2,6-Dinitrotoluene	NA	250 U
2-Chloronaphthalene	NA	250 U
2-Chlorophenol	NA	490 U
2-Methylnaphthalene	NA	11,000
2-Methylphenol	NA	250 U
2-Nitroaniline	NA	490 U

CTO-166
Yorktown - Site 3
Unvalidated Soil Raw Analytical Results
February and June 2009

Station ID	YS03-SO01	
Sample ID	YS03-SO01-0209	YS03-SO01-0609
Sample Date	02/02/09	06/24/09
Chemical Name		
2-Nitrophenol	NA	250 U
3,3'-Dichlorobenzidine	NA	250 U
3-Nitroaniline	NA	490 U
4,6-Dinitro-2-methylphenol	NA	490 U
4-Bromophenyl-phenylether	NA	250 U
4-Chloro-3-methylphenol	NA	250 U
4-Chloroaniline	NA	250 U
4-Chlorophenyl-phenylether	NA	250 U
4-Methylphenol	NA	490 U
4-Nitroaniline	NA	490 U
4-Nitrophenol	NA	490 U
Acenaphthene	NA	250 U
Acenaphthylene	NA	250 U
Acetophenone	NA	250 U
Anthracene	NA	250 U
Atrazine	NA	250 U
Benzaldehyde	NA	250 U
Benzo(a)anthracene	NA	250 U
Benzo(a)pyrene	NA	250 U
Benzo(b)fluoranthene	NA	250 U
Benzo(g,h,i)perylene	NA	250 U
Benzo(k)fluoranthene	NA	250 U
bis(2-Chloroethoxy)methane	NA	250 U
bis(2-Chloroethyl)ether	NA	250 U
bis(2-Ethylhexyl)phthalate	NA	480
Butylbenzylphthalate	NA	250 U
Caprolactam	NA	250 U
Carbazole	NA	250 U
Chrysene	NA	250 U
Dibenz(a,h)anthracene	NA	250 U
Dibenzofuran	NA	310
Diethylphthalate	NA	250 U
Dimethyl phthalate	NA	250 U
Di-n-butylphthalate	NA	250 U
Di-n-octylphthalate	NA	250 U
Fluoranthene	NA	250 U
Fluorene	NA	740
Hexachlorobenzene	NA	250 U
Hexachlorobutadiene	NA	250 U
Hexachlorocyclopentadiene	NA	250 U
Hexachloroethane	NA	250 U
Indeno(1,2,3-cd)pyrene	NA	250 U
Isophorone	NA	250 U
Naphthalene	NA	1,800
n-Nitroso-di-n-propylamine	NA	250 U
n-Nitrosodiphenylamine	NA	250 U
Nitrobenzene	NA	250 U
Pentachlorophenol	NA	490 U
Phenanthrene	NA	2,100
Phenol	NA	250 U
Pyrene	NA	140 J
Pesticide/Polychlorinated Biphenyls (µg/kg)		
4,4'-DDD	NA	4.8 JP
4,4'-DDE	NA	4.9 U
4,4'-DDT	NA	4.9 U
Aldrin	NA	2.5 U
alpha-BHC	NA	3.3 P
alpha-Chlordane	NA	0.53 J
Aroclor-1016	NA	36 U
Aroclor-1221	NA	51 U
Aroclor-1232	NA	25 U
Aroclor-1242	NA	25 U
Aroclor-1248	NA	25 U
Aroclor-1254	NA	25 U
Aroclor-1260	NA	25 U
beta-BHC	NA	0.667
delta-BHC	NA	4.4 P

CTO-166
Yorktown - Site 3
Unvalidated Soil Raw Analytical Results
February and June 2009

Station ID	YS03-SO01	
Sample ID	YS03-SO01-0209	YS03-SO01-0609
Sample Date	02/02/09	06/24/09
Chemical Name		
Dieldrin	NA	2.5 JP
Endosulfan I	NA	2.5 U
Endosulfan II	NA	4.9 U
Endosulfan sulfate	NA	4.9 U
Endrin	NA	4.9 U
Endrin aldehyde	NA	4.9 U
Endrin ketone	NA	4.9 U
gamma-BHC (Lindane)	NA	3.6 P
gamma-Chlordane	NA	1.3 JP
Heptachlor	NA	2.3 JPB
Heptachlor epoxide	NA	1.6 JP
Methoxychlor	NA	25 U
Toxaphene	NA	120 U
Total Metals (mg/kg)		
Aluminum	NA	12,700 E
Antimony	NA	0.95 B
Arsenic	NA	30.5 E
Barium	NA	57.2 E
Beryllium	NA	1.9
Cadmium	NA	0.74 U
Calcium	NA	3,270 E
Chromium	NA	35.1 E
Cobalt	NA	17.4 E
Copper	NA	8.6
Iron	NA	30,600 E
Lead	NA	12.4
Magnesium	NA	2,640 E
Manganese	NA	125 E
Mercury	NA	0.045 B
Nickel	NA	19.6 E
Potassium	NA	2,460
Selenium	NA	0.74 U
Silver	NA	0.74 U
Sodium	NA	221 B
Thallium	NA	1.5 U
Vanadium	NA	26.7 E
Zinc	NA	63.7 E
Wet Chemistry		
Oil and Grease (mg/kg)	NA	220 U
Total Petroleum Hydrocarbons ()		
TPH-diesel range (UG/KG)	NA	350,000
TPH-gas range (UG/KG)	NA	220 JB
TPH-oil range (UG/KG)	NA	66,000

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

E - Concentration exceeds calibration range of GC/MS instrument (Organic) OR Value is estimated due to matrix interferences (Inorganic)

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher

U - The material was analyzed for, but not detected

mg/kg - Milligrams per kilogram

µg/kg - Micrograms per kilogram

CTO-166
Yorktown - Site 3
Unvalidated Soil Detected Analytical Results
February and June 2009

Station ID	YS03-SO01	
Sample ID	YS03-SO01-0209	YS03-SO01-0609
Sample Date	02/02/09	06/24/09
Chemical Name		
Volatile Organic Compounds (µg/kg)		
Acetone	28 L	NA
cis-1,2-Dichloroethene	11	NA
Isopropylbenzene	4.5 J	NA
Methylcyclohexane	8.8	NA
Trichloroethene	14	NA
Semivolatile Organic Compounds (µg/kg)		
1,1-Biphenyl	NA	400
2-Methylnaphthalene	NA	11,000
bis(2-Ethylhexyl)phthalate	NA	480
Dibenzofuran	NA	310
Fluorene	NA	740
Naphthalene	NA	1,800
Phenanthrene	NA	2,100
Pyrene	NA	140 J
Pesticide/Polychlorinated Biphenyls (µg/kg)		
4,4'-DDD	NA	4.8 JP
alpha-BHC	NA	3.3 P
alpha-Chlordane	NA	0.53 J
beta-BHC	NA	0.667
delta-BHC	NA	4.4 P
Dieldrin	NA	2.5 JP
gamma-BHC (Lindane)	NA	3.6 P
gamma-Chlordane	NA	1.3 JP
Heptachlor	NA	2.3 JPB
Heptachlor epoxide	NA	1.6 JP
Total Metals (mg/kg)		
Aluminum	NA	12,700 E
Antimony	NA	0.95 B
Arsenic	NA	30.5 E
Barium	NA	57.2 E
Beryllium	NA	1.9
Calcium	NA	3,270 E
Chromium	NA	35.1 E
Cobalt	NA	17.4 E
Copper	NA	8.6
Iron	NA	30,600 E
Lead	NA	12.4
Magnesium	NA	2,640 E
Manganese	NA	125 E
Mercury	NA	0.045 B
Nickel	NA	19.6 E
Potassium	NA	2,460
Sodium	NA	221 B
Vanadium	NA	26.7 E
Zinc	NA	63.7 E
Wet Chemistry		
No Detections	NA	NA
Total Petroleum Hydrocarbons ()		
TPH-diesel range (UG/KG)	NA	350,000
TPH-gas range (UG/KG)	NA	220 JB
TPH-oil range (UG/KG)	NA	66,000

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

E - Concentration exceeds calibration range of GC/MS instrument (Organic) OR Value is estimated due to matrix interferences (Inorganic)

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher

mg/kg - Milligrams per kilogram

µg/kg - Micrograms per kilogram

CTO-166
Yorktown - Site 3
Unvalidated Soil Exceedance Results
February and June 2009

Station ID	Adjusted Industrial Soil RSLs	Adjusted Residential Soil RSLs	YS03-SO01	
Sample ID			YS03-SO01-0209	YS03-SO01-0609
Sample Date			02/02/09	06/24/09
Chemical Name				
Volatile Organic Compounds (µg/kg)				
Acetone	63,000,000	6,100,000	28 L	NA
cis-1,2-Dichloroethene	1,000,000	78,000	11	NA
Isopropylbenzene	270,000	210,000	4.5 J	NA
Methylcyclohexane	--	--	8.8	NA
Trichloroethene	14,000	2,800	14	NA
Semivolatile Organic Compounds (µg/kg)				
1,1-Biphenyl	210,000	210,000	NA	400
2-Methylnaphthalene	370,000	31,000	NA	11,000
bis(2-Ethylhexyl)phthalate	120,000	35,000	NA	480
Dibenzofuran	100,000	7,800	NA	310
Fluorene	2,200,000	230,000	NA	740
Naphthalene	18,000	3,600	NA	1,800
Phenanthrene	17,000,000	1,700,000	NA	2,100
Pyrene	1,700,000	170,000	NA	140 J
Pesticide/Polychlorinated Biphenyls (µg/kg)				
4,4'-DDD	7,200	2,000	NA	4.8 JP
alpha-BHC	270	77	NA	3.3 P
alpha-Chlordane	6,500	1,600	NA	0.53 J
beta-BHC	960	270	NA	0.667
delta-BHC	960	270	NA	4.4 P
Dieldrin	110	30	NA	2.5 JP
gamma-BHC (Lindane)	2,100	520	NA	3.6 P
gamma-Chlordane	6,500	1,600	NA	1.3 JP
Heptachlor	380	110	NA	2.3 JPB
Heptachlor epoxide	190	53	NA	1.6 JP
Total Metals (mg/kg)				
Aluminum	99,000	7,700	NA	12,700 E
Antimony	41	3.1	NA	0.95 B
Arsenic	1.6	0.39	NA	**30.5 E**
Barium	19,000	1,500	NA	57.2 E
Beryllium	200	16	NA	1.9
Calcium	--	--	NA	3,270 E
Chromium	5.6	0.29	NA	**35.1 E**
Cobalt	30	2.3	NA	17.4 E
Copper	4,100	310	NA	8.6
Iron	72,000	5,500	NA	30,600 E
Lead	800	400	NA	12.4
Magnesium	--	--	NA	2,640 E
Manganese	2,300	180	NA	125 E
Mercury	31	2.4	NA	0.045 B
Nickel	2,000	160	NA	19.6 E
Potassium	--	--	NA	2,460
Sodium	--	--	NA	221 B
Vanadium	520	39	NA	26.7 E
Zinc	31,000	2,400	NA	63.7 E
Wet Chemistry				
No Detections			NA	NA
Total Petroleum Hydrocarbons ()				
TPH-diesel range (UG/KG)	--	--	NA	350,000
TPH-gas range (UG/KG)	--	--	NA	220 JB
TPH-oil range (UG/KG)	--	--	NA	66,000

Notes:

Bold text indicates exceedance of Adjusted Industrial Soil RSLs

Underline indicates exceedance of Adjusted Residential Soil RSLs

RSLs were adjusted for noncarcinogens to account for exposure to multiple constituents

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

E - Concentration exceeds calibration range of GC/MS instrument (Organic) OR Value is estimated due to matrix interferences (Inorganic)

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher

U - The material was analyzed for, but not detected

mg/kg - Milligrams per kilogram

µg/kg - Micrograms per kilogram

CTO-166
Yorktown - Site 1
Validated Surface Water Raw Analytical Results
July 2009

Station ID	YS01-SW031		YS01-SW032	YS01-SW033
Sample ID	YS01-SW31-0709	YS01-SW31P-0709	YS01-SW32-0709	YS01-SW33-0709
Sample Date	07/23/09	07/23/09	07/21/09	07/21/09
Chemical Name				
Volatile Organic Compounds (µg/l)				
1,1,1-Trichloroethane	0.5 U	0.5 U	0.5 UL	0.5 UL
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U	0.5 UL	0.5 UL
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5 U	0.5 U	0.5 UL	0.5 UL
1,1,2-Trichloroethane	0.5 U	0.5 U	0.5 UL	0.5 UL
1,1-Dichloroethane	0.5 U	0.5 U	0.5 UL	0.5 UL
1,1-Dichloroethene	0.5 U	0.5 U	0.5 UL	0.5 UL
1,2,4-Trichlorobenzene	0.5 U	0.5 U	0.5 UL	0.5 UL
1,2-Dibromo-3-chloropropane	0.5 U	0.5 U	0.5 UL	0.5 UL
1,2-Dibromoethane	0.5 U	0.5 U	0.5 UL	0.5 UL
1,2-Dichlorobenzene	0.5 U	0.5 U	0.5 UL	0.5 UL
1,2-Dichloroethane	0.5 U	0.5 U	0.5 UL	0.5 UL
1,2-Dichloroethene (total)	0.5 U	0.5 U	0.5 UL	0.5 UL
1,2-Dichloropropane	0.5 U	0.5 U	0.5 UL	0.5 UL
1,3-Dichlorobenzene	0.5 U	0.5 U	0.5 UL	0.5 UL
1,4-Dichlorobenzene	0.5 U	0.5 U	0.5 UL	0.5 UL
2-Butanone	2.5 R	2.5 R	2.5 R	2.5 R
2-Hexanone	2.5 U	2.5 U	2.5 UL	2.5 UL
4-Methyl-2-pentanone	2.5 U	2.5 U	2.5 UL	2.5 UL
Acetone	7.3 B	5.3 B	6.8 B	5.5 B
Benzene	0.5 U	0.5 U	0.5 UL	0.5 UL
Bromodichloromethane	0.5 U	0.5 U	0.5 UL	0.5 UL
Bromoform	0.5 U	0.5 U	0.5 UL	0.5 UL
Bromomethane	0.5 U	0.5 U	0.5 UL	0.5 UL
Carbon disulfide	0.11 J	0.1 J	0.12 L	0.5 UL
Carbon tetrachloride	0.5 U	0.5 U	0.5 UL	0.5 UL
Chlorobenzene	0.5 U	0.5 U	0.5 UL	0.5 UL
Chloroethane	0.5 U	0.5 U	0.5 UL	0.5 UL
Chloroform	0.5 U	0.5 U	0.5 UL	0.5 UL
Chloromethane	0.12 J	0.5 U	0.5 UL	0.5 UL
cis-1,2-Dichloroethene	0.5 U	0.5 U	0.5 UL	0.5 UL
cis-1,3-Dichloropropene	0.5 U	0.5 U	0.5 UL	0.5 UL
Cyclohexane	0.5 U	0.5 U	0.5 UL	0.5 UL
Dibromochloromethane	0.5 U	0.5 U	0.5 UL	0.5 UL
Dichlorodifluoromethane (Freon-12)	0.5 U	0.5 U	0.5 UL	0.5 UL
Ethylbenzene	0.5 U	0.5 U	0.5 UL	0.5 UL
Isopropylbenzene	0.5 U	0.5 U	0.5 UL	0.5 UL
m- and p-Xylene	1 U	1 U	1 UL	1 UL
Methyl acetate	0.5 U	0.5 U	0.5 UL	0.5 UL
Methylcyclohexane	0.5 U	0.5 U	0.5 UL	0.5 UL
Methylene chloride	0.5 U	0.5 U	0.5 UL	0.5 UL
Methyl-tert-butyl ether (MTBE)	0.5 U	0.5 U	0.5 UL	0.5 UL
o-Xylene	0.5 U	0.5 U	0.5 UL	0.5 UL
Styrene	0.5 U	0.5 U	0.5 UL	0.5 UL
Tetrachloroethene	0.5 U	0.5 U	0.5 UL	0.5 UL
Toluene	0.5 U	0.5 U	0.5 UL	0.5 UL
trans-1,2-Dichloroethene	0.5 U	0.5 U	0.5 UL	0.5 UL
trans-1,3-Dichloropropene	0.5 U	0.5 U	0.5 UL	0.5 UL
Trichloroethene	0.5 U	0.5 U	0.5 UL	0.5 UL
Trichlorofluoromethane(Freon-11)	0.5 U	0.5 U	0.5 UL	0.5 UL
Vinyl chloride	0.5 U	0.5 U	0.5 UL	0.5 UL
Xylene, total	0.5 U	0.5 U	0.5 UL	0.5 UL
Total Metals (µg/l)				
Aluminum	1,440 J	2,980 J	761 J	680 J
Antimony	10 U	10 U	10 U	10 U
Arsenic	10 UL	10 UL	10 UL	10 UL
Barium	36.8 J	41.1 J	28.8 J	27.1 J
Beryllium	0.47 B	0.75 B	0.4 B	0.38 B
Cadmium	5 UL	5 UL	5 UL	5 UL
Calcium	216,000	215,000	229,000	229,000
Chromium	2.1 B	4.9 B	1.3 B	0.67 B
Cobalt	0.86 L	1.9 L	0.91 L	5 UL
Copper	9.6 L	2.3 L	5 UL	5 UL
Cyanide	NA	NA	NA	NA
Iron	2,240 J	4,990 J	903	814
Lead	2.5 B	5.2 B	3 UL	3 UL
Magnesium	624,000	641,000	726,000	729,000
Manganese	213	235	86.5	70.1
Mercury	0.12 B	0.2 U	0.1 J	0.2 U
Nickel	40 UL	2 B	40 UL	40 UL
Potassium	291,000	312,000	332,000	340,000
Selenium	5 U	5 U	5 U	5 U
Silver	5 UL	5 UL	5 UL	5 UL
Sodium	4,850,000 J	4,970,000 J	5,280,000 J	5,050,000 J
Thallium	10 UL	10 UL	10 UL	10 UL
Vanadium	5.9 J	9.4 J	4.4 J	3.6 J
Zinc	23.2 B	20.1 B	6.1 B	6 B

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Yorktown - Site 1
Validated Surface Water Raw Analytical Results
July 2009

Station ID	YS01-SW031		YS01-SW032	YS01-SW033
Sample ID	YS01-SW31-0709	YS01-SW31P-0709	YS01-SW32-0709	YS01-SW33-0709
Sample Date	07/23/09	07/23/09	07/21/09	07/21/09
Chemical Name				
Dissolved Metals (µg/l)				
Aluminum, Dissolved	92 B	103 B	163 B	227 B
Antimony, Dissolved	10 U	10 U	10 U	10 U
Arsenic, Dissolved	4.4 J	10 U	10 U	2.8 J
Barium, Dissolved	29.7 J	40.3 J	26.5 J	26.1 J
Beryllium, Dissolved	0.92 B	0.96 B	0.91 B	1 B
Cadmium, Dissolved	0.35 J	5 U	5 U	5 U
Calcium, Dissolved	199,000	208,000	228,000	236,000
Chromium, Dissolved	10 U	10 U	10 U	10 U
Cobalt, Dissolved	0.98 J	5 U	0.6 J	1.1 J
Copper, Dissolved	5 UL	5 UL	5 UL	5 UL
Iron, Dissolved	64.8 J	60.7 J	167	270
Lead, Dissolved	3 UL	3 UL	3 UL	3 UL
Magnesium, Dissolved	610,000	626,000	725,000	726,000
Manganese, Dissolved	160	202	43.5	39.2
Mercury, Dissolved	0.2 U	0.2 U	0.2 U	0.2 U
Nickel, Dissolved	40 U	40 U	40 U	40 U
Potassium, Dissolved	296,000 J	304,000 J	345,000 J	357,000 J
Selenium, Dissolved	5 U	5 U	5 U	5 U
Silver, Dissolved	5 UL	5 UL	5 UL	5 UL
Sodium, Dissolved	4,930,000	4,870,000	5,530,000	5,570,000
Thallium, Dissolved	5.7 B	5.3 B	4.3 B	5 B
Vanadium, Dissolved	2.6 J	2 B	2.8 J	3.2 J
Zinc, Dissolved	12 J	15.1 J	22.4	28
Wet Chemistry				
Total dissolved solids (TDS) (mg/l)	19,500	NA	24,600	24,800

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

mg/l - Milligrams per liter

µg/l - Micrograms per liter

CTO-166
Yorktown - Site 1
Validated Surface Water Detected Analytical Results
July 2009

Station ID	YS01-SW031		YS01-SW032	YS01-SW033
Sample ID	YS01-SW31-0709	YS01-SW31P-0709	YS01-SW32-0709	YS01-SW33-0709
Sample Date	07/23/09	07/23/09	07/21/09	07/21/09
Chemical Name				
Volatile Organic Compounds (µg/l)				
Carbon disulfide	0.11 J	0.1 J	0.12 L	0.5 UL
Chloromethane	0.12 J	0.5 U	0.5 UL	0.5 UL
Total Metals (µg/l)				
Aluminum	1,440 J	2,980 J	761 J	680 J
Barium	36.8 J	41.1 J	28.8 J	27.1 J
Cobalt	0.86 L	1.9 L	0.91 L	5 UL
Copper	9.6 L	2.3 L	5 UL	5 UL
Iron	2,240 J	4,990 J	903	814
Manganese	213	235	86.5	70.1
Mercury	0.12 B	0.2 U	0.1 J	0.2 U
Vanadium	5.9 J	9.4 J	4.4 J	3.6 J
Dissolved Metals (µg/l)				
Arsenic, Dissolved	4.4 J	10 U	10 U	2.8 J
Barium, Dissolved	29.7 J	40.3 J	26.5 J	26.1 J
Cadmium, Dissolved	0.35 J	5 U	5 U	5 U
Cobalt, Dissolved	0.98 J	5 U	0.6 J	1.1 J
Iron, Dissolved	64.8 J	60.7 J	167	270
Manganese, Dissolved	160	202	43.5	39.2
Vanadium, Dissolved	2.6 J	2 B	2.8 J	3.2 J
Zinc, Dissolved	12 J	15.1 J	22.4	28
Wet Chemistry				
Total dissolved solids (TDS) (mg/l)	19,500	NA	24,600	24,800

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

mg/l - Milligrams per liter

µg/l - Micrograms per liter

CTO-166
Yorktown - Site 1
Validated Surface Water Exceedance Results
1992-2009

Station ID	ERA Marine SW Screening Value	CLEAN RSLs Tap X 10 for SW Adjusted	YS01-SW031		YS01-SW032	YS01-SW033
Sample ID			YS01-SW31-0709	YS01-SW31P-0709	YS01-SW32-0709	YS01-SW33-0709
Sample Date			07/23/09	07/23/09	07/21/09	07/21/09
Chemical Name						
Volatile Organic Compounds (µg/l)						
Carbon disulfide	--	1,000	0.11 J	0.1 J	0.12 L	0.5 UL
Chloromethane	2,700	190	0.12 J	0.5 U	0.5 UL	0.5 UL
Total Metals (µg/l)						
Aluminum	--	37,000	1,440 J	2,980 J	761 J	680 J
Barium	200	7,300	36.8 J	41.1 J	28.8 J	27.1 J
Cobalt	--	11	0.86 L	1.9 L	0.91 L	5 UL
Copper	3.73	1,500	**9.6 L**	2.3 L	5 UL	5 UL
Iron	--	26,000	2,240 J	4,990 J	903	814
Manganese	100	880	**213**	**235**	86.5	70.1
Mercury	1.11	11	0.12 B	0.2 U	0.1 J	0.2 U
Vanadium	50.0	180	5.9 J	9.4 J	4.4 J	3.6 J
Dissolved Metals (µg/l)						
Arsenic, Dissolved	36.0	0.45	**4.4 J**	10 U	10 U	**2.8 J**
Barium, Dissolved	200	7,300	29.7 J	40.3 J	26.5 J	26.1 J
Cadmium, Dissolved	8.80	18	0.35 J	5 U	5 U	5 U
Cobalt, Dissolved	--	11	0.98 J	5 U	0.6 J	1.1 J
Iron, Dissolved	--	26,000	64.8 J	60.7 J	167	270
Manganese, Dissolved	100	880	**160**	**202**	43.5	39.2
Vanadium, Dissolved	50.0	180	2.6 J	2 B	2.8 J	3.2 J
Zinc, Dissolved	81.0	11,000	12 J	15.1 J	22.4	28
Wet Chemistry						
Total dissolved solids (TDS) (mg/l)	--	--	19,500	NA	24,600	24,800

Notes:

Concentrations shaded blue exceed ERA Marine SW SVs

Concentrations shaded green exceed RSLs

RSLs were adjusted for noncarcinogens to account for exposure to multiple constituents
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
mg/l - Milligrams per liter
µg/l - Micrograms per liter

CTO-166
Camp Lejeune - Site 3
Validated Surface Water Raw Analytical Results
July 2009

Station ID	YS03-SW003	YS03-SW004	YS03-SW005		YS03-SW006	YS03-SW007	YS03-SW008	YS03-SW009	YS03-SW010	YS03-SW011	YS03-SW012
Sample ID	YS03-SW03-0709	YS03-SW04-0709	YS03-SW05-0709	YS03-SW05P-0709	YS03-SW06-0709	YS03-SW07-0709	YS03-SW08-0709	YS03-SW09-0709	YS03-SW10-0709	YS03-SW11-0709	YS03-SW12-0709
Sample Date	07/24/09	07/24/09	07/23/09	07/23/09	07/22/09	07/22/09	07/22/09	07/22/09	07/22/09	07/21/09	07/21/09
Chemical Name											
Volatile Organic Compounds (µg/l)											
1,1,1-Trichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
1,1,2-Trichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
1,1-Dichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
1,1-Dichloroethene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
1,2,4-Trichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
1,2-Dibromo-3-chloropropane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
1,2-Dibromoethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
1,2-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
1,2-Dichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
1,2-Dichloroethene (total)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
1,2-Dichloropropane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
1,3-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
1,4-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
2-Butanone	2.5 R	2.5 R	2.5 R	2.5 R	2.5 R	2.5 R	2.5 R	2.5 R	2.5 R	2.5 R	2.5 R
2-Hexanone	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 UL	2.5 UL
4-Methyl-2-pentanone	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 UL	2.5 UL
Acetone	6.2 B	4.4 B	6 B	7.1 B	5.1 B	4.8 B	3.8 B	4.7 B	4.3 B	4.9 B	5.9 B
Benzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Bromodichloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Bromoform	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Bromomethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Carbon disulfide	0.5 U	0.5 U	0.14 J	0.11 J	0.14 J	0.13 J	0.5 U	0.11 J	0.5 U	0.5 UL	0.5 UL
Carbon tetrachloride	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Chlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Chloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Chloroform	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Chloromethane	0.5 U	0.5 U	0.5 U	0.13 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
cis-1,2-Dichloroethene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
cis-1,3-Dichloropropene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Cyclohexane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Dibromochloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Dichlorodifluoromethane (Freon-12)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Ethylbenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Isopropylbenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
m- and p-Xylene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UL	1 UL
Methyl acetate	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Methylcyclohexane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Methylene chloride	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Methyl-tert-butyl ether (MTBE)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
o-Xylene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Styrene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Tetrachloroethene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Toluene	0.5 U	0.13 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.12 J	0.5 UL	0.1 L
trans-1,2-Dichloroethene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
trans-1,3-Dichloropropene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Trichloroethene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Trichlorofluoromethane(Freon-11)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Vinyl chloride	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Xylene, total	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Total Metals (µg/l)											
Aluminum	413 B	437 B	1,130 J	1,050 J	889 J	754 J	564 J	684 J	1,190 J	604 J	597 J
Antimony	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Arsenic	10 U	10 U	10 UL	10 UL	10 UL	10 UL	10 UL	10 UL	10 UL	10 UL	10 UL
Barium	29.2 J	29.6 J	29.6 J	28.8 J	30.1 J	28.4 J	28.5 J	28.3 J	28 J	26.9 J	26.5 J
Beryllium	0.8 B	0.8 B	0.48 B	0.44 B	0.42 B	0.37 B	0.38 B	0.42 B	5 U	0.39 B	5 U
Cadmium	5 U	5 U	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL
Calcium	230,000	232,000	226,000	223,000	233,000	225,000	233,000	225,000	225,000	233,000	232,000
Chromium	10 U	10 U	10 U	10 U	0.71 B	10 U	0.72 B	1.3 B	0.66 B	10 U	10 U
Cobalt	5 U	5 U	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL

CTO-166
Camp Lejeune - Site 3
Validated Surface Water Raw Analytical Results
July 2009

Station ID	YS03-SW003	YS03-SW004	YS03-SW005		YS03-SW006	YS03-SW007	YS03-SW008	YS03-SW009	YS03-SW010	YS03-SW011	YS03-SW012
Sample ID	YS03-SW03-0709	YS03-SW04-0709	YS03-SW05-0709	YS03-SW05P-0709	YS03-SW06-0709	YS03-SW07-0709	YS03-SW08-0709	YS03-SW09-0709	YS03-SW10-0709	YS03-SW11-0709	YS03-SW12-0709
Sample Date	07/24/09	07/24/09	07/23/09	07/23/09	07/22/09	07/22/09	07/22/09	07/22/09	07/22/09	07/21/09	07/21/09
Chemical Name											
Copper	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL
Iron	526	506	1,270	1,210	971	838	715	816	844	776	755
Lead	3 UL	3 UL	3 UL	3 UL	3 UL	3 UL	3 UL	3 UL	3 UL	4.2 L	3 UL
Magnesium	708,000	684,000	698,000	688,000	722,000	695,000	747,000	720,000	679,000	738,000	714,000
Manganese	62.3	52.4	139	136	108	93.5	81.5	66.5	55.8	50.8	47.7
Mercury	0.2 U	0.2 U	0.2 U	0.14 B	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40 U	40 U	40 UL	40 UL	40 UL	40 UL	40 UL	40 UL	40 UL	40 UL	40 UL
Potassium	336,000	338,000	339,000	330,000	341,000	332,000	345,000	339,000	317,000	340,000	338,000
Selenium	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Silver	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL
Sodium	5,310,000 J	5,190,000 J	5,110,000 J	5,470,000 J	5,050,000 J	5,250,000 J	5,370,000 J	5,260,000 J	5,070,000 J	5,300,000 J	5,210,000 J
Thallium	10 U	10 U	10 UL	10 UL	10 UL	10 UL	10 UL	10 UL	10 UL	10 UL	10 UL
Vanadium	3.7 J	3.3 J	4.4 J	4.6 J	3.7 J	3.6 J	4 J	4 J	4.3 J	3.5 J	3.2 J
Zinc	3.5 B	5 B	7.2 B	6.1 B	6.5 B	7.1 B	33.5	7.5 B	6.8 B	6.3 B	6.7 B
Dissolved Metals (µg/l)											
Aluminum, Dissolved	33.5 B	34.5 B	105 B	108 B	88.5 B	99.6 B	97.6 B	103 B	101 B	216 B	186 B
Antimony, Dissolved	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Arsenic, Dissolved	4 J	4.4 J	2.7 J	2.4 J	10 U	3.2 J	3.7 J	2.8 J	10 U	3.6 J	10 U
Barium, Dissolved	27.4 J	26.2 J	25.6 J	27.7 J	27.9 J	27.1 J	26.7 J	26.5 J	25.1 J	25.5 J	24.9 J
Beryllium, Dissolved	5 U	5 U	1 B	1.1 B	0.95 B	0.95 B	0.91 B	0.92 B	0.94 B	1 B	0.91 B
Cadmium, Dissolved	5 UL	5 UL	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Calcium, Dissolved	231,000	228,000	216,000	231,000	227,000	226,000	236,000	235,000	238,000	235,000	234,000
Chromium, Dissolved	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Cobalt, Dissolved	5 U	5 U	5 U	5 U	5 U	0.96 J	0.67 J	5 U	5 U	5 U	0.64 J
Copper, Dissolved	5 U	5 U	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL
Iron, Dissolved	62.7 J	61.4 J	69.7 J	61.1 J	66.6 J	72.7 J	94.7 J	73.1 J	47.3 J	240	215
Lead, Dissolved	3 U	3 U	3 UL	3 UL	3 UL	3 UL	3 UL	3 UL	3 UL	3 UL	3 UL
Magnesium, Dissolved	718,000	727,000	694,000	692,000	713,000	704,000	720,000	723,000	715,000	722,000	723,000
Manganese, Dissolved	41.2	30.3	91.1	95.4	89.1	71.5	62.4	38.9	15.3	22.1	9.5 J
Mercury, Dissolved	0.2 UL	0.2 UL	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel, Dissolved	40 U	40 U	40 U	40 U	40 U	40 U	40 U	40 U	40 U	40 U	40 U
Potassium, Dissolved	352,000 J	353,000 J	336,000 J	358,000 J	353,000 J	351,000 J	357,000 J	360,000 J	351,000 J	360,000 J	350,000 J
Selenium, Dissolved	5 U	5 U	5 U	5 U	3.1 K	5 U	5 U	5 U	5 U	5 U	5 U
Silver, Dissolved	5 U	5 U	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL	5 UL
Sodium, Dissolved	5,590,000	5,680,000	5,350,000	5,540,000	5,540,000	5,510,000	5,610,000	5,690,000	5,590,000	5,560,000	5,560,000
Thallium, Dissolved	10 U	10 U	7.1 B	10 U	4 B	10 U	7 B	10 U	10 U	5.6 B	5.5 B
Vanadium, Dissolved	2 J	2 J	2.9 J	2.6 J	2.7 J	2.7 J	3.1 J	2.2 B	2.4 B	2.4 B	2.7 J
Zinc, Dissolved	20 UL	20 UL	4.8 J	3.4 J	11.9 J	27.6	25	25.3	9.1 J	24.9	14.4 J
Wet Chemistry											
Total dissolved solids (TDS) (mg/l)	25,000	25,000	22,800	NA	25,900	24,600	25,000	24,700	25,200	25,900	24,900

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

mg/l - Milligrams per liter

µg/l - Micrograms per liter

CTO-166
Camp Lejeune - Site 3
Validated Surface Water Detected Analytical Results
July 2009

Station ID	YS03-SW003	YS03-SW004	YS03-SW005		YS03-SW006	YS03-SW007	YS03-SW008	YS03-SW009	YS03-SW010	YS03-SW011	YS03-SW012
Sample ID	YS03-SW03-0709	YS03-SW04-0709	YS03-SW05-0709	YS03-SW05P-0709	YS03-SW06-0709	YS03-SW07-0709	YS03-SW08-0709	YS03-SW09-0709	YS03-SW10-0709	YS03-SW11-0709	YS03-SW12-0709
Sample Date	07/24/09	07/24/09	07/23/09	07/23/09	07/22/09	07/22/09	07/22/09	07/22/09	07/22/09	07/21/09	07/21/09
Chemical Name											
Volatile Organic Compounds (µg/l)											
Carbon disulfide	0.5 U	0.5 U	0.14 J	0.11 J	0.14 J	0.13 J	0.5 U	0.11 J	0.5 U	0.5 UL	0.5 UL
Chloromethane	0.5 U	0.5 U	0.5 U	0.13 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Toluene	0.5 U	0.13 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.12 J	0.5 UL	0.1 L
Total Metals (µg/l)											
Aluminum	413 B	437 B	1,130 J	1,050 J	889 J	754 J	564 J	684 J	1,190 J	604 J	597 J
Barium	29.2 J	29.6 J	29.6 J	28.8 J	30.1 J	28.4 J	28.5 J	28.3 J	28 J	26.9 J	26.5 J
Calcium	230,000	232,000	226,000	223,000	233,000	225,000	233,000	225,000	225,000	233,000	232,000
Iron	526	506	1,270	1,210	971	838	715	816	844	776	755
Lead	3 UL	3 UL	3 UL	3 UL	3 UL	3 UL	3 UL	3 UL	3 UL	4.2 L	3 UL
Magnesium	708,000	684,000	698,000	688,000	722,000	695,000	747,000	720,000	679,000	738,000	714,000
Manganese	62.3	52.4	139	136	108	93.5	81.5	66.5	55.8	50.8	47.7
Potassium	336,000	338,000	339,000	330,000	341,000	332,000	345,000	339,000	317,000	340,000	338,000
Sodium	5,310,000 J	5,190,000 J	5,110,000 J	5,470,000 J	5,050,000 J	5,250,000 J	5,370,000 J	5,260,000 J	5,070,000 J	5,300,000 J	5,210,000 J
Vanadium	3.7 J	3.3 J	4.4 J	4.6 J	3.7 J	3.6 J	4 J	4 J	4.3 J	3.5 J	3.2 J
Zinc	3.5 B	5 B	7.2 B	6.1 B	6.5 B	7.1 B	33.5	7.5 B	6.8 B	6.3 B	6.7 B
Dissolved Metals (µg/l)											
Arsenic, Dissolved	4 J	4.4 J	2.7 J	2.4 J	10 U	3.2 J	3.7 J	2.8 J	10 U	3.6 J	10 U
Barium, Dissolved	27.4 J	26.2 J	25.6 J	27.7 J	27.9 J	27.1 J	26.7 J	26.5 J	25.1 J	25.5 J	24.9 J
Calcium, Dissolved	231,000	228,000	216,000	231,000	227,000	226,000	236,000	235,000	238,000	235,000	234,000
Cobalt, Dissolved	5 U	5 U	5 U	5 U	5 U	0.96 J	0.67 J	5 U	5 U	5 U	0.64 J
Iron, Dissolved	62.7 J	61.4 J	69.7 J	61.1 J	66.6 J	72.7 J	94.7 J	73.1 J	47.3 J	240	215
Magnesium, Dissolved	718,000	727,000	694,000	692,000	713,000	704,000	720,000	723,000	715,000	722,000	723,000
Manganese, Dissolved	41.2	30.3	91.1	95.4	89.1	71.5	62.4	38.9	15.3	22.1	9.5 J
Potassium, Dissolved	352,000 J	353,000 J	336,000 J	358,000 J	353,000 J	351,000 J	357,000 J	360,000 J	351,000 J	360,000 J	350,000 J
Selenium, Dissolved	5 U	5 U	5 U	5 U	3.1 K	5 U	5 U	5 U	5 U	5 U	5 U
Sodium, Dissolved	5,590,000	5,680,000	5,350,000	5,540,000	5,540,000	5,510,000	5,610,000	5,690,000	5,590,000	5,560,000	5,560,000
Vanadium, Dissolved	2 J	2 J	2.9 J	2.6 J	2.7 J	2.7 J	3.1 J	2.2 B	2.4 B	2.4 B	2.7 J
Zinc, Dissolved	20 UL	20 UL	4.8 J	3.4 J	11.9 J	27.6	25	25.3	9.1 J	24.9	14.4 J
Wet Chemistry											
Total dissolved solids (TDS) (mg/l)	25,000	25,000	22,800	NA	25,900	24,600	25,000	24,700	25,200	25,900	24,900

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

mg/l - Milligrams per liter

µg/l - Micrograms per liter

CTO-166
Camp Lejeune - Site 3
Validated Surface Water Exceedance Results
July 2009

Station ID	ERA Marine SW Screening Value	CLEAN RSLs Tap X 10 for SW Adjusted	YS03-SW003	YS03-SW004	YS03-SW005		YS03-SW006	YS03-SW007	YS03-SW008	YS03-SW009	YS03-SW010	YS03-SW011	YS03-SW012
Sample ID			YS03-SW03-0709	YS03-SW04-0709	YS03-SW05-0709	YS03-SW05P-0709	YS03-SW06-0709	YS03-SW07-0709	YS03-SW08-0709	YS03-SW09-0709	YS03-SW10-0709	YS03-SW11-0709	YS03-SW12-0709
Sample Date			07/24/09	07/24/09	07/23/09	07/23/09	07/22/09	07/22/09	07/22/09	07/22/09	07/22/09	07/21/09	07/21/09
Chemical Name													
Volatile Organic Compounds (µg/l)													
Carbon disulfide	--	1,000	0.5 U	0.5 U	0.14 J	0.11 J	0.14 J	0.13 J	0.5 U	0.11 J	0.5 U	0.5 UL	0.5 UL
Chloromethane	2,700	190	0.5 U	0.5 U	0.5 U	0.13 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 UL
Toluene	215	2,300	0.5 U	0.13 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.12 J	0.5 UL	0.1 L
Total Metals (µg/l)													
Aluminum	--	37,000	413 B	437 B	1,130 J	1,050 J	889 J	754 J	564 J	684 J	1,190 J	604 J	597 J
Barium	200	7,300	29.2 J	29.6 J	29.6 J	28.8 J	30.1 J	28.4 J	28.5 J	28.3 J	28 J	26.9 J	26.5 J
Iron	--	26,000	526	506	1,270	1,210	971	838	715	816	844	776	755
Lead	8.52	--	3 UL	3 UL	3 UL	3 UL	3 UL	3 UL	3 UL	3 UL	3 UL	4.2 L	3 UL
Manganese	100	880	62.3	52.4	**139**	**136**	**108**	93.5	81.5	66.5	55.8	50.8	47.7
Vanadium	50	180	3.7 J	3.3 J	4.4 J	4.6 J	3.7 J	3.6 J	4 J	4 J	4.3 J	3.5 J	3.2 J
Zinc	86	11,000	3.5 B	5 B	7.2 B	6.1 B	6.5 B	7.1 B	33.5	7.5 B	6.8 B	6.3 B	6.7 B
Dissolved Metals (µg/l)													
Arsenic, Dissolved	36	0.45	**4 J**	**4.4 J**	**2.7 J**	**2.4 J**	10 U	**3.2 J**	**3.7 J**	**2.8 J**	10 U	**3.6 J**	10 U
Barium, Dissolved	200	7,300	27.4 J	26.2 J	25.6 J	27.7 J	27.9 J	27.1 J	26.7 J	26.5 J	25.1 J	25.5 J	24.9 J
Cobalt, Dissolved	--	11	5 U	5 U	5 U	5 U	5 U	0.96 J	0.67 J	5 U	5 U	5 U	0.64 J
Iron, Dissolved	--	26,000	62.7 J	61.4 J	69.7 J	61.1 J	66.6 J	72.7 J	94.7 J	73.1 J	47.3 J	240	215
Manganese, Dissolved	100	880	41.2	30.3	91.1	95.4	89.1	71.5	62.4	38.9	15.3	22.1	9.5 J
Selenium, Dissolved	71	180	5 U	5 U	5 U	5 U	3.1 K	5 U	5 U	5 U	5 U	5 U	5 U
Vanadium, Dissolved	50	180	2 J	2 J	2.9 J	2.6 J	2.7 J	2.7 J	3.1 J	2.2 B	2.4 B	2.4 B	2.7 J
Zinc, Dissolved	81	11,000	20 UL	20 UL	4.8 J	3.4 J	11.9 J	27.6	25	25.3	9.1 J	24.9	14.4 J
Wet Chemistry													
Total dissolved solids (TDS) (mg/l)	--	--	25,000	25,000	22,800	NA	25,900	24,600	25,000	24,700	25,200	25,900	24,900

Notes:

Concentrations shaded blue exceed ERA Marine SW SVs

Concentrations shaded green exceed RSLs

RSLs were adjusted for noncarcinogens to account for exposure to multiple constituents
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
mg/l - Milligrams per liter
µg/l - Micrograms per liter

CTO-166
Yorktown - Site 1
Unvalidated Porewater Raw Analytical Results
September 2009

Station ID	YS01-WN02		YS01-WN03
Sample ID	YS01-WN02-0909	YS01-WN02P-0909	YS01-WN03-0909
Sample Date	09/01/09	09/01/09	09/01/09
Chemical Name			
Volatile Organic Compounds (µg/l)			
1,1,1-Trichloroethane	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluo	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	0.5 U	0.5 U	0.5 U
1,2,4-Trichlorobenzene	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	0.5 U	0.5 U	0.5 U
1,2-Dibromoethane	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	0.5 U	0.5 U	0.5 U
2-Butanone	1.3 B	1.7 B	0.69 B
2-Hexanone	2.5 U	2.5 U	2.5 U
4-Methyl-2-pentanone	2.5 U	2.5 U	2.5 U
Acetone	7.2 B	3.3 B	2.1 B
Benzene	0.5 U	0.5 U	0.5 U
Bromodichloromethane	0.5 U	0.5 U	0.5 U
Bromoform	0.5 U	0.5 U	0.5 U
Bromomethane	0.5 U	0.5 U	0.5 U
Carbon disulfide	0.3 J	0.26 J	0.27 J
Carbon tetrachloride	0.5 U	0.5 U	0.5 U
Chlorobenzene	0.5 U	0.5 U	0.5 U
Chloroethane	0.5 U	0.5 U	0.5 U
Chloroform	0.5 U	0.5 U	0.5 U
Chloromethane	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	0.5 U	0.5 U	0.5 U
Cyclohexane	0.69 J	1.2 J	1.4
Dibromochloromethane	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane	0.5 U	0.5 U	0.5 U
Ethylbenzene	0.5 U	0.5 U	0.5 U
Isopropyl benzene	0.5 U	0.5 U	0.5 U
m,p-xylene	1 U	1 U	1 U
Methyl acetate	0.5 U	0.5 U	0.5 U
Methylcyclohexane	0.5 U	0.5 U	0.5 U
Methylene chloride	0.5 U	0.5 U	0.5 U
Methyl-tert-butyl ether	0.5 U	0.5 U	0.5 U
o-xylene	0.5 U	0.5 U	0.5 U
Styrene	0.5 U	0.5 U	0.5 U
Tetrachloroethene	0.5 U	0.5 U	0.5 U
Toluene	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	0.5 U	0.5 U	0.5 U
trans-1,3-Dichloropropene	0.5 U	0.5 U	0.5 U
Trichloroethene	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane	0.5 U	0.5 U	0.5 U
Vinyl chloride	0.5 U	0.5 U	0.5 U
Xylene (total)	0.5 U	0.5 U	0.5 U

Notes:

Shading indicates detections

NA - Not analyzed

B - Not detected substantially above the level reported in laboratory or field blanks

J - Analyte present, value may or may not be accurate or precise

U - The material was analyzed for, but not detected

µg/l - Micrograms per liter

CTO-166
Yorktown - Site 1
Unvalidated Porewater Detected Analytical Results
September 2009

Station ID	YS01-WN02		YS01-WN03
Sample ID	YS01-WN02-0909	YS01-WN02P-0909	YS01-WN03-0909
Sample Date	09/01/09	09/01/09	09/01/09
Chemical Name			
Volatile Organic Compounds (µg/l)			
Carbon disulfide	0.3 J	0.26 J	0.27 J
Cyclohexane	0.69 J	1.2 J	1.4

Notes:

Shading indicates detections

NA - Not analyzed

J - Analyte present, value may or may not be accurate or precise

µg/l - Micrograms per liter

CTO-166
Yorktown - Site 3
Unvalidated Porewater Raw Analytical Results
September 2009

Station ID	YS03-WN01	YS03-WN02	YS03-WN03	YS03-WN04
Sample ID	YS03-WN01-0909	YS03-WN02-0909	YS03-WN03-0909	YS03-WN04-0909
Sample Date	09/01/09	09/02/09	09/02/09	09/01/09
Chemical Name				
Volatile Organic Compounds (µg/l)				
1,1,1-Trichloroethane	0.5 U	2.5 U	2.5 U	0.5 U
1,1,2,2-Tetrachloroethane	0.5 U	2.5 U	2.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluo	0.5 U	2.5 U	2.5 U	0.5 U
1,1,2-Trichloroethane	0.5 U	2.5 U	2.5 U	0.5 U
1,1-Dichloroethane	0.5 U	2.5 U	2.5 U	0.5 U
1,1-Dichloroethene	0.5 U	2.5 U	2.5 U	0.5 U
1,2,4-Trichlorobenzene	0.5 U	2.5 U	2.5 U	0.5 U
1,2-Dibromo-3-chloropropane	0.5 U	2.5 U	2.5 U	0.5 U
1,2-Dibromoethane	0.5 U	2.5 U	2.5 U	0.5 U
1,2-Dichlorobenzene	0.5 U	2.5 U	2.5 U	0.5 U
1,2-Dichloroethane	0.5 U	2.5 U	2.5 U	0.5 U
1,2-Dichloroethene (total)	0.5 U	2.5 U	2.5 U	0.5 U
1,2-Dichloropropane	0.5 U	2.5 U	2.5 U	0.5 U
1,3-Dichlorobenzene	0.5 U	2.5 U	2.5 U	0.5 U
1,4-Dichlorobenzene	0.5 U	2.5 U	2.5 U	0.5 U
2-Butanone	0.93 B	13 U	2.8 B	1 B
2-Hexanone	0.98 B	13 U	13 U	2.5 U
4-Methyl-2-pentanone	2.5 U	13 U	13 U	2.5 U
Acetone	2.5 U	13 U	13 U	1.7 B
Benzene	0.5 U	2.5 U	2.5 U	0.5 U
Bromodichloromethane	0.5 U	2.5 U	2.5 U	0.5 U
Bromoform	0.5 U	2.5 U	2.5 U	0.5 U
Bromomethane	0.5 U	2.5 U	2.5 U	0.5 U
Carbon disulfide	0.5 U	2.5 U	3.8	2.3
Carbon tetrachloride	0.5 U	2.5 U	2.5 U	0.5 U
Chlorobenzene	0.5 U	2.5 U	2.5 U	0.5 U
Chloroethane	0.5 U	2.5 U	2.5 U	0.5 U
Chloroform	0.5 U	2.5 U	2.5 U	0.5 U
Chloromethane	0.5 U	2.5 U	2.5 U	0.5 U
cis-1,2-Dichloroethene	0.5 U	2.5 U	2.5 U	0.5 U
cis-1,3-Dichloropropene	0.5 U	2.5 U	2.5 U	0.5 U
Cyclohexane	0.5 U	0.76 J	2 J	1.3
Dibromochloromethane	0.5 U	2.5 U	2.5 U	0.5 U
Dichlorodifluoromethane	0.5 U	2.5 U	2.5 U	0.5 U
Ethylbenzene	0.5 U	2.5 U	2.5 U	0.5 U
Isopropyl benzene	0.5 U	2.5 U	2.5 U	0.5 U
m,p-xylene	1 U	5 U	5 U	1 U
Methyl acetate	0.5 U	2.5 U	2.5 U	0.5 U
Methylcyclohexane	0.5 U	2.5 U	2.5 U	0.5 U
Methylene chloride	0.5 U	2.3 B	2.4 B	0.5 U
Methyl-tert-butyl ether	0.5 U	2.5 U	2.5 U	0.5 U
o-xylene	0.5 U	2.5 U	2.5 U	0.5 U
Styrene	0.5 U	2.5 U	2.5 U	0.5 U
Tetrachloroethene	0.5 U	2.5 U	2.5 U	0.5 U
Toluene	0.5 U	0.86 J	0.96 J	0.15 J
trans-1,2-Dichloroethene	0.5 U	2.5 U	2.5 U	0.5 U
trans-1,3-Dichloropropene	0.5 U	2.5 U	2.5 U	0.5 U
Trichloroethene	0.5 U	2.5 U	2.5 U	0.5 U
Trichlorofluoromethane	0.5 U	2.5 U	2.5 U	0.5 U
Vinyl chloride	0.5 U	2.5 U	2.5 U	0.5 U
Xylene (total)	0.5 U	2.5 U	2.5 U	0.5 U

Notes:

Shading indicates detections

NA - Not analyzed

B - Not detected substantially above the level reported in laboratory or field blanks

J - Analyte present, value may or may not be accurate or precise

U - The material was analyzed for, but not detected

µg/l - Micrograms per liter

CTO-166
Yorktown - Site 3
Unvalidated Porewater Detected Analytical Results
September 2009

Station ID	YS03-WN01	YS03-WN02	YS03-WN03	YS03-WN04
Sample ID	YS03-WN01-0909	YS03-WN02-0909	YS03-WN03-0909	YS03-WN04-0909
Sample Date	09/01/09	09/02/09	09/02/09	09/01/09
Chemical Name				
Volatile Organic Compounds (µg/l)				
Carbon disulfide	0.5 U	2.5 U	3.8	2.3
Cyclohexane	0.5 U	0.76 J	2 J	1.3
Toluene	0.5 U	0.86 J	0.96 J	0.15 J

Notes:

Shading indicates detections

NA - Not analyzed

J - Analyte present, value may or may not be accurate or precise

U - The material was analyzed for, but not detected

µg/l - Micrograms per liter

Appendix I
Site 1 Human Health Risk Assessment Tables

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Groundwater	Groundwater	Columbia and Yorktown-Eastover Aquifer - Tap Water	Resident	Adult	Dermal Absorption	On-site	Quant	Although unlikely, groundwater will be evaluated for use as a future potable water supply.
						Ingestion	On-site	Quant	Although unlikely, groundwater will be evaluated for use as a future potable water supply.
					Child	Dermal Absorption	On-site	Quant	Although unlikely, groundwater will be evaluated for use as a future potable water supply.
						Ingestion	On-site	Quant	Although unlikely, groundwater will be evaluated for use as a future potable water supply.
					Child/Adult	Dermal Absorption	On-site	Quant	Although unlikely, groundwater will be evaluated for use as a future potable water supply. Child/Adult evaluated for cancer risk only.
						Ingestion	On-site	Quant	Although unlikely, groundwater will be evaluated for use as a future potable water supply. Child/Adult evaluated for cancer risk only.
				Industrial Worker	Adult	Dermal Absorption	On-site	None	Industrial workers not expected to take a significant number of showers/baths at workplace.
						Ingestion	On-site	Quant	Although unlikely, groundwater will be evaluated for use as a future potable water supply.
			Columbia and Yorktown-Eastover Aquifer - Excavation Pit	Construction Worker	Adult	Dermal Absorption	On-site	Quant	Construction worker may contact groundwater in an excavation during excavation and construction activities.
						Ingestion	On-site	None	Incidental ingestion of groundwater from an excavation during excavation and construction activities expected to be insignificant compared to dermal exposure.
		Air	Columbia and Yorktown-Eastover Aquifer - Water Vapors at Showerhead	Resident	Adult	Inhalation	On-site	Quant	Although unlikely, groundwater will be evaluated for use as future potable water supply.
					Child	Inhalation	On-site	Quant	Although unlikely, groundwater will be evaluated for use as future potable water supply.
				Industrial Worker	Adult	Inhalation	On-site	None	Industrial workers not expected to take a significant number of showers/baths at workplace.
			Columbia and Yorktown-Eastover Aquifer - Volatilization from Water in Excavation Pit	Construction Worker	Adult	Inhalation	On-site	Quant	Construction worker may inhale volatiles from groundwater in an excavation during excavation and construction activities.
			Columbia and Yorktown-Eastover Aquifer - Vapor Intrusion to Indoor Air	Resident	Adult	Inhalation	On-site	Qual	Future resident could inhale vapors migrating from groundwater in indoor air if future resident constructed on site.
					Child	Inhalation	On-site	Qual	Future resident could inhale vapors migrating from groundwater into indoor air if future resident constructed on site.
			Columbia and Yorktown-Eastover Aquifer - Vapor Intrusion to Indoor Air	Industrial Worker	Adult	Inhalation	On-site	Qual	Future industrial workers could inhale vapors migrating from groundwater into indoor air if future industrial building constructed on site.

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Surface Water	Surface Water	Indian Field Creek	Trespasser/Visitor	Adult	Dermal Absorption	On-site	Quant	Trespassers/visitors could contact surface water in Indian Field Creek downgradient of Site 1.
						Ingestion	On-site	Quant	Trespassers/visitors could contact surface water in Indian Field Creek downgradient of Site 1.
					Adolescent	Dermal Absorption	On-site	Quant	Trespassers/visitors could contact surface water in Indian Field Creek downgradient of Site 1.
						Ingestion	On-site	Quant	Trespassers/visitors could contact surface water in Indian Field Creek downgradient of Site 1.
	Sediment	Sediment	Indian Field Creek	Trespasser/Visitor	Adult	Dermal Absorption	On-site	Quant	Trespassers/visitors could contact sediment in Indian Field Creek downgradient of Site 1.
						Ingestion	On-site	Quant	Trespassers/visitors could contact sediment in Indian Field Creek downgradient of Site 1.
					Adolescent	Dermal Absorption	On-site	Quant	Trespassers/visitors could contact sediment in Indian Field Creek downgradient of Site 1.
						Ingestion	On-site	Quant	Trespassers/visitors could contact sediment in Indian Field Creek downgradient of Site 1.
Future	Surface Water	Surface Water	Indian Field Creek	Construction Worker	Adult	Dermal Absorption	On-site	Quant	Construction workers could contact surface water in Indian Field Creek downgradient of Site 1.
						Ingestion	On-site	Quant	Construction workers could contact surface water in Indian Field Creek downgradient of Site 1.
	Sediment	Sediment	Indian Field Creek	Construction Worker	Adult	Dermal Absorption	On-site	Quant	Construction workers could contact surface water in Indian Field Creek downgradient of Site 1.
						Ingestion	On-site	Quant	Construction workers could contact surface water in Indian Field Creek downgradient of Site 1.

Quant: will be quantitatively evaluated.

Qual: will be qualitatively evaluated.

None: Not considered to be a complete pathway, therefore, not evaluated.

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Columbia and Yorktown - Eastover Aquifer Tap Water	**79-00-5**	**1,1,2-Trichloroethane**	**1.7E+00**	**1.7E+00**	**UG/L**	**YS01-GW22-0309**	**1/17**	**0.5 - 4.2**	**1.7E+00**	**N/A**	**4.1E-02 N**	**5.0E+00**	**MCL**	**YES**	**ASL**
	75-34-3	1,1-Dichloroethane	2.6E-01 J	6.0E-01	UG/L	YS01-GW25-0309	2/17	0.5 - 4.2	6.0E-01	N/A	2.4E+00 C	N/A		NO	BSL
	75-35-4	1,1-Dichloroethene	8.6E+00	8.6E+00	UG/L	YS01-GW22P-0309	1/17	0.5 - 4.2	8.6E+00	N/A	2.6E+01 N	7.0E+00	MCL	NO	BSL
	540-59-0	**1,2-Dichloroethene (total)**	**2.0E-01 J**	**3.0E+03**	**UG/L**	**YS01-GW22-0309**	**6/17**	**0.5 - 710**	**3.0E+03**	**N/A**	**1.3E+01 N**	**7.0E+01**	**MCL**	**YES**	**ASL**
	71-43-2	Benzene	2.4E-01 J	2.4E-01 J	UG/L	YS01-GW22-0309 : YS01-GW22P-0309	1/17	0.5 - 4.2	2.4E-01	N/A	3.9E-01 C	5.0E+00	MCL	NO	BSL
	75-15-0	Carbon disulfide	1.5E-01 J	1.4E+00	UG/L	YS01-GW05-0309	3/17	0.5 - 4.2	1.4E+00	N/A	7.2E+01 N	N/A		NO	BSL
	67-66-3	**Chloroform**	**3.5E-01 J**	**7.4E-01**	**UG/L**	**YS01-GW24-0309**	**3/17**	**0.5 - 4.2**	**7.4E-01**	**N/A**	**1.9E-01 C**	**8.0E+01**	**MCL**	**YES**	**ASL**
	74-87-3	Chloromethane	1.4E-01 J	1.4E-01 J	UG/L	YS01-GW24-0309	1/17	0.5 - 4.2	1.4E-01	N/A	1.9E+01 N	N/A		NO	BSL
	156-59-2	**cis-1,2-Dichloroethene**	**2.1E-01 J**	**3.0E+03**	**UG/L**	**YS01-GW22-0309**	**6/17**	**0.5 - 710**	**3.0E+03**	**N/A**	**2.8E+00 N**	**7.0E+01**	**MCL**	**YES**	**ASL**
	75-71-8	Dichlorodifluoromethane (Freon-12)	1.4E-01 J	1.4E-01 J	UG/L	YS01-GW12-0309	1/17	0.5 - 4.2	1.4E-01	N/A	1.9E+01 N	N/A		NO	BSL
	100-41-4	Ethylbenzene	1.3E-01 J	1.6E-01 J	UG/L	YS01-GW24-0309	2/17	0.5 - 4.2	1.6E-01	N/A	1.3E+00 C	7.0E+02	MCL	NO	BSL
	127-18-4	Tetrachloroethene	2.1E-01 J	2.1E-01 J	UG/L	YS01-GW22-0309 : YS01-GW22P-0309	1/17	0.5 - 4.2	2.1E-01	N/A	3.5E+00 N	5.0E+00	MCL	NO	BSL
	156-60-5	trans-1,2-Dichloroethene	1.5E-01 J	5.6E+00	UG/L	YS01-GW22-0309	2/17	0.5 - 4.2	5.6E+00	N/A	8.6E+00 N	1.0E+02	MCL	NO	BSL
	79-01-6	**Trichloroethene**	**5.4E-01**	**1.8E+04**	**UG/L**	**YS01-GW22-0309**	**7/17**	**0.5 - 710**	**1.8E+04**	**N/A**	**2.6E-01 N**	**5.0E+00**	**MCL**	**YES**	**ASL**
	75-01-4	**Vinyl chloride**	**4.8E-01 J**	**3.6E+00**	**UG/L**	**YS01-GW22-0309 : YS01-GW22P-0309**	**2/17**	**0.5 - 4.2**	**3.6E+00**	**N/A**	**1.5E-02 C**	**2.0E+00**	**MCL**	**YES**	**ASL**
	7429-90-5	**Aluminum, Dissolved**	**1.9E+02 J**	**1.8E+03**	**UG/L**	**YS01-GW05-0309**	**4/17**	**200 - 200**	**1.8E+03**	**1.0E+02**	**1.6E+03 N**	**50-200**	**SMCL**	**YES**	**ASL**
	7440-38-2	**Arsenic, Dissolved**	**2.9E+00 J**	**2.9E+01**	**UG/L**	**YS01-GW18-0309**	**5/17**	**10 - 10**	**2.9E+01**	**1.4E+00**	**4.5E-02 C**	**1.0E+01**	**MCL**	**YES**	**ASL**
	7440-39-3	Barium, Dissolved	2.1E+00 J	1.6E+02 J	UG/L	YS01-GW13-0309	17/17	200 - 200	1.6E+02	1.3E+02	2.9E+02 N	2.0E+03	MCL	NO	BSL
	7440-43-9	**Cadmium, Dissolved**	**5.5E+00**	**1.3E+01**	**UG/L**	**YS01-GW12-0309**	**2/17**	**5 - 5**	**1.3E+01**	**1.8E-01**	**6.9E-01 N**	**5.0E+00**	**MCL**	**YES**	**ASL**
	7440-70-2	Calcium, Dissolved	2.0E+03 J	1.5E+05	UG/L	YS01-GW25-0309	17/17	5000 - 5000	1.5E+05	1.1E+05	N/A	N/A		NO	NUT
	7440-47-3	**Chromium, Dissolved**	**8.9E-01 J**	**1.4E+00 J**	**UG/L**	**YS01-GW22-0309**	**2/17**	**10 - 10**	**1.4E+00**	**6.0E+00**	**3.1E-02 C**	**1.0E+02**	**MCL**	**YES**	**ASL**
	7440-48-4	**Cobalt, Dissolved**	**6.7E-01 J**	**1.4E+01**	**UG/L**	**YS01-GW05-0309**	**4/17**	**5 - 5**	**1.4E+01**	**7.0E-01**	**4.7E-01 N**	**N/A**		**YES**	**ASL**
	7440-50-8	Copper, Dissolved	9.5E-01 L	2.2E+01	UG/L	YS01-GW05A-0309	9/17	5 - 5	2.2E+01	3.0E+00	6.2E+01 N	1.3E+03	AL	NO	BSL
	7439-89-6	**Iron, Dissolved**	**6.0E+02**	**8.0E+03**	**UG/L**	**YS01-GW18-0309**	**4/17**	**100 - 100**	**8.0E+03**	**2.8E+02**	**1.1E+03 N**	**3.0E+02**	**SMCL**	**YES**	**ASL**
	7439-92-1	Lead, Dissolved	2.9E+00 J	5.3E+00	UG/L	YS01-GW04-0309	2/17	3 - 3	5.3E+00	1.7E+00	1.5E+01	1.5E+01	MCL	NO	BSL
	7439-95-4	Magnesium, Dissolved	4.7E+02 J	1.8E+04	UG/L	YS01-GW05-0309	17/17	5000 - 5000	1.8E+04	3.9E+03	N/A	N/A		NO	NUT
	7439-96-5	**Manganese, Dissolved**	**5.4E+00 J**	**2.3E+02**	**UG/L**	**YS01-GW18-0309**	**16/17**	**10 - 10**	**2.3E+02**	**5.0E+01**	**3.2E+01 N**	**5.0E+01**	**SMCL**	**YES**	**ASL**
	7439-97-6	Mercury, Dissolved	1.4E-01 J	1.5E-01 L	UG/L	YS01-GW12A-0309	2/17	0.2 - 0.2	1.5E-01	1.0E-01	4.3E-01 N	2.0E+00	MCL	NO	BSL
	7440-02-0	Nickel, Dissolved	1.6E+00 J	9.0E+00 J	UG/L	YS01-GW05-0309	5/17	40 - 40	9.0E+00	1.2E+01	3.0E+01 N	N/A		NO	BSL
	7440-09-7	Potassium, Dissolved	1.3E+03 J	1.3E+04 J	UG/L	YS01-GW12AP-0309	6/17	5000 - 5000	1.3E+04	1.7E+03	N/A	N/A		NO	NUT
	7782-49-2	**Selenium, Dissolved**	**6.7E+00 K**	**1.9E+01 K**	**UG/L**	**YS01-GW18-0309**	**5/17**	**5 - 5**	**1.9E+01**	**9.1E+00**	**7.8E+00 N**	**5.0E+01**	**MCL**	**YES**	**ASL**
	7440-23-5	Sodium, Dissolved	2.7E+03 J	1.9E+04	UG/L	YS01-GW05-0309	16/17	5000 - 5000	1.9E+04	1.0E+04	N/A	N/A		NO	NUT
	7440-62-2	Vanadium, Dissolved	2.1E+00 J	4.4E+00 J	UG/L	YS01-GW05-0309	2/17	20 - 20	4.4E+00	4.3E+00 J	7.8E+00 N	N/A		NO	BSL
	7440-66-6	**Zinc, Dissolved**	**1.4E+00 J**	**2.5E+03**	**UG/L**	**YS01-GW12-0309**	**7/17**	**20 - 20**	**2.5E+03**	**4.5E+00**	**4.7E+02 N**	**5.0E+03**	**SMCL**	**YES**	**ASL**

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Following USEPA Region III guidance (*Guidance on the Selection of Analytical Metal Results from Monitoring Well Samples for Use in Quantitative Assessment* of Risk, USEPA, 1992), dissolved inorganic groundwater data used for tap water because an order of magnitude difference noted between dissolved and total results.

[2] Maximum concentration is used for screening.

[3] Background values are the lower of the Columbia and Yorktown aquifer background groundwater concentration.

[4] Oak Ridge National Laboratory (ORNL). Nov. 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). [Online]. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml
RSL value for chromium VI used as surrogate for chromium.
Safe Drinking Water Act Action Level for lead used as screening level for lead.
RSL value for mercury (inorganic salts) used as surrogate for mercury.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
UG/L = micrograms per liter
N/A = not available, not applicable
MCL = Maximum Contaminant Level, Primary Drinking Water Standards
SMCL = Maximum Contaminant Level, Secondary Drinking Water Standards
AL = Action Level, Safe Drinking Water Act

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Columbia and Yorktown -	**79-00-5**	**1,1,2-Trichloroethane**	**1.7E+00**	**1.7E+00**	**UG/L**	**YS01-GW22-0309**	**1/17**	**0.5 - 4.2**	**1.7E+00**	**N/A**	**4.1E-02 N**	**5.0E+00**	**MCL**	**YES**	**ASL**
Eastover Aquifer	75-34-3	1,1-Dichloroethane	2.6E-01 J	6.0E-01	UG/L	YS01-GW25-0309	2/17	0.5 - 4.2	6.0E-01	N/A	2.4E+00 C	N/A		NO	BSL
Water Vapors at	75-35-4	1,1-Dichloroethene	8.6E+00	8.6E+00	UG/L	YS01-GW22P-0309	1/17	0.5 - 4.2	8.6E+00	N/A	2.6E+01 N	7.0E+00	MCL	NO	BSL
Showerhead and	**540-59-0**	**1,2-Dichloroethene (total)**	**2.0E-01 J**	**3.0E+03**	**UG/L**	**YS01-GW22-0309**	**6/17**	**0.5 - 710**	**3.0E+03**	**N/A**	**1.3E+01 N**	**N/A**		**YES**	**ASL**
Excavation Pit	71-43-2	Benzene	2.4E-01 J	2.4E-01 J	UG/L	YS01-GW22-0309 : YS01-GW22P-0309	1/17	0.5 - 4.2	2.4E-01	N/A	3.9E-01 C	5.0E+00	MCL	NO	BSL
	75-15-0	Carbon disulfide	1.5E-01 J	1.4E+00	UG/L	YS01-GW05-0309	3/17	0.5 - 4.2	1.4E+00	N/A	7.2E+01 N	N/A		NO	BSL
	67-66-3	**Chloroform**	**3.5E-01 J**	**7.4E-01**	**UG/L**	**YS01-GW24-0309**	**3/17**	**0.5 - 4.2**	**7.4E-01**	**N/A**	**1.9E-01 C**	**8.0E+01**	**MCL**	**YES**	**ASL**
	74-87-3	Chloromethane	1.4E-01 J	1.4E-01 J	UG/L	YS01-GW24-0309	1/17	0.5 - 4.2	1.4E-01	N/A	1.9E+01 N	N/A		NO	BSL
	156-59-2	**cis-1,2-Dichloroethene**	**2.1E-01 J**	**3.0E+03**	**UG/L**	**YS01-GW22-0309**	**6/17**	**0.5 - 710**	**3.0E+03**	**N/A**	**2.8E+00 N**	**7.0E+01**	**MCL**	**YES**	**ASL**
	75-71-8	Dichlorodifluoromethane (Freon-12)	1.4E-01 J	1.4E-01 J	UG/L	YS01-GW12-0309	1/17	0.5 - 4.2	1.4E-01	N/A	1.9E+01 N	N/A		NO	BSL
	100-41-4	Ethylbenzene	1.3E-01 J	1.6E-01 J	UG/L	YS01-GW24-0309	2/17	0.5 - 4.2	1.6E-01	N/A	1.3E+00 C	7.0E+02	MCL	NO	BSL
	127-18-4	Tetrachloroethene	2.1E-01 J	2.1E-01 J	UG/L	YS01-GW22-0309 : YS01-GW22P-0309	1/17	0.5 - 4.2	2.1E-01	N/A	3.5E+00 N	5.0E+00	MCL	NO	BSL
	156-60-5	trans-1,2-Dichloroethene	1.5E-01 J	5.6E+00	UG/L	YS01-GW22-0309	2/17	0.5 - 4.2	5.6E+00	N/A	8.6E+00 N	1.0E+02	MCL	NO	BSL
	79-01-6	**Trichloroethene**	**5.4E-01**	**1.8E+04**	**UG/L**	**YS01-GW22-0309**	**7/17**	**0.5 - 710**	**1.8E+04**	**N/A**	**2.6E-01 N**	**5.0E+00**	**MCL**	**YES**	**ASL**
	75-01-4	**Vinyl chloride**	**4.8E-01 J**	**3.6E+00**	**UG/L**	**YS01-GW22-0309 : YS01-GW22P-0309**	**2/17**	**0.5 - 4.2**	**3.6E+00**	**N/A**	**1.5E-02 C**	**2.0E+00**	**MCL**	**YES**	**ASL**

[1] Minimum and maximum detected concentration.

[2] Maximum concentration is used for screening.

[3] Background values are the lowest maximum detected concentration from comparison of Columbia and Yorktown aquifer background dataset

[4] Oak Ridge National Laboratory (ORNL). Nov. 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). [Online]. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
UG/L = micrograms per liter
N/A = not available, not applicable
MCL = Maximum Contaminant Level, Primary Drinking Water Standards

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Columbia and Yorktown -	**79-00-5**	**1,1,2-Trichloroethane**	**1.7E+00**	**1.7E+00**	**UG/L**	**YS01-GW22-0309**	**1/17**	**0.5 - 4.2**	**1.7E+00**	**N/A**	**4.1E-02 N**	**5.0E+00**	**MCL**	**YES**	**ASL**
Eastover Aquifer	75-34-3	1,1-Dichloroethane	2.6E-01 J	6.0E-01	UG/L	YS01-GW25-0309	2/17	0.5 - 4.2	6.0E-01	N/A	2.4E+00 C	N/A		NO	BSL
Water in Excavation	75-35-4	1,1-Dichloroethene	8.6E+00	8.6E+00	UG/L	YS01-GW22P-0309	1/17	0.5 - 4.2	8.6E+00	N/A	2.6E+01 N	7.0E+00	MCL	NO	BSL
Pit	**540-59-0**	**1,2-Dichloroethene (total)**	**2.0E-01 J**	**3.0E+03**	**UG/L**	**YS01-GW22-0309**	**6/17**	**0.5 - 710**	**3.0E+03**	**N/A**	**1.3E+01 N**	**N/A**		**YES**	**ASL**
	71-43-2	Benzene	2.4E-01 J	2.4E-01 J	UG/L	YS01-GW22-0309 : YS01-GW22P-0309	1/17	0.5 - 4.2	2.4E-01	N/A	3.9E-01 C	5.0E+00	MCL	NO	BSL
	75-15-0	Carbon disulfide	1.5E-01 J	1.4E+00	UG/L	YS01-GW05-0309	3/17	0.5 - 4.2	1.4E+00	N/A	7.2E+01 N	N/A		NO	BSL
	67-66-3	**Chloroform**	**3.5E-01 J**	**7.4E-01**	**UG/L**	**YS01-GW24-0309**	**3/17**	**0.5 - 4.2**	**7.4E-01**	**N/A**	**1.9E-01 C**	**8.0E+01**	**MCL**	**YES**	**ASL**
	74-87-3	Chloromethane	1.4E-01 J	1.4E-01 J	UG/L	YS01-GW24-0309	1/17	0.5 - 4.2	1.4E-01	N/A	1.9E+01 N	N/A		NO	BSL
	156-59-2	**cis-1,2-Dichloroethene**	**2.1E-01 J**	**3.0E+03**	**UG/L**	**YS01-GW22-0309**	**6/17**	**0.5 - 710**	**3.0E+03**	**N/A**	**2.8E+00 N**	**7.0E+01**	**MCL**	**YES**	**ASL**
	75-71-8	Dichlorodifluoromethane (Freon-12)	1.4E-01 J	1.4E-01 J	UG/L	YS01-GW12-0309	1/17	0.5 - 4.2	1.4E-01	N/A	1.9E+01 N	N/A		NO	BSL
	100-41-4	Ethylbenzene	1.3E-01 J	1.6E-01 J	UG/L	YS01-GW24-0309	2/17	0.5 - 4.2	1.6E-01	N/A	1.3E+00 C	7.0E+02	MCL	NO	BSL
	127-18-4	Tetrachloroethene	2.1E-01 J	2.1E-01 J	UG/L	YS01-GW22-0309 : YS01-GW22P-0309	1/17	0.5 - 4.2	2.1E-01	N/A	3.5E+00 N	5.0E+00	MCL	NO	BSL
	156-60-5	trans-1,2-Dichloroethene	1.5E-01 J	5.6E+00	UG/L	YS01-GW22-0309	2/17	0.5 - 4.2	5.6E+00	N/A	8.6E+00 N	1.0E+02	MCL	NO	BSL
	79-01-6	**Trichloroethene**	**5.4E-01**	**1.8E+04**	**UG/L**	**YS01-GW22-0309**	**7/17**	**0.5 - 710**	**1.8E+04**	**N/A**	**2.6E-01 N**	**5.0E+00**	**MCL**	**YES**	**ASL**
	75-01-4	**Vinyl chloride**	**4.8E-01 J**	**3.6E+00**	**UG/L**	**YS01-GW22-0309 : YS01-GW22P-0309**	**2/17**	**0.5 - 4.2**	**3.6E+00**	**N/A**	**1.5E-02 C**	**2.0E+00**	**MCL**	**YES**	**ASL**
	7429-90-5	**Aluminum**	**1.1E+02 J**	**5.0E+03**	**UG/L**	**YS01-GW21-0309**	**17/17**	**200 - 200**	**5.0E+03**	**2.2E+03**	1.6E+03 N	**50-200**	**SMCL**	**YES**	**ASL**
	7440-36-0	**Antimony**	**6.0E+00 J**	**1.0E+01**	**UG/L**	**YS01-GW12A-0309**	**12/17**	**10 - 10**	**1.0E+01**	**1.9E+01**	**6.0E-01 N**	**6.0E+00**	**MCL**	**YES**	**ASL**
	7440-38-2	**Arsenic**	**5.2E+00 J**	**2.7E+01**	**UG/L**	**YS01-GW14-0309**	**5/17**	**10 - 10**	**2.7E+01**	**2.3E+00**	**4.5E-02 C**	**1.0E+01**	**MCL**	**YES**	**ASL**
	7440-39-3	Barium	2.8E+00 J	1.7E+02 J	UG/L	YS01-GW13-0309	17/17	200 - 200	1.7E+02	1.2E+02	2.9E+02 N	2.0E+03	MCL	NO	BSL
	7440-41-7	Beryllium	7.3E-01 J	7.3E-01 J	UG/L	YS01-GW05-0309	1/17	5 - 5	7.3E-01	2.5E+00	1.6E+00 N	4.0E+00	MCL	NO	BSL
	7440-43-9	**Cadmium**	**6.6E-01 J**	**1.1E+01**	**UG/L**	**YS01-GW12-0309**	**7/17**	**5 - 5**	**1.1E+01**	**6.1E-01**	**6.9E-01 N**	**5.0E+00**	**MCL**	**YES**	**ASL**
	7440-70-2	Calcium	1.9E+03 J	1.6E+05	UG/L	YS01-GW21-0309	17/17	5000 - 5000	1.6E+05	1.6E+05	N/A	N/A		NO	NUT
	7440-47-3	**Chromium**	**1.6E+00 J**	**3.5E+01**	**UG/L**	**YS01-GW05A-0309**	**16/17**	**10 - 10**	**3.5E+01**	**1.5E+01**	**3.1E-02 C**	**1.0E+02**	**MCL**	**YES**	**ASL**
	7440-48-4	**Cobalt**	**2.5E+00 J**	**1.1E+01**	**UG/L**	**YS01-GW05-0309**	**4/17**	**5 - 5**	**1.1E+01**	**2.1E+01**	**4.7E-01 N**	**N/A**		**YES**	**ASL**
	7440-50-8	Copper	8.5E-01 J	9.1E+00	UG/L	YS01-GW21-0309	14/17	5 - 5	9.1E+00	1.2E+01	6.2E+01 N	1.3E+03	AL	NO	BSL
	7439-89-6	**Iron**	**3.2E+02**	**1.4E+04**	**UG/L**	**YS01-GW21-0309**	**17/17**	**100 - 100**	**1.4E+04**	**8.9E+02**	**1.1E+03 N**	**3.0E+02**	**SMCL**	**YES**	**ASL**
	7439-92-1	Lead	1.6E+00 L	6.0E+00 L	UG/L	YS01-GW14-0309 : YS01-GW21-0309	15/17	3 - 3	6.0E+00	2.1E+01	1.5E+01 AL	1.5E+01	MCL	NO	BSL
	7439-95-4	Magnesium	4.3E+02 J	1.7E+04	UG/L	YS01-GW05-0309	17/17	5000 - 5000	1.7E+04	3.6E+03	N/A	N/A		NO	NUT
	7439-96-5	**Manganese**	**2.1E+01**	**7.1E+02**	**UG/L**	**YS01-GW21-0309**	**17/17**	**10 - 10**	**7.1E+02**	**5.8E+01**	**3.2E+01 N**	**5.0E+01**	**SMCL**	**YES**	**ASL**
	7440-02-0	Nickel	2.1E+00 J	5.6E+00 J	UG/L	YS01-GW22P-0309	2/17	40 - 40	5.6E+00	1.1E+01	3.0E+01 N	N/A		NO	BSL
	7440-09-7	Potassium	1.2E+02 J	1.9E+04 J	UG/L	YS01-GW12A-0309	17/17	5000 - 5000	1.9E+04	3.5E+03	N/A	N/A		NO	NUT
	7782-49-2	Selenium	2.8E+00 J	2.8E+00 J	UG/L	YS01-GW05-0309	1/17	5 - 5	2.8E+00	N/A	7.8E+00 N	5.0E+01	MCL	NO	BSL
	7440-23-5	Sodium	2.3E+03 J	1.8E+04	UG/L	YS01-GW05-0309	17/17	5000 - 5000	1.8E+04	9.9E+03	N/A	N/A		NO	NUT
	7440-62-2	**Vanadium**	**9.6E-01 J**	**3.4E+01**	**UG/L**	**YS01-GW21-0309**	**15/17**	**20 - 20**	**3.4E+01**	**2.6E+01**	**7.8E+00 N**	**N/A**		**YES**	**ASL**
	7440-66-6	**Zinc**	**5.8E+00 J**	**2.2E+03**	**UG/L**	**YS01-GW12-0309**	**14/17**	**20 - 20**	**2.2E+03**	**4.5E+00**	**4.7E+02 N**	**5.0E+03**	**SMCL**	**YES**	**ASL**

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Total inorganic groundwater data used for water in excavation pit because construction worker would be exposed directly to the water in the excavation pit.
[2] Maximum concentration is used for screening.
[3] Background values are the lower of the Columbia and Yorktown aquifer background groundwater concentration.
[4] Oak Ridge National Laboratory (ORNL). Nov. 2011. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. [Online]. Adjusted Tap Water RSL.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). [Online]. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml
RSL value for chromium VI used as surrogate for chromium.
Safe Drinking Water Act Action Level for lead used as screening level for lead.
RSL value for mercury (inorganic salts) used as surrogate for mercury.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

COPC = Chemical of Potential Concern
J = Estimated Value
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
UG/L = micrograms per liter
ND = not detected
N/A = not available, not applicable
MCL = Maximum Contaminant Level, Primary Drinking Water Standards
SMCL = Maximum Contaminant Level, Secondary Drinking Water Standards
AL = Action Level, Safe Drinking Water Act

Updated by: D. Stannard/WDC (4/19/2012)
Checked by: G. Howard-Peebles

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Columbia and Yorktown -	79-00-5	1,1,2-Trichloroethane	1.7E+00	1.7E+00	UG/L	YS01-GW22-0309	1/17	0.5 - 4.2	1.7E+00	N/A	5.0E+00 M	5.0E+00	MCL	NO	BSL
Eastover Aquifer	75-34-3	1,1-Dichloroethane	2.6E-01 J	6.0E-01	UG/L	YS01-GW25-0309	2/17	0.5 - 4.2	6.0E-01	N/A	1.0E+01 C	N/A		NO	BSL
Vapor Intrusion	75-35-4	1,1-Dichloroethene	8.6E+00	8.6E+00	UG/L	YS01-GW22P-0309	1/17	0.5 - 4.2	8.6E+00	N/A	2.8E+01 N	7.0E+00	MCL	NO	BSL
Into Indoor Air	**540-59-0**	**1,2-Dichloroethene (total)**	**2.0E-01 J**	**3.0E+03**	**UG/L**	**YS01-GW22-0309**	**6/17**	**0.5 - 710**	**3.0E+03**	**N/A**	**5.7E+01 N**	**N/A**		**YES**	**ASL**
	71-43-2	Benzene	2.4E-01 J	2.4E-01 J	UG/L	YS01-GW22-0309 : YS01-GW22P-0309	1/17	0.5 - 4.2	2.4E-01	N/A	5.0E+00 M	5.0E+00	MCL	NO	BSL
	75-15-0	Carbon disulfide	1.5E-01 J	1.4E+00	UG/L	YS01-GW05-0309	3/17	0.5 - 4.2	1.4E+00	N/A	1.8E+02 N	N/A		NO	BSL
	67-66-3	Chloroform	3.5E-01 J	7.4E-01	UG/L	YS01-GW24-0309	3/17	0.5 - 4.2	7.4E-01	N/A	8.0E+01 M	8.0E+01	MCL	NO	BSL
	74-87-3	Chloromethane	1.4E-01 J	1.4E-01 J	UG/L	YS01-GW24-0309	1/17	0.5 - 4.2	1.4E-01	N/A	3.4E+01 N	N/A		NO	BSL
	156-59-2	**cis-1,2-Dichloroethene**	**2.1E-01 J**	**3.0E+03**	**UG/L**	**YS01-GW22-0309**	**6/17**	**0.5 - 710**	**3.0E+03**	**N/A**	**7.0E+01 M**	**7.0E+01**	**MCL**	**YES**	**ASL**
	75-71-8	Dichlorodifluoromethane (Freon-12)	1.4E-01 J	1.4E-01 J	UG/L	YS01-GW12-0309	1/17	0.5 - 4.2	1.4E-01	N/A	1.2E+00 N	N/A		NO	BSL
	100-41-4	Ethylbenzene	1.3E-01 J	1.6E-01 J	UG/L	YS01-GW24-0309	2/17	0.5 - 4.2	1.6E-01	N/A	7.0E+02 M	7.0E+02	MCL	NO	BSL
	127-18-4	Tetrachloroethene	2.1E-01 J	2.1E-01 J	UG/L	YS01-GW22-0309 : YS01-GW22P-0309	1/17	0.5 - 4.2	2.1E-01	N/A	1.0E+01 N	5.0E+00	MCL	NO	BSL
	156-60-5	trans-1,2-Dichloroethene	1.5E-01 J	5.6E+00	UG/L	YS01-GW22-0309	2/17	0.5 - 4.2	5.6E+00	N/A	1.0E+02 M	1.0E+02	MCL	NO	BSL
	79-01-6	**Trichloroethene**	**5.4E-01**	**1.8E+04**	**UG/L**	**YS01-GW22-0309**	**7/17**	**0.5 - 710**	**1.8E+04**	**N/A**	**5.0E+00 M**	**5.0E+00**	**MCL**	**YES**	**ASL**
	75-01-4	**Vinyl chloride**	**4.8E-01 J**	**3.6E+00**	**UG/L**	**YS01-GW22-0309 : YS01-GW22P-0309**	**2/17**	**0.5 - 4.2**	**3.6E+00**	**N/A**	**2.0E+00 M**	**2.0E+00**	**MCL**	**YES**	**ASL**

[1] Minimum and maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values are the lowest maximum detected concentration from comparison of Columbia and Yorktown aquifer background dataset
[4] See Table 2.4 Supplement A
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

J = Estimated Value
C = Carcinogenic
N = Noncarcinogenic
UG/L = micrograms per liter
ND = not detected
N/A = not available, not applicable
M or MCL = Maximum Contaminant Level, Primary Drinking Water Standards

Table 2.4 Supplement A
Calculation of Target Groundwater Concentrations for Vapor Intrusion Screening
Site 1, NWS, Yorktown, Yorktown, Virginia

CAS Number	Constituent	Unit Risk Factor (URF) $(ug/m^3)^{-1}$	Reference Concentration (RfC) mg/m^3	Target Indoor Air Concentration[2], carcinogen (C_{Cancer}) ug/m^3	Target Indoor Air Concentration[2], non-carcinogen ($C_{non-Cancer}$) ug/m^3	Target Indoor Air Concentration ($C_{target,ia}$) ug/m^3	System Temperature Henry's Law Constant (H'TS)[3] Dimensionless	Risk-Based Target Groundwater Concentration (C_{gw}) ug/L	MCL ug/L	Final Target Groundwater Concentration[4] (C_{gw}) ug/L
79-00-5	1,1,2-Trichloroethane	1.6E-05	2.0E-04	1.5E-01	2.1E-02	2.1E-02	1.8E-02	1.2E+00	5.0E+00	5.0E+00
75-34-3	1,1-Dichloroethane	1.6E-06	N/A	1.5E+00	N/A	1.5E+00	1.5E-01	1.0E+01	N/A	1.0E+01
75-35-4	1,1-Dichloroethene	N/A	2.0E-01	NA	2.1E+01	2.1E+01	7.3E-01	2.8E+01	7.0E+00	2.8E+01
540-59-0	1,2-Dichloroethene (total)	N/A	6.0E-02	N/A	6.3E+00	6.3E+00	1.1E-01	5.7E+01	N/A	5.7E+01
71-43-2	Benzene	7.8E-06	3.0E-02	3.1E-01	3.1E+00	3.1E-01	1.3E-01	2.3E+00	5.0E+00	5.0E+00
75-15-0	Carbon disulfide	N/A	7.0E-01	NA	7.3E+01	7.3E+01	4.0E-01	1.8E+02	N/A	1.8E+02
67-66-3	Chloroform	2.3E-05	9.8E-02	1.1E-01	1.0E+01	1.1E-01	9.6E-02	1.1E+00	8.0E+01	8.0E+01
74-87-3	Chloromethane	N/A	9.0E-02	NA	9.4E+00	9.4E+00	2.8E-01	3.4E+01	N/A	3.4E+01
156-59-2	cis-1,2-Dichloroethene	N/A	N/A	NA	NA	NA	1.1E-01	N/A	7.0E+01	7.0E+01
75-71-8	Dichlorodifluoromethane (Freon-12)	N/A	1.0E-01	NA	1.0E+01	1.0E+01	8.1E+00	1.2E+00	N/A	1.2E+00
100-41-4	Ethylbenzene	2.5E-06	1.0E+00	9.7E-01	1.0E+02	9.7E-01	1.6E-01	5.9E+00	7.0E+02	7.0E+02
127-18-4	Tetrachloroethene	2.7E-06	4.0E-02	9.4E+00	4.2E+00	4.2E+00	4.1E-01	1.0E+01	5.0E+00	1.0E+01
156-60-5	trans-1,2-Dichloroethene	N/A	6.0E-02	N/A	6.3E+00	6.3E+00	1.1E-01	5.7E+01	1.0E+02	1.0E+02
79-01-6	Trichloroethene	4.1E-06	2.0E-03	4.3E-01	2.1E-01	2.1E-01	2.3E-01	9.1E-01	5.0E+00	5.0E+00
75-01-4	Vinyl chloride	4.4E-06	1.0E-01	1.6E-01	1.0E+01	1.6E-01	8.6E-01	1.9E-01	2.0E+00	2.0E+00

Notes:
[1] The vapor intrusion screening levels [i.e., target groundwater concentration from Table 2c, Subsurface Vapor Intrusion Guidance (EPA, 2002)] were updated using the methodology presented in Appendix D of Subsurface Vapor Intrusion Guidance (EPA, 2002).
[2] Values are Regional Screening Levels (RSL) for residential air (based on 10-6 for carcinogens and HQ of 0.1 for noncarcinogens). [Oak Ridge National Laboratory (ORNL), Nov. 2011].
[3] H'TS = Henry's Law Constant (dimensionless) at system (i.e., groundwater) temperature. Calculated using equation 3 from EPA, 2004.
Average groundwater temperature (13°C) based on data from March 2009 sampling event.
[4] If the calculated groundwater target concentration is less than the Maximum Contaminant Level (MCL) for the compound, the target concentration is set at the MCL (EPA, 2002).
RfC and RSL values for trans-1,2-Dichloroethene used as surrogate for 1,2-Dichloroethene (total).
MCL = maximum contaminant level (EPA, 2009).
N/A = Not available.

Variables	Units	Value
$C_{target,ia}$ = Target indoor air conc., minimum	ug/m^3	Solved by Eq. 1
C_{gw} = Target groundwater conc.	ug/L	Solved by Eq. 2
TCR = Target Cancer Risk	unitless	1.00E-06
THQ = Target Hazard Quotient	unitless	0.1
URF = Unit Risk Factor	$(ug/m^3)^{-1}$	Chemical-specific
RfC = Reference Concentration	mg/m^3	Chemical-specific
H = Dimensionless Henry's Law Constant	unitless	Chemical-specific
alpha (α) = Attenuation Factor	unitless	0.001

Equation 1: $C_{target,ia}$ = Minimum(C_{cancer}, $C_{non-cancer}$)
Equation 2: Cgw = $C_{target,ia} \times 10^{-3}\ m^3/L * 1/H'TS * 1/\alpha$

Table 3.1

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Columbia and Yorktown - Eastover Aquifer Tap Water	1,1,2-Trichloroethane	UG/L	N/A	N/A		1.7E+00		1.7E+00	UG/L	Max	7
	Chloroform	UG/L	N/A	N/A		7.4E-01		7.4E-01	UG/L	Max	7
	cis-1,2-Dichloroethene[a]	UG/L	6.0E+02	3.3E+03	NP	3.0E+03		3.0E+03	UG/L	Max	1, 3, 5
	Trichloroethene	UG/L	3.6E+03	4.1E+04	NP	1.8E+04		1.8E+04	UG/L	Max	1, 5
	Vinyl chloride	UG/L	1.1E+00	N/A		3.6E+00		3.6E+00	UG/L	Max	4, 8
	Aluminum, Dissolved	UG/L	7.9E+02	1.3E+03	NP	1.8E+03		1.3E+03	UG/L	95% KM-t	4
	Arsenic, Dissolved	UG/L	4.0E+00	5.4E+00	NP	5.7E+00	J	5.4E+00	UG/L	95% KM-t	1, 2
	Cadmium, Dissolved	UG/L	NA	NA		ND		NA		NA	6
	Chromium, Dissolved	UG/L	N/A	N/A		1.4E+00	J	1.4E+00	UG/L	Max	7
	Cobalt, Dissolved	UG/L	N/A	N/A		1.4E+01		1.4E+01	UG/L	Max	7
	Iron, Dissolved	UG/L	1.2E+03	2.3E+03	NP	3.4E+03		2.3E+03	UG/L	95% KM-t	1, 2
	Manganese, Dissolved	UG/L	5.1E+01	8.6E+01	N	1.3E+02		8.6E+01	UG/L	95% Stud-t	1, 2, 3
	Selenium, Dissolved	UG/L	N/A	N/A		6.7E+00	K	6.7E+00	UG/L	Max	7
	Zinc, Dissolved	UG/L	N/A	N/A		3.4E+01		3.4E+01	UG/L	Max	7

[a] Although both 1,2-DCE and cis-1,2-DCE identified as COPCs, assumes the majority of the 1,2-DCE is in the cis-1,2-DCE form based on the concentrations of cis- and trans-1,2-DCE.

Values were calculated using the results from the wells from the center of the plume. For VOCs these included YS01-GW04-0309, YS01-GW04A-0309, YS01-GW22-0309, YS01-GW022P-0309, YS01-GW23-0309, and YS01-GW24-0309. For metals these included YS01-GW04-0309, YS01-GW04A-0309, YS01-GW05-0309, YS01-GW05A-0309, YS01-GW21-0309, YS01-GW22-0309, and YS01-GW22P-0309.

ProUCL, Version 4.1.00 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. May 2010. Prepared by Lockheed Martin Environmental Services).

Options: Maximum Detected Value (Max); 95% Kaplan-Meier (t) UCL (95% KM-t); 95% Student's-T test UCL (95% Stud-t);

Table 3.1

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale

UCL Rationale:

(1) Shapiro-Wilk W Test/Lilliefors test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.
(3) Test indicates data are gamma distributed.
(4) Distribution tests are inconclusive
(5) Max value used because 95% UCL greater than max.
(6) Constituent was retained as COPC for all Site 1 wells, however was not detected in wells selected for evaluation in the HHRA.
(7) Maximum detected concentration used because constituent detected in only one sample.
(8) Maximum values used because not enough distinct values in dataset.

N = Normal
N/A = Not applicable/not availa
NP = Non-Parametric
ug/L = micrograms per liter
J = Estimated Value

Table 3.2
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 1
NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Columbia and Yorktown - Eastover Aquifer Water Vapors at Showerhead and Excavation Pit	1,1,2-Trichloroethane	UG/L	N/A	N/A		1.7E+00	1.7E+00	UG/L	Max	7
	Chloroform	UG/L	N/A	N/A		7.4E-01	7.4E-01	UG/L	Max	7
	cis-1,2-Dichloroethene[a]	UG/L	6.0E+02	3.3E+03	NP	3.0E+03	3.0E+03	UG/L	Max	1, 3, 5
	Trichloroethene	UG/L	3.6E+03	4.1E+04	NP	1.8E+04	1.8E+04	UG/L	Max	1, 5
	Vinyl chloride	UG/L	1.1E+00	N/A		3.6E+00	3.6E+00	UG/L	Max	4, 8

[a] Although both 1,2-DCE and cis-1,2-DCE identified as COPCs, assumes the majority of the 1,2-DCE is in the cis-1,2-DCE form based on the concentrations of cis- and trans-1,2-DCE.
Values were calculated using the results from the wells from the center of the plume. For VOCs these included YS01-GW04-0309, YS01-GW04A-0309, YS01-GW22-0309, YS01-GW022P-0309, YS01-GW23-0309, and YS01-GW24-0309. For metals these included YS01-GW04-0309, YS01-GW04A-0309, YS01-GW05-0309, YS01-GW05A-0309, YS01-GW21-0309, YS01-GW22-0309, and YS01-GW22P-0309.
ProUCL, Version 4.1.00 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. May 2010. Prepared by Lockheed Martin Environmental Services).
Options: Maximum Detected Value (M)

UCL Rationale:
(1) Shapiro-Wilk W Test/Lilliefors test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.
(3) Test indicates data are gamma distributed.
(4) Distribution tests are inconclusive
(5) Max value used because 95% UCL greater than max.
(6) Constituent was retained as COPC for all Site 1 wells, however was not detected in wells selected for evaluation in the HHRA.
(7) Maximum detected concentration used because constituent detected in only one sample.
(8) Maximum values used because not enough distinct values in dataset.

N = Normal
N/A = Not applicable/not available
NP = Non-Parametric
ug/L = micrograms per liter

Table 3.3

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Columbia and Yorktown - Eastover Aquifer Water in Excavation Pit	1,1,2-Trichloroethane	UG/L	N/A	N/A		1.7E+00		1.7E+00	UG/L	Max	7
	Chloroform	UG/L	N/A	N/A		7.4E-01		7.4E-01	UG/L	Max	7
	cis-1,2-Dichloroethene[a]	UG/L	6.0E+02	3.3E+03	NP	3.0E+03		3.0E+03	UG/L	Max	1, 3, 5
	Trichloroethene	UG/L	3.6E+03	4.1E+04	NP	1.8E+04		1.8E+04	UG/L	Max	1, 5
	Vinyl chloride	UG/L	1.1E+00	N/A		3.6E+00		3.6E+00	UG/L	Max	4, 8
	Aluminum	UG/L	2.3E+03	3.9E+03	N	5.0E+03		3.9E+03	UG/L	95% Stud-t	1, 2, 3
	Antimony	UG/L	7.5E+00	8.5E+00	NP	9.3E+00	J	8.5E+00	UG/L	95% KM-t	1, 2
	Arsenic	UG/L	6.8E+00	1.1E+01	NP	1.5E+01		1.1E+01	UG/L	95% KM-t	4
	Cadmium	UG/L	N/A	N/A		2.9E+00	J	2.9E+00	UG/L	Max	7
	Chromium	UG/L	1.3E+01	2.5E+01	N	3.5E+01		2.5E+01	UG/L	95% Stud-t	1, 2, 3
	Cobalt	UG/L	6.4E+00	8.8E+00	NP	1.1E+01		8.8E+00	UG/L	95% KM-t	4
	Iron	UG/L	4.6E+03	8.7E+03	N	1.4E+04		8.7E+03	UG/L	95% Stud-t	1, 2, 3
	Manganese	UG/L	1.7E+02	6.4E+02	NP	7.1E+02		6.4E+02	UG/L	95% Cheb-m	1
	Vanadium	UG/L	9.3E+00	2.0E+01	NP	3.4E+01		2.0E+01	UG/L	95% KM-t	1, 2, 3
	Zinc	UG/L	2.0E+01	3.0E+01	NP	3.5E+01		3.0E+01	UG/L	95% KM-t	1, 2, 3

[a] Although both 1,2-DCE and cis-1,2-DCE identified as COPCs, assumes the majority of the 1,2-DCE is in the cis-1,2-DCE form based on the concentrations of cis- and trans-1,2-DCE.

Values were calculated using the results from the wells from the center of the plume. For VOCs these included YS01-GW04-0309, YS01-GW04A-0309, YS01-GW22-0309, YS01-GW022P-0309, YS01-GW23-0309, and YS01-GW24-0309. For metals these included YS01-GW04-0309, YS01-GW04A-0309, YS01-GW05-0309, YS01-GW05A-0309, YS01-GW21-0309, YS01-GW22-0309, and YS01-GW22P-0309.

ProUCL, Version 4.1.00 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. May 2010. Prepared by Lockheed Martin Environmental Services).

Options: Maximum Detected Value (M); 95% Kaplan-Meier (t) UCL (95% KM-t); 95% Chebyshev (mean, std) UCL (95% Cheb-m); 95% Student's-T test UCL (95% Stud-t)

Table 3.3

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale

UCL Rationale:

(1) Shapiro-Wilk W Test/Lilliefors test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.
(3) Test indicates data are gamma distributed.
(4) Distribution tests are inconclusive
(5) Max value used because 95% UCL greater than max.
(6) Constituent was retained as COPC for all Site 1 wells, however was not detected in wells selected for evaluation in the HHRA.
(7) Maximum detected concentration used because constituent detected in only one sample.
(8) Maximum values used because not enough distinct values in dataset.

N = Normal
N/A = Not applicable/not available
NP = Non-Parametric
ug/L = micrograms per liter
J = Estimated Value

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Columbia and Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Water	2	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Child	Columbia and Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Columbia and Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				IR-W-A	Ingestion Rate of Water, Adult	2	liters/day	EPA, 1997	CW x IR-W-Adj x EF x CF2 x 1/AT
				IR-W-C	Ingestion Rate of Water, Child	1	liters/day	EPA, 1997	
				IR-W-Adj	Ingestion Rate of Water, Age-adjusted	1.09	liter-year/kg-day	calculated	IR-W-Adj (liter-year/kd-day) =
				EF	Exposure Frequency	350	days/year	EPA, 1991	(ED-C x IR-W-C / BW-C) +
				ED-A	Exposure Duration, Adult	24	years	EPA, 1991	(ED-A x IR-W-A / BW-A)
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Industrial Worker	Adult	Columbia and Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1991	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	250	days/year	EPA, 1991	
				ED	Exposure Duration	25	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	
Dermal	Resident	Adult	Columbia and Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	0.58	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	18,000	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	350	days/year	EPA, 2004	
				ED	Exposure Duration	24	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Child	Columbia and Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	1	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	6,600	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	350	days/year	EPA, 2004	
				ED	Exposure Duration	6	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	
		Child/Adult	Columbia and Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) = DA-Adj x EF x 1/AT
				DAevent-A	Dermally Absorbed Dose per Event, Adult	calculated	mg/cm^2-event	calculated	
				DAevent-C	Dermally Absorbed Dose per Event, Child	calculated	mg/cm^2-event	calculated	DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
				DA-Adj	Dermally Absorbed Dose, Age-adjusted	calculated	mg-year/event-kg	calculated	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}-A	Event Time, Adult	0.58	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				t_{event}-C	Event Time, Child	1.0	hr/event	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				SA-A	Skin Surface Area, Adult	18,000	cm^2	EPA, 2004	x CF2 x CF3
				SA-C	Skin Surface Area, Child	6,600	cm^2	EPA, 2004	
				EV	Event Frequency	1	events/day	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				EF	Exposure Frequency	350	days/year	EPA, 2004	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				ED-A	Exposure Duration, Adult	24	years	EPA, 2004	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				ED-C	Exposure Duration, Child	6	years	EPA, 2004	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Construction Worker	Adult	Columbia and Yorktown-Eastover Aquifer -	CW	Chemical Concentration in Water	See Table 3.3	µg/l	See Table 3.3	CDI (mg/kg-day) =
			Water in Excavation Pit	DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	8	hr/day	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2004, (3)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	125	days/year	(2)	
				ED	Exposure Duration	1	years	EPA, 1991	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

(1) Professional judgment based on construction activities that would occur 8 hrs per day for the RME.

(2) Assumed contact with groundwater during construction project would be 125 days/year.

(3) Skin surface area in contact with groundwater assumed to be hands, forearms, lower legs, and feet.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE 4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	Columbia and Yorktown-Eastover Aquifer - Water Vapors at Showerhead	CW	Chemical Concentration in Water	See Table 3.2	µg/l	See Table 3.2	Chronic Daily Intake (CDI) (mg/m3) =
				CAa	Chemical Concentration in Air	Calculated	mg/m^3	Calculated	CAa x ETa x EDa x EF x CF1 x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				EDa	Exposure Duration	24	years	EPA, 1991	Use Foster & Chrostowski Shower model to
				ETa	Exposure Time	0.58	hr/day	EPA, 2004	calculate Ca-a and Ca-c
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Child	Columbia and Yorktown-Eastover Aquifer - Water Vapors at Showerhead	CW	Chemical Concentration in Water	See Table 3.2	µg/l	See Table 3.2	Chronic Daily Intake (CDI) (mg/m3) =
				CAc	Chemical Concentration in Air	Calculated	mg/m^3	Calculated	CA_c x ET_c x ED_c x EF x CF1 x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				EDc	Exposure Duration	6	years	EPA, 1991	Use Foster & Chrostowski Shower model to
				ETc	Exposure Time	1	hr/day	EPA, 2004	calculate Ca-a and Ca-c
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Columbia and Yorktown-Eastover Aquifer - Water Vapors at Showerhead	CW	Chemical Concentration in Water	See Table 3.2	µg/l	See Table 3.2	Chronic Daily Intake (CDI) (mg/m3) =
				Ca-a	Air Concentration for shower, Adult	Calculated	mg/m^3	Calculated	(CAc x ETc x EDc + CAa x ETa x EDa) x EF x CF1 x 1/AT
				Ca-c	Air Concentration for shower, child	Calculated	mg/m^3	Calculated	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				EDa	Exposure Duration, Adult	24	years	EPA, 1991	Use Foster & Chrostowski Shower model to
				EDc	Exposure Duration, Child	6	years	EPA, 1991	calculate Ca-a and Ca-c
				ETa	Exposure Time	0.58	hr/day	EPA, 2004	
				ETc	Exposure Time	1	hr/day	EPA, 2004	
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Industrial Worker	Adult	Columbia and Yorktown-Eastover Aquifer - Vapor Intrusion to Indoor Air	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	Chronic Daily Intake (CDI) (mg/m3) =
				CA	Chemical Concentration in Air	See Table 3.2	mg/m^3	See Table 3.2	CA x ET x EF x ED x CF1 x 1/AT
				ET	Exposure Time	8	hr/day	(3)	
				EF	Exposure Frequency	250	days/year	EPA, 1991	CA calculated using Johnson and Ettinger model
				ED	Exposure Duration	25	years	EPA, 1991	
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	
	Construction Worker	Adult	Columbia and Yorktown-Eastover Aquifer - Water Vapors at Excavation Pit	CW	Chemical Concentration in Water	See Table 3.3	µg/l	See Table 3.3	Chronic Daily Intake (CDI) (mg/m3) =
				CA	Chemical Concentration in Air	calculated	mg/m^3		CA x ET x EF x ED x CF1 x 1/AT
				ET	Exposure Time	8	hr/day	(1)	
				EF	Exposure Frequency	125	days/year	(2)	
				ED	Exposure Duration	1	years	EPA, 1991	CA calculated using Virginia Voluntary Remediation
				CF1	Conversion Factor 1	1/24	day/hour	- -	Program Method
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

Notes:

(1) Professional judgment based on construction activities that would occur 8 hrs per day for the RME.

(2) Assumed contact with groundwater during construction project would be 125 days/year.

(3) Assumed that worker would be present 8 hrs per day.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE 4.1.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURE
Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Columbia and Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1.4	liters/day	EPA, 1993	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 1993	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Child	Columbia and Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Columbia and Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				IR-W-A	Ingestion Rate of Water, Adult	1.4	liters/day	EPA, 1993	CW x IR-W-Adj x EF x CF2 x 1/AT
				IR-W-C	Ingestion Rate of Water, Child	1	liters/day	EPA, 1997	
				IR-W-Adj	Ingestion Rate of Water, Age-adjusted	0.58	liter-year/kg-day	calculated	IR-W-Adj (liter-year/kd-day) =
				EF	Exposure Frequency	234	days/year	EPA, 1993	(ED-C x IR-W-C / BW-C) +
				ED-A	Exposure Duration, Adult	9	years	EPA, 1993	(ED-A x IR-W-A / BW-A)
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.1.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Industrial Worker	Adult	Columbia and Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1991	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	219	days/year	EPA, 2004	
				ED	Exposure Duration	9	years	EPA, 2004	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
Dermal	Resident	Adult	Columbia and Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	Calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	Chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	Chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	Chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	0.25	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	18,000	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

TABLE 4.1.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Child	Columbia and Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	Calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	Chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	Chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	Chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	0.33	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	6,600	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 2001	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	
		Child/Adult	Columbia and Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) = DA-Adj x EF x 1/AT
				DAevent-A	Dermally Absorbed Dose per Event, Adult	Calculated	mg/cm^2-event	calculated	
				DAevent-C	Dermally Absorbed Dose per Event, Child	Calculated	mg/cm^2-event	calculated	DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
				DA-Adj	Dermally Absorbed Dose, Age-adjusted	Calculated	mg-year/event-kg	calculated	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
				FA	Fraction absorbed water	Chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	Chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	Chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}-A	Event Time, Adult	0.25	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				t_{event}-C	Event Time, Child	0.33	hr/event	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				SA-A	Skin Surface Area, Adult	18,000	cm^2	EPA, 2004	x CF2 x CF3
				SA-C	Skin Surface Area, Child	6,600	cm^2	EPA, 2004	
				EV	Event Frequency	1	events/day	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				EF	Exposure Frequency	234	days/year	EPA, 1993	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				ED-A	Exposure Duration, Adult	9	years	EPA, 2001	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				ED-C	Exposure Duration, Child	6	years	EPA, 2001	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

TABLE 4.1.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Construction Worker	Adult	Columbia and Yorktown-Eastover Aquifer -	CW	Chemical Concentration in Water	See Table 3.3	µg/l	See Table 3.3	CDI (mg/kg-day) =
			Water in Excavation Pit	DAevent	Dermally Absorbed Dose per Event	Calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	Chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	Chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	Chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	4	hr/day	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2004, (3)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	125	days/year	(2)	
				ED	Exposure Duration	1	years	EPA, 1991	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

(1) Professional judgment assuming 1/2 RME value for CT.

(2) Assumed duration of construction project may be 1/2 a year.

(3) Skin surface area in contact with groundwater assumed to be hands, forearms, lower legs, and feet.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE 4.2.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	Columbia and Yorktown-Eastover Aquifer - Water Vapors at Showerhead	CW	Chemical Concentration in Water	See Table 3.2	µg/l	See Table 3.2	Chronic Daily Intake (CDI) (mg/m3) =
				CAa	Chemical Concentration in Air	Calculated	mg/m^3	Calculated	CAa x ETa x EDa x EF x CF1 x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				EDa	Exposure Duration	9	years	EPA, 1993	Use Foster & Chrostowski Shower model to
				ETa	Exposure Time	0.25	hr/day	EPA, 2004	calculate Ca-a and Ca-c
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Child	Columbia and Yorktown-Eastover Aquifer - Water Vapors at Showerhead	CW	Chemical Concentration in Water	See Table 3.2	µg/l	See Table 3.2	Chronic Daily Intake (CDI) (mg/m3) =
				CAc	Chemical Concentration in Air	Calculated	mg/m^3	Calculated	CA_c x ET_c x ED_c x EF x CF1 x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				EDc	Exposure Duration	6	years	EPA, 1991	Use Foster & Chrostowski Shower model to
				ETc	Exposure Time	0.33	hr/day	EPA, 2004	calculate Ca-a and Ca-c
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Columbia and Yorktown-Eastover Aquifer - Water Vapors at Showerhead	CW	Chemical Concentration in Water	See Table 3.2	µg/l	See Table 3.2	Chronic Daily Intake (CDI) (mg/m3) =
				Ca-a	Air Concentration for shower, Adult	Calculated	mg/m^3	Calculated	(CAc x ETc x EDc + CAa x ETa x EDa)
				Ca-c	Air Concentration for shower, child	Calculated	mg/m^3	Calculated	x EF x CF1 x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				EDa	Exposure Duration, Adult	9	years	EPA, 1993	Use Foster & Chrostowski Shower model to
				EDc	Exposure Duration, Child	6	years	EPA, 1991	calculate Ca-a and Ca-c
				ETa	Exposure Time	0.25	hr/day	EPA, 2004	
				ETc	Exposure Time	0.33	hr/day	EPA, 2004	
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.2.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Construction Worker	Adult	Columbia and Yorktown-Eastover Aquifer - Water Vapors at Excavation Pit						
				CW	Chemical Concentration in Water	See Table 3.3	µg/l	See Table 3.3	Chronic Daily Intake (CDI) (mg/m3) =
				CA	Chemical Concentration in Air	calculated	mg/m^3		CA x ET x EF x ED x CF1 x 1/AT
				ET	Exposure Time	4	hr/day	(1)	
				EF	Exposure Frequency	125	days/year	(2)	
				ED	Exposure Duration	1	years	EPA, 1991	CA calculated using Virginia Voluntary Remediation
				CF1	Conversion Factor 1	1/24	day/hour	- -	Program Method
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

Notes:

(1) Professional judgment assuming 1/2 RME value for CT.

(2) Assumed contact with groundwater during construction project would be 125 days/year.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Site 1

NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
1,1,2-Trichloroethane	Chronic	4.0E-03	mg/kg-day	Generally > 50%	4.0E-03	mg/kg-day	Blood	1000/1	IRIS	4/24/2012
	Subchronic	4.0E-03	mg/kg/day	Generally > 50%	4.0E-03	mg/kg/day	Blood	1000	PPRTV	4/1/2011
Chloroform	Chronic	1.0E-02	mg/kg-day	Generally > 50%	1.0E-02	mg/kg-day	Liver	100/1	IRIS	4/24/2012
	Subchronic	2.0E-02	mg/kg/day	Generally > 50%	2.0E-02	mg/kg/day	Kidney	300	HEAST	7/1/1997
cis-1,2-Dichloroethene	Chronic	2.0E-03	mg/kg/day	Generally > 50%	2.0E-03	mg/kg/day	Kidney	3000/1	IRIS	4/24/2012
	Subchronic	2.0E-02	mg/kg/day	Generally > 50%	2.0E-02	mg/kg/day	Kidney	300	PPRTV	2/3/2011
Trichloroethene	Chronic	5.0E-04	mg/kg-day	Generally > 50%	5.0E-04	mg/kg-day	Heart, Immunotoxicity	10-1000	IRIS	4/24/2012
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vinyl chloride	Chronic	3.0E-03	mg/kg-day	Generally > 50%	3.0E-03	mg/kg-day	Liver	30/1	IRIS	4/24/2012
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aluminum	Chronic	1.0E+00	mg/kg-day	NA	1.0E+00	mg/kg-day	Neurological, Developmental	100	PPRTV	10/23/2006
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	Chronic	4.0E-04	mg/kg-day	15%	6.0E-05	mg/kg-day	Longevity, Blood	1000/1	IRIS	4/24/2012
	Subchronic	4.0E-04	mg/kg-day	15%	6.0E-05	mg/kg-day	Whole Body, Blood	1000	PPRTV	7/29/2008
Arsenic	Chronic	3.0E-04	mg/kg-day	95%	3.0E-04	mg/kg-day	Skin, Vascular	3/1	IRIS	4/24/2012
	Subchronic	3.0E-04	mg/kg-day	95%	3.0E-04	mg/kg-day	Skin, Vascular	3	HEAST	7/1/1997
Cadmium (water)	Chronic	5.0E-04	mg/kg-day	5%	2.5E-05	mg/kg-day	Blood	10/1	IRIS	4/24/2012
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium (hexavalent)	Chronic	3.0E-03	mg/kg-day	2.5%	7.5E-05	mg/kg-day	Not identified	300/3	IRIS	4/24/2012
	Subchronic	2.0E-02	mg/kg-day	2.5%	5.0E-04	mg/kg-day	Not identified	100	HEAST	7/1/1997
Cobalt	Chronic	3.0E-04	mg/kg-day	N/A	3.0E-04	mg/kg/day	Thyroid	1000	PPRTV	8/25/2008
	Subchronic	3.0E-03	mg/kg-day	N/A	3.0E-03	mg/kg/day	Thyroid	300	PPRTV	8/25/2008
Iron	Chronic	7.0E-01	mg/kg-day	NA	7.0E-01	mg/kg-day	Gastrointestinal	1.5	PPRTV	9/11/2006
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	Chronic	2.4E-02	mg/kg-day	4%	9.6E-04	mg/kg-day	CNS	1/1	IRIS	4/24/2012
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	Chronic	5.0E-03	mg/kg-day	30 - 80%	5.0E-03	mg/kg-day	Whole Body	3/1	IRIS	5/1/2012
	Subchronic	5.0E-03	mg/kg-day	30 - 80%	5.0E-03	mg/kg-day	Whole Body	3	HEAST	7/1/1997
Vanadium	Chronic	5.0E-03	mg/kg-day	2.6%	1.3E-04	mg/kg-day	Hair, Blood	100	RSL	11/2011
	Subchronic	7.0E-03	mg/kg-day	2.6%	1.8E-04	mg/kg-day	Lifetime	100	HEAST	7/1/1997
Zinc	Chronic	3.0E-01	mg/kg-day	Variable	3.0E-01	mg/kg-day	Blood	3/1	IRIS	5/1/2012
	Subchronic	3.0E-01	mg/kg-day	Variable	3.0E-01	mg/kg-day	Blood	3	HEAST	7/1/1997

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evalution Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Final. Section 4.2 and Exhibit 4-1. USEPA recommends that the oral RfD should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 50%. Constituents that do not have oral absorption efficiencies reported on this table were assumed to have an oral absorption efficiency of 100%.

(2) Adjusted Dermal RfD = RfD (oral) x Absorption Efficiency or ABS_{GI}

(3) For IRIS values, the date IRIS was searched.
For HEAST values, the date of HEAST.
For PPRTV values, the date of the PPRTV document.
For RSL values, the date of the RSL Table.

Definitions:
HEAST= Health Effects Assessment Summary Tables
IRIS = Integrated Risk Information System
RSL = Region Screening Level Table
PPRTV = Provisional Peer-Reviewed Toxicity Values
CNS = Central Nervous System
N/A = Not Applicable or Not Available

TABLE 5.2
NON-CANCER TOXICITY DATA -- INHALATION
Site 1
NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ	Dates (MM/DD/YY)
1,1,2-Trichloroethane	Chronic	2.0E-04	mg/m^3	Nasal	3000	PPRTV	4/1/2011
	Subchronic	2.0E-03	mg/m^3	Nasal	300	PPRTV	4/1/2011
Chloroform	Chronic	9.8E-02	mg/m^3	Liver	N/A	ASTDR	9/97
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
cis-1,2-Dichloroethene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Trichloroethene	Chronic	2.0E-03	mg/m^3	Heart, Immunotoxicity	10-1000	IRIS	4/24/2012
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Vinyl chloride	Chronic	1.0E-01	mg/m^3	Liver	30/1	IRIS	4/24/2012
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Aluminum	Chronic	5.0E-03	mg/m^3	Neurological	300	PPRTV	10/23/2006
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	Chronic	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	Chronic	1.5E-05	mg/m^3	Developmental, Cardiovascular, Nervous System	3/1	Cal EPA	4/24/2012
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Cadmium	Chronic	2.0E-05	mg/m^3	Kidney	N/A	Cal EPA	4/24/2012
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Chromium (hexavalent)	Chronic	1.0E-04	mg/m^3	Respiratory System	300/1	IRIS	4/24/2012
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	Chronic	6.0E-06	mg/m^3	Respiratory System	100	PPRTV	8/25/2008
	Subchronic	2.0E-05	mg/m^3	Respiratory System	100	PPRTV	8/25/2008
Iron	Chronic	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	Chronic	5.0E-05	mg/m^3	CNS	1000/1	IRIS	4/24/2012
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	Chronic	2.0E-02	mg/m^3	Respiratory System	30/1	Cal EPA	5/1/2012
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	Chronic	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	Chronic	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A

Cal EPA = California EPA

IRIS = Integrated Risk Information System

N/A = Not Applicable or Not Available.

ATSDR = Agency for Toxic Substances and Disease Registry

CNS = Central Nervous System

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

Site 1

NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	EPA Carcinogen Group	Source	Date (MM/DD/YY)
1,1,2-Trichloroethane	5.7E-02	Generally > 50%	5.7E-02	$(mg/kg\text{-}day)^{-1}$	C	IRIS	4/24/2012
Chloroform	3.1E-02	Generally > 50%	3.1E-02	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA	4/24/2012
cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Trichloroethene (3)	4.6E-02	Generally > 50%	4.6E-02	$(mg/kg\text{-}day)^{-1}$	2A	IRIS	4/24/2012
Vinyl Chloride (3)	7.2E-01	Generally > 50%	7.2E-01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	4/24/2012
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	1.5E+00	95%	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	4/24/2012
Cadmium	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium (3)	5.0E-01	2.5%	1.3E-02	N/A	D	New Jersey	4/24/2012
Cobalt	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. Section 4.2 and Exhibit 4-1. USEPA recommends that the oral slope factor should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 50%. Constituents that do not have oral absorption efficiencies reported on this table were assumed to have an oral absorption efficiency of 100%.

(2) Adjusted based on RAGS Part E.

(3) This chemical operates with a mutagenic mode of action.
Chemical-specific data are not available; therefore, default age-dependant adjustment factors (ADAF) will be applied to the slope factor as follows:

AGE	AGE ADAF
0-<2	10
2-<16	3
16-<30	1

Definitions:

N/A = Not Available

IRIS = Integrated Risk Information System

NCEA = National Center for Environmental Assessment

PPRTV = Provisional Peer-Reviewed Toxicity Value

Weight of Evidence definitions:

Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans and cancer.

Group B1 chemicals (probable human carcinogens) are agents for which there is limited evidence of possible carcinogenicity in humans.

Group B2 chemicals (probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate or a lack of evidence in humans.

Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.

Group D chemicals (not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.

Group E chemicals (evidence of noncarcinogenicity in humans) are agents for which there is no evidence of carcinogenicity from human or animal studies, or both.

2A - Probably carcinogenic to humans

2B - Possibly carcinogenic to humans

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

Site 1

NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Unit Risk	Units	Weight of Evidence/ Cancer Guidance Description	Source	Date (MM/DD/YY)
1,1,2-Trichloroethane	1.6E-05	$(ug/m3)^{-1}$	C	IRIS	4/24/2012
Chloroform	2.3E-05	$(ug/m3)^{-1}$	B2	IRIS	4/24/2012
cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	N/A
Trichloroethene (1)	4.1E-06	$(ug/m3)^{-1}$	A	IRIS	4/24/2012
Vinyl chloride (1)	4.4E-06	$(ug/m3)^{-1}$	A	IRIS	4/24/2012
Aluminum	N/A	N/A	N/A	N/A	N/A
Antimony	N/A	N/A	N/A	N/A	N/A
Arsenic	4.3E-03	$(ug/m3)^{-1}$	A	IRIS	4/24/2012
Cadmium	1.8E-03	$(ug/m3)^{-1}$	B1	IRIS	4/24/2012
Chromium (1)	8.4E-02	$(ug/m3)^{-1}$	A	IRIS	4/24/2012
Cobalt	9.0E-03	$(ug/m3)^{-1}$	B1	PPRTV	8/25/2008
Iron	N/A	N/A	N/A	N/A	N/A
Manganese	N/A	N/A	N/A	N/A	N/A
Selenium	N/A	N/A	N/A	N/A	N/A
Vanadium	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A

Definitions:

N/A = Not Available

IRIS = Integrated Risk Information System

CalEPA = California EPA

(1) This chemical operates with a mutagenic mode of action.

Chemical-specific data are not available; therefore, default age-dependant adjustment factors (ADAF) will be applied to the slope factor as follows:

AGE	AGE ADAF
0-<2	10
2-<16	3
16-<30	1

Weight of Evidence definitions:

Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans and cancer.

Group B1 chemicals (probable human carcinogens) are agents for which there is limited evidence of possible carcinogenicity in humans.

Group B2 chemicals (probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate or a lack of evidence in humans.

Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.

Group D chemicals (not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.

Group E chemicals (evidence of noncarcinogenicity in humans) are agents for which there is no evidence of carcinogenicity fron

2A - Probably carcinogenic to humans

2B - Possibly carcinogenic to humans

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
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	
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	Ingestion	1,1,2-Trichloroethane	1.7E+00	µg/L	N/A		N/A		N/A	4.7E-05	mg/kg/day	4.0E-03	mg/kg/day	1.2E-02
				Chloroform	7.4E-01	µg/L	N/A		N/A		N/A	2.0E-05	mg/kg/day	1.0E-02	mg/kg/day	2.0E-03
				cis-1,2-Dichloroethene	3.0E+03	µg/L	N/A		N/A		N/A	8.2E-02	mg/kg/day	2.0E-03	mg/kg/day	4.1E+01
				Trichloroethene	1.8E+04	µg/L	N/A		N/A		N/A	4.9E-01	mg/kg/day	5.0E-04	mg/kg/day	9.9E+02
				Vinyl chloride	3.6E+00	µg/L	N/A		N/A		N/A	9.9E-05	mg/kg/day	3.0E-03	mg/kg/day	3.3E-02
				Aluminum, Dissolved	1.3E+03	µg/L	N/A		N/A		N/A	3.6E-02	mg/kg/day	1.0E+00	mg/kg/day	3.6E-02
				Arsenic, Dissolved	5.4E+00	µg/L	N/A		N/A		N/A	1.5E-04	mg/kg/day	3.0E-04	mg/kg/day	4.9E-01
				Chromium, Dissolved	1.4E+00	µg/L	N/A		N/A		N/A	3.8E-05	mg/kg/day	3.0E-03	mg/kg/day	1.3E-02
				Cobalt, Dissolved	1.4E+01	µg/L	N/A		N/A		N/A	3.8E-04	mg/kg/day	3.0E-04	mg/kg/day	1.3E+00
				Iron, Dissolved	2.3E+03	µg/L	N/A		N/A		N/A	6.2E-02	mg/kg/day	7.0E-01	mg/kg/day	8.9E-02
				Manganese, Dissolved	8.6E+01	µg/L	N/A		N/A		N/A	2.4E-03	mg/kg/day	2.4E-02	mg/kg/day	9.8E-02
				Selenium, Dissolved	6.7E+00	µg/L	N/A		N/A		N/A	1.8E-04	mg/kg/day	5.0E-03	mg/kg/day	3.7E-02
				Zinc, Dissolved	3.4E+01	µg/L	N/A		N/A		N/A	9.3E-04	mg/kg/day	3.0E-01	mg/kg/day	3.1E-03
			Exp. Route Total								0.0E+00					1.0E+03
			Dermal	1,1,2-Trichloroethane	1.7E+00	µg/L	N/A		N/A		N/A	4.4E-06	mg/kg/day	4.0E-03	mg/kg/day	1.1E-03
				Chloroform	7.4E-01	µg/L	N/A		N/A		N/A	1.8E-06	mg/kg/day	1.0E-02	mg/kg/day	1.8E-04
				cis-1,2-Dichloroethene	3.0E+03	µg/L	N/A		N/A		N/A	7.3E-03	mg/kg/day	2.0E-03	mg/kg/day	3.7E+00
				Trichloroethene	1.8E+04	µg/L	N/A		N/A		N/A	8.3E-02	mg/kg/day	5.0E-04	mg/kg/day	1.7E+02
				Vinyl chloride	3.6E+00	µg/L	N/A		N/A		N/A	5.2E-06	mg/kg/day	3.0E-03	mg/kg/day	1.7E-03
				Aluminum, Dissolved	1.3E+03	µg/L	N/A		N/A		N/A	1.9E-04	mg/kg/day	1.0E+00	mg/kg/day	1.9E-04
				Arsenic, Dissolved	5.4E+00	µg/L	N/A		N/A		N/A	7.7E-07	mg/kg/day	3.0E-04	mg/kg/day	2.6E-03
				Chromium, Dissolved	1.4E+00	µg/L	N/A		N/A		N/A	4.0E-07	mg/kg/day	7.5E-05	mg/kg/day	5.3E-03
				Cobalt, Dissolved	1.4E+01	µg/L	N/A		N/A		N/A	7.8E-07	mg/kg/day	3.0E-04	mg/kg/day	2.6E-03
				Iron, Dissolved	2.3E+03	µg/L	N/A		N/A		N/A	3.2E-04	mg/kg/day	7.0E-01	mg/kg/day	4.6E-04
				Manganese, Dissolved	8.6E+01	µg/L	N/A		N/A		N/A	1.2E-05	mg/kg/day	9.6E-04	mg/kg/day	1.3E-02
				Selenium, Dissolved	6.7E+00	µg/L	N/A		N/A		N/A	9.6E-07	mg/kg/day	5.0E-03	mg/kg/day	1.9E-04
				Zinc, Dissolved	3.4E+01	µg/L	N/A		N/A		N/A	2.9E-06	mg/kg/day	3.0E-01	mg/kg/day	9.7E-06
			Exp. Route Total								0.0E+00					1.7E+02
		Exposure Point Total									0.0E+00					1.2E+03
	Exposure Medium Total										0.0E+00					1.2E+03
	Air	Columbia and Yorktown -Eastover Aquifer Water Vapors at Showerhead	Inhalation	1,1,2-Trichloroethane	1.7E+00	µg/L	N/A		N/A		N/A	6.4E-05	mg/m^3	2.0E-04	mg/m^3	3.2E-01
				Chloroform	7.4E-01	µg/L	N/A		N/A		N/A	3.5E-05	mg/m^3	9.8E-02	mg/m^3	3.6E-04
				cis-1,2-Dichloroethene	3.0E+03	µg/L	N/A		N/A		N/A	1.6E-01	mg/m^3	N/A		N/A
				Trichloroethene	1.8E+04	µg/L	N/A		N/A		N/A	8.6E-01	mg/m^3	2.0E-03	mg/m^3	4.3E+02
				Vinyl chloride	3.6E+00	µg/L	N/A		N/A		N/A	2.5E-04	mg/m^3	1.0E-01	mg/m^3	2.5E-03
			Exp. Route Total								0.0E+00					4.3E+02
		Exposure Point Total									0.0E+00					4.3E+02
	Exposure Medium Total										0.0E+00					4.3E+02
Groundwater Total											0.0E+00					1.6E+03

N/A - Not available.

DA_{event} for dermal exposure to groundwater calculated on Table 7.1.RME Supplement A

Inhalation exposure while showering calculated on Table 7.1.RME Supplement B

Table 7.1.RME Supplement A
Calculation of DA_{event}
Residential Adult Groundwater
Site 1, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient (K_p) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (t_{event}) (hr)	DA_{event} (mg/cm^2-event)	Eq
1,1,2-Trichloroethane	1.7E+00	6.4E-03	2.9E-02	6.0E-01	1.4E+00	1.0E+00	0.58	1.8E-08	2
Chloroform	7.4E-01	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	0.58	7.5E-09	2
cis-1,2-Dichloroethene[1]	3.0E+03	7.7E-03	2.9E-02	3.7E-01	8.9E-01	1.0E+00	0.58	3.0E-05	2
Trichloroethene	1.8E+04	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	0.58	3.4E-04	2
Vinyl chloride	3.6E+00	5.6E-03	1.7E-02	2.4E-01	5.7E-01	1.0E+00	0.58	2.1E-08	3
Aluminum, Dissolved	1.3E+03	1.0E-03	NA	NA	NA	NA	0.58	7.7E-07	1
Arsenic, Dissolved	5.4E+00	1.0E-03	NA	NA	NA	NA	0.58	3.1E-09	1
Chromium, Dissolved	1.4E+00	2.0E-03	NA	NA	NA	NA	0.58	1.6E-09	1
Cobalt, Dissolved	1.4E+01	4.0E-04	NA	NA	NA	NA	0.58	3.2E-09	1
Iron, Dissolved	2.3E+03	1.0E-03	NA	NA	NA	NA	0.58	1.3E-06	1
Manganese, Dissolved	8.6E+01	1.0E-03	NA	NA	NA	NA	0.58	5.0E-08	1
Selenium, Dissolved	6.7E+00	1.0E-03	NA	NA	NA	NA	0.58	3.9E-09	1
Zinc, Dissolved	3.4E+01	6.0E-04	NA	NA	NA	NA	0.58	1.2E-08	1

[1] trans-1,2-Dichloroethane used as a surrogate.

Inorganics: DA_{event} (mg/cm^2-event) =

K_p x CW x t_{event} x 0.001 mg/µg x 0.001 l/cm^3 (eq 1)

Organics: DA_{event} (mg/cm^2-event) =

If t_{event}<t*, then DA_{event} =

2 x FA x K_p x CW x (sqrt((6 x τ_{event} x t_{event})/π)) x 0.001 mg/µg x 0.001 l/cm^3 (eq 2)

If t_{event}>t*, then DA_{event} =

FA x K_p x CW x (t_{event}/(1+B) + 2 x τ_{event} x ((1 + 3xB + 3xB^2)/$(1+B)^2$) x 0.001 mg/µg x 0.001 l/cm^3 (eq 3)

Notes:

NA - Not applicable

Permeability constants and other input parameter values from EPA 2004,*Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document

B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).

t* - Time to reach steady-state

Table 7.1.RME Supplement B

Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model

Adult Resident

Site 1, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Exposure Point Concentration Cwo (µg/L)	Molecular weight (MW) (g/mole)	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl (VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/L)	S (µg/m^3 -min)	Ca (mg/m^3)
1,1,2-Trichloroethane	1.7E+00	1.3E+02	8.2E-04	1.1E+03	1.1E+01	8.8E+00	1.2E+01	1.6E-01	1.3E-01	2.8E-03
Chloroform	7.4E-01	1.2E+02	3.7E-03	1.2E+03	1.2E+01	1.1E+01	1.5E+01	8.9E-02	7.4E-02	1.5E-03
cis-1,2-Dichloroethene	3.0E+03	9.7E+01	4.1E-03	1.3E+03	1.3E+01	1.3E+01	1.7E+01	4.0E+02	3.3E+02	6.9E+00
Trichloroethene	1.8E+04	1.3E+02	9.9E-03	1.1E+03	1.2E+01	1.1E+01	1.5E+01	2.1E+03	1.8E+03	3.7E+01
Vinyl chloride	3.6E+00	6.3E+01	2.8E-02	1.6E+03	1.7E+01	1.7E+01	2.2E+01	6.1E-01	5.1E-01	1.1E-02

Variables	Units	Exposure Assumptions
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4
Tl = Calibration temp. of water	K (20C +273)	293
Ts = Shower water temperature	k (45C)	318
Us = water viscosity at Ts	centipoise	0.596
Ul = water viscosity at Tl	cp	1.002
Cwd = conc. leaving droplets after time sdt	µg/l	Solved by Eq 5
sdt = shower droplet drop time	sec	0.5
d = shower droplet diameter	mm	1
FR = shower water flow rate	l/min	10
SV = shower room air volume	m^3	12
S = indoor VOC generation rate	µg/m^3-min	Solved by Eq 6
Ds = duration of shower	min	34.8
Dt = total duration in shower room	min	60
R = air exchange rate	min^{-1}	0.0083
Ca = indoor air concentration of VOCs	µg/m^3	Solved by Eq 7

Equation 1:	Kg(VOC) =	$3000 * (18 / MW)^{0.5}$
Equation 2:	Kl(VOC) =	$20 * (44 / MW)^{0.5}$
Equation 3:	KL =	$((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))^{-1}$
Equation 4:	Kal =	$(KL * (((Tl * Us) / (Ts * Ul))^{-0.3}))$
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))
Equation 6:	S =	(Cwd * FR / SV)
Equation 7:	Ca =	If t>Ds [(S / R) * (Ds + (EXP(-R * Dt) / R) -(EXP(R *(Ds - Dt)) / R)] / Dt * 1/1000

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: 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	
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	Ingestion	1,1,2-Trichloroethane	1.7E+00	µg/L	N/A		N/A		N/A	1.1E-04	mg/kg/day	4.0E-03	mg/kg/day	2.7E-02
				Chloroform	7.4E-01	µg/L	N/A		N/A		N/A	4.7E-05	mg/kg/day	1.0E-02	mg/kg/day	4.7E-03
				cis-1,2-Dichloroethene	3.0E+03	µg/L	N/A		N/A		N/A	1.9E-01	mg/kg/day	2.0E-03	mg/kg/day	9.6E+01
				Trichloroethene	1.8E+04	µg/L	N/A		N/A		N/A	1.2E+00	mg/kg/day	5.0E-04	mg/kg/day	2.3E+03
				Vinyl chloride	3.6E+00	µg/L	N/A		N/A		N/A	2.3E-04	mg/kg/day	3.0E-03	mg/kg/day	7.7E-02
				Aluminum, Dissolved	1.3E+03	µg/L	N/A		N/A		N/A	8.4E-02	mg/kg/day	1.0E+00	mg/kg/day	8.4E-02
				Arsenic, Dissolved	5.4E+00	µg/L	N/A		N/A		N/A	3.5E-04	mg/kg/day	3.0E-04	mg/kg/day	1.2E+00
				Chromium, Dissolved	1.4E+00	µg/L	N/A		N/A		N/A	8.9E-05	mg/kg/day	3.0E-03	mg/kg/day	3.0E-02
				Cobalt, Dissolved	1.4E+01	µg/L	N/A		N/A		N/A	8.8E-04	mg/kg/day	3.0E-04	mg/kg/day	2.9E+00
				Iron, Dissolved	2.3E+03	µg/L	N/A		N/A		N/A	1.4E-01	mg/kg/day	7.0E-01	mg/kg/day	2.1E-01
				Manganese, Dissolved	8.6E+01	µg/L	N/A		N/A		N/A	5.5E-03	mg/kg/day	2.4E-02	mg/kg/day	2.3E-01
				Selenium, Dissolved	6.7E+00	µg/L	N/A		N/A		N/A	4.3E-04	mg/kg/day	5.0E-03	mg/kg/day	8.6E-02
				Zinc, Dissolved	3.4E+01	µg/L	N/A		N/A		N/A	2.2E-03	mg/kg/day	3.0E-01	mg/kg/day	7.2E-03
			Exp. Route Total								0.0E+00					2.4E+03
			Dermal	1,1,2-Trichloroethane	1.7E+00	µg/L	N/A		N/A		N/A	9.9E-06	mg/kg/day	4.0E-03	mg/kg/day	2.5E-03
				Chloroform	7.4E-01	µg/L	N/A		N/A		N/A	4.2E-06	mg/kg/day	1.0E-02	mg/kg/day	4.2E-04
				cis-1,2-Dichloroethene	3.0E+03	µg/L	N/A		N/A		N/A	1.7E-02	mg/kg/day	2.0E-03	mg/kg/day	8.5E+00
				Trichloroethene	1.8E+04	µg/L	N/A		N/A		N/A	1.9E-01	mg/kg/day	5.0E-04	mg/kg/day	3.7E+02
				Vinyl chloride	3.6E+00	µg/L	N/A		N/A		N/A	1.2E-05	mg/kg/day	3.0E-03	mg/kg/day	4.2E-03
				Aluminum, Dissolved	1.3E+03	µg/L	N/A		N/A		N/A	5.6E-04	mg/kg/day	1.0E+00	mg/kg/day	5.6E-04
				Arsenic, Dissolved	5.4E+00	µg/L	N/A		N/A		N/A	2.3E-06	mg/kg/day	3.0E-04	mg/kg/day	7.6E-03
				Chromium, Dissolved	1.4E+00	µg/L	N/A		N/A		N/A	1.2E-06	mg/kg/day	7.5E-05	mg/kg/day	1.6E-02
				Cobalt, Dissolved	1.4E+01	µg/L	N/A		N/A		N/A	2.3E-06	mg/kg/day	3.0E-04	mg/kg/day	7.7E-03
				Iron, Dissolved	2.3E+03	µg/L	N/A		N/A		N/A	9.6E-04	mg/kg/day	7.0E-01	mg/kg/day	1.4E-03
				Manganese, Dissolved	8.6E+01	µg/L	N/A		N/A		N/A	3.6E-05	mg/kg/day	9.6E-04	mg/kg/day	3.8E-02
				Selenium, Dissolved	6.7E+00	µg/L	N/A		N/A		N/A	2.8E-06	mg/kg/day	5.0E-03	mg/kg/day	5.7E-04
				Zinc, Dissolved	3.4E+01	µg/L	N/A		N/A		N/A	8.6E-06	mg/kg/day	3.0E-01	mg/kg/day	2.9E-05
			Exp. Route Total								0.0E+00					3.8E+02
		Exposure Point Total									0.0E+00					2.8E+03
	Exposure Medium Total										0.0E+00					2.8E+03
	Air	Columbia and Yorktown -Eastover Aquifer Water Vapors at Showerhead	Inhalation	1,1,2-Trichloroethane	1.7E+00	µg/L	N/A		N/A		N/A	3.5E-05	mg/m^3	2.0E-04	mg/m3	1.8E-01
				Chloroform	7.4E-01	µg/L	N/A		N/A		N/A	2.0E-05	mg/m^3	9.8E-02	mg/m^3	2.0E-04
				cis-1,2-Dichloroethene	3.0E+03	µg/L	N/A		N/A		N/A	8.8E-02	mg/m^3	N/A		N/A
				Trichloroethene	1.8E+04	µg/L	N/A		N/A		N/A	4.7E-01	mg/m^3	2.0E-03	mg/m3	2.4E+02
				Vinyl chloride	3.6E+00	µg/L	N/A		N/A		N/A	1.4E-04	mg/m^3	1.0E-01	mg/m^3	1.4E-03
			Exp. Route Total								0.0E+00					2.4E+02
		Exposure Point Total									0.0E+00					2.4E+02
	Exposure Medium Total										0.0E+00					2.4E+02
Groundwater Total											0.0E+00					3.0E+03

N/A - Not available.

DA_{event} for dermal exposure to groundwater calculated on Table 7.2.RME Supplement A

Inhalation explosure while showering calculated on Table 7.2.RME Supplement B

Table 7.2.RME Supplement A
Calculation of DA_{event}
Residential Child Groundwater
Site 1, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient (K_p) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (t_{event}) (hr)	DA_{event} (mg/cm^2-event)	Eq
1,1,2-Trichloroethane	1.7E+00	6.4E-03	2.9E-02	6.0E-01	1.4E+00	1.0E+00	1	2.3E-08	2
Chloroform	7.4E-01	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	1	9.8E-09	2
cis-1,2-Dichloroethene[1]	3.0E+03	7.7E-03	2.9E-02	3.7E-01	8.9E-01	1.0E+00	1	4.0E-05	3
Trichloroethene	1.8E+04	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	1	4.4E-04	2
Vinyl chloride	3.6E+00	5.6E-03	1.7E-02	2.4E-01	5.7E-01	1.0E+00	1	3.0E-08	3
Aluminum, Dissolved	1.3E+03	1.0E-03	NA	NA	NA	NA	1	1.3E-06	1
Arsenic, Dissolved	5.4E+00	1.0E-03	NA	NA	NA	NA	1	5.4E-09	1
Chromium, Dissolved	1.4E+00	2.0E-03	NA	NA	NA	NA	1	2.8E-09	1
Cobalt, Dissolved	1.4E+01	4.0E-04	NA	NA	NA	NA	1	5.5E-09	1
Iron, Dissolved	2.3E+03	1.0E-03	NA	NA	NA	NA	1	2.3E-06	1
Manganese, Dissolved	8.6E+01	1.0E-03	NA	NA	NA	NA	1	8.6E-08	1
Selenium, Dissolved	6.7E+00	1.0E-03	NA	NA	NA	NA	1	6.7E-09	1
Zinc, Dissolved	3.4E+01	6.0E-04	NA	NA	NA	NA	1	2.0E-08	1

[1] trans-1,2-Dichloroethane used as a surrogate.

Inorganics: DA_{event} (mg/cm^2-event) =

K_p x CW x t_{event} x 0.001 mg/µg x 0.001 l/cm^3 (eq 1)

Organics: DA_{event} (mg/cm^2-event) =

If t_{event}<t*, then DA_{event} =

2 x FA x K_p x CW x (sqrt((6 x τ_{event} x t_{event})/π)) x 0.001 mg/µg x 0.001 l/cm^3 (eq 2)

If t_{event}>t*, then DA_{event} =

FA x K_p x CW x (t_{event}/(1+B) + 2 x τ_{event} x ((1 + 3xB + 3xB^2)/$(1+B)^2$) x 0.001 mg/µg x 0.001 l/cm^3 (eq 3)

Notes:

NA - Not applicable

Permeability constants and other input parameter values from EPA 2004,*Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document

B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).

t* - Time to reach steady-state

Table 7.2.RME Supplement B

Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model

Child Resident

Site 1, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Exposure Point Concentration Cwo (µg/L)	Molecular weight (MW) (g/mole)	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl (VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/L)	S (µg/m^3 -min)	Ca (mg/m^3)
1,1,2-Trichloroethane	1.7E+00	1.3E+02	8.2E-04	1.1E+03	1.1E+01	8.8E+00	1.2E+01	1.6E-01	1.3E-01	4.0E-03
Chloroform	7.4E-01	1.2E+02	3.7E-03	1.2E+03	1.2E+01	1.1E+01	1.5E+01	8.9E-02	7.4E-02	2.2E-03
cis-1,2-Dichloroethene	3.0E+03	9.7E+01	4.1E-03	1.3E+03	1.3E+01	1.3E+01	1.7E+01	4.0E+02	3.3E+02	1.0E+01
Trichloroethene	1.8E+04	1.3E+02	9.9E-03	1.1E+03	1.2E+01	1.1E+01	1.5E+01	2.1E+03	1.8E+03	5.4E+01
Vinyl chloride	3.6E+00	6.3E+01	2.8E-02	1.6E+03	1.7E+01	1.7E+01	2.2E+01	6.1E-01	5.1E-01	1.5E-02

Variables	Units	Exposure Assumptions
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4
Tl = Calibration temp. of water	K (20C +273)	293
Ts = Shower water temperature	k (45C)	318
Us = water viscosity at Ts	centipoise	0.596
Ul = water viscosity at Tl	cp	1.002
Cwd = conc. leaving droplets after time sdt	µg/l	Solved by Eq 5
sdt = shower droplet drop time	sec	0.5
d = shower droplet diameter	mm	1
FR = shower water flow rate	l/min	10
SV = shower room air volume	m^3	12
S = indoor VOC generation rate	µg/m^3-min	Solved by Eq 6
Ds = duration of shower	min	60
Dt = total duration in shower room	min	80
R = air exchange rate	min^{-1}	0.0083
Ca = indoor air concentration of VOCs	µg/m^3	Solved by Eq 7

Equation 1:	Kg(VOC) =	3000 * (18 / MW)$^{0.5}$
Equation 2:	Kl(VOC) =	20 * (44 / MW)$^{0.5}$
Equation 3:	KL =	((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))$^{-1}$
Equation 4:	Kal =	(KL * (((Tl * Us) / (Ts * Ul))$^{-0.5}$))
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))
Equation 6:	S =	(Cwd * FR / SV)
Equation 7:	Ca =	If t>Ds [(S / R) * (Ds + (EXP(-R * Dt) / R) -(EXP(R *(Ds - Dt)) / R)] / Dt * 1/1000

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/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	
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	Ingestion	1,1,2-Trichloroethane	1.7E+00	µg/L	2.5E-05	mg/kg/day	5.7E-02	(mg/kg-day)$^{-1}$	1.4E-06	N/A		N/A		N/A
				Chloroform	7.4E-01	µg/L	1.1E-05	mg/kg/day	3.1E-02	(mg/kg-day)$^{-1}$	3.4E-07	N/A		N/A		N/A
				cis-1,2-Dichloroethene	3.0E+03	µg/L	4.5E-02	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Trichloroethene (1)	1.8E+04	µg/L			4.6E-02	(mg/kg-day)$^{-1}$	3.8E-02	N/A		N/A		N/A
				Vinyl chloride (1)	3.6E+00	µg/L			7.2E-01	(mg/kg-day)$^{-1}$	5.4E-05	N/A		N/A		N/A
				Aluminum, Dissolved	1.3E+03	µg/L	2.0E-02	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Arsenic, Dissolved	5.4E+00	µg/L	8.1E-05	mg/kg/day	1.5E+00	(mg/kg-day)$^{-1}$	1.2E-04	N/A		N/A		N/A
				Chromium, Dissolved (1)	1.4E+00	µg/L			5.0E-01	(mg/kg-day)$^{-1}$	3.3E-05	N/A		N/A		N/A
				Cobalt, Dissolved	1.4E+01	µg/L	2.0E-04	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Iron, Dissolved	2.3E+03	µg/L	3.4E-02	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Manganese, Dissolved	8.6E+01	µg/L	1.3E-03	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Selenium, Dissolved	6.7E+00	µg/L	1.0E-04	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Zinc, Dissolved	3.4E+01	µg/L	5.0E-04	mg/kg/day	N/A		N/A	N/A		N/A		N/A
			Exp. Route Total								3.8E-02					0.0E+00
			Dermal	1,1,2-Trichloroethane	1.7E+00	µg/L	2.3E-06	mg/kg/day	5.7E-02	(mg/kg-day)$^{-1}$	1.3E-07	N/A		N/A		N/A
				Chloroform	7.4E-01	µg/L	9.9E-07	mg/kg/day	3.1E-02	(mg/kg-day)$^{-1}$	3.1E-08	N/A		N/A		N/A
				cis-1,2-Dichloroethene	3.0E+03	µg/L	4.0E-03	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Trichloroethene (1)	1.8E+04	µg/L			4.6E-02	(mg/kg-day)$^{-1}$	6.3E-03	N/A		N/A		N/A
				Vinyl chloride (1)	3.6E+00	µg/L			7.2E-01	(mg/kg-day)$^{-1}$	2.9E-06	N/A		N/A		N/A
				Aluminum, Dissolved	1.3E+03	µg/L			N/A		N/A	N/A		N/A		N/A
				Arsenic, Dissolved	5.4E+00	µg/L	4.6E-07	mg/kg/day	1.5E+00	(mg/kg-day)$^{-1}$	6.9E-07	N/A		N/A		N/A
				Chromium, Dissolved (1)	1.4E+00	µg/L			1.3E-02	(mg/kg-day)$^{-1}$	9.9E-09	N/A		N/A		N/A
				Cobalt, Dissolved	1.4E+01	µg/L	4.7E-07	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Iron, Dissolved	2.3E+03	µg/L	1.9E-04	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Manganese, Dissolved	8.6E+01	µg/L	7.4E-06	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Selenium, Dissolved	6.7E+00	µg/L	5.7E-07	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Zinc, Dissolved	3.4E+01	µg/L	1.7E-06	mg/kg/day	N/A		N/A	N/A		N/A		N/A
			Exp. Route Total								6.3E-03					0.0E+00
		Exposure Point Total									4.5E-02					0.0E+00
	Exposure Medium Total										4.5E-02					0.0E+00

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/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	
Groundwater	Air	Columbia and Yorktown -Eastover Aquifer Water Vapors at Showerhead	Inhalation	1,1,2-Trichloroethane	1.7E+00	µg/L	3.6E-05	µg/m^3	1.6E-05	(µg/m^3)$^{-1}$	5.7E-10			N/A		N/A
				Chloroform	7.4E-01	µg/L	2.0E-05	µg/m^3	2.3E-05	(µg/m^3)$^{-1}$	4.5E-10			N/A		N/A
				cis-1,2-Dichloroethene	3.0E+03	µg/L	8.9E-02	µg/m^3	N/A	(µg/m^3)$^{-1}$	N/A			N/A		N/A
				Trichloroethene (1)	1.8E+04	µg/L			4.6E-06	(µg/m^3)$^{-1}$	7.8E-03			N/A		N/A
				Vinyl chloride (1)	3.6E+00	µg/L			4.4E-06	(µg/m^3)$^{-1}$	8.4E-07			N/A		N/A
			Exp. Route Total								7.8E-03					0.0E+00
		Exposure Point Total									7.8E-03					0.0E+00
	Exposure Medium Total										7.8E-03					0.0E+00
Groundwater Total											5.3E-02					0.0E+00

N/A - Not available.

DA_{event} for dermal exposure to groundwater calculated on Tables 7.1.RME Supplement A and 7.2.RME Supplement A

Inhalation exposure while showering calculated on Tables 7.1.RME Supplement B and 7.2.RME Supplement B

1. See Table 7.3.RME Supplement A for calculation of intake and cancer risk following MMOA method.

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial 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	
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	Ingestion	1,1,2-Trichloroethane	1.7E+00	µg/L	5.9E-06	mg/kg/day	5.7E-02	$(mg/kg\text{-}day)^{-1}$	3.4E-07	1.7E-05	mg/kg/day	4.0E-03	mg/kg/day	4.2E-03
				Chloroform	7.4E-01	µg/L	2.6E-06	mg/kg/day	3.1E-02	$(mg/kg\text{-}day)^{-1}$	8.0E-08	7.2E-06	mg/kg/day	1.0E-02	mg/kg/day	7.2E-04
				cis-1,2-Dichloroethene	3.0E+03	µg/L	1.0E-02	mg/kg/day	N/A	$(mg/kg\text{-}day)^{-1}$	N/A	2.9E-02	mg/kg/day	2.0E-03	mg/kg/day	1.5E+01
				Trichloroethene	1.8E+04	µg/L	6.3E-02	mg/kg/day	4.6E-02	$(mg/kg\text{-}day)^{-1}$	2.9E-03	1.8E-01	mg/kg/day	5.0E-04	mg/kg/day	3.5E+02
				Vinyl chloride	3.6E+00	µg/L	1.3E-05	mg/kg/day	7.2E-01	$(mg/kg\text{-}day)^{-1}$	9.1E-06	3.5E-05	mg/kg/day	3.0E-03	mg/kg/day	1.2E-02
				Aluminum, Dissolved	1.3E+03	µg/L	4.6E-03	mg/kg/day	N/A	$(mg/kg\text{-}day)^{-1}$	N/A	1.3E-02	mg/kg/day	1.0E+00	mg/kg/day	1.3E-02
				Arsenic, Dissolved	5.4E+00	µg/L	1.9E-05	mg/kg/day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.8E-05	5.3E-05	mg/kg/day	3.0E-04	mg/kg/day	1.8E-01
				Chromium, Dissolved	1.4E+00	µg/L	4.9E-06	mg/kg/day	5.0E-01	$(mg/kg\text{-}day)^{-1}$	2.4E-06	1.4E-05	mg/kg/day	3.0E-03	mg/kg/day	4.6E-03
				Cobalt, Dissolved	1.4E+01	µg/L	4.8E-05	mg/kg/day	N/A	$(mg/kg\text{-}day)^{-1}$	N/A	1.3E-04	mg/kg/day	3.0E-04	mg/kg/day	4.5E-01
				Iron, Dissolved	2.3E+03	µg/L	7.9E-03	mg/kg/day	N/A	$(mg/kg\text{-}day)^{-1}$	N/A	2.2E-02	mg/kg/day	7.0E-01	mg/kg/day	3.2E-02
				Manganese, Dissolved	8.6E+01	µg/L	3.0E-04	mg/kg/day	N/A	$(mg/kg\text{-}day)^{-1}$	N/A	8.4E-04	mg/kg/day	2.4E-02	mg/kg/day	3.5E-02
				Selenium, Dissolved	6.7E+00	µg/L	2.3E-05	mg/kg/day	N/A		N/A	6.6E-05	mg/kg/day	5.0E-03	mg/kg/day	1.3E-02
				Zinc, Dissolved	3.4E+01	µg/L	1.2E-04	mg/kg/day	N/A		N/A	3.3E-04	mg/kg/day	3.0E-01	mg/kg/day	1.1E-03
			Exp. Route Total								2.9E-03					3.7E+02
		Exposure Point Total									2.9E-03					3.7E+02
	Exposure Medium Total										2.9E-03					3.7E+02
Groundwater Total											2.9E-03					3.7E+02

N/A - Not available.

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 1

NWS Yorktown, Yorktown, Virginia

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	
Groundwater	Groundwater	Columbia and Yorktown-Eastover Aquifer Water in Excavation Pit	Dermal	1,1,2-Trichloroethane	1.7E+00	µg/L	3.9E-08	mg/kg/day	5.7E-02	$(mg/kg\text{-}day)^{-1}$	2.2E-09	2.7E-06	mg/kg/day	4.0E-03	mg/kg/day	6.9E-04
				Chloroform	7.4E-01	µg/L	1.8E-08	mg/kg/day	3.1E-02	$(mg/kg\text{-}day)^{-1}$	5.5E-10	1.2E-06	mg/kg/day	2.0E-02	mg/kg/day	6.2E-05
				cis-1,2-Dichloroethene	3.0E+03	µg/L	7.9E-05	mg/kg/day	N/A		N/A	5.5E-03	mg/kg/day	2.0E-02	mg/kg/day	2.8E-01
				Trichloroethene	1.8E+04	µg/L	7.4E-04	mg/kg/day	4.6E-02	$(mg/kg\text{-}day)^{-1}$	3.4E-05	5.2E-02	mg/kg/day	5.0E-04	mg/kg/day	1.0E+02
				Vinyl chloride	3.6E+00	µg/L	6.7E-08	mg/kg/day	7.2E-01	$(mg/kg\text{-}day)^{-1}$	4.8E-08	4.7E-06	mg/kg/day	3.0E-03	mg/kg/day	1.6E-03
				Aluminum	3.9E+03	µg/L	1.2E-05	mg/kg/day	N/A		N/A	8.7E-04	mg/kg/day	1.0E+00	mg/kg/day	8.7E-04
				Antimony	8.5E+00	µg/L	2.7E-08	mg/kg/day	N/A		N/A	1.9E-06	mg/kg/day	6.0E-05	mg/kg/day	3.1E-02
				Arsenic	1.1E+01	µg/L	3.5E-08	mg/kg/day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.2E-08	2.4E-06	mg/kg/day	3.0E-04	mg/kg/day	8.1E-03
				Cadmium	2.9E+00	µg/L	9.2E-09	mg/kg/day	N/A		N/A	6.5E-07	mg/kg/day	2.5E-05	mg/kg/day	2.6E-02
				Chromium	2.5E+01	µg/L	1.6E-07	mg/kg/day	5.0E-01	$(mg/kg\text{-}day)^{-1}$	7.9E-08	1.1E-05	mg/kg/day	5.0E-04	mg/kg/day	2.2E-02
				Cobalt	8.8E+00	µg/L	1.1E-08	mg/kg/day	N/A		N/A	7.9E-07	mg/kg/day	3.0E-03	mg/kg/day	2.6E-04
				Iron	8.7E+03	µg/L	2.8E-05	mg/kg/day	N/A		N/A	1.9E-03	mg/kg/day	7.0E-01	mg/kg/day	2.8E-03
				Manganese	6.4E+02	µg/L	2.0E-06	mg/kg/day	N/A		N/A	1.4E-04	mg/kg/day	9.6E-04	mg/kg/day	1.5E-01
				Vanadium	2.0E+01	µg/L	6.3E-08	mg/kg/day	N/A		N/A	4.4E-06	mg/kg/day	1.8E-04	mg/kg/day	2.4E-02
				Zinc	3.0E+01	µg/L	5.8E-08	mg/kg/day	N/A		N/A	4.0E-06	mg/kg/day	3.0E-01	mg/kg/day	1.3E-05
			Exp. Route Total								3.4E-05					1.0E+02
		Exposure Point Total									3.4E-05					1.0E+02
	Exposure Medium Total										3.4E-05					1.0E+02
	Air	Columbia and Yorktown - Eastover Aquifer Water Vapors in Excavation Pit	Inhalation	1,1,2-Trichloroethane	1.7E+00	µg/L	1.0E-04	$\mu g/m^3$	1.6E-05	$(\mu g/m^3)^{-1}$	1.7E-09	7.3E-06	mg/m^3	2.0E-03	mg/m^3	3.7E-03
				Chloroform	7.4E-01	µg/L	4.5E-05	$\mu g/m^3$	2.3E-05	$(\mu g/m^3)^{-1}$	1.0E-09	3.1E-06	mg/m^3	9.8E-02	mg/m^3	3.2E-05
				cis-1,2-Dichloroethene	3.0E+03	µg/L	2.3E-01	$\mu g/m^3$	N/A		N/A	1.6E-02	mg/m^3	N/A		N/A
				Trichloroethene	1.8E+04	µg/L	1.2E+00	$\mu g/m^3$	4.1E-06	$(\mu g/m^3)^{-1}$	4.8E-06	8.3E-02	mg/m^3	3.0E-03	mg/m^3	2.8E+01
				Vinyl chloride	3.6E+00	µg/L	3.4E-04	$\mu g/m^3$	4.4E-06	$(\mu g/m^3)^{-1}$	1.5E-09	2.4E-05	mg/m^3	1.0E-01	mg/m^3	2.4E-04
			Exp. Route Total								4.8E-06					2.8E+01
		Exposure Point Total									4.8E-06					2.8E+01
	Exposure Medium Total										4.8E-06					2.8E+01
Groundwater Total											3.9E-05					1.3E+02
Total of Receptor Risks Across All Media											3.9E-05	Total of Receptor Hazards Across All Media				1.3E+02

N/A - Not available.

DA_{event} for dermal exposure to groundwater calculated on Tables 7.5.RME Supplement A

Table 7.5.RME Supplement A
Calculation of DA_{event}
Construction Worker Groundwater
Site 1, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient (K_p) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (t_{event}) (hr)	DA_{event} (mg/cm^2-event)	Eq
1,1,2-Trichloroethane	1.7E+00	6.4E-03	2.9E-02	6.0E-01	1.4E+00	1.0E+00	8	9.9E-08	3
Chloroform	7.4E-01	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	8	4.4E-08	3
cis-1,2-Dichloroethene	3.0E+03	7.7E-03	2.9E-02	3.7E-01	8.9E-01	1.0E+00	8	2.0E-04	3
Trichloroethene	1.8E+04	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	8	1.8E-03	3
Vinyl chloride	3.6E+00	5.6E-03	1.7E-02	2.4E-01	5.7E-01	1.0E+00	8	1.7E-07	3
Aluminum	3.9E+03	1.0E-03	NA	NA	NA	NA	8	3.1E-05	1
Antimony	8.5E+00	1.0E-03	NA	NA	NA	NA	8	6.8E-08	1
Arsenic	1.1E+01	1.0E-03	NA	NA	NA	NA	8	8.7E-08	1
Cadmium	2.9E+00	1.0E-03	NA	NA	NA	NA	8	2.3E-08	1
Chromium	2.5E+01	2.0E-03	NA	NA	NA	NA	8	4.0E-07	1
Cobalt	8.8E+00	4.0E-04	NA	NA	NA	NA	8	2.8E-08	1
Iron	8.7E+03	1.0E-03	NA	NA	NA	NA	8	6.9E-05	1
Manganese	6.4E+02	1.0E-03	NA	NA	NA	NA	8	5.1E-06	1
Vanadium	2.0E+01	1.0E-03	NA	NA	NA	NA	8	1.6E-07	1
Zinc	3.0E+01	6.0E-04	NA	NA	NA	NA	8	1.4E-07	1

Inorganics: DA_{event} (mg/cm^2-event) =
K_p x CW x t_{event} x 0.001 mg/µg x 0.001 l/cm^3 (eq 1)

Organics: DA_{event} (mg/cm^2-event) =
If t_{event}<t*, then DA_{event} =
2 x FA x K_p x CW x (sqrt((6 x τ_{event} x t_{event})/π)) x 0.001 mg/µg x 0.001 l/cm^3 (eq 2)

If t_{event}>t*, then DA_{event} =
FA x K_p x CW x (t_{event}/(1+B) + 2 x τ_{event} x ((1 + 3xB + 3xB^2)/(1+B)^2) x 0.001 mg/µg x 0.001 l/cm^3 (eq 3)

Notes:
NA - Not applicable
Permeability constants from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state

Table 7.5.RME Supplement B
Calculation of Inhalation Concentration in Excavation Trench
Construction Worker
Site 1, NWS Yorktown, Yorktown, Virginia

Exposure-point concentrations (inhalation) for construction/utility workers in a trench: Groundwater less than 15 feet deep	CAS No.	Molecular Weight MWi g/mol	Henry's Law Constant Hi atm-m3/mol	Gas-Phase Mass Transfer Coefficient KiG cm/s	Liquid-Phase Mass Transfer Coefficient KiL cm/s	Overall Mass Transfer Coefficient Ki cm/s	Concentration of Contaminant in Groundwater Cgw ug/L	Volatilization Factor VF L/m3	Concentration of Contaminant in Trench Ctrench ug/m3	Concentration of Contaminant in Trench Ctrench mg/m3
Volatile Organic Compounds (VOCs)										
Chloroform	67-66-3	119.38	3.7E-03	4.4E-01	1.0E-03	1.0E-03	6.6E-01	4.2E-02	2.8E-02	2.8E-05
Tetrachloroethene	127-18-4	165.83	1.8E-02	4.0E-01	8.8E-04	8.8E-04	#REF!	#REF!	#REF!	#REF!
Trichloroethene	79-01-6	131.39	1.0E-02	4.3E-01	9.9E-04	9.8E-04	1.8E+04	4.0E-02	7.2E+02	7.2E-01
Vinyl Chloride (commercial, construction)	75-01-4	62.50	2.7E-02	5.5E-01	1.4E-03	1.4E-03	3.6E+00	5.9E-02	2.1E-01	2.1E-04
cis-1,2-Dichloroethene	156-59-2	96.94	4.1E-03	4.7E-01	1.1E-03	1.1E-03	3.0E+03	4.6E-02	1.4E+02	1.4E-01
1,1,2-Trichloroethane	79-00-5	133.40	9.1E-04	4.3E-01	9.8E-04	9.2E-04	1.7E+00	3.8E-02	6.4E-02	6.4E-05

Equations

VF = $(K_i \times A \times F \times 10^{-3} \times 10^{4} \times 3600) / (ACH \times V)$

K_i = $1 / \{(1/k_{iL}) + [(R\ T) / (H_i\ k_{iG})]\}$

k_{iL} = $(MW_{O2}/MW_i)^{0.5} \times (T/298) \times k_{L},O_2$

k_{iG} = $(MW_{H2O}/MW_i)^{0.335} \times (T/298)^{1.005} \times k_G, H_2O$

Parameter Value

For Mass-Transfer Coefficients

Kg,H2O	0.833	cm/s
MWH2O	18	
Kg,O2	0.002	cm/s
MWO2	32	
T	**77**	F
T	298	K
R	8.20E-05	atm-m3/mol-K

For Emission Flux and Concentration in Trench

CF1	1.00E-03	L/cm3
CF2	1.00E+04	cm2/m2
CF3	3600	s/hr
F	**1**	
ACH	360	hr-1

Trench dimensions

Length	**10**	ft
	3.05	m
Width	**10**	ft
	3.05	m
Depth	**8**	ft
	2.44	m
Width/Depth	1.25	

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
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	
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	Ingestion	1,1,2-Trichloroethane	1.7E+00	µg/L	N/A		N/A		N/A	2.2E-05	mg/kg/day	4.0E-03	mg/kg/day	5.4E-03
				Chloroform	7.4E-01	µg/L	N/A		N/A		N/A	9.5E-06	mg/kg/day	1.0E-02	mg/kg/day	9.5E-04
				cis-1,2-Dichloroethene	3.0E+03	µg/L	N/A		N/A		N/A	3.8E-02	mg/kg/day	2.0E-03	mg/kg/day	1.9E+01
				Trichloroethene	1.8E+04	µg/L	N/A		N/A		N/A	2.3E-01	mg/kg/day	5.0E-04	mg/kg/day	4.6E+02
				Vinyl chloride	3.6E+00	µg/L	N/A		N/A		N/A	4.6E-05	mg/kg/day	3.0E-03	mg/kg/day	1.5E-02
				Aluminum, Dissolved	1.3E+03	µg/L	N/A		N/A		N/A	1.7E-02	mg/kg/day	1.0E+00	mg/kg/day	1.7E-02
				Arsenic, Dissolved	5.4E+00	µg/L	N/A		N/A		N/A	6.9E-05	mg/kg/day	3.0E-04	mg/kg/day	2.3E-01
				Chromium, Dissolved	1.4E+00	µg/L	N/A		N/A		N/A	1.8E-05	mg/kg/day	3.0E-03	mg/kg/day	6.0E-03
				Cobalt, Dissolved	1.4E+01	µg/L	N/A		N/A		N/A	1.8E-04	mg/kg/day	3.0E-04	mg/kg/day	5.9E-01
				Iron, Dissolved	2.3E+03	µg/L	N/A		N/A		N/A	2.9E-02	mg/kg/day	7.0E-01	mg/kg/day	4.1E-02
				Manganese, Dissolved	8.6E+01	µg/L	N/A		N/A		N/A	1.1E-03	mg/kg/day	2.4E-02	mg/kg/day	4.6E-02
				Selenium, Dissolved	6.7E+00	µg/L	N/A		N/A		N/A	8.6E-05	mg/kg/day	5.0E-03	mg/kg/day	1.7E-02
				Zinc, Dissolved	3.4E+01	µg/L	N/A		N/A		N/A	4.3E-04	mg/kg/day	3.0E-01	mg/kg/day	1.4E-03
			Exp. Route Total								0.0E+00					4.8E+02
			Dermal	1,1,2-Trichloroethane	1.7E+00	µg/L	N/A		N/A		N/A	1.9E-06	mg/kg/day	4.0E-03	mg/kg/day	4.8E-04
				Chloroform	7.4E-01	µg/L	N/A		N/A		N/A	8.1E-07	mg/kg/day	1.0E-02	mg/kg/day	8.1E-05
				cis-1,2-Dichloroethene	3.0E+03	µg/L	N/A		N/A		N/A	3.2E-03	mg/kg/day	2.0E-03	mg/kg/day	1.6E+00
				Trichloroethene	1.8E+04	µg/L	N/A		N/A		N/A	3.6E-02	mg/kg/day	5.0E-04	mg/kg/day	7.3E+01
				Vinyl chloride	3.6E+00	µg/L	N/A		N/A		N/A	2.4E-06	mg/kg/day	3.0E-03	mg/kg/day	8.1E-04
				Aluminum, Dissolved	1.3E+03	µg/L	N/A		N/A		N/A	5.4E-05	mg/kg/day	1.0E+00	mg/kg/day	5.4E-05
				Arsenic, Dissolved	5.4E+00	µg/L	N/A		N/A		N/A	2.2E-07	mg/kg/day	3.0E-04	mg/kg/day	7.4E-04
				Chromium, Dissolved	1.4E+00	µg/L	N/A		N/A		N/A	1.2E-07	mg/kg/day	7.5E-05	mg/kg/day	1.5E-03
				Cobalt, Dissolved	1.4E+01	µg/L	N/A		N/A		N/A	2.3E-07	mg/kg/day	3.0E-04	mg/kg/day	7.5E-04
				Iron, Dissolved	2.3E+03	µg/L	N/A		N/A		N/A	9.3E-05	mg/kg/day	7.0E-01	mg/kg/day	1.3E-04
				Manganese, Dissolved	8.6E+01	µg/L	N/A		N/A		N/A	3.6E-06	mg/kg/day	9.6E-04	mg/kg/day	3.7E-03
				Selenium, Dissolved	6.7E+00	µg/L	N/A		N/A		N/A	2.8E-07	mg/kg/day	5.0E-03	mg/kg/day	5.5E-05
				Zinc, Dissolved	3.4E+01	µg/L	N/A		N/A		N/A	8.4E-07	mg/kg/day	3.0E-01	mg/kg/day	2.8E-06
			Exp. Route Total								0.0E+00					7.4E+01
		Exposure Point Total									0.0E+00					5.6E+02
	Exposure Medium Total										0.0E+00					5.6E+02
	Air	Columbia and Yorktown -Eastover Aquifer Water Vapors at Showerhead	Inhalation	1,1,2-Trichloroethane	1.7E+00	µg/L	N/A		N/A		N/A	9.1E-06	mg/m^3	2.0E-04	mg/m^3	4.6E-02
				Chloroform	7.4E-01	µg/L	N/A		N/A		N/A	5.1E-06	mg/m^3	9.8E-02	mg/m^3	5.2E-05
				cis-1,2-Dichloroethene	3.0E+03	µg/L	N/A		N/A		N/A	2.3E-02	mg/m^3	N/A		N/A
				Trichloroethene	1.8E+04	µg/L	N/A		N/A		N/A	1.2E-01	mg/m^3	2.0E-03	mg/m^3	6.1E+01
				Vinyl chloride	3.6E+00	µg/L	N/A		N/A		N/A	3.5E-05	mg/m^3	1.0E-01	mg/m^3	3.5E-04
			Exp. Route Total								0.0E+00					6.1E+01
		Exposure Point Total									0.0E+00					6.1E+01
	Exposure Medium Total										0.0E+00					6.1E+01
Groundwater Total											0.0E+00					6.2E+02

N/A - Not available.

DA_{event} for dermal exposure to groundwater calculated on Table 7.1.CTE Supplement A

Inhalation exposure while showering calculated on Table 7.1.CTE Supplement B

Table 7.1.CTE Supplement A
Calculation of DA_{event}
Residential Adult Groundwater
Site 1, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient (K_p) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (t_{event}) (hr)	DA_{event} (mg/cm^2-event)	Eq
1,1,2-Trichloroethane	1.7E+00	6.4E-03	2.9E-02	6.0E-01	1.4E+00	1.0E+00	0.25	1.2E-08	2
Chloroform	7.4E-01	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	0.25	4.9E-09	2
cis-1,2-Dichloroethene[1]	3.0E+03	7.7E-03	2.9E-02	3.7E-01	8.9E-01	1.0E+00	0.25	2.0E-05	2
Trichloroethene	1.8E+04	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	0.25	2.2E-04	2
Vinyl chloride	3.6E+00	5.6E-03	1.7E-02	2.4E-01	5.7E-01	1.0E+00	0.25	1.5E-08	2
Aluminum, Dissolved	1.3E+03	1.0E-03	NA	NA	NA	NA	0.25	3.3E-07	1
Arsenic, Dissolved	5.4E+00	1.0E-03	NA	NA	NA	NA	0.25	1.3E-09	1
Chromium, Dissolved	1.4E+00	2.0E-03	NA	NA	NA	NA	0.25	7.0E-10	1
Cobalt, Dissolved	1.4E+01	4.0E-04	NA	NA	NA	NA	0.25	1.4E-09	1
Iron, Dissolved	2.3E+03	1.0E-03	NA	NA	NA	NA	0.25	5.7E-07	1
Manganese, Dissolved	8.6E+01	1.0E-03	NA	NA	NA	NA	0.25	2.2E-08	1
Selenium, Dissolved	6.7E+00	1.0E-03	NA	NA	NA	NA	0.25	1.7E-09	1
Zinc, Dissolved	3.4E+01	6.0E-04	NA	NA	NA	NA	0.25	5.1E-09	1

[1] trans-1,2-Dichloroethane used as a surrogate.

Inorganics: DA_{event} (mg/cm^2-event) =

K_p x CW x t_{event} x 0.001 mg/µg x 0.001 l/cm^3 (eq 1)

Organics: DA_{event} (mg/cm^2-event) =

If t_{event}<t*, then DA_{event} =

2 x FA x K_p x CW x (sqrt((6 x τ_{event} x t_{event})/π)) x 0.001 mg/µg x 0.001 l/cm^3 (eq 2)

If t_{event}>t*, then DA_{event} =

FA x K_p x CW x (t_{event}/(1+B) + 2 x τ_{event} x ((1 + 3xB + 3xB^2)/$(1+B)^2$) x 0.001 mg/µg x 0.001 l/cm^3 (eq 3)

Notes:

NA - Not applicable

Permeability constants and other input parameter values from EPA 2004,*Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document

B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).

t* - Time to reach steady-state

Table 7.1.CTE Supplement B

Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model

Adult Resident

Site 1, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Exposure Point Concentration Cwo (µg/L)	Molecular weight (MW) (g/mole)	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl (VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/L)	S (µg/m^3 -min)	Ca (mg/m^3)
1,1,2-Trichloroethane	1.7E+00	1.3E+02	8.2E-04	1.1E+03	1.1E+01	8.8E+00	1.2E+01	1.6E-01	1.3E-01	1.4E-03
Chloroform	7.4E-01	1.2E+02	3.7E-03	1.2E+03	1.2E+01	1.1E+01	1.5E+01	8.9E-02	7.4E-02	7.6E-04
cis-1,2-Dichloroethene	3.0E+03	9.7E+01	4.1E-03	1.3E+03	1.3E+01	1.3E+01	1.7E+01	4.0E+02	3.3E+02	3.4E+00
Trichloroethene	1.8E+04	1.3E+02	9.9E-03	1.1E+03	1.2E+01	1.1E+01	1.5E+01	2.1E+03	1.8E+03	1.8E+01
Vinyl chloride	3.6E+00	6.3E+01	2.8E-02	1.6E+03	1.7E+01	1.7E+01	2.2E+01	6.1E-01	5.1E-01	5.2E-03

Variables	Units	Exposure Assumptions
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4
Tl = Calibration temp. of water	K (20C +273)	293
Ts = Shower water temperature	k (45C)	318
Us = water viscosity at Ts	centipoise	0.596
Ul = water viscosity at Tl	cp	1.002
Cwd = conc. leaving droplets after time sdt	µg/l	Solved by Eq 5
sdt = shower droplet drop time	sec	0.5
d = shower droplet diameter	mm	1
FR = shower water flow rate	l/min	10
SV = shower room air volume	m^3	12
S = indoor VOC generation rate	µg/m^3-min	Solved by Eq 6
Ds = duration of shower	min	15
Dt = total duration in shower room	min	30
R = air exchange rate	min^{-1}	0.0083
Ca = indoor air concentration of VOCs	µg/m^3	Solved by Eq 7

Equation 1:	Kg(VOC) =	$3000 * (18 / MW)^{0.5}$
Equation 2:	Kl(VOC) =	$20 * (44 / MW)^{0.5}$
Equation 3:	KL =	$((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))^{-1}$
Equation 4:	Kal =	$(KL * (((Tl * Us) / (Ts * Ul))^{-0.5}))$
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))
Equation 6:	S =	(Cwd * FR / SV)
Equation 7:	Ca =	If t>Ds [(S / R) * (Ds + (EXP(-R * Dt) / R) -(EXP(R *(Ds - Dt)) / R)] / Dt * 1/1000

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: 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	
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	Ingestion	1,1,2-Trichloroethane	1.7E+00	µg/L	N/A		N/A		N/A	7.3E-05	mg/kg/day	4.0E-03	mg/kg/day	1.8E-02
				Chloroform	7.4E-01	µg/L	N/A		N/A		N/A	3.2E-05	mg/kg/day	1.0E-02	mg/kg/day	3.2E-03
				cis-1,2-Dichloroethene	3.0E+03	µg/L	N/A		N/A		N/A	1.3E-01	mg/kg/day	2.0E-03	mg/kg/day	6.4E+01
				Trichloroethene	1.8E+04	µg/L	N/A		N/A		N/A	7.7E-01	mg/kg/day	5.0E-04	mg/kg/day	1.5E+03
				Vinyl chloride	3.6E+00	µg/L	N/A		N/A		N/A	1.5E-04	mg/kg/day	3.0E-03	mg/kg/day	5.1E-02
				Aluminum, Dissolved	1.3E+03	µg/L	N/A		N/A		N/A	5.6E-02	mg/kg/day	1.0E+00	mg/kg/day	5.6E-02
				Arsenic, Dissolved	5.4E+00	µg/L	N/A		N/A		N/A	2.3E-04	mg/kg/day	3.0E-04	mg/kg/day	7.7E-01
				Chromium, Dissolved	1.4E+00	µg/L	N/A		N/A		N/A	6.0E-05	mg/kg/day	3.0E-03	mg/kg/day	2.0E-02
				Cobalt, Dissolved	1.4E+01	µg/L	N/A		N/A		N/A	5.9E-04	mg/kg/day	3.0E-04	mg/kg/day	2.0E+00
				Iron, Dissolved	2.3E+03	µg/L	N/A		N/A		N/A	9.7E-02	mg/kg/day	7.0E-01	mg/kg/day	1.4E-01
				Manganese, Dissolved	8.6E+01	µg/L	N/A		N/A		N/A	3.7E-03	mg/kg/day	2.4E-02	mg/kg/day	1.5E-01
				Selenium, Dissolved	6.7E+00	µg/L	N/A		N/A		N/A	2.9E-04	mg/kg/day	5.0E-03	mg/kg/day	5.7E-02
				Zinc, Dissolved	3.4E+01	µg/L	N/A		N/A		N/A	1.4E-03	mg/kg/day	3.0E-01	mg/kg/day	4.8E-03
			Exp. Route Total								0.0E+00					1.6E+03
			Dermal	1,1,2-Trichloroethane	1.7E+00	µg/L	N/A		N/A		N/A	3.8E-06	mg/kg/day	4.0E-03	mg/kg/day	9.5E-04
				Chloroform	7.4E-01	µg/L	N/A		N/A		N/A	1.6E-06	mg/kg/day	1.0E-02	mg/kg/day	1.6E-04
				cis-1,2-Dichloroethene	3.0E+03	µg/L	N/A		N/A		N/A	7.1E-03	mg/kg/day	2.0E-03	mg/kg/day	3.5E+00
				Trichloroethene	1.8E+04	µg/L	N/A		N/A		N/A	7.2E-02	mg/kg/day	5.0E-04	mg/kg/day	1.4E+02
				Vinyl chloride	3.6E+00	µg/L	N/A		N/A		N/A	4.6E-06	mg/kg/day	3.0E-03	mg/kg/day	1.5E-03
				Aluminum, Dissolved	1.3E+03	µg/L	N/A		N/A		N/A	1.2E-04	mg/kg/day	1.0E+00	mg/kg/day	1.2E-04
				Arsenic, Dissolved	5.4E+00	µg/L	N/A		N/A		N/A	5.0E-07	mg/kg/day	3.0E-04	mg/kg/day	1.7E-03
				Chromium, Dissolved	1.4E+00	µg/L	N/A		N/A		N/A	2.6E-07	mg/kg/day	7.5E-05	mg/kg/day	3.5E-03
				Cobalt, Dissolved	1.4E+01	µg/L	N/A		N/A		N/A	5.1E-07	mg/kg/day	3.0E-04	mg/kg/day	1.7E-03
				Iron, Dissolved	2.3E+03	µg/L	N/A		N/A		N/A	2.1E-04	mg/kg/day	7.0E-01	mg/kg/day	3.0E-04
				Manganese, Dissolved	8.6E+01	µg/L	N/A		N/A		N/A	8.0E-06	mg/kg/day	9.6E-04	mg/kg/day	8.4E-03
				Selenium, Dissolved	6.7E+00	µg/L	N/A		N/A		N/A	6.2E-07	mg/kg/day	5.0E-03	mg/kg/day	1.2E-04
				Zinc, Dissolved	3.4E+01	µg/L	N/A		N/A		N/A	1.9E-06	mg/kg/day	3.0E-01	mg/kg/day	6.3E-06
			Exp. Route Total								0.0E+00					1.5E+02
		Exposure Point Total									0.0E+00					1.8E+03
	Exposure Medium Total										0.0E+00					1.8E+03
	Air	Columbia and Yorktown -Eastover Aquifer Water Vapors at Showerhead	Inhalation	1,1,2-Trichloroethane	1.7E+00	µg/L	N/A		N/A		N/A	1.2E-10	mg/m^3	2.0E-04		5.9E-07
				Chloroform	7.4E-01	µg/L	N/A		N/A		N/A	5.0E-11	mg/m^3	9.8E-02	mg/m^3	5.1E-10
				cis-1,2-Dichloroethene	3.0E+03	µg/L	N/A		N/A		N/A	2.2E-07	mg/m^3	N/A		N/A
				Trichloroethene	1.8E+04	µg/L	N/A		N/A		N/A	2.2E-06	mg/m^3	2.0E-03	mg/m^3	1.1E-03
				Vinyl chloride	3.6E+00	µg/L	N/A		N/A		N/A	1.4E-10	mg/m^3	1.0E-01	mg/m^3	1.4E-09
			Exp. Route Total								0.0E+00					1.1E-03
		Exposure Point Total									0.0E+00					1.1E-03
	Exposure Medium Total										0.0E+00					1.1E-03
Groundwater Total											0.0E+00					1.8E+03

N/A - Not available.

DA_{event} for dermal exposure to groundwater calculated on Table 7.2.CTE Supplement A

Table 7.2.CTE Supplement A
Calculation of DA_{event}
Residential Child Groundwater
Site 1, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient (K_p) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (t_{event}) (hr)	DA_{event} (mg/cm^2-event)	Eq
1,1,2-Trichloroethane	1.7E+00	6.4E-03	2.9E-02	6.0E-01	1.4E+00	1.0E+00	0.33	1.3E-08	2
Chloroform	7.4E-01	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	0.33	5.7E-09	2
cis-1,2-Dichloroethene[1]	3.0E+03	7.7E-03	2.9E-02	3.7E-01	8.9E-01	1.0E+00	0.33	2.5E-05	2
Trichloroethene	1.8E+04	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	0.33	2.5E-04	2
Vinyl chloride	3.6E+00	5.6E-03	1.7E-02	2.4E-01	5.7E-01	1.0E+00	0.33	1.6E-08	2
Aluminum, Dissolved	1.3E+03	1.0E-03	NA	NA	NA	NA	0.33	4.4E-07	1
Arsenic, Dissolved	5.4E+00	1.0E-03	NA	NA	NA	NA	0.33	1.8E-09	1
Chromium, Dissolved	1.4E+00	2.0E-03	NA	NA	NA	NA	0.33	9.2E-10	1
Cobalt, Dissolved	1.4E+01	4.0E-04	NA	NA	NA	NA	0.33	1.8E-09	1
Iron, Dissolved	2.3E+03	1.0E-03	NA	NA	NA	NA	0.33	7.5E-07	1
Manganese, Dissolved	8.6E+01	1.0E-03	NA	NA	NA	NA	0.33	2.8E-08	1
Selenium, Dissolved	6.7E+00	1.0E-03	NA	NA	NA	NA	0.33	2.2E-09	1
Zinc, Dissolved	3.4E+01	6.0E-04	NA	NA	NA	NA	0.33	6.7E-09	1

[1] trans-1,2-Dichloroethane used as a surrogate.

Inorganics: DA_{event} (mg/cm^2-event) =

K_p x CW x t_{event} x 0.001 mg/µg x 0.001 l/cm^3 (eq 1)

Organics: DA_{event} (mg/cm^2-event) =

If t_{event}<t*, then DA_{event} =

2 x FA x K_p x CW x (sqrt((6 x τ_{event} x t_{event})/π)) x 0.001 mg/µg x 0.001 l/cm^3 (eq 2)

If t_{event}>t*, then DA_{event} =

FA x K_p x CW x (t_{event}/(1+B) + 2 x τ_{event} x ((1 + 3xB + 3xB^2)/$(1+B)^2$) x 0.001 mg/µg x 0.001 l/cm^3 (eq 3)

Notes:

NA - Not applicable

Permeability constants and other input parameter values from EPA 2004,*Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document

B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).

t* - Time to reach steady-state

Table 7.2.CTE Supplement B

Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model

Child Resident

Site 1, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Exposure Point Concentration Cwo (µg/L)	Molecular weight (MW) (g/mole)	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl (VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/L)	S (µg/m^3 -min)	Ca (mg/m^3)
1,1,2-Trichloroethane	1.7E+00	1.3E+02	8.2E-04	1.1E+03	1.1E+01	8.8E+00	1.2E+01	1.6E-01	1.3E-01	1.8E-03
Chloroform	7.4E-01	1.2E+02	3.7E-03	1.2E+03	1.2E+01	1.1E+01	1.5E+01	8.9E-02	7.4E-02	9.7E-04
cis-1,2-Dichloroethene	3.0E+03	9.7E+01	4.1E-03	1.3E+03	1.3E+01	1.3E+01	1.7E+01	4.0E+02	3.3E+02	4.4E+00
Trichloroethene	1.8E+04	1.3E+02	9.9E-03	1.1E+03	1.2E+01	1.1E+01	1.5E+01	2.1E+03	1.8E+03	2.4E+01
Vinyl chloride	3.6E+00	6.3E+01	2.8E-02	1.6E+03	1.7E+01	1.7E+01	2.2E+01	6.1E-01	5.1E-01	6.7E-03

Variables	Units	Exposure Assumptions
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4
Tl = Calibration temp. of water	K (20C +273)	293
Ts = Shower water temperature	k (45C)	318
Us = water viscosity at Ts	centipoise	0.596
Ul = water viscosity at Tl	cp	1.002
Cwd = conc. leaving droplets after time sdt	µg/l	Solved by Eq 5
sdt = shower droplet drop time	sec	0.5
d = shower droplet diameter	mm	1
FR = shower water flow rate	l/min	10
SV = shower room air volume	m^3	12
S = indoor VOC generation rate	µg/m^3-min	Solved by Eq 6
Ds = duration of shower	min	19.8
Dt = total duration in shower room	min	40
R = air exchange rate	min^{-1}	0.0083
Ca = indoor air concentration of VOCs	µg/m^3	Solved by Eq 7

Equation 1:	Kg(VOC) =	$3000 * (18 / MW)^{0.5}$
Equation 2:	Kl(VOC) =	$20 * (44 / MW)^{0.5}$
Equation 3:	KL =	$((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))^{-1}$
Equation 4:	Kal =	$(KL * (((Tl * Us) / (Ts * Ul))^{-0.5}))$
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))
Equation 6:	S =	(Cwd * FR / SV)
Equation 7:	Ca =	If t>Ds [(S / R) * (Ds + (EXP(-R * Dt) / R) -(EXP(R *(Ds - Dt)) / R)] / Dt * 1/1000

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/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	
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	Ingestion	1,1,2-Trichloroethane	1.7E+00	µg/L	9.0E-06	mg/kg/day	5.7E-02	(mg/kg-day)$^{-1}$	5.1E-07	N/A		N/A		N/A
				Chloroform	7.4E-01	µg/L	3.9E-06	mg/kg/day	3.1E-02	(mg/kg-day)$^{-1}$	1.2E-07	N/A		N/A		N/A
				cis-1,2-Dichloroethene	3.0E+03	µg/L	1.6E-02	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Trichloroethene (1)	1.8E+04	µg/L			4.6E-02	(mg/kg-day)$^{-1}$	2.0E-02	N/A		N/A		N/A
				Vinyl chloride (1)	3.6E+00	µg/L			7.2E-01	(mg/kg-day)$^{-1}$	2.4E-05	N/A		N/A		N/A
				Aluminum, Dissolved	1.3E+03	µg/L	7.0E-03	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Arsenic, Dissolved	5.4E+00	µg/L	2.9E-05	mg/kg/day	1.5E+00	(mg/kg-day)$^{-1}$	4.3E-05	N/A		N/A		N/A
				Chromium, Dissolved (1)	1.4E+00	µg/L			5.0E-01	(mg/kg-day)$^{-1}$	1.7E-05	N/A		N/A		N/A
				Cobalt, Dissolved	1.4E+01	µg/L	7.3E-05	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Iron, Dissolved	2.3E+03	µg/L	1.2E-02	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Manganese, Dissolved	8.6E+01	µg/L	4.6E-04	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Selenium, Dissolved	6.7E+00	µg/L	3.6E-05	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Zinc, Dissolved	3.4E+01	µg/L	1.8E-04	mg/kg/day	N/A		N/A	N/A		N/A		N/A
			Exp. Route Total								2.0E-02					0.0E+00
			Dermal	1,1,2-Trichloroethane	1.7E+00	µg/L	5.7E-07	mg/kg/day	5.7E-02	(mg/kg-day)$^{-1}$	3.3E-08	N/A		N/A		N/A
				Chloroform	7.4E-01	µg/L	2.4E-07	mg/kg/day	3.1E-02	(mg/kg-day)$^{-1}$	7.5E-09	N/A		N/A		N/A
				cis-1,2-Dichloroethene	3.0E+03	µg/L	1.0E-03	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Trichloroethene (1)	1.8E+04	µg/L			4.6E-02	(mg/kg-day)$^{-1}$	2.1E-03	N/A		N/A		N/A
				Vinyl chloride (1)	3.6E+00	µg/L			7.2E-01	(mg/kg-day)$^{-1}$	8.2E-07	N/A		N/A		N/A
				Aluminum, Dissolved	1.3E+03	µg/L			N/A		N/A	N/A		N/A		N/A
				Arsenic, Dissolved	5.4E+00	µg/L	7.2E-08	mg/kg/day	1.5E+00	(mg/kg-day)$^{-1}$	1.1E-07	N/A		N/A		N/A
				Chromium, Dissolved (1)	1.4E+00	µg/L			1.3E-02	(mg/kg-day)$^{-1}$	2.0E-09	N/A		N/A		N/A
				Cobalt, Dissolved	1.4E+01	µg/L	7.3E-08	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Iron, Dissolved	2.3E+03	µg/L	3.0E-05	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Manganese, Dissolved	8.6E+01	µg/L	1.1E-06	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Selenium, Dissolved	6.7E+00	µg/L	5.7E-07	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Zinc, Dissolved	3.4E+01	µg/L	1.7E-06	mg/kg/day	N/A		N/A	N/A		N/A		N/A
			Exp. Route Total								2.2E-03					0.0E+00
		Exposure Point Total									2.2E-02					0.0E+00
	Exposure Medium Total										2.2E-02					0.0E+00

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/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	
Groundwater	Air	Columbia and Yorktown -Eastover Aquifer Water Vapors at Showerhead	Inhalation	1,1,2-Trichloroethane	1.7E+00	µg/L	2.5E-06	µg/m^3	1.6E-05	(µg/m^3)$^{-1}$	4.0E-11			N/A		N/A
				Chloroform	7.4E-01	µg/L	1.4E-06	µg/m^3	2.3E-05	(µg/m^3)$^{-1}$	3.2E-11			N/A		N/A
				cis-1,2-Dichloroethene	3.0E+03	µg/L	6.2E-03	µg/m^3	N/A	(µg/m^3)$^{-1}$	N/A			N/A		N/A
				Trichloroethene (1)	1.8E+04	µg/L			4.6E-06	(µg/m^3)$^{-1}$	2.3E-03			N/A		N/A
				Vinyl chloride (1)	3.6E+00	µg/L			4.4E-06	(µg/m^3)$^{-1}$	6.5E-08			N/A		N/A
			Exp. Route Total								2.3E-03					0.0E+00
		Exposure Point Total									2.3E-03					0.0E+00
	Exposure Medium Total										2.3E-03					0.0E+00
Groundwater Total											2.5E-02					0.0E+00

N/A - Not available.

DA_{event} for dermal exposure to groundwater calculated on Tables 7.1.CTE Supplement A and 7.2.CTE Supplement A

Inhalation exposure while showering calculated on Tables 7.1.CTME Supplement B and 7.2.CTE Supplement B

1. See Table 7.3.CTE Supplement A for calculation of intake and cancer risk following MMOA method.

TABLE 7.3.CTE Supplement A

CALCULATION OF CHEMICAL CANCER RISKS FOR COPC WITH MUTAGENIC MODE OF ACTION

CENTRAL TENDENCY EXPOSURE

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations										
							Intake					CSF/Unit Risk					Cancer Risk
					Value	Units	Value				Units	Value				Units	
							0-2 yrs	2-6 yrs	6-16 years	16-30 yrs		0-2 yrs (ADAF=10)	2-6 yrs (ADAF=3)	6-16 yrs (ADAF=3)	16-30 yrs (ADAF=1)		
Groundwater	Groundwater	Tap Water	Ingestion	Trichloroethene	1.8E+04	ug/l	2.2E-02	4.4E-02	3.0E-02		mg/kg/day	4.6E-01	1.4E-01	1.4E-01	4.6E-02	1/(mg/kg-day)	2.0E-02
				Vinyl chloride	3.6E+00	ug/l	1.3E-05		5.9E-06		mg/kg/day	1.5E+00		7.2E-01		1/(mg/kg-day)	2.4E-05
				Chromium	1.4E+00	ug/l	1.7E-06	3.4E-06	2.3E-06		mg/kg/day	5.0E+00	1.5E+00	1.5E+00	5.0E-01	1/(mg/kg-day)	1.7E-05
			Dermal	Trichloroethene	1.8E+04	ug/l	2.0E-03	4.1E-03	4.7E-03		mg/kg/day	4.6E-01	1.4E-01	1.4E-01	4.6E-02	1/(mg/kg-day)	2.1E-03
				Vinyl chloride	3.6E+00	ug/l	3.9E-07		3.1E-07		mg/kg/day	1.5E+00		7.2E-01		1/(mg/kg-day)	8.2E-07
				Chromium	1.4E+00	ug/l	7.4E-09	1.5E-08	1.5E-08		mg/kg/day	1.3E-01	3.8E-02	3.8E-02	1.3E-02	1/(mg/kg-day)	2.0E-09
	Air	Columbia and Yorktown -Eastover Aquifer Water Vapors at Showerhead	Inhalation	Trichloroethene	1.8E+04	ug/l	5.9E+00	1.2E+01	1.6E+02		$\mu g/m^3$	4.1E-05	1.2E-05	1.2E-05	4.1E-06	$(\mu g/m^3)^{-1}$	2.3E-03
				Vinyl chloride	3.6E+00	ug/l	5.1E-03		4.5E-03		$\mu g/m^3$	8.8E-06		4.4E-06		$(\mu g/m^3)^{-1}$	6.5E-08

Cancer risk = $(Intake_{0-2} \times CSF_{0-2}) + (Intake_{2-6} \times CSF_{2-6}) + (Intake_{6-16} \times CSF_{6-16}) + (Intake_{16-30} \times CSF_{16-30})$

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 1

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial 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	
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	Ingestion	1,1,2-Trichloroethane	1.7E+00	µg/L	1.9E-06	mg/kg/day	5.7E-02	(mg/kg-day)-1	1.1E-07	1.5E-05	mg/kg/day	4.0E-03	mg/kg/day	3.6E-03
				Chloroform	7.4E-01	µg/L	8.2E-07	mg/kg/day	3.1E-02	(mg/kg-day)-1	2.5E-08	6.3E-06	mg/kg/day	1.0E-02	mg/kg/day	6.3E-04
				cis-1,2-Dichloroethene	3.0E+03	µg/L	3.3E-03	mg/kg/day	N/A	(mg/kg-day)-1	N/A	2.6E-02	mg/kg/day	2.0E-03	mg/kg/day	1.3E+01
				Trichloroethene	1.8E+04	µg/L	2.0E-02	mg/kg/day	4.6E-02	(mg/kg-day)-1	9.1E-04	1.5E-01	mg/kg/day	5.0E-04	mg/kg/day	3.1E+02
				Vinyl chloride	3.6E+00	µg/L	4.0E-06	mg/kg/day	7.2E-01	(mg/kg-day)-1	2.9E-06	3.1E-05	mg/kg/day	3.0E-03	mg/kg/day	1.0E-02
				Aluminum, Dissolved	1.3E+03	µg/L	1.5E-03	mg/kg/day	N/A	(mg/kg-day)-1	N/A	1.1E-02	mg/kg/day	1.0E+00	mg/kg/day	1.1E-02
				Arsenic, Dissolved	5.4E+00	µg/L	5.9E-06	mg/kg/day	1.5E+00	(mg/kg-day)-1	8.9E-06	4.6E-05	mg/kg/day	3.0E-04	mg/kg/day	1.5E-01
				Chromium, Dissolved	1.4E+00	µg/L	1.5E-06	mg/kg/day	5.0E-01	(mg/kg-day)-1	7.7E-07	1.2E-05	mg/kg/day	3.0E-03	mg/kg/day	4.0E-03
				Cobalt, Dissolved	1.4E+01	µg/L	1.5E-05	mg/kg/day	N/A	(mg/kg-day)-1	N/A	1.2E-04	mg/kg/day	3.0E-04	mg/kg/day	3.9E-01
				Iron, Dissolved	2.3E+03	µg/L	2.5E-03	mg/kg/day	N/A	(mg/kg-day)-1	N/A	1.9E-02	mg/kg/day	7.0E-01	mg/kg/day	2.8E-02
				Manganese, Dissolved	8.6E+01	µg/L	9.5E-05	mg/kg/day	N/A	(mg/kg-day)-1	N/A	7.4E-04	mg/kg/day	2.4E-02	mg/kg/day	3.1E-02
				Selenium, Dissolved	6.7E+00	µg/L	7.4E-06	mg/kg/day	N/A		N/A	5.7E-05	mg/kg/day	5.0E-03	mg/kg/day	1.1E-02
				Zinc, Dissolved	3.4E+01	µg/L	3.7E-05	mg/kg/day	N/A		N/A	2.9E-04	mg/kg/day	3.0E-01	mg/kg/day	9.7E-04
			Exp. Route Total								9.3E-04					3.2E+02
		Exposure Point Total									9.3E-04					3.2E+02
	Exposure Medium Total										9.3E-04					3.2E+02
Groundwater Total											9.3E-04					3.2E+02

N/A - Not available.

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 1

NWS Yorktown, Yorktown, Virginia

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	
Groundwater	Groundwater	Columbia and Yorktown-Eastover Aquifer Water in Excavation Pit	Dermal	1,1,2-Trichloroethane	1.7E+00	µg/L	2.2E-08	mg/kg/day	5.7E-02	$(mg/kg\text{-}day)^{-1}$	1.3E-09	1.6E-06	mg/kg/day	4.0E-02	mg/kg/day	3.9E-05
				Chloroform	7.4E-01	µg/L	9.9E-09	mg/kg/day	3.1E-02	$(mg/kg\text{-}day)^{-1}$	3.1E-10	6.9E-07	mg/kg/day	2.0E-02	mg/kg/day	3.5E-05
				cis-1,2-Dichloroethene	3.0E+03	µg/L	4.3E-05	mg/kg/day	N/A		N/A	3.0E-03	mg/kg/day	2.0E-02	mg/kg/day	1.5E-01
				Trichloroethene	1.8E+04	µg/L	4.2E-04	mg/kg/day	4.6E-02	$(mg/kg\text{-}day)^{-1}$	1.9E-05	2.9E-02	mg/kg/day	5.0E-04	mg/kg/day	5.9E+01
				Vinyl chloride	3.6E+00	µg/L	3.5E-08	mg/kg/day	7.2E-01	$(mg/kg\text{-}day)^{-1}$	2.6E-08	2.5E-06	mg/kg/day	3.0E-03	mg/kg/day	8.3E-04
				Aluminum	3.9E+03	µg/L	6.2E-06	mg/kg/day	N/A		N/A	4.4E-04	mg/kg/day	1.0E+00	mg/kg/day	4.4E-04
				Antimony	8.5E+00	µg/L	1.3E-08	mg/kg/day	N/A		N/A	9.4E-07	mg/kg/day	6.0E-05	mg/kg/day	1.6E-02
				Arsenic	1.1E+01	µg/L	1.7E-08	mg/kg/day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.6E-08	1.2E-06	mg/kg/day	3.0E-04	mg/kg/day	4.1E-03
				Cadmium	2.9E+00	µg/L	4.6E-09	mg/kg/day	N/A		N/A	3.2E-07	mg/kg/day	2.5E-05	mg/kg/day	1.3E-02
				Chromium	2.5E+01	µg/L	7.9E-08	mg/kg/day	5.0E-01	$(mg/kg\text{-}day)^{-1}$	3.9E-08	5.5E-06	mg/kg/day	5.0E-04	mg/kg/day	1.1E-02
				Cobalt	8.8E+00	µg/L	5.6E-09	mg/kg/day	N/A		N/A	3.9E-07	mg/kg/day	3.0E-03	mg/kg/day	1.3E-04
				Iron	8.7E+03	µg/L	1.4E-05	mg/kg/day	N/A		N/A	9.7E-04	mg/kg/day	7.0E-01	mg/kg/day	1.4E-03
				Manganese	6.4E+02	µg/L	1.0E-06	mg/kg/day	N/A		N/A	7.1E-05	mg/kg/day	9.6E-04	mg/kg/day	7.4E-02
				Vanadium	2.0E+01	µg/L	3.1E-08	mg/kg/day	N/A		N/A	2.2E-06	mg/kg/day	1.8E-04	mg/kg/day	1.2E-02
				Zinc	3.0E+01	µg/L	5.8E-08	mg/kg/day	N/A		N/A	2.0E-06	mg/kg/day	3.0E-01	mg/kg/day	6.7E-06
			Exp. Route Total								1.9E-05					5.9E+01
		Exposure Point Total									1.9E-05					5.9E+01
	Exposure Medium Total										1.9E-05					5.9E+01
	Air	Columbia and Yorktown - Eastover Aquifer Water Vapors in Excavation Pit	Inhalation	1,1,2-Trichloroethane	1.7E+00	µg/L	5.2E-05	$\mu g/m^3$	1.6E-05	$(\mu g/m^3)^{-1}$	8.4E-10	3.7E-06	mg/m^3	2.0E-03	mg/m^3	1.8E-03
				Chloroform	7.4E-01	µg/L	2.2E-05	$\mu g/m^3$	2.3E-05	$(\mu g/m^3)^{-1}$	5.2E-10	1.6E-06	mg/m^3	9.8E-02	mg/m^3	1.6E-05
				cis-1,2-Dichloroethene	3.0E+03	µg/L	1.1E-01	$\mu g/m^3$	N/A		N/A	8.0E-03	mg/m^3	N/A		N/A
				Trichloroethene	1.8E+04	µg/L	5.9E-01	$\mu g/m^3$	4.1E-06	$(\mu g/m^3)^{-1}$	2.4E-06	4.1E-02	mg/m^3	3.0E-03	mg/m^3	1.4E+01
				Vinyl chloride	3.6E+00	µg/L	1.7E-04	$\mu g/m^3$	4.4E-06	$(\mu g/m^3)^{-1}$	7.6E-10	1.2E-05	mg/m^3	1.0E-01	mg/m^3	1.2E-04
			Exp. Route Total								2.4E-06					1.4E+01
		Exposure Point Total									2.4E-06					1.4E+01
	Exposure Medium Total										2.4E-06					1.4E+01
Groundwater Total											2.2E-05					7.3E+01
Total of Receptor Risks Across All Media											2.2E-05	Total of Receptor Hazards Across All Media				7.3E+01

N/A - Not available.

DA_{event} for dermal exposure to groundwater calculated on Tables 7.5.CTE Supplement A

Table 7.5.CTE Supplement A
Calculation of DA_{event}
Construction Worker Groundwater
Site 1, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient (K_p) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (t_{event}) (hr)	DA_{event} (mg/cm^2-event)	Eq
1,1,2-Trichloroethane	1.7E+00	6.4E-03	2.9E-02	6.0E-01	1.4E+00	1.0E+00	4	5.6E-08	3
Chloroform	7.4E-01	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	4	2.5E-08	3
cis-1,2-Dichloroethene	3.0E+03	7.7E-03	2.9E-02	3.7E-01	8.9E-01	1.0E+00	4	1.1E-04	3
Trichloroethene	1.8E+04	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	4	1.1E-03	3
Vinyl chloride	3.6E+00	5.6E-03	1.7E-02	2.4E-01	5.7E-01	1.0E+00	4	8.9E-08	3
Aluminum	3.9E+03	1.0E-03	NA	NA	NA	NA	4	1.6E-05	1
Antimony	8.5E+00	1.0E-03	NA	NA	NA	NA	4	3.4E-08	1
Arsenic	1.1E+01	1.0E-03	NA	NA	NA	NA	4	4.4E-08	1
Cadmium	2.9E+00	1.0E-03	NA	NA	NA	NA	4	1.2E-08	1
Chromium	2.5E+01	2.0E-03	NA	NA	NA	NA	4	2.0E-07	1
Cobalt	8.8E+00	4.0E-04	NA	NA	NA	NA	4	1.4E-08	1
Iron	8.7E+03	1.0E-03	NA	NA	NA	NA	4	3.5E-05	1
Manganese	6.4E+02	1.0E-03	NA	NA	NA	NA	4	2.6E-06	1
Vanadium	2.0E+01	1.0E-03	NA	NA	NA	NA	4	7.9E-08	1
Zinc	3.0E+01	6.0E-04	NA	NA	NA	NA	4	7.2E-08	1

Inorganics: DA_{event} (mg/cm^2-event) =
K_p x CW x t_{event} x 0.001 mg/µg x 0.001 l/cm^3 (eq 1)

Organics: DA_{event} (mg/cm^2-event) =
If t_{event}<t*, then DA_{event} =
2 x FA x K_p x CW x (sqrt((6 x τ_{event} x t_{event})/π)) x 0.001 mg/µg x 0.001 l/cm^3 (eq 2)

If t_{event}>t*, then DA_{event} =
FA x K_p x CW x (t_{event}/(1+B) + 2 x τ_{event} x ((1 + 3xB + 3xB^2)/(1+B)^2) x 0.001 mg/µg x 0.001 l/cm^3 (eq 3)

Notes:
NA - Not applicable
Permeability constants from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	1,1,2-Trichloroethane	N/A	N/A	N/A	0.0.E+00	Blood	1.2.E-02	N/A	1.1.E-03	1.3.E-02
			Chloroform	N/A	N/A	N/A	0.0.E+00	Liver	2.0.E-03	N/A	1.8.E-04	2.2.E-03
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0.E+00	Kidney	4.1.E+01	N/A	3.7.E+00	4.5.E+01
			Trichloroethene	N/A	N/A	N/A	0.0.E+00	Heart, Immunotoxicity	9.9.E+02	N/A	1.7.E+02	1.2.E+03
			Vinyl chloride	N/A	N/A	N/A	0.0.E+00	Liver	3.3.E-02	N/A	1.7.E-03	3.5.E-02
			Aluminum, Dissolved	N/A	N/A	N/A	0.0.E+00	Neurological, Developmental	3.6.E-02	N/A	1.9.E-04	3.6.E-02
			Arsenic, Dissolved	N/A	N/A	N/A	0.0.E+00	Skin, Vascular	4.9.E-01	N/A	2.6.E-03	5.0.E-01
			Chromium, Dissolved	N/A	N/A	N/A	0.0.E+00	Not identified	1.3.E-02	N/A	5.3.E-03	1.8.E-02
			Cobalt, Dissolved	N/A	N/A	N/A	0.0.E+00	Thyroid	1.3.E+00	N/A	2.6.E-03	1.3.E+00
			Iron, Dissolved	N/A	N/A	N/A	0.0.E+00	Gastrointestinal	8.9.E-02	N/A	4.6.E-04	8.9.E-02
			Manganese, dissolved	N/A	N/A	N/A	0.0.E+00	CNS	9.8.E-02	N/A	1.3.E-02	1.1.E-01
			Selenium, Dissolved	N/A	N/A	N/A	0.0.E+00	Whole Body	3.7.E-02	N/A	1.9.E-04	3.7.E-02
			Zinc, Dissolved	N/A	N/A	N/A	0.0.E+00	Blood	3.1.E-03	N/A	9.7.E-06	3.1.E-03
			Chemical Total	0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00		1.0.E+03	0.0.E+00	1.7.E+02	1.2.E+03
		Exposure Point Total					0.0.E+00					1.2.E+03
	Exposure Medium Total						0.0.E+00					1.2.E+03
	Air	Columbia and Yorktown -Eastover Water Vapors at Showerhead	1,1,2-Trichloroethane	N/A	N/A	N/A	0.0.E+00	Nasal	N/A	3.2.E-01	N/A	3.2.E-01
			Chloroform	N/A	N/A	N/A	0.0.E+00	Liver	N/A	3.6.E-04	N/A	3.6.E-04
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0.E+00	N/A	N/A	N/A	N/A	0.0.E+00
			Trichloroethene	N/A	N/A	N/A	0.0.E+00	Heart, Immunotoxicity	N/A	4.3.E+02	N/A	4.3.E+02
			Vinyl chloride	N/A	N/A	N/A	0.0.E+00	Liver	N/A	2.5.E-03	N/A	2.5.E-03
			Chemical Total	0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00		0.0.E+00	4.3.E+02	0.0.E+00	4.3.E+02
		Exposure Point Total					0.0.E+00					4.3.E+02
	Exposure Medium Total						0.0.E+00					4.3.E+02
Medium Total							0.0.E+00					1.6.E+03
Receptor Total							0.0.E+00				Receptor HI Total	1.6.E+03

HI - Hazard Index
N/A - Not applicable
CNS = Central Nervous System

Total Blood HI Across All Media =	1.6.E-02
Total Gastrointestinal HI Across All Media=	8.9.E-02
Total Kidney HI Across All Media =	4.5.E+01
Total Liver HI Across All Media =	4.0.E-02

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
								Total Neurological/Nervous System HI Across All Media =				1.5.E-01
								Total Whole Body HI Across all Media =				3.7.E-02
								Total Developmental HI Across all Media =				3.6.E-02
								Total Skin HI Across All Media=				5.0.E-01
								Total Thyroid HI Across All Media=				1.3.E+00
								Total Vascular HI Across All Media=				5.0.E-01
								Total Heart HI Across All Media=				1.6.E+03
								Total Immune System HI Across All Media=				1.6.E+03
								Total Nasal HI Across All Media=				3.2.E-01

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	1,1,2-Trichloroethane	N/A	N/A	N/A	0.0.E+00	Blood	2.7.E-02	N/A	2.5.E-03	3.0.E-02
			Chloroform	N/A	N/A	N/A	0.0.E+00	Liver	4.7.E-03	N/A	4.2.E-04	5.1.E-03
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0.E+00	Kidney	9.6.E+01	N/A	8.5.E+00	1.0.E+02
			Trichloroethene	N/A	N/A	N/A	0.0.E+00	Heart, Immunotoxicity	2.3.E+03	N/A	3.7.E+02	2.7.E+03
			Vinyl chloride	N/A	N/A	N/A	0.0.E+00	Liver	7.7.E-02	N/A	4.2.E-03	8.1.E-02
			Aluminum, Dissolved	N/A	N/A	N/A	0.0.E+00	Neurological, Developmental	8.4.E-02	N/A	5.6.E-04	8.5.E-02
			Arsenic, Dissolved	N/A	N/A	N/A	0.0.E+00	Skin, Vascular	1.2.E+00	N/A	7.6.E-03	1.2.E+00
			Chromium, Dissolved	N/A	N/A	N/A	0.0.E+00	Not identified	3.0.E-02	N/A	1.6.E-02	4.6.E-02
			Cobalt, Dissolved	N/A	N/A	N/A	0.0.E+00	Thyroid	2.9.E+00	N/A	7.7.E-03	2.9.E+00
			Iron, Dissolved	N/A	N/A	N/A	0.0.E+00	Gastrointestinal	2.1.E-01	N/A	1.4.E-03	2.1.E-01
			Manganese, dissolved	N/A	N/A	N/A	0.0.E+00	CNS	2.3.E-01	N/A	3.8.E-02	2.7.E-01
			Selenium, Dissolved	N/A	N/A	N/A	0.0.E+00	Whole Body	8.6.E-02	N/A	5.7.E-04	8.6.E-02
			Zinc, Dissolved	N/A	N/A	N/A	0.0.E+00	Blood	7.2.E-03	N/A	2.9.E-05	7.2.E-03
			Chemical Total	0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00		2.4.E+03	0.0.E+00	3.8.E+02	2.8.E+03
		Exposure Point Total					0.0.E+00					2.8.E+03
	Exposure Medium Total						0.0.E+00					2.8.E+03
	Air	Columbia and Yorktown -Eastover Water Vapors at Showerhead	1,1,2-Trichloroethane	N/A	N/A	N/A	0.0.E+00	Nasal	N/A	1.8.E-01	N/A	1.8.E-01
			Chloroform	N/A	N/A	N/A	0.0.E+00	Liver	N/A	2.0.E-04	N/A	2.0.E-04
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0.E+00	N/A	N/A	N/A	N/A	0.0.E+00
			Trichloroethene	N/A	N/A	N/A	0.0.E+00	Heart, Immunotoxicity	N/A	2.4.E+02	N/A	2.4.E+02
			Vinyl chloride	N/A	N/A	N/A	0.0.E+00	Liver	N/A	1.4.E-03	N/A	1.4.E-03
			Chemical Total	0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00		0.0.E+00	2.4.E+02	0.0.E+00	2.4.E+02
		Exposure Point Total					0.0.E+00					2.4.E+02
	Exposure Medium Total						0.0.E+00					2.4.E+02
Medium Total							0.0.E+00					3.0.E+03
Receptor Total							0.0.E+00				Receptor HI Total	3.0.E+03

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

HI - Hazard Index
N/A - Not applicable
CNS = Central Nervous System

Total Blood HI Across All Media =	3.7.E-02
Total Gastrointestinal HI Across All Media=	2.1.E-01
Total Kidney HI Across All Media =	1.0.E+02
Total Liver HI Across All Media =	8.8.E-02
Total Neurological/Nervous System HI Across All Media =	3.5.E-01
Total Whole Body HI Across all Media =	8.6.E-02
Total Developmental HI Across all Media =	8.5.E-02
Total Skin HI Across All Media=	1.2.E+00
Total Thyroid HI Across All Media=	2.9.E+00
Total Vascular HI Across All Media=	1.2.E+00
Total Heart HI Across All Media=	2.9.E+03
Total Immune System HI Across All Media=	2.9.E+03
Total Nasal HI Across All Media=	1.8.E-01

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	1,1,2-Trichloroethane	1.4.E-06	N/A	1.3.E-07	1.6.E-06	Blood	N/A	N/A	N/A	0.0.E+00
			Chloroform	3.4.E-07	N/A	3.1.E-08	3.7.E-07	Liver	N/A	N/A	N/A	0.0.E+00
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0.E+00	Kidney	N/A	N/A	N/A	0.0.E+00
			Trichloroethene	3.8.E-02	N/A	6.3.E-03	4.5.E-02	Heart, Immunotoxicity	N/A	N/A	N/A	0.0.E+00
			Vinyl chloride	5.4.E-05	N/A	2.9.E-06	5.7.E-05	Liver	N/A	N/A	N/A	0.0.E+00
			Aluminum, Dissolved	N/A	N/A	N/A	0.0.E+00	Neurological, Developmental	N/A	N/A	N/A	0.0.E+00
			Arsenic, Dissolved	1.2.E-04	N/A	6.9.E-07	1.2.E-04	Skin, Vascular	N/A	N/A	N/A	0.0.E+00
			Chromium, Dissolved	3.3.E-05	N/A	9.9.E-09	3.3.E-05	Not identified	N/A	N/A	N/A	0.0.E+00
			Cobalt, Dissolved	N/A	N/A	N/A	0.0.E+00	Thyroid	N/A	N/A	N/A	0.0.E+00
			Iron, Dissolved	N/A	N/A	N/A	0.0.E+00	Gastrointestinal	N/A	N/A	N/A	0.0.E+00
			Manganese-dissolved	N/A	N/A	N/A	0.0.E+00	CNS	N/A	N/A	N/A	0.0.E+00
			Selenium, Dissolved	N/A	N/A	N/A	0.0.E+00	Whole Body	N/A	N/A	N/A	0.0.E+00
			Zinc, Dissolved	N/A	N/A	N/A	0.0.E+00	Blood	N/A	N/A	N/A	0.0.E+00
			Chemical Total	3.9.E-02	0.0.E+00	6.3.E-03	4.5.E-02		0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00
		Exposure Point Total					4.5.E-02					0.0.E+00
	Exposure Medium Total						4.5.E-02					0.0.E+00
	Air	Columbia and Yorktown -Eastover Water Vapors at Showerhead	1,1,2-Trichloroethane	N/A	5.7.E-10	N/A	5.7.E-10	Nasal	N/A	N/A	N/A	0.0.E+00
			Chloroform	N/A	4.5.E-10	N/A	4.5.E-10	Liver	N/A	N/A	N/A	0.0.E+00
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0.E+00	N/A	N/A	N/A	N/A	0.0.E+00
			Trichloroethene	N/A	7.8.E-03	N/A	7.8.E-03	Heart, Immunotoxicity	N/A	N/A	N/A	0.0.E+00
			Vinyl chloride	N/A	8.4.E-07	N/A	8.4.E-07	Liver	N/A	N/A	N/A	0.0.E+00
			Chemical Total	0.0.E+00	7.8.E-03	0.0.E+00	7.8.E-03		0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00
		Exposure Point Total					7.8.E-03					0.0.E+00
	Exposure Medium Total						7.8.E-03					0.0.E+00
Medium Total							5.3.E-02					0.0.E+00
Receptor Total							5.3.E-02				Receptor HI Total	0.0.E+00

HI - Hazard Index

N/A - Not applicable

CNS = Central Nervous System

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 1, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	1,1,2-Trichloroethane	3.4.E-07	N/A	N/A	3.4.E-07	Blood	4.2.E-03	N/A	N/A	4.2.E-03
			Chloroform	8.0.E-08	N/A	N/A	8.0.E-08	Liver	7.2.E-04	N/A	N/A	7.2.E-04
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0.E+00	Kidney	1.5.E+01	N/A	N/A	1.5.E+01
			Trichloroethene	2.9.E-03	N/A	N/A	2.9.E-03	Heart, Immunotoxicity	3.5.E+02	N/A	N/A	3.5.E+02
			Vinyl chloride	9.1.E-06	N/A	N/A	9.1.E-06	Liver	1.2.E-02	N/A	N/A	1.2.E-02
			Aluminum, Dissolved	N/A	N/A	N/A	0.0.E+00	Neurological, Developmental	1.3.E-02	N/A	N/A	1.3.E-02
			Arsenic, Dissolved	2.8.E-05	N/A	N/A	2.8.E-05	Skin, Vascular	1.8.E-01	N/A	N/A	1.8.E-01
			Chromium, Dissolved	2.4.E-06	N/A	N/A	2.4.E-06	Not identified	4.6.E-03	N/A	N/A	4.6.E-03
			Cobalt, Dissolved	N/A	N/A	N/A	0.0.E+00	Thyroid	4.5.E-01	N/A	N/A	4.5.E-01
			Iron, Dissolved	N/A	N/A	N/A	0.0.E+00	Gastrointestinal	3.2.E-02	N/A	N/A	3.2.E-02
			Manganese, dissolved	N/A	N/A	N/A	0.0.E+00	CNS	3.5.E-02	N/A	N/A	3.5.E-02
			Selenium, Dissolved	N/A	N/A	N/A	0.0.E+00	Whole Body	1.3.E-02	N/A	N/A	1.3.E-02
			Zinc, Dissolved	N/A	N/A	N/A	0.0.E+00	Blood	1.1.E-03	N/A	N/A	1.1.E-03
			Chemical Total	2.9.E-03	0.0.E+00	0.0.E+00	2.9.E-03		3.7.E+02	0.0.E+00	0.0.E+00	3.7.E+02
		Exposure Point Total					2.9.E-03					3.7.E+02
	Exposure Medium Total						2.9.E-03					3.7.E+02
Medium Total							2.9.E-03					3.7.E+02
Receptor Total							2.9.E-03				Receptor HI Total	3.7.E+02

HI - Hazard Index
N/A - Not applicable
CNS = Central Nervous System

Total Blood HI Across All Media =	5.3.E-03
Total Gastrointestinal HI Across All Media=	3.2.E-02
Total Kidney HI Across All Media =	1.5.E+01
Total Liver HI Across All Media =	1.2.E-02
Total Neurological/Nervous System HI Across All Media =	4.8.E-02
Total Whole Body HI Across all Media =	1.3.E-02
Total Developmental HI Across all Media =	1.3.E-02
Total Skin HI Across All Media=	1.8.E-01
Total Thyroid HI Across All Media=	4.5.E-01
Total Vascular HI Across All Media=	1.8.E-01
Total Heart HI Across All Media=	3.5.E+02
Total Immune System HI Across All Media=	3.5.E+02

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown Eastover										
		Aquifer	1,1,2-Trichloroethane	N/A	N/A	2.2.E-09	2.2.E-09	Blood	N/A	N/A	6.9.E-04	6.9.E-04
		Excavation Pit	Chloroform	N/A	N/A	5.5.E-10	5.5.E-10	Liver	N/A	N/A	6.2.E-05	6.2.E-05
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0.E+00	Kidney	N/A	N/A	2.8.E-01	2.8.E-01
			Trichloroethene	N/A	N/A	3.4.E-05	3.4.E-05	Liver	N/A	N/A	1.0.E+02	1.0.E+02
			Vinyl chloride	N/A	N/A	4.8.E-08	4.8.E-08	Liver	N/A	N/A	1.6.E-03	1.6.E-03
			Aluminum	N/A	N/A	N/A	0.0.E+00	Neurological, Developmental	N/A	N/A	8.7.E-04	8.7.E-04
			Antimony	N/A	N/A	N/A	0.0.E+00	Whole Body, Blood	N/A	N/A	3.1.E-02	3.1.E-02
			Arsenic	N/A	N/A	5.2.E-08	5.2.E-08	Skin, Vascular	N/A	N/A	8.1.E-03	8.1.E-03
			Cadmium	N/A	N/A	N/A	0.0.E+00	Blood	N/A	N/A	2.6.E-02	2.6.E-02
			Chromium	N/A	N/A	7.9.E-08	7.9.E-08	Not identified	N/A	N/A	2.2.E-02	2.2.E-02
			Cobalt	N/A	N/A	N/A	0.0.E+00	Thyroid	N/A	N/A	2.6.E-04	2.6.E-04
			Iron	N/A	N/A	N/A	0.0.E+00	Gastrointestinal	N/A	N/A	2.8.E-03	2.8.E-03
			Manganese	N/A	N/A	N/A	0.0.E+00	CNS	N/A	N/A	1.5.E-01	1.5.E-01
			Vanadium	N/A	N/A	N/A	0.0.E+00	Lifetime	N/A	N/A	2.4.E-02	2.4.E-02
			Zinc	N/A	N/A	N/A	0.0.E+00	Blood	N/A	N/A	1.3.E-05	1.3.E-05
			Chemical Total	0.0.E+00	0.0.E+00	3.4.E-05	3.4.E-05		0.0.E+00	0.0.E+00	1.0.E+02	1.0.E+02
		Exposure Point Total					3.4.E-05					1.0.E+02
	Exposure Medium Total						3.4.E-05					1.0.E+02
	Air	Columbia and Yorktown Eastover										
		Water Vapors at	1,1,2-Trichloroethane	N/A	1.7.E-09	N/A	1.7.E-09	Nasal	N/A	3.7.E-03	N/A	3.7.E-03
		Excavation Pit	Chloroform	N/A	1.0.E-09	N/A	1.0.E-09	Liver	N/A	3.2.E-05	N/A	3.2.E-05
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0.E+00	N/A	N/A	N/A	N/A	0.0.E+00
			Trichloroethene	N/A	4.8.E-06	N/A	4.8.E-06	Heart, Immunotoxicity	N/A	2.8.E+01	N/A	2.8.E+01
			Vinyl chloride	N/A	1.5.E-09	N/A	1.5.E-09	Liver	N/A	2.4.E-04	N/A	2.4.E-04
			Chemical Total	0.0.E+00	4.8.E-06	0.0.E+00	4.8.E-06		0.0.E+00	2.8.E+01	0.0.E+00	2.8.E+01
		Exposure Point Total					4.8.E-06					2.8.E+01
	Exposure Medium Total						4.8.E-06					2.8.E+01
Medium Total							3.9.E-05					1.3.E+02
Receptor Total							3.9.E-05				Receptor HI Total	1.3.E+02

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Blood HI Across All Media =	5.8.E-02
Total Neurological/Nervous System HI Across All Media =	2.8.E-03
Total Developmental HI Across all Media =	8.7.E-04
Total Kidney HI Across All Media =	2.8.E-01
Total Liver HI Across All Media =	1.0.E+02
Total Neurological/Nervous System HI Across All Media =	1.5.E-01
Total Skin HI Across All Media=	8.1.E-03
Total Thyroid HI Across All Media=	2.6.E-04
Total Vascular HI Across All Media=	8.1.E-03
Total Heart HI Across All Media=	2.8.E+01
Total Immune System HI Across All Media=	2.8.E+01
Total Whole Body HI Across All Media=	3.1.E-02
Total Nasal HI Across All Media=	3.7.E-03

TABLE 9.1.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	1,1,2-Trichloroethane	N/A	N/A	N/A	0.0.E+00	Blood	5.4.E-03	N/A	4.8.E-04	5.9.E-03
			Chloroform	N/A	N/A	N/A	0.0.E+00	Liver	9.5.E-04	N/A	8.1.E-05	1.0.E-03
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0.E+00	Kidney	1.9.E+01	N/A	1.6.E+00	2.1.E+01
			Trichloroethene	N/A	N/A	N/A	0.0.E+00	Heart, Immunotoxicity	4.6.E+02	N/A	7.3.E+01	5.3.E+02
			Vinyl chloride	N/A	N/A	N/A	0.0.E+00	Liver	1.5.E-02	N/A	8.1.E-04	1.6.E-02
			Aluminum, Dissolved	N/A	N/A	N/A	0.0.E+00	Neurological, Developmental	1.7.E-02	N/A	5.4.E-05	1.7.E-02
			Arsenic, Dissolved	N/A	N/A	N/A	0.0.E+00	Skin, Vascular	2.3.E-01	N/A	7.4.E-04	2.3.E-01
			Chromium, Dissolved	N/A	N/A	N/A	0.0.E+00	Not identified	6.0.E-03	N/A	1.5.E-03	7.5.E-03
			Cobalt, Dissolved	N/A	N/A	N/A	0.0.E+00	Thyroid	5.9.E-01	N/A	7.5.E-04	5.9.E-01
			Iron, Dissolved	N/A	N/A	N/A	0.0.E+00	Gastrointestinal	4.1.E-02	N/A	1.3.E-04	4.2.E-02
			Manganese, dissolved	N/A	N/A	N/A	0.0.E+00	CNS	4.6.E-02	N/A	3.7.E-03	5.0.E-02
			Selenium, Dissolved	N/A	N/A	N/A	0.0.E+00	Whole Body	1.7.E-02	N/A	5.5.E-05	1.7.E-02
			Zinc, Dissolved	N/A	N/A	N/A	0.0.E+00	Blood	1.4.E-03	N/A	2.8.E-06	1.4.E-03
			Chemical Total	0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00		4.8.E+02	0.0.E+00	7.4.E+01	5.6.E+02
		Exposure Point Total					0.0.E+00					5.6.E+02
	Exposure Medium Total						0.0.E+00					5.6.E+02
	Air	Columbia and Yorktown -Eastover Water Vapors at Showerhead	1,1,2-Trichloroethane	N/A	N/A	N/A	0.0.E+00	Nasal	N/A	4.6.E-02	N/A	4.6.E-02
			Chloroform	N/A	N/A	N/A	0.0.E+00	Liver	N/A	5.2.E-05	N/A	5.2.E-05
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0.E+00	N/A	N/A	N/A	N/A	0.0.E+00
			Trichloroethene	N/A	N/A	N/A	0.0.E+00	Heart, Immunotoxicity	N/A	6.1.E+01	N/A	6.1.E+01
			Vinyl chloride	N/A	N/A	N/A	0.0.E+00	Liver	N/A	3.5.E-04	N/A	3.5.E-04
			Chemical Total	0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00		0.0.E+00	6.1.E+01	0.0.E+00	6.1.E+01
		Exposure Point Total					0.0.E+00					6.1.E+01
	Exposure Medium Total						0.0.E+00					6.1.E+01
Medium Total							0.0.E+00					6.2.E+02
Receptor Total							0.0.E+00				Receptor HI Total	6.2.E+02

HI - Hazard Index

N/A - Not applicable

CNS = Central Nervous System

Total Blood HI Across All Media =	7.4.E-03
Total Gastrointestinal HI Across All Media=	4.2.E-02
Total Kidney HI Across All Media =	2.1.E+01
Total Liver HI Across All Media =	1.8.E-02
Total Neurological/Nervous System HI Across All Media =	6.7.E-02
Total Whole Bodyl HI Across all Media =	1.7.E-02
Total Developmental HI Across all Media =	1.7.E-02
Total Skin HI Across All Media=	2.3.E-01
Total Thyroid HI Across All Media=	5.9.E-01
Total Vascular HI Across All Media=	2.3.E-01
Total Heart HI Across All Media=	6.0.E+02
Total Immune System HI Across All Media=	6.0.E+02
Total Nasal HI Across All Media=	4.6.E-02

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown Eastover Aquifer Tap Water										
			1,1,2-Trichloroethane	N/A	N/A	N/A	0.0.E+00	Blood	1.8.E-02	N/A	9.5.E-04	1.9.E-02
			Chloroform	N/A	N/A	N/A	0.0.E+00	Liver	3.2.E-03	N/A	1.6.E-04	3.3.E-03
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0.E+00	Kidney	6.4.E+01	N/A	3.5.E+00	6.8.E+01
			Trichloroethene	N/A	N/A	N/A	0.0.E+00	N/A	1.5.E+03	N/A	1.4.E+02	1.7.E+03
			Vinyl chloride	N/A	N/A	N/A	0.0.E+00	Liver	5.1.E-02	N/A	1.5.E-03	5.3.E-02
			Aluminum, Dissolved	N/A	N/A	N/A	0.0.E+00	Neurological, Developmental	5.6.E-02	N/A	1.2.E-04	5.6.E-02
			Arsenic, Dissolved	N/A	N/A	N/A	0.0.E+00	Skin, Vascular	7.7.E-01	N/A	1.7.E-03	7.7.E-01
			Chromium, Dissolved	N/A	N/A	N/A	0.0.E+00	Not identified	2.0.E-02	N/A	3.5.E-03	2.3.E-02
			Cobalt, Dissolved	N/A	N/A	N/A	0.0.E+00	Thyroid	2.0.E+00	N/A	1.7.E-03	2.0.E+00
			Iron, Dissolved	N/A	N/A	N/A	0.0.E+00	Gastrointestinal	1.4.E-01	N/A	3.0.E-04	1.4.E-01
			Manganese, dissolved	N/A	N/A	N/A	0.0.E+00	CNS	1.5.E-01	N/A	8.4.E-03	1.6.E-01
			Selenium, Dissolved	N/A	N/A	N/A	0.0.E+00	Whole Body	5.7.E-02	N/A	1.2.E-04	5.7.E-02
			Zinc, Dissolved	N/A	N/A	N/A	0.0.E+00	Blood	4.8.E-03	N/A	6.3.E-06	4.8.E-03
			Chemical Total	0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00		1.6.E+03	0.0.E+00	1.5.E+02	1.8.E+03
		Exposure Point Total					0.0.E+00					1.8.E+03
	Exposure Medium Total						0.0.E+00					1.8.E+03
	Air	Columbia and Yorktown Eastover Water Vapors at Showerhead										
			1,1,2-Trichloroethane	N/A	N/A	N/A	0.0.E+00	Nasal	N/A	5.9.E-07	N/A	5.9.E-07
			Chloroform	N/A	N/A	N/A	0.0.E+00	Liver	N/A	5.1.E-10	N/A	5.1.E-10
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0.E+00	N/A	N/A	N/A	N/A	0.0.E+00
			Trichloroethene	N/A	N/A	N/A	0.0.E+00	Heart, Immunotoxicity	N/A	1.1.E-03	N/A	1.1.E-03
			Vinyl chloride	N/A	N/A	N/A	0.0.E+00	Liver	N/A	1.4.E-09	N/A	1.4.E-09
			Chemical Total	0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00		0.0.E+00	1.1.E-03	0.0.E+00	1.1.E-03
		Exposure Point Total					0.0.E+00					1.1.E-03
	Exposure Medium Total						0.0.E+00					1.1.E-03
Medium Total							0.0.E+00					1.8.E+03
Receptor Total							0.0.E+00				Receptor HI Total	1.8.E+03

HI - Hazard Index
N/A - Not applicable
CNS = Central Nervous System

Total Blood HI Across All Media =	2.4.E-02
Total Gastrointestinal HI Across All Media=	1.4.E-01
Total Kidney HI Across All Media =	6.8.E+01
Total Liver HI Across All Media =	5.6.E-02
Total Neurological/Nervous System HI Across All Media =	2.2.E-01
Total Whole Bodyl HI Across all Media =	5.7.E-02
Total Developmental HI Across all Media =	5.6.E-02
Total Skin HI Across All Media=	7.7.E-01
Total Thyroid HI Across All Media=	2.0.E+00
Total Vascular HI Across All Media=	7.7.E-01
Total Heart HI Across All Media=	1.7.E+03
Total Immune System HI Across All Media=	1.7.E+03
Total Nasal HI Across All Media=	5.9.E-07

TABLE 9.3.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	1,1,2-Trichloroethane	5.1.E-07	N/A	3.3.E-08	5.5.E-07	Blood	N/A	N/A	N/A	0.0.E+00
			Chloroform	1.2.E-07	N/A	7.5.E-09	1.3.E-07	Liver	N/A	N/A	N/A	0.0.E+00
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0.E+00	Kidney	N/A	N/A	N/A	0.0.E+00
			Trichloroethene	2.0.E-02	N/A	2.1.E-03	2.2.E-02	N/A	N/A	N/A	N/A	0.0.E+00
			Vinyl chloride	2.4.E-05	N/A	8.2.E-07	2.5.E-05	Liver	N/A	N/A	N/A	0.0.E+00
			Aluminum, Dissolved	N/A	N/A	N/A	0.0.E+00	Neurological, Developmental	N/A	N/A	N/A	0.0.E+00
			Arsenic, Dissolved	4.3.E-05	N/A	1.1.E-07	4.3.E-05	Skin, Vascular	N/A	N/A	N/A	0.0.E+00
			Chromium, Dissolved	1.7.E-05	N/A	2.0.E-09	1.7.E-05	Not identified	N/A	N/A	N/A	0.0.E+00
			Cobalt, Dissolved	N/A	N/A	N/A	0.0.E+00	Thyroid	N/A	N/A	N/A	0.0.E+00
			Iron, Dissolved	N/A	N/A	N/A	0.0.E+00	Gastrointestinal	N/A	N/A	N/A	0.0.E+00
			Manganese, dissolved	N/A	N/A	N/A	0.0.E+00	CNS	N/A	N/A	N/A	0.0.E+00
			Selenium, Dissolved	N/A	N/A	N/A	0.0.E+00	Whole Body	N/A	N/A	N/A	0.0.E+00
			Zinc, Dissolved	N/A	N/A	N/A	0.0.E+00	Blood	N/A	N/A	N/A	0.0.E+00
			Chemical Total	2.0.E-02	0.0.E+00	2.2.E-03	2.3.E-02		0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00
		Exposure Point Total					2.3.E-02					0.0.E+00
	Exposure Medium Total						2.3.E-02					0.0.E+00
	Air	Columbia and Yorktown -Eastover Water Vapors at Showerhead	1,1,2-Trichloroethane	N/A	4.0.E-11	N/A	4.0.E-11	Nasal	N/A	N/A	N/A	0.0.E+00
			Chloroform	N/A	3.2.E-11	N/A	3.2.E-11	Liver	N/A	N/A	N/A	0.0.E+00
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0.E+00	N/A	N/A	N/A	N/A	0.0.E+00
			Trichloroethene	N/A	2.3.E-03	N/A	2.3.E-03	Heart, Immunotoxicity	N/A	N/A	N/A	0.0.E+00
			Vinyl chloride	N/A	6.5.E-08	N/A	6.5.E-08	Liver	N/A	N/A	N/A	0.0.E+00
			Chemical Total	0.0.E+00	2.3.E-03	0.0.E+00	2.3.E-03		0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00
		Exposure Point Total					2.3.E-03					0.0.E+00
	Exposure Medium Total						2.3.E-03					0.0.E+00
Medium Total							2.5.E-02					0.0.E+00
Receptor Total							2.5.E-02				Receptor HI Total	0.0.E+00

HI - Hazard Index

N/A - Not applicable

CNS - Central Nervous System

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 1, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	1,1,2-Trichloroethane	1.1.E-07	N/A	N/A	1.1.E-07	Blood	3.6.E-03	N/A	N/A	3.6.E-03
			Chloroform	2.5.E-08	N/A	N/A	2.5.E-08	Liver	6.3.E-04	N/A	N/A	6.3.E-04
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0.E+00	Kidney	1.3.E+01	N/A	N/A	1.3.E+01
			Trichloroethene	9.1.E-04	N/A	N/A	9.1.E-04	N/A	3.1.E+02	N/A	N/A	3.1.E+02
			Vinyl chloride	2.9.E-06	N/A	N/A	2.9.E-06	Liver	1.0.E-02	N/A	N/A	1.0.E-02
			Aluminum, Dissolved	N/A	N/A	N/A	0.0.E+00	Neurological, Developmental	1.1.E-02	N/A	N/A	1.1.E-02
			Arsenic, Dissolved	8.9.E-06	N/A	N/A	8.9.E-06	Skin, Vascular	1.5.E-01	N/A	N/A	1.5.E-01
			Chromium, Dissolved	7.7.E-07	N/A	N/A	7.7.E-07	Not identified	4.0.E-03	N/A	N/A	4.0.E-03
			Cobalt, Dissolved	N/A	N/A	N/A	0.0.E+00	Thyroid	3.9.E-01	N/A	N/A	3.9.E-01
			Iron, Dissolved	N/A	N/A	N/A	0.0.E+00	Gastrointestinal	2.8.E-02	N/A	N/A	2.8.E-02
			Manganese-dissolved	N/A	N/A	N/A	0.0.E+00	CNS	3.1.E-02	N/A	N/A	3.1.E-02
			Selenium, Dissolved	N/A	N/A	N/A	0.0.E+00	Whole Body	1.1.E-02	N/A	N/A	1.1.E-02
			Zinc, Dissolved	N/A	N/A	N/A	0.0.E+00	Blood	9.7.E-04	N/A	N/A	9.7.E-04
			Chemical Total	9.3.E-04	0.0.E+00	0.0.E+00	9.3.E-04		3.2.E+02	0.0.E+00	0.0.E+00	3.2.E+02
		Exposure Point Total					9.3.E-04					3.2.E+02
	Exposure Medium Total						9.3.E-04					3.2.E+02
Medium Total							9.3.E-04					3.2.E+02
Receptor Total							9.3.E-04				Receptor HI Total	3.2.E+02

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Blood HI Across All Media =	4.6.E-03
Total Gastrointestinal HI Across All Media=	2.8.E-02
Total Kidney HI Across All Media =	1.3.E+01
Total Liver HI Across All Media =	1.1.E-02
Total Neurological/Central Nervous System HI Across All Media =	4.2.E-02
Total Whole Body HI Across All Media=	1.1.E-02
Total Skin HI Across All Media=	1.5.E-01
Total Thyroid HI Across All Media=	3.9.E-01
Total Vascular HI Across All Media=	1.5.E-01
Total Developmental HI Across all Media =	1.1.E-02

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Site 1, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown Eastover Aquifer Water in Excavation Pit										
			1,1,2-Trichloroethane	N/A	N/A	1.3.E-09	1.3.E-09	Blood	N/A	N/A	3.9.E-05	3.9.E-05
			Chloroform	N/A	N/A	3.1.E-10	3.1.E-10	Liver	N/A	N/A	3.5.E-05	3.5.E-05
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0.E+00	Kidney	N/A	N/A	1.5.E-01	1.5.E-01
			Trichloroethene	N/A	N/A	1.9.E-05	1.9.E-05	Liver	N/A	N/A	5.9.E+01	5.9.E+01
			Vinyl chloride	N/A	N/A	2.6.E-08	2.6.E-08	Liver	N/A	N/A	8.3.E-04	8.3.E-04
			Aluminum	N/A	N/A	N/A	0.0.E+00	Neurological, Developmental	N/A	N/A	4.4.E-04	4.4.E-04
			Antimony	N/A	N/A	N/A	0.0.E+00	Whole Body, Blood	N/A	N/A	1.6.E-02	1.6.E-02
			Arsenic	N/A	N/A	2.6.E-08	2.6.E-08	Skin, Vascular	N/A	N/A	4.1.E-03	4.1.E-03
			Cadmium	N/A	N/A	N/A	0.0.E+00	Blood	N/A	N/A	1.3.E-02	1.3.E-02
			Chromium	N/A	N/A	3.9.E-08	3.9.E-08	Not identified	N/A	N/A	1.1.E-02	1.1.E-02
			Cobalt	N/A	N/A	N/A	0.0.E+00	Thyroid	N/A	N/A	1.3.E-04	1.3.E-04
			Iron	N/A	N/A	N/A	0.0.E+00	Gastrointestinal	N/A	N/A	1.4.E-03	1.4.E-03
			Manganese	N/A	N/A	N/A	0.0.E+00	CNS	N/A	N/A	7.4.E-02	7.4.E-02
			Vanadium	N/A	N/A	N/A	0.0.E+00	Lifetime	N/A	N/A	1.2.E-02	1.2.E-02
			Zinc	N/A	N/A	N/A	0.0.E+00	Blood	N/A	N/A	6.7.E-06	6.7.E-06
			Chemical Total	0.0.E+00	0.0.E+00	1.9.E-05	1.9.E-05		0.0.E+00	0.0.E+00	5.9.E+01	5.9.E+01
		Exposure Point Total					1.9.E-05					5.9.E+01
	Exposure Medium Total						1.9.E-05					5.9.E+01
	Air	Columbia and Yorktown -Eastover Aquifer - Water Vapors in Excavation Pit										
			1,1,2-Trichloroethane	N/A	8.4.E-10	N/A	8.4.E-10	Nasal	N/A	1.8.E-03	N/A	1.8.E-03
			Chloroform	N/A	5.2.E-10	N/A	5.2.E-10	Liver	N/A	1.6.E-05	N/A	1.6.E-05
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0.E+00	N/A	N/A	N/A	N/A	0.0.E+00
			Trichloroethene	N/A	2.4.E-06	N/A	2.4.E-06	Heart, Immunotoxicity	N/A	1.4.E+01	N/A	1.4.E+01
			Vinyl chloride	N/A	7.6.E-10	N/A	7.6.E-10	Liver	N/A	1.2.E-04	N/A	1.2.E-04
			Chemical Total	0.0.E+00	2.4.E-06	0.0.E+00	2.4.E-06		0.0.E+00	1.4.E+01	0.0.E+00	1.4.E+01
		Exposure Point Total					2.4.E-06					1.4.E+01
	Exposure Medium Total						2.4.E-06					1.4.E+01
Medium Total							2.2.E-05					7.3.E+01
Receptor Total							2.2.E-05				Receptor HI Total	7.3.E+01

TABLE 9.5.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Blood HI Across All Media =	2.9.E-02
Total Neurological/Nervous System HI Across All Media =	1.4.E-03
Total Developmental HI Across all Media =	4.4.E-04
Total Kidney HI Across All Media =	1.5.E-01
Total Liver HI Across All Media =	5.9.E+01
Total Neurological/Nervous System HI Across All Media =	7.5.E-02
Total Skin HI Across All Media=	4.1.E-03
Total Thyroid HI Across All Media=	1.3.E-04
Total Vascular HI Across All Media=	4.1.E-03
Total Heart HI Across All Media=	1.4.E+01
Total Immune System HI Across All Media=	1.4.E+01
Total Whole Body HI Across All Media=	1.6.E-02
Total Nasal HI Across All Media=	1.8.E-03

TABLE 10.1.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown - Eastover Aquifer Tap Water	cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	4.1E+01	N/A	3.7E+00	4.5E+01
			Trichloroethene	N/A	N/A	N/A	0.0E+00	Heart, Immunotoxicity	9.9E+02	N/A	1.7E+02	1.2E+03
			Arsenic, Dissolved	N/A	N/A	N/A	0.0E+00	Skin, Vascular	4.9E-01	N/A	2.6E-03	5.0E-01
			Cobalt, Dissolved	N/A	N/A	N/A	0.0E+00	Thyroid	9.9E+02	N/A	1.7E+02	1.2E+03
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		2.0E+03	0.0E+00	3.4E+02	2.3E+03
		Exposure Point Total					0.0E+00					2.3E+03
	Exposure Medium Total						0.0E+00					2.3E+03
	Air	Eastover Water Vapors at Showerhead	1,1,2-Trichloroethane	N/A	N/A	N/A	0.0E+00	Nasal	N/A	3.2E-01	N/A	3.2E-01
			Trichloroethene	N/A	N/A	N/A	0.0E+00	Heart, Immunotoxicity	N/A	4.3E+02	N/A	4.3E+02
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	4.3E+02	0.0E+00	4.3E+02
		Exposure Point Total					0.0E+00					4.3E+02
	Exposure Medium Total						0.0E+00					4.3E+02
Medium Total							0.0E+00					2.8E+03
Receptor Total							0.0E+00				Receptor HI Total	2.8E+03

HI - Hazard Index
N/A - Not applicable
CNS = Central Nervous System

Total Kidney HI Across All Media =	4.5E+01
Total Skin HI Across All Media=	5.0E-01
Total Vascular HI Across All Media=	5.0E-01
Total Thyroid HI Across All Media=	1.2E+03
Total Heart HI Across All Media=	1.6E+03
Total Immune System HI Across All Media=	1.6E+03
Total Nasal HI Across All Media=	3.2E-01

TABLE 10.2.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown - Eastover Aquifer Tap Water	cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	9.6E+01	N/A	8.5E+00	1.0E+02
			Trichloroethene	N/A	N/A	N/A	0.0E+00	Heart, Immunotoxicity	2.3E+03	N/A	3.7E+02	2.7E+03
			Cobalt, Dissolved	N/A	N/A	N/A	0.0E+00	Thyroid	2.9E+00	N/A	7.7E-03	2.9E+00
			Arsenic, Dissolved	N/A	N/A	N/A	0.0E+00	Skin, Vascular	2.3E+03	N/A	3.7E+02	2.7E+03
			Iron, Dissolved	N/A	N/A	N/A	0.0E+00	Gastrointestinal	1.2E+00	N/A	7.6E-03	1.2E+00
			Manganese, dissolved	N/A	N/A	N/A	0.0E+00	CNS	3.0E-02	N/A	1.6E-02	4.6E-02
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		4.7E+03	0.0E+00	7.5E+02	5.5E+03
		Exposure Point Total					0.0E+00					5.5E+03
	Exposure Medium Total						0.0E+00					5.5E+03
	Air	Eastover Water Vapors at Showerhead	1,1,2-Trichloroethane	N/A	N/A	N/A	0.0E+00	Nasal	N/A	1.8E-01	N/A	1.8E-01
			Trichloroethene	N/A	N/A	N/A	0.0E+00	Heart, Immunotoxicity	N/A	2.4E+02	N/A	2.4E+02
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	2.4E+02	0.0E+00	2.4E+02
		Exposure Point Total					0.0E+00					2.4E+02
	Exposure Medium Total						0.0E+00					2.4E+02
Medium Total							0.0E+00					5.7E+03
Receptor Total							0.0E+00				Receptor HI Total	5.7E+03

HI - Hazard Index
N/A - Not applicable
CNS = Central Nervous System

Total Kidney HI Across All Media =	1.0E+02
Total Thyroid HI Across All Media=	2.9E+00
Total Skin HI Across All Media=	2.7E+03
Total Vascular HI Across All Media=	2.7E+03
Total Gastrointestinal HI Across All Media =	1.2E+00
Total Neurological/Nervous System HI Across All Media =	4.6E-02
Total Heart HI Across All Media=	2.9E+03
Total Immune System HI Across All Media=	2.9E+03
Total Nasal HI Across All Media=	1.8E-01

TABLE 10.3.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	1,1,2-Trichloroethane	1.4E-06	N/A	1.3E-07	1.6E-06	Blood	N/A	N/A	N/A	0.0E+00
			Trichloroethene	3.8E-02	N/A	6.3E-03	4.5E-02	Heart, Immunotoxicity	N/A	N/A	N/A	0.0E+00
			Vinyl chloride	5.4E-05	N/A	2.9E-06	5.7E-05	Liver	N/A	N/A	N/A	0.0E+00
			Arsenic, Dissolved	1.2E-04	N/A	6.9E-07	1.2E-04	Skin, Vascular	N/A	N/A	N/A	0.0E+00
			Chromium, Dissolved	3.3E-05	N/A	9.9E-09	3.3E-05	Not identified	N/A	N/A	N/A	0.0E+00
			Chemical Total	3.9E-02	0.0E+00	6.3E-03	4.5E-02		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					4.5E-02					0.0E+00
	Exposure Medium Total						4.5E-02					0.0E+00
	Air	Columbia and Yorktown -Eastover Water Vapors at Showerhead	Trichloroethene	N/A	7.8E-03	N/A	7.8E-03	Heart, Immunotoxicity	N/A	N/A	N/A	0.0E+00
			Vinyl chloride	N/A	8.4E-07	N/A	8.4E-07	Liver	N/A	N/A	N/A	0.0E+00
			Chemical Total	0.0E+00	7.8E-03	0.0E+00	7.8E-03		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					7.8E-03					0.0E+00
	Exposure Medium Total						7.8E-03					0.0E+00
Medium Total							5.3E-02					0.0E+00
Receptor Total							5.3E-02				Receptor HI Total	0.0E+00

HI - Hazard Index
N/A - Not applicable
CNS = Central Nervous System

TABLE 10.4.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	1.5E+01	N/A	N/A	1.5E+01
			Trichloroethene	2.9E-03	N/A	N/A	2.9E-03	Heart, Immunotoxicity	3.5E+02	N/A	N/A	3.5E+02
			Vinyl chloride	9.1E-06	N/A	N/A	9.1E-06	Liver	1.2E-02	N/A	N/A	1.2E-02
			Arsenic, Dissolved	2.8E-05	N/A	N/A	2.8E-05	Skin, Vascular	1.8E-01	N/A	N/A	1.8E-01
			Chromium, Dissolved	2.4E-06	N/A	N/A	2.4E-06	Not identified	4.6E-03	N/A	N/A	4.6E-03
			Cobalt, Dissolved	N/A	N/A	N/A	0.0E+00	Thyroid	4.5E-01	N/A	N/A	4.5E-01
			Chemical Total	2.9E-03	0.0E+00	0.0E+00	2.9E-03		3.7E+02	0.0E+00	0.0E+00	3.7E+02
		Exposure Point Total					2.9E-03					3.7E+02
	Exposure Medium Total						2.9E-03					3.7E+02
Medium Total							2.9E-03					3.7E+02
Receptor Total							2.9E-03				Receptor HI Total	3.7E+02

HI - Hazard Index
N/A - Not applicable
CNS = Central Nervous System

Total Kidney HI Across All Media =	1.5E+01
Total Liver HI Across All Media =	1.2E-02
Total Skin HI Across All Media=	1.8E-01
Total Thyroid HI Across All Media=	4.5E-01
Total Vascular HI Across All Media=	1.8E-01
Total Heart HI Across All Media=	3.5E+02
Total Immune System HI Across All Media=	3.5E+02

TABLE 10.5.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Excavation Pit	cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	N/A	N/A	2.8E-01	2.8E-01
			Trichloroethene	N/A	N/A	3.4E-05	3.4E-05	Liver	N/A	N/A	1.0E+02	1.0E+02
			Chemical Total	0.0E+00	0.0E+00	3.4E-05	3.4E-05		0.0E+00	0.0E+00	1.0E+02	1.0E+02
		Exposure Point Total					3.4E-05					1.0E+02
	Exposure Medium Total						3.4E-05					1.0E+02
	Air	-Eastover Water Vapors at Excavation Pit	Trichloroethene	N/A	4.8E-06	N/A	4.8E-06	Heart, Immunotoxicity	N/A	2.8E+01	N/A	2.8E+01
			Chemical Total	0.0E+00	4.8E-06	0.0E+00	4.8E-06		0.0E+00	2.8E+01	0.0E+00	2.8E+01
		Exposure Point Total					4.8E-06					2.8E+01
	Exposure Medium Total						4.8E-06					2.8E+01
Medium Total							3.9E-05					1.3E+02
Receptor Total							3.9E-05				Receptor HI Total	1.3E+02

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Kidney HI Across All Media =	2.8E-01
Total Liver HI Across All Media =	1.0E+02
Total Heart HI Across All Media=	2.8E+01
Total Immune System HI Across All Media=	2.8E+01

TABLE 10.1.CTE
RISK SUMMARY
CENTRAL TENDENCY EXPOSURE
Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	1.9E+01	N/A	1.6E+00	2.1E+01
			Trichloroethene	N/A	N/A	N/A	0.0E+00	Heart, Immunotoxicity	4.6E+02	N/A	7.3E+01	5.3E+02
			Arsenic, Dissolved	N/A	N/A	N/A	0.0E+00	Skin, Vascular	2.3E-01	N/A	7.4E-04	2.3E-01
			Cobalt, Dissolved	N/A	N/A	N/A	0.0E+00	Thyroid	5.9E-01	N/A	7.5E-04	5.9E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		4.8E+02	0.0E+00	7.4E+01	5.6E+02
		Exposure Point Total					0.0E+00					5.6E+02
	Exposure Medium Total						0.0E+00					5.6E+02
	Air	-Eastover Water Vapors at Showerhead	Trichloroethene	N/A	N/A	N/A	0.0E+00	Heart, Immunotoxicity	N/A	6.1E+01	N/A	6.1E+01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	6.1E+01	0.0E+00	6.1E+01
		Exposure Point Total					0.0E+00					6.1E+01
	Exposure Medium Total						0.0E+00					6.1E+01
Medium Total							0.0E+00					6.2E+02
Receptor Total							0.0E+00				Receptor HI Total	6.2E+02

HI - Hazard Index
N/A - Not applicable
CNS = Central Nervous System

Total Kidney HI Across All Media =	2.1E+01
Total Skin HI Across All Media=	2.3E-01
Total Thyroid HI Across All Media=	5.9E-01
Total Vascular HI Across All Media=	2.3E-01
Total Heart HI Across All Media=	6.0E+02
Total Immune System HI Across All Media=	6.0E+02

TABLE 10.2.CTE

RISK SUMMARY

CENTRAL TENDENCY EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown - Eastover Aquifer Tap Water	cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	6.4E+01	N/A	3.5E+00	6.8E+01
			Trichloroethene	N/A	N/A	N/A	0.0E+00	N/A	1.5E+03	N/A	1.4E+02	1.7E+03
			Arsenic, Dissolved	N/A	N/A	N/A	0.0E+00	Skin, Vascular	7.7E-01	N/A	1.7E-03	7.7E-01
			Cobalt, Dissolved	N/A	N/A	N/A	0.0E+00	Thyroid	2.0E+00	N/A	1.7E-03	2.0E+00
			Manganese, dissolved	N/A	N/A	N/A	0.0E+00	CNS	1.5E-01	N/A	8.4E-03	1.6E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.6E+03	0.0E+00	1.5E+02	1.8E+03
		Exposure Point Total					0.0E+00					1.8E+03
	Exposure Medium Total						0.0E+00					1.8E+03
Medium Total							0.0E+00					1.8E+03
Receptor Total							0.0E+00				Receptor HI Total	1.8E+03

HI - Hazard Index
N/A - Not applicable
CNS = Central Nervous System

Total Kidney HI Across All Media =	6.8E+01
Total Neurological/Nervous System HI Across All Media =	1.6E-01
Total Skin HI Across All Media=	7.7E-01
Total Thyroid HI Across All Media=	2.0E+00
Total Vascular HI Across All Media=	7.7E-01

TABLE 10.3.CTE
RISK SUMMARY
CENTRAL TENDENCY EXPOSURE
Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	Trichloroethene	2.0E-02	N/A	2.1E-03	2.2E-02	N/A	N/A	N/A	N/A	0.0E+00
			Vinyl chloride	2.4E-05	N/A	8.2E-07	2.5E-05	Liver	N/A	N/A	N/A	0.0E+00
			Arsenic, Dissolved	4.3E-05	N/A	1.1E-07	4.3E-05	Skin, Vascular	N/A	N/A	N/A	0.0E+00
			Chromium, Dissolved	1.7E-05	N/A	2.0E-09	1.7E-05	Not identified	N/A	N/A	N/A	0.0E+00
			Chemical Total	2.0E-02	0.0E+00	2.2E-03	2.3E-02		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					2.3E-02					0.0E+00
	Exposure Medium Total						2.3E-02					0.0E+00
	Air	-Eastover Water Vapors at Showerhead	Trichloroethene	N/A	2.3E-03	N/A	2.3E-03	Heart, Immunotoxicity	N/A	N/A	N/A	0.0E+00
			Chemical Total	0.0E+00	2.3E-03	0.0E+00	2.3E-03		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					2.3E-03					0.0E+00
	Exposure Medium Total						2.3E-03					0.0E+00
Medium Total							2.5E-02					0.0E+00
Receptor Total							2.5E-02				Receptor HI Total	0.0E+00

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

TABLE 10.4.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	1.5E+01	N/A	N/A	1.5E+01
			Trichloroethene	2.9E-03	N/A	N/A	2.9E-03	Heart, Immunotoxicity	3.5E+02	N/A	N/A	3.5E+02
			Vinyl chloride	9.1E-06	N/A	N/A	9.1E-06	Liver	1.2E-02	N/A	N/A	1.2E-02
			Arsenic, Dissolved	2.8E-05	N/A	N/A	2.8E-05	Skin, Vascular	1.8E-01	N/A	N/A	1.8E-01
			Chromium, Dissolved	2.4E-06	N/A	N/A	2.4E-06	Not identified	4.6E-03	N/A	N/A	4.6E-03
			Cobalt, Dissolved	N/A	N/A	N/A	0.0E+00	Thyroid	4.5E-01	N/A	N/A	4.5E-01
			Chemical Total	2.9E-03	0.0E+00	0.0E+00	2.9E-03		3.7E+02	0.0E+00	0.0E+00	3.7E+02
		Exposure Point Total					2.9E-03					3.7E+02
	Exposure Medium Total						2.9E-03					3.7E+02
Medium Total							2.9E-03					3.7E+02
Receptor Total							2.9E-03				Receptor HI Total	3.7E+02

HI - Hazard Index
N/A - Not applicable
CNS = Central Nervous System

Total Kidney HI Across All Media =	1.5E+01
Total Liver HI Across All Media =	1.2E-02
Total Skin HI Across All Media=	1.8E-01
Total Thyroid HI Across All Media=	4.5E-01
Total Vascular HI Across All Media=	1.8E-01
Total Heart HI Across All Media=	3.5E+02
Total Immune System HI Across All Media=	3.5E+02

TABLE 10.5.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Excavation Pit	cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	N/A	N/A	2.8E-01	2.8E-01
			Trichloroethene	N/A	N/A	3.4E-05	3.4E-05	Liver	N/A	N/A	1.0E+02	1.0E+02
			Chemical Total	0.0E+00	0.0E+00	3.4E-05	3.4E-05		0.0E+00	0.0E+00	1.0E+02	1.0E+02
		Exposure Point Total					3.4E-05					1.0E+02
	Exposure Medium Total						3.4E-05					1.0E+02
	Air	-Eastover Water Vapors at Excavation Pit	Trichloroethene	N/A	4.8E-06	N/A	4.8E-06	Heart, Immunotoxicity	N/A	2.8E+01	N/A	2.8E+01
			Chemical Total	0.0E+00	4.8E-06	0.0E+00	4.8E-06		0.0E+00	2.8E+01	0.0E+00	2.8E+01
		Exposure Point Total					4.8E-06					2.8E+01
	Exposure Medium Total						4.8E-06					2.8E+01
Medium Total							3.9E-05					1.3E+02
Receptor Total							3.9E-05				Receptor HI Total	1.3E+02

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Kidney HI Across All Media =	2.8E-01
Total Liver HI Across All Media =	1.0E+02
Total Heart HI Across All Media=	2.8E+01
Total Immune System HI Across All Media=	2.8E+01

TABLE 10.1.CTE
RISK SUMMARY
CENTRAL TENDENCY EXPOSURE
Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	1.9E+01	N/A	1.6E+00	2.1E+01
			Trichloroethene	N/A	N/A	N/A	0.0E+00	Heart, Immunotoxicity	4.6E+02	N/A	7.3E+01	5.3E+02
			Arsenic, Dissolved	N/A	N/A	N/A	0.0E+00	Skin, Vascular	2.3E-01	N/A	7.4E-04	2.3E-01
			Cobalt, Dissolved	N/A	N/A	N/A	0.0E+00	Thyroid	5.9E-01	N/A	7.5E-04	5.9E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		4.8E+02	0.0E+00	7.4E+01	5.6E+02
		Exposure Point Total					0.0E+00					5.6E+02
	Exposure Medium Total						0.0E+00					5.6E+02
	Air	-Eastover Water Vapors at Showerhead	Trichloroethene	N/A	N/A	N/A	0.0E+00	Heart, Immunotoxicity	N/A	6.1E+01	N/A	6.1E+01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	6.1E+01	0.0E+00	6.1E+01
		Exposure Point Total					0.0E+00					6.1E+01
	Exposure Medium Total						0.0E+00					6.1E+01
Medium Total							0.0E+00					6.2E+02
Receptor Total							0.0E+00				Receptor HI Total	6.2E+02

HI - Hazard Index
N/A - Not applicable
CNS = Central Nervous System

Total Kidney HI Across All Media =	2.1E+01
Total Skin HI Across All Media=	2.3E-01
Total Thyroid HI Across All Media=	5.9E-01
Total Vascular HI Across All Media=	2.3E-01
Total Heart HI Across All Media=	6.0E+02
Total Immune System HI Across All Media=	6.0E+02

TABLE 10.2.CTE

RISK SUMMARY

CENTRAL TENDENCY EXPOSURE

Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown - Eastover Aquifer Tap Water	cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	6.4E+01	N/A	3.5E+00	6.8E+01
			Trichloroethene	N/A	N/A	N/A	0.0E+00	N/A	1.5E+03	N/A	1.4E+02	1.7E+03
			Arsenic, Dissolved	N/A	N/A	N/A	0.0E+00	Skin, Vascular	7.7E-01	N/A	1.7E-03	7.7E-01
			Cobalt, Dissolved	N/A	N/A	N/A	0.0E+00	Thyroid	2.0E+00	N/A	1.7E-03	2.0E+00
			Manganese, dissolved	N/A	N/A	N/A	0.0E+00	CNS	1.5E-01	N/A	8.4E-03	1.6E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.6E+03	0.0E+00	1.5E+02	1.8E+03
		Exposure Point Total					0.0E+00					1.8E+03
	Exposure Medium Total						0.0E+00					1.8E+03
Medium Total							0.0E+00					1.8E+03
Receptor Total							0.0E+00				Receptor HI Total	1.8E+03

HI - Hazard Index
N/A - Not applicable
CNS = Central Nervous System

Total Kidney HI Across All Media =	6.8E+01
Total Neurological/Nervous System HI Across All Media =	1.6E-01
Total Skin HI Across All Media=	7.7E-01
Total Thyroid HI Across All Media=	2.0E+00
Total Vascular HI Across All Media=	7.7E-01

TABLE 10.3.CTE
RISK SUMMARY
CENTRAL TENDENCY EXPOSURE
Site 1, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	Trichloroethene	2.0E-02	N/A	2.1E-03	2.2E-02	N/A	N/A	N/A	N/A	0.0E+00
			Vinyl chloride	2.4E-05	N/A	8.2E-07	2.5E-05	Liver	N/A	N/A	N/A	0.0E+00
			Arsenic, Dissolved	4.3E-05	N/A	1.1E-07	4.3E-05	Skin, Vascular	N/A	N/A	N/A	0.0E+00
			Chromium, Dissolved	1.7E-05	N/A	2.0E-09	1.7E-05	Not identified	N/A	N/A	N/A	0.0E+00
			Chemical Total	2.0E-02	0.0E+00	2.2E-03	2.3E-02		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					2.3E-02					0.0E+00
	Exposure Medium Total						2.3E-02					0.0E+00
	Air	-Eastover Water Vapors at Showerhead	Trichloroethene	N/A	2.3E-03	N/A	2.3E-03	Heart, Immunotoxicity	N/A	N/A	N/A	0.0E+00
			Chemical Total	0.0E+00	2.3E-03	0.0E+00	2.3E-03		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					2.3E-03					0.0E+00
	Exposure Medium Total						2.3E-03					0.0E+00
Medium Total							2.5E-02					0.0E+00
Receptor Total							2.5E-02				Receptor HI Total	0.0E+00

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

TABLE 10.4.CTE
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 1, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown -Eastover Aquifer Tap Water	cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	1.3E+01	N/A	N/A	1.3E+01
			Trichloroethene	9.1E-04	N/A	N/A	9.1E-04	N/A	3.1E+02	N/A	N/A	3.1E+02
			Vinyl chloride	2.9E-06	N/A	N/A	2.9E-06	Liver	1.0E-02	N/A	N/A	1.0E-02
			Arsenic, Dissolved	8.9E-06	N/A	N/A	8.9E-06	Skin, Vascular	1.5E-01	N/A	N/A	1.5E-01
			Cobalt, Dissolved	N/A	N/A	N/A	0.0E+00	Thyroid	3.9E-01	N/A	N/A	3.9E-01
			Chemical Total	9.2E-04	0.0E+00	0.0E+00	9.2E-04		3.2E+02	0.0E+00	0.0E+00	3.2E+02
		Exposure Point Total					9.2E-04					3.2E+02
	Exposure Medium Total						9.2E-04					3.2E+02
Medium Total							9.2E-04					3.2E+02
Receptor Total							9.2E-04				Receptor HI Total	3.2E+02

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Kidney HI Across All Media =	1.3E+01
Total Liver HI Across All Media =	1.0E-02
Total Skin HI Across All Media=	1.5E-01
Total Thyroid HI Across All Media=	3.9E-01
Total Vascular HI Across All Media=	1.5E-01

TABLE 10.5.CTE
RISK SUMMARY
CENTRAL TENDENCY EXPOSURE
Site 1, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Columbia and Yorktown Eastover Aquifer Water in Excavation Pit	cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	N/A	N/A	1.5E-01	1.5E-01
			Trichloroethene	N/A	N/A	1.9E-05	1.9E-05	Liver	N/A	N/A	5.9E+01	5.9E+01
			Chemical Total	0.0E+00	0.0E+00	1.9E-05	1.9E-05		0.0E+00	0.0E+00	5.9E+01	5.9E+01
		Exposure Point Total					1.9E-05					5.9E+01
	Exposure Medium Total						1.9E-05					5.9E+01
	Air	Columbia and Yorktown -Eastover Aquifer - Water Vapors in Excavation Pit	Trichloroethene	N/A	2.4E-06	N/A	2.4E-06	Heart, Immunotoxicity	N/A	1.4E+01	N/A	1.4E+01
			Chemical Total	0.0E+00	2.4E-06	0.0E+00	2.4E-06		0.0E+00	1.4E+01	0.0E+00	1.4E+01
		Exposure Point Total					2.4E-06					1.4E+01
	Exposure Medium Total						2.4E-06					1.4E+01
Medium Total							2.2E-05					7.3E+01
Receptor Total							2.2E-05				Receptor HI Total	7.3E+01

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Kidney HI Across All Media =	1.5E-01
Total Liver HI Across All Media =	5.9E+01
Total Heart HI Across All Media=	1.4E+01
Total Immune System HI Across All Media=	1.4E+01

Table 11
Comparison of Non-Detected Chemicals to Regional Screening Levels
Groundwater at Site 1, Yorktown

CAS Number	Chemical	Range of Detection Limits ug/L	Concentration Used for Screening ug/L	Screening [1] Toxicity Value ug/L		Exceeds Screening Value?	Rationale for Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	0.5 - 4.2	4.2E+00	7.5E+02	N	NO	DLBSL
79-34-5	1,1,2,2-Tetrachloroethane	0.5 - 4.2	4.2E+00	6.7E-02	C	YES	DLASL
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5 - 4.2	4.2E+00	5.9E+03	N	NO	DLBSL
120-82-1	1,2,4-Trichlorobenzene	0.5 - 4.2	4.2E+00	3.9E-01	N	YES	DLASL
96-12-8	1,2-Dibromo-3-chloropropane	0.5 - 4.2	4.2E+00	3.2E-04	C	YES	DLASL
106-93-4	1,2-Dibromoethane	0.5 - 4.2	4.2E+00	6.5E-03	C	YES	DLASL
95-50-1	1,2-Dichlorobenzene	0.5 - 4.2	4.2E+00	2.8E+01	N	NO	DLBSL
107-06-2	1,2-Dichloroethane	0.5 - 4.2	4.2E+00	1.5E-01	C	YES	DLASL
78-87-5	1,2-Dichloropropane	0.5 - 4.2	4.2E+00	3.8E-01	C	YES	DLASL
541-73-1	1,3-Dichlorobenzene	0.5 - 4.2	4.2E+00	4.3E-01	C	YES	DLASL
106-46-7	1,4-Dichlorobenzene	0.5 - 4.2	4.2E+00	4.3E-01	C	YES	DLASL
78-93-3	2-Butanone	2.5 - 2.5	2.5E+00	4.9E+02	N	NO	DLBSL
591-78-6	2-Hexanone	2.5 - 21	2.1E+01	3.4E+00	N	YES	DLASL
108-10-1	4-Methyl-2-pentanone	2.5 - 21	2.1E+01	1.0E+02	N	NO	DLBSL
67-64-1	Acetone	2.5 - 21	2.1E+01	1.2E+03	N	NO	DLBSL
75-27-4	Bromodichloromethane	0.5 - 4.2	4.2E+00	1.2E-01	C	YES	DLASL
75-25-2	Bromoform	0.5 - 4.2	4.2E+00	7.9E+00	C	NO	DLBSL
74-83-9	Bromomethane	0.5 - 4.2	4.2E+00	7.0E-01	N	YES	DLASL
56-23-5	Carbon tetrachloride	0.5 - 4.2	4.2E+00	3.9E-01	C	YES	DLASL
108-90-7	Chlorobenzene	0.5 - 4.2	4.2E+00	7.2E+00	N	NO	DLBSL
75-00-3	Chloroethane	0.5 - 4.2	4.2E+00	2.1E+03	N	NO	DLBSL
10061-01-5	cis-1,3-Dichloropropene	0.5 - 4.2	4.2E+00	4.1E-01	C	YES	DLASL
110-82-7	Cyclohexane	0.5 - 4.2	4.2E+00	1.3E+03	N	NO	DLBSL
124-48-1	Dibromochloromethane	0.5 - 4.2	4.2E+00	1.5E-01	C	YES	DLASL
98-82-8	Isopropylbenzene	0.5 - 4.2	4.2E+00	3.9E+01	N	NO	DLBSL
m&pXYLENE	m- and p-Xylene	1 - 8.3	8.3E+00	1.9E+01	N	NO	DLBSL
79-20-9	Methyl acetate	0.5 - 4.2	4.2E+00	1.6E+03	N	NO	DLBSL
108-87-2	Methylcyclohexane	0.5 - 4.2	4.2E+00	5.7E+01	N	NO	DLBSL
75-09-2	Methylene chloride	0.5 - 4.2	4.2E+00	4.7E+00	C	NO	DLBSL
1634-04-4	Methyl-tert-butyl ether (MTBE)	0.5 - 4.2	4.2E+00	1.2E+01	C	NO	DLBSL
95-47-6	o-Xylene	0.5 - 4.2	4.2E+00	1.9E+01	N	NO	DLBSL
100-42-5	Styrene	0.5 - 4.2	4.2E+00	1.1E+02	N	NO	DLBSL
108-88-3	Toluene	0.5 - 4.2	4.2E+00	8.6E+01	N	NO	DLBSL
10061-02-6	trans-1,3-Dichloropropene	0.5 - 4.2	4.2E+00	4.1E-01	C	YES	DLASL
75-69-4	Trichlorofluoromethane(Freon-11)	0.5 - 4.2	4.2E+00	1.1E+02	N	NO	DLBSL
1330-20-7	Xylene, total	0.5 - 4.2	4.2E+00	1.9E+01	N	NO	DLBSL
7439-97-6	Mercury	0.2 - 0.2	2.0E-01	4.3E-01	N	NO	DLBSL
7440-22-4	Silver	5 - 5	5.0E+00	7.1E+00	N	NO	DLBSL
7440-28-0	Thallium	10 - 10	1.0E+01	1.6E-02	N	YES	DLASL
7440-36-0	Antimony, Dissolved	10 - 10	1.0E+01	6.0E-01	N	YES	DLASL
7440-41-7	Beryllium, Dissolved	5 - 5	5.0E+00	1.6E+00	N	YES	DLASL
7440-22-4	Silver, Dissolved	5 - 5	5.0E+00	7.1E+00	N	NO	DLBSL
7440-28-0	Thallium, Dissolved	10 - 10	1.0E+01	1.6E-02	N	YES	DLBSL

[1] Oak Ridge National Laboratory (ORNL). November, 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites. Tap Water RSL. [Online]. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml

RSL value for 1,4-Dichlorobenzene used as surrogate for 1,3-Dichlorobenzene

RSL value for total xylene used as a surrogate for m- and p-xylene

RSL value for Mercury (inorganic salts) used as surrogate for mercury.

RSL value for 1,3-dichloropropene used as a surrogate for cis-1,3-dichloropropene and trans-1,3-dichloropropene.

Definitions:
C = Carcinogenic
N = Noncarcinogenic
NTX = No Toxicity Information
DLBSL = Detection limit below screening level
DLASL = Detection limit above screening level
ug/L = microgram per liter

Appendix J
Site 3 Human Health Risk Assessment Tables

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Site 3, NWS Yorktown

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Groundwater	Groundwater	Yorktown-Eastover Aquifer - Tap Water	Resident	Adult	Dermal Absorption	On-site	Quant	Although unlikely, groundwater will be evaluated for use as a future potable water supply.
						Ingestion	On-site	Quant	Although unlikely, groundwater will be evaluated for use as a future potable water supply.
					Child	Dermal Absorption	On-site	Quant	Although unlikely, groundwater will be evaluated for use as a future potable water supply.
						Ingestion	On-site	Quant	Although unlikely, groundwater will be evaluated for use as a future potable water supply.
					Child/Adult	Dermal Absorption	On-site	Quant	Although unlikely, groundwater will be evaluated for use as a future potable water supply. Child/Adult evaluated for cancer risk only.
						Ingestion	On-site	Quant	Although unlikely, groundwater will be evaluated for use as a future potable water supply. Child/Adult evaluated for cancer risk only.
				Industrial Worker	Adult	Dermal Absorption	On-site	None	Industrial workers not expected to take a significant number of showers/baths at workplace.
						Ingestion	On-site	Quant	Although unlikely, groundwater will be evaluated for use as a future potable water supply.
			Yorktown-Eastover Aquifer - Excavation Pit	Construction Worker	Adult	Dermal Absorption	On-site	None	Depth to groundwater greater than depth a construction worker would contact.
						Ingestion	On-site	None	Depth to groundwater greater than depth a construction worker would contact.
		Air	Yorktown-Eastover Aquifer-Water Vapors at Showerhead	Resident	Adult	Inhalation	On-site	Quant	Although unlikely, groundwater will be evaluated for use as future potable water supply.
					Child	Inhalation	On-site	Quant	Although unlikely, groundwater will be evaluated for use as future potable water supply.
				Industrial Worker	Adult	Inhalation	On-site	None	Industrial workers not expected to take a significant number of showers/baths at workplace.
			Yorktown-Eastover Aquifer-Volatilization from Water in Excavation Pit	Construction Worker	Adult	Inhalation	On-site	None	Depth to groundwater greater than depth a construction worker would contact.
			Yorktown-Eastover Aquifer-Vapor Intrusion to Indoor Air	Resident	Adult	Inhalation	On-site	Quant	Future resident could inhale vapors migrating from groundwater in indoor air if future resident constructed on site.
					Child	Inhalation	On-site	Quant	Future resident could inhale vapors migrating from groundwater into indoor air if future resident constructed on site.
					Child/Adult	Inhalation	On-site	Quant	Future resident could inhale vapors migrating from groundwater into indoor air if future resident constructed on site. Child/Adult evaluated for cancer risk only.
				Industrial Worker	Adult	Inhalation	On-site	Quant	Future industrial workers could inhale vapors migrating from groundwater into indoor air if future industrial building constructed on site.

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Site 3, NWS Yorktown

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Surface Water	Surface Water	Indian Field Creek	Trespasser/Visitor	Adult	Dermal Absorption	On-site	Quant	Trespassers/visitors could contact surface water in Indian Field Creek downgradient of Site 3.
						Ingestion	On-site	Quant	Trespassers/visitors could contact surface water in Indian Field Creek downgradient of Site 3.
					Adolescent	Dermal Absorption	On-site	Quant	Trespassers/visitors could contact surface water in Indian Field Creek downgradient of Site 3.
						Ingestion	On-site	Quant	Trespassers/visitors could contact surface water in Indian Field Creek downgradient of Site 3.
	Sediment	Sediment	Indian Field Creek	Trespasser/Visitor	Adult	Dermal Absorption	On-site	Quant	Trespassers/visitors could contact sediment in Indian Field Creek downgradient of Site 3.
						Ingestion	On-site	Quant	Trespassers/visitors could contact sediment in Indian Field Creek downgradient of Site 3.
					Adolescent	Dermal Absorption	On-site	Quant	Trespassers/visitors could contact sediment in Indian Field Creek downgradient of Site 3.
						Ingestion	On-site	Quant	Trespassers/visitors could contact sediment in Indian Field Creek downgradient of Site 3.
Future	Surface Water	Surface Water	Indian Field Creek	Construction Worker	Adult	Dermal Absorption	On-site	Quant	Construction workers could contact surface water in Indian Field Creek downgradient of Site 3.
						Ingestion	On-site	Quant	Construction workers could contact surface water in Indian Field Creek downgradient of Site 3.
	Sediment	Sediment	Indian Field Creek	Construction Worker	Adult	Dermal Absorption	On-site	Quant	Construction workers could contact sediment in Indian Field Creek downgradient of Site 3.
						Ingestion	On-site	Quant	Construction workers could contact sediment in Indian Field Creek downgradient of Site 3.

Quant: will be quantitatively evaluated.

Qual: will be qualitatively evaluated.

None: Not considered to be a complete pathway, therefore, not evaluated.

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Yorktown - Eastover Aquifer Tap Water	**75-34-3**	**1,1-Dichloroethane**	**8.2E+00 J**	**8.2E+00 J**	**UG/L**	**YS03-GW24-0309**	**1/19**	**0.5 - 36**	**8.2E+00**	**N/A**	**2.4E+00 C**	**N/A**		**YES**	**ASL**
	75-35-4	1,1-Dichloroethene	3.5E-01 J	1.2E+01 J	UG/L	YS03-GW24-0309	5/19	0.5 - 36	1.2E+01	N/A	2.6E+01 N	7.0E+00	MCL	NO	BSL
	540-59-0	**1,2-Dichloroethene (total)**	**1.3E-01 J**	**1.4E+03**	**UG/L**	**YS03-GW24-0309**	**14/19**	**0.5 - 36**	**1.4E+03**	**N/A**	**1.3E+01 N**	**N/A**		**YES**	**ASL**
	106-46-7	**1,4-Dichlorobenzene**	**1.1E-01 J**	**5.6E-01 J**	**UG/L**	**YS03-GW25P-0309**	**2/19**	**0.5 - 36**	**5.6E-01**	**N/A**	**4.2E-01 C**	**7.5E+01**	**MCL**	**YES**	**ASL**
	75-15-0	Carbon disulfide	1.3E-01 J	1.6E+00	UG/L	YS03-GW21-0309	2/19	0.5 - 36	1.6E+00	N/A	7.2E+01 N	N/A		NO	BSL
	156-59-2	**cis-1,2-Dichloroethene**	**1.4E-01 J**	**1.4E+03**	**UG/L**	**YS03-GW24-0309**	**14/19**	**0.5 - 36**	**1.4E+03**	**N/A**	**2.8E+00 N**	**7.0E+01**	**MCL**	**YES**	**ASL**
	75-71-8	Dichlorodifluoromethane (Freon-12)	1.5E-01 J	1.5E-01 J	UG/L	YS03-GW08B-0309 : YS03-GW08BP-0309	1/19	0.5 - 36	1.5E-01	N/A	1.9E+01 N	N/A		NO	BSL
	100-41-4	Ethylbenzene	1.5E-01 J	8.7E-01	UG/L	YS03-GW29P-0709	4/19	0.5 - 36	1.9E-01	N/A	1.3E+00 C	7.0E+02	MCL	NO	BSL
	79-20-9	Methyl acetate	4.0E-01 J	4.0E-01 J	UG/L	YS03-GW21-0309	1/19	0.5 - 36	4.0E-01	N/A	1.6E+03 N	N/A		NO	BSL
	156-60-5	**trans-1,2-Dichloroethene**	**1.0E-01 J**	**8.8E+00 J**	**UG/L**	**YS03-GW24-0309**	**6/19**	**0.5 - 36**	**8.8E+00**	**N/A**	**8.6E+00 N**	**1.0E+02**	**MCL**	**YES**	**ASL**
	79-01-6	**Trichloroethene**	**4.9E-01 J**	**4.0E+02**	**UG/L**	**YS03-GW24-0309**	**14/19**	**0.5 - 36**	**4.0E+02**	**N/A**	**2.6E-01 C**	**5.0E+00**	**MCL**	**YES**	**ASL**
	75-01-4	**Vinyl chloride**	**1.9E-01 J**	**1.2E+03**	**UG/L**	**YS03-GW24-0309**	**9/19**	**0.5 - 36**	**1.2E+03**	**N/A**	**1.5E-02 C**	**2.0E+00**	**MCL**	**YES**	**ASL**
	7429-90-5	**Aluminum, Dissolved**	**2.0E+03**	**2.0E+03**	**UG/L**	**YS03-GW19A-0409**	**1/19**	**200 - 200**	**2.0E+03**	**1.0E+02**	**1.6E+03 N**	**50-200**	**SMCL**	**YES**	**ASL**
	7440-38-2	**Arsenic, Dissolved**	**2.8E+00 J**	**3.5E+01**	**UG/L**	**YS03-GW21-0309**	**17/19**	**10 - 10**	**3.5E+01**	**1.4E+00**	**4.5E-02 C**	**1.0E+01**	**MCL**	**YES**	**ASL**
	7440-39-3	Barium, Dissolved	1.4E+01 J	6.7E+01 J	UG/L	YS03-GW24-0309	19/19	200 - 200	6.7E+01	1.3E+02	2.9E+02 N	2.0E+03	MCL	NO	BSL
	7440-43-9	Cadmium, Dissolved	4.4E-01 J	4.4E-01 J	UG/L	YS03-GW27-0309	1/19	5 - 5	4.4E-01	1.8E-01	6.9E-01 N	5.0E+00	MCL	NO	BSL
	7440-70-2	Calcium, Dissolved	3.1E+04	2.2E+05	UG/L	YS03-GW24-0309	19/19	5000 - 5000	2.2E+05	1.1E+05	N/A	N/A		NO	NUT
	7440-50-8	Copper, Dissolved	1.5E+00 J	1.5E+00 J	UG/L	YS03-GW27-0309	1/19	5 - 5	1.5E+00	3.0E+00	6.2E+01 N	1.3E+03	AL	NO	BSL
	7439-89-6	**Iron, Dissolved**	**1.2E+02**	**2.0E+03**	**UG/L**	**YS03-GW21-0309**	**9/19**	**100 - 100**	**2.0E+03**	**2.8E+02**	**1.1E+03 N**	**3.0E+02**	**SMCL**	**YES**	**ASL**
	7439-95-4	Magnesium, Dissolved	5.9E+02 J	8.0E+03	UG/L	YS03-GW24-0309	19/19	5000 - 5000	8.0E+03	1.1E+04	N/A	N/A		NO	NUT
	7439-96-5	**Manganese, Dissolved**	**1.4E+01**	**1.3E+03**	**UG/L**	**YS03-GW21-0309**	**18/19**	**10 - 10**	**1.3E+03**	**5.0E+01**	**3.2E+01 N**	**5.0E+01**	**SMCL**	**YES**	**ASL**
	7439-97-6	Mercury, Dissolved	1.0E-01 J	1.3E-01 J	UG/L	YS03-GW22-0309	3/19	0.2 - 0.2	1.3E-01	1.0E-01	4.3E-01 N	2.0E+00	MCL	NO	BSL
	7440-02-0	Nickel, Dissolved	1.5E+01 J	1.5E+01 J	UG/L	YS03-GW24-0309	1/19	40 - 40	1.5E+01	1.2E+01	3.0E+01 N	N/A		NO	BSL
	7440-09-7	Potassium, Dissolved	1.4E+03 J	2.1E+03 J	UG/L	YS03-GW19A-0409	3/19	5000 - 5000	2.1E+03	1.3E+04	N/A	N/A		NO	NUT
	7782-49-2	**Selenium, Dissolved**	**2.3E+00 J**	**1.1E+01 L**	**UG/L**	**YS03-GW27-0309**	**11/19**	**5 - 5**	**1.1E+01**	**9.1E+00**	**7.8E+00 N**	**5.0E+01**	**MCL**	**YES**	**ASL**
	7440-22-4	Silver, Dissolved	8.3E-01 J	9.3E-01 J	UG/L	YS03-GW06-0309	2/19	5 - 5	9.3E-01	N/A	7.1E+00 N	N/A		NO	BSL
	7440-23-5	Sodium, Dissolved	4.8E+03 J	4.2E+04	UG/L	YS03-GW23-0309	19/19	5000 - 5000	4.2E+04	6.3E+04	N/A	N/A		NO	NUT
	7440-28-0	**Thallium, Dissolved**	**4.1E+00 J**	**4.1E+00 J**	**UG/L**	**YS03-GW08BP-0309**	**1/19**	**10 - 10**	**4.1E+00**	**N/A**	**1.6E-02**	**2.0E+00**	**MCL**	**YES**	**ASL**
	7440-62-2	Vanadium, Dissolved	2.0E+00 J	5.7E+00 J	UG/L	YS03-GW19A-0409	2/19	20 - 20	5.7E+00	4.3E+00	7.8E+00 N	N/A		NO	BSL
	7440-66-6	Zinc, Dissolved	3.4E+01	1.1E+02	UG/L	YS03-GW19A-0409	2/19	20 - 20	1.1E+02	N/A	4.7E+02 N	5.0E+03	SMCL	NO	BSL

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Following USEPA Region III guidance (*Guidance on the Selection of Analytical Metal Results from Monitoring Well Samples for Use in Quantitative Assessment* of Risk, USEPA, 1992), dissolved inorganic groundwater data used for tap water because an order of magnitude difference noted between dissolved and total results.

[2] Maximum concentration is used for screening.

[3] Background values are the Yorktown Eastover aquifer background concentration.

[4] Oak Ridge National Laboratory (ORNL). Nov. 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). [Online]. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml
RSL value for mercury (inorganic salts) used as surrogate for mercury.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

COPC = Chemical of Potential Concern
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
UG/L = micrograms per liter
N/A = not available, not applicable
MCL = Maximum Contaminant Level, Primary Drinking Water Standards
SMCL = Maximum Contaminant Level, Secondary Drinking Water Standards
AL = Action Level, Safe Drinking Water Act

Updated by: D. Stannard/WDC (4/20/2012)
Checked by: G. Howard-Peebles (4/27/2012)

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Yorktown - Eastover Aquifer Water Vapors at Showerhead and in Excavation Pit	**75-34-3**	**1,1-Dichloroethane**	**8.2E+00 J**	**8.2E+00 J**	**UG/L**	**YS03-GW24-0309**	**1/19**	**0.5 - 36**	**8.2E+00**	**N/A**	**2.4E+00 C**	**N/A**		**YES**	**ASL**
	75-35-4	1,1-Dichloroethene	3.5E-01 J	1.2E+01 J	UG/L	YS03-GW24-0309	5/19	0.5 - 36	1.2E+01	N/A	2.6E+01 N	7.0E+00	MCL	NO	BSL
	540-59-0	**1,2-Dichloroethene (total)**	**1.3E-01 J**	**1.4E+03**	**UG/L**	**YS03-GW24-0309**	**14/19**	**0.5 - 36**	**1.4E+03**	**N/A**	**1.3E+01 N**	**N/A**		**YES**	**ASL**
	106-46-7	**1,4-Dichlorobenzene**	**1.1E-01 J**	**5.6E-01 J**	**UG/L**	**YS03-GW25P-0309**	**2/19**	**0.5 - 36**	**5.6E-01**	**N/A**	**4.2E-01 C**	**7.5E+01**	**MCL**	**YES**	**ASL**
	75-15-0	Carbon disulfide	1.3E-01 J	1.6E+00	UG/L	YS03-GW21-0309	2/19	0.5 - 36	1.6E+00	N/A	7.2E+01 N	N/A		NO	BSL
	156-59-2	**cis-1,2-Dichloroethene**	**1.4E-01 J**	**1.4E+03**	**UG/L**	**YS03-GW24-0309**	**14/19**	**0.5 - 36**	**1.4E+03**	**N/A**	**2.8E+00 N**	**7.0E+01**	**MCL**	**YES**	**ASL**
	75-71-8	Dichlorodifluoromethane (Freon-12)	1.5E-01 J	1.5E-01 J	UG/L	YS03-GW08B-0309 : YS03-GW08BP-0309	1/19	0.5 - 36	1.5E-01	N/A	1.9E+01 N	N/A		NO	BSL
	100-41-4	Ethylbenzene	1.5E-01 J	8.7E-01	UG/L	YS03-GW29P-0709	4/19	0.5 - 36	1.9E-01	N/A	1.3E+00 C	7.0E+02	MCL	NO	BSL
	79-20-9	Methyl acetate	4.0E-01 J	4.0E-01 J	UG/L	YS03-GW21-0309	1/19	0.5 - 36	4.0E-01	N/A	1.6E+03 N	N/A		NO	BSL
	156-60-5	**trans-1,2-Dichloroethene**	**1.0E-01 J**	**8.8E+00 J**	**UG/L**	**YS03-GW24-0309**	**6/19**	**0.5 - 36**	**8.8E+00**	**N/A**	**8.6E+00 N**	**1.0E+02**	**MCL**	**YES**	**ASL**
	79-01-6	**Trichloroethene**	**4.9E-01 J**	**4.0E+02**	**UG/L**	**YS03-GW24-0309**	**14/19**	**0.5 - 36**	**4.0E+02**	**N/A**	**2.6E-01 C**	**5.0E+00**	**MCL**	**YES**	**ASL**
	75-01-4	**Vinyl chloride**	**1.9E-01 J**	**1.2E+03**	**UG/L**	**YS03-GW24-0309**	**9/19**	**0.5 - 36**	**1.2E+03**	**N/A**	**1.5E-02 C**	**2.0E+00**	**MCL**	**YES**	**ASL**

[1] Minumum and maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values are the maximum detected concentration from Yorktown Eastover aquifer Background dataset
[4] Oak Ridge National Laboratory (ORNL). Nov. 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). [Online]. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml
RSL value for Manganese (water) used as surrogate for manganese.
RSL value for Mercury (inorganic salts) used as surrogate for mercury.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

COPC = Chemical of Potential Concern
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
UG/L = micrograms per liter
N/A = not available, not applicable
MCL = Maximum Contaminant Level, Primary Drinking Water Standards
SMCL = Maximum Contaminant Level, Secondary Drinking Water Standards
AL = Action Level, Safe Drinking Water Act

Updated by: D. Stannard/WDC (4/20/2012)
Checked by: G. Howard-Peebles (4/27/2012)

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Yorktown - Eastover Aquifer Water in Excavation Pit	**75-34-3**	**1,1-Dichloroethane**	**8.2E+00 J**	**8.2E+00 J**	**UG/L**	**YS03-GW24-0309**	**1/19**	**0.5 - 36**	**8.2E+00**	**N/A**	**2.4E+00 C**	**N/A**		**YES**	**ASL**
	75-35-4	1,1-Dichloroethene	3.5E-01 J	1.2E+01 J	UG/L	YS03-GW24-0309	5/19	0.5 - 36	1.2E+01	N/A	2.6E+01 N	7.0E+00	MCL	NO	BSL
	540-59-0	**1,2-Dichloroethene (total)**	**1.3E-01 J**	**1.4E+03**	**UG/L**	**YS03-GW24-0309**	**14/19**	**0.5 - 36**	**1.4E+03**	**N/A**	**1.3E+01 N**	**N/A**		**YES**	**ASL**
	106-46-7	**1,4-Dichlorobenzene**	**1.1E-01 J**	**5.6E-01 J**	**UG/L**	**YS03-GW25P-0309**	**2/19**	**0.5 - 36**	**5.6E-01**	**N/A**	**4.2E-01 C**	**7.5E+01**	**MCL**	**YES**	**ASL**
	75-15-0	Carbon disulfide	1.3E-01 J	1.6E+00	UG/L	YS03-GW21-0309	2/19	0.5 - 36	1.6E+00	N/A	7.2E+01 N	N/A		NO	BSL
	156-59-2	**cis-1,2-Dichloroethene**	**1.4E-01 J**	**1.4E+03**	**UG/L**	**YS03-GW24-0309**	**14/19**	**0.5 - 36**	**1.4E+03**	**N/A**	**2.8E+00 N**	**7.0E+01**	**MCL**	**YES**	**ASL**
	75-71-8	Dichlorodifluoromethane (Freon-12)	1.5E-01 J	1.5E-01 J	UG/L	YS03-GW08B-0309 : YS03-GW08BP-0309	1/19	0.5 - 36	1.5E-01	N/A	1.9E+01 N	N/A		NO	BSL
	100-41-4	Ethylbenzene	1.5E-01 J	8.7E-01	UG/L	YS03-GW29P-0709	4/19	0.5 - 36	1.9E-01	N/A	1.3E+00 C	7.0E+02	MCL	NO	BSL
	79-20-9	Methyl acetate	4.0E-01 J	4.0E-01 J	UG/L	YS03-GW21-0309	1/19	0.5 - 36	4.0E-01	N/A	1.6E+03 N	N/A		NO	BSL
	156-60-5	**trans-1,2-Dichloroethene**	**1.0E-01 J**	**8.8E+00 J**	**UG/L**	**YS03-GW24-0309**	**6/19**	**0.5 - 36**	**8.8E+00**	**N/A**	**8.6E+00 N**	**1.0E+02**	**MCL**	**YES**	**ASL**
	79-01-6	**Trichloroethene**	**4.9E-01 J**	**4.0E+02**	**UG/L**	**YS03-GW24-0309**	**14/19**	**0.5 - 36**	**4.0E+02**	**N/A**	**2.6E-01 C**	**5.0E+00**	**MCL**	**YES**	**ASL**
	75-01-4	**Vinyl chloride**	**1.9E-01 J**	**1.2E+03**	**UG/L**	**YS03-GW24-0309**	**9/19**	**0.5 - 36**	**1.2E+03**	**N/A**	**1.5E-02 C**	**2.0E+00**	**MCL**	**YES**	**ASL**
	7429-90-5	**Aluminum**	**1.2E+02 J**	**1.9E+04**	**UG/L**	**YS03-GW19A-0409**	**18/19**	**200 - 200**	**1.9E+04**	**2.2E+03**	**1.6E+03 N**	**50-200**	**SMCL**	**YES**	**ASL**
	7440-38-2	**Arsenic**	**2.7E+00 J**	**6.1E+01**	**UG/L**	**YS03-GW19A-0409**	**7/19**	**10 - 10**	**6.1E+01**	**2.3E+00**	**4.5E-02 C**	**1.0E+01**	**MCL**	**YES**	**ASL**
	7440-39-3	Barium	1.3E+01 J	1.3E+02 J	UG/L	YS03-GW24-0309	19/19	200 - 200	1.3E+02	1.2E+02	2.9E+02 N	2.0E+03	MCL	NO	BSL
	7440-41-7	Beryllium	6.9E-01 J	6.9E-01 J	UG/L	YS03-GW19A-0409	1/19	5 - 5	6.9E-01	2.5E+00	1.6E+00 N	1.3E+01	MCL	NO	BSL
	7440-70-2	Calcium	3.2E+04	3.4E+05	UG/L	YS03-GW24-0309	19/19	5000 - 5000	3.4E+05	1.7E+05	N/A	N/A		NO	NUT
	7440-47-3	**Chromium**	**1.4E+00 J**	**5.2E+02**	**UG/L**	**YS03-GW24-0309**	**11/19**	**10 - 10**	**5.2E+02**	**1.5E+01**	**3.1E-02 C**	**N/A**		**YES**	**ASL**
	7440-48-4	**Cobalt**	**2.6E+00 J**	**1.1E+01**	**UG/L**	**YS03-GW24-0309**	**6/19**	**5 - 5**	**1.1E+01**	**2.1E+01**	**4.7E-01 N**	**N/A**		**YES**	**ASL**
	7440-50-8	Copper	1.7E+00 J	5.5E+01	UG/L	YS03-GW19-0309	7/19	5 - 5	5.5E+01	1.2E+01	6.2E+01 N	1.3E+03	AL	NO	BSL
	7439-89-6	**Iron**	**1.6E+02**	**5.0E+04**	**UG/L**	**YS03-GW19A-0409**	**18/19**	**100 - 100**	**5.0E+04**	**8.9E+02**	**1.1E+03 N**	**3.0E+02**	**SMCL**	**YES**	**ASL**
	7439-92-1	**Lead**	**1.8E+00 L**	**1.7E+01**	**UG/L**	**YS03-GW19A-0409**	**9/19**	**3 - 3**	**1.7E+01**	**2.1E+01**	**1.5E+01 AL**	**1.5E+01**	**MCL**	**YES**	**ASL**
	7439-95-4	Magnesium	5.0E+02 J	1.2E+04	UG/L	YS03-GW24-0309	19/19	5000 - 5000	1.2E+04	1.2E+04	N/A	N/A		NO	NUT
	7439-96-5	**Manganese**	**2.6E+01**	**1.3E+03**	**UG/L**	**YS03-GW19A-0409**	**18/19**	**10 - 10**	**1.3E+03**	**5.8E+01**	**3.2E+01 N**	**5.0E+01**	**SMCL**	**YES**	**ASL**
	7439-97-6	Mercury	1.0E-01 J	2.8E-01	UG/L	YS03-GW20A-0309	2/19	0.2 - 0.2	2.8E-01	8.1E-02	4.3E-01 N	2.0E+00	MCL	NO	BSL
	7440-02-0	**Nickel**	**2.1E+00 J**	**2.5E+02**	**UG/L**	**YS03-GW24-0309**	**9/19**	**40 - 40**	**2.5E+02**	**1.1E+01**	**3.0E+01 N**	**N/A**		**YES**	**ASL**
	7440-09-7	Potassium	7.5E+02 J	8.4E+03	UG/L	YS03-GW19A-0409	19/19	5000 - 5000	8.4E+03	1.3E+04	N/A	N/A		NO	NUT
	7782-49-2	Selenium	3.5E+00 J	3.5E+00 J	UG/L	YS03-GW19A-0409	1/19	5 - 5	3.5E+00	N/A	7.8E+00 N	5.0E+01	MCL	NO	BSL
	7440-23-5	Sodium	5.2E+03	3.6E+04	UG/L	YS03-GW23-0309	19/19	5000 - 5000	3.6E+04	6.5E+04	N/A	N/A		NO	NUT
	7440-62-2	**Vanadium**	**9.5E-01 J**	**7.8E+01**	**UG/L**	**YS03-GW19A-0409**	**12/19**	**20 - 20**	**7.8E+01**	**2.6E+01**	**7.8E+00 N**	**N/A**		**YES**	**ASL**
	7440-66-6	**Zinc**	**5.5E+00 J**	**2.8E+03**	**UG/L**	**YS03-GW19A-0409**	**12/19**	**20 - 20**	**2.8E+03**	**4.5E+00**	**4.7E+02 N**	**5.0E+03**	**SMCL**	**YES**	**ASL**

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Total inorganic groundwater data used for water in excavation pit because construction worker would be exposed directly to the water in the excavation pit.
[2] Maximum concentration is used for screening.
[3] Background values are Yorktown Eastover aquifer Background concentrations.
[4] Oak Ridge National Laboratory (ORNL). Nov. 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). [Online]. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml
RSL value for Manganese (water) used as surrogate for manganese.
RSL value for Mercury (inorganic salts) used as surrogate for mercury.
Safe Drinking Water Act Action Level for Lead as screening level for lead.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

COPC = Chemical of Potential Concern
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
UG/L = micrograms per liter
N/A = not available, not applicable
MCL = Maximum Contaminant Level, Primary Drinking Water Standards
SMCL = Maximum Contaminant Level, Secondary Drinking Water Standards
AL = Action Level, Safe Drinking Water Act

Updated by: D. Stannard/WDC (4/20/2012)
Checked by: G. Howard-Peebles (4/27/2012)

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Yorktown -	75-34-3	1,1-Dichloroethane	8.2E+00 J	8.2E+00 J	UG/L	YS03-GW24-0309	1/19	0.5 - 36	8.2E+00	N/A	9.3E+00 C	N/A		NO	BSL
Eastover Aquifer	75-35-4	1,1-Dichloroethene	3.5E-01 J	1.2E+01 J	UG/L	YS03-GW24-0309	5/19	0.5 - 36	1.2E+01	N/A	2.6E+01 N	7.0E+00	MCL	NO	BSL
Vapor Intrusion	**540-59-0**	**1,2-Dichloroethene (total)**	**1.3E-01 J**	**1.4E+03**	**UG/L**	**YS03-GW24-0309**	**14/19**	**0.5 - 36**	**1.4E+03**	**N/A**	**5.2E+01 N**	**N/A**		**YES**	**ASL**
Into Indoor Air	106-46-7	1,4-Dichlorobenzene	1.1E-01 J	5.6E-01 J	UG/L	YS03-GW25P-0309	2/19	0.5 - 36	5.6E-01	N/A	7.5E+01 M	7.5E+01	MCL	NO	BSL
	75-15-0	Carbon disulfide	1.3E-01 J	1.6E+00	UG/L	YS03-GW21-0309	2/19	0.5 - 36	1.6E+00	N/A	1.7E+02 N	N/A		NO	BSL
	156-59-2	**cis-1,2-Dichloroethene**	**1.4E-01 J**	**1.4E+03**	**UG/L**	**YS03-GW24-0309**	**14/19**	**0.5 - 36**	**1.4E+03**	**N/A**	**7.0E+01 M**	**7.0E+01**	**MCL**	**YES**	**ASL**
	75-71-8	Dichlorodifluoromethane (Freon-12)	1.5E-01 J	1.5E-01 J	UG/L	YS03-GW08B-0309 : YS03-GW08BP-0309	1/19	0.5 - 36	1.5E-01	N/A	1.1E+00 N	N/A		NO	BSL
	100-41-4	Ethylbenzene	1.5E-01 J	8.7E-01	UG/L	YS03-GW29P-0709	4/19	0.5 - 36	1.9E-01	N/A	7.0E+02 M	7.0E+02	MCL	NO	BSL
	79-20-9	Methyl acetate	4.0E-01 J	4.0E-01 J	UG/L	YS03-GW21-0309	1/19	0.5 - 36	4.0E-01	N/A	N/A	N/A		NO	NTX
	156-60-5	trans-1,2-Dichloroethene	1.0E-01 J	8.8E+00 J	UG/L	YS03-GW24-0309	6/19	0.5 - 36	8.8E+00	N/A	1.0E+02 M	1.0E+02	MCL	NO	BSL
	79-01-6	**Trichloroethene**	**4.9E-01 J**	**4.0E+02**	**UG/L**	**YS03-GW24-0309**	**14/19**	**0.5 - 36**	**4.0E+02**	**N/A**	**5.0E+00 M**	**5.0E+00**	**MCL**	**YES**	**ASL**
	75-01-4	**Vinyl chloride**	**1.9E-01 J**	**1.2E+03**	**UG/L**	**YS03-GW24-0309**	**9/19**	**0.5 - 36**	**1.2E+03**	**N/A**	**2.0E+00 M**	**2.0E+00**	**MCL**	**YES**	**ASL**

[1] Minumum and maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values are the maximum detected concentration from Yorktown Eastover aquifer Background dataset
[4] See Table 2.4 Supplement A
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

COPC = Chemical of Potential Concern
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
UG/L = micrograms per liter
N/A = not available, not applicable
MCL or M = Maximum Contaminant Level, Primary Drinking Water Standards
SMCL = Maximum Contaminant Level, Secondary Drinking Water Standards
AL = Action Level, Safe Drinking Water Act

Updated by: D. Stannard/WDC (4/20/2012)
Checked by: G. Howard-Peebles (4/27/2012)

Table 2.4 Supplement A
Calculation of Target Groundwater Concentrations for Vapor Intrusion Screening[1]
Site 3, NWS, Yorktown, Yorktown, Virginia

CAS Number	Constituent	Unit Risk Factor (URF) $(ug/m^3)^{-1}$	Reference Concentration (RfC) mg/m^3	Target Indoor Air Concentration[2], carcinogen (C_{Cancer}) ug/m^3	Target Indoor Air Concentration[2], non-carcinogen ($C_{non-Cancer}$) ug/m^3	Target Indoor Air Concentration ($C_{target,ia}$) ug/m^3	System Temperature Henry's Law Constant (H'TS)[3] Dimensionless	Risk-Based Target Groundwater Concentration (C_{gw}) ug/L	MCL ug/L	Final Target Groundwater Concentration[4] (C_{gw}) ug/L
75-34-3	1,1-Dichloroethane	1.6E-06	N/A	1.5E+00	NA	1.5E+00	1.6E-01	9.3E+00	N/A	9.3E+00
75-35-4	1,1-Dichloroethene	N/A	2.0E-01	N/A	2.1E+01	2.1E+01	8.0E-01	2.6E+01	7.0E+00	2.6E+01
540-59-0	1,2-Dichloroethene (total)	N/A	6.0E-02	N/A	6.3E+00	6.3E+00	1.2E-01	5.2E+01	N/A	5.2E+01
106-46-7	1,4-Dichlorobenzene	1.1E-05	8.0E-01	2.2E-01	8.3E+01	2.2E-01	5.5E-02	4.0E+00	7.5E+01	7.5E+01
75-15-0	Carbon disulfide	N/A	7.0E-01	N/A	7.3E+01	7.3E+01	4.4E-01	1.7E+02	N/A	1.7E+02
156-59-2	cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	N/A	1.2E-01	N/A	7.0E+01	7.0E+01
75-71-8	Dichlorodifluoromethane (Freon-12)	N/A	1.0E-01	N/A	1.0E+01	1.0E+01	9.2E+00	1.1E+00	N/A	1.1E+00
100-41-4	Ethylbenzene	2.5E-06	1.0E+00	9.7E-01	1.0E+02	9.7E-01	1.9E-01	5.1E+00	7.0E+02	7.0E+02
79-20-9	Methyl acetate	N/A	N/A	N/A	N/A	N/A	3.1E-03	N/A	N/A	N/A
156-60-5	trans-1,2-Dichloroethene	N/A	6.0E-02	N/A	6.3E+00	6.3E+00	1.2E-01	5.2E+01	1.0E+02	1.0E+02
79-01-6	Trichloroethene	4.1E-06	2.0E-03	4.3E-01	2.1E-01	2.1E-01	2.6E-01	8.1E-01	5.0E+00	5.0E+00
75-01-4	Vinyl chloride	4.4E-06	1.0E-01	1.6E-01	1.0E+01	1.6E-01	9.2E-01	1.8E-01	2.0E+00	2.0E+00

Notes:
[1] The vapor intrusion screening levels [i.e., target groundwater concentration from Table 2c, Subsurface Vapor Intrusion Guidance (EPA, 2002)] were updated using the methodology presented in Appendix D of Subsurface Vapor Intrusion Guidance (EPA, 2002).
[2] Values are Regional Screening Levels (RSL) for residential air (based on 10^6 for carcinogens and HQ of 0.1 for noncarcinogens). [Oak Ridge National Laboratory (ORNL), Nov. 2011].
[3] H'TS = Henry's Law Constant (dimensionless) at system (i.e., groundwater) temperature. Calculated using equation 3 from USEPA, 2004. Average groundwater temperature (15.5°C) based on data from March 2009 sampling event.
[4] If the calculated groundwater target concentration is less than the Maximum Contaminant Level (MCL) for the compound, the target concentration is set at the MCL (EPA, 2002).
RfC and RSL values for trans-1,2-Dichloroethene used as surrogate for 1,2-Dichloroethene (total).
MCL = maximum contaminant level (EPA, 2009).
N/A = Not available.

Variables	Units	Value
$C_{target,ia}$ = Target indoor air conc., minimum	ug/m^3	Solved by Eq. 1
C_{gw} = Target groundwater conc.	ug/L	Solved by Eq. 2
TCR = Target Cancer Risk	unitless	1.00E-06
THQ = Target Hazard Quotient	unitless	0.1
URF = Unit Risk Factor	$(ug/m^3)^{-1}$	Chemical-specific
RfC = Reference Concentration	mg/m^3	Chemical-specific
H = Dimensionless Henry's Law Constant	unitless	Chemical-specific
alpha (α) = Attenuation Factor	unitless	0.001

Equation 1: $C_{target,ia}$ = Minimum(C_{cancer}, $C_{non-cancer}$)
Equation 2: Cgw = $C_{target,ia} \times 10^{-3}\ m^3/L * 1/H'TS * 1/\alpha$

Table 3.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 3
NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Yorktown - Eastover Aquifer Tap Water	1,1-Dichloroethane	UG/L	N/A	N/A		8.2E+00	J	8.2E+00	UG/L	Max	7
	1,4-Dichlorobenzene	UG/L	2.6E-01	5.6E-01	NP	5.6E-01	J	5.6E-01	UG/L	95% KM-BCA	4
	cis-1,2-Dichloroethene[a]	UG/L	3.9E+02	2.0E+03	G	1.4E+03		1.4E+03	UG/L	Max	1, 3, 5
	Trichloroethene	UG/L	1.1E+02	2.0E+02	N	4.0E+02		2.0E+02	UG/L	95% Stud-t	1, 2, 3
	Vinyl chloride	UG/L	3.0E+02	1.1E+03	NP	1.2E+03		1.1E+03	UG/L	95% KM	1, 3
	Aluminum, Dissolved	UG/L	N/A	N/A		2.0E+03		2.0E+03	UG/L	Max	8
	Arsenic, Dissolved	UG/L	8.9E+00	2.5E+01	NP	3.5E+01		2.5E+01	UG/L	95% Cheb-m	4
	Iron, Dissolved	UG/L	1.7E+03	1.8E+03	NP	2.0E+03		1.8E+03	UG/L	95% KM-t	1, 2
	Manganese, Dissolved	UG/L	3.4E+02	8.7E+02	G	1.3E+03		8.7E+02	UG/L	G-App	1, 3
	Selenium, Dissolved	UG/L	5.7E+00	8.2E+00	NP	1.1E+01	L	8.2E+00	UG/L	95% KM-t	1, 2, 3
	Thallium, Dissolved	UG/L	N/A	N/A		ND		N/A		N/A	6

[a] Although 1,2-DCE, cis-1,2-DCE, and trans-1,2-DCE were identified as COPCs, assumes the majority of the 1,2-DCE is in the cis-1,2-DCE form based on the concentrations of cis- and trans-1,2-DCE

Values were calculated using the results from the wells from the center of the plume. These wells included YS03-GW19-0309, YS03-GW19A-0409, YS03-GW21-0309, YS03-GW24-0309, YS31-GW25-0309, YS03-GW25P-0309, YS03-GW26-0309, YS03-GW27-0309, YS03-GW28-0309

ProUCL, Version 4.1.00 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. May 2010. Prepared by Lockheed Martin Environmental Services).
Options: Approximate Gamma UCL (G-App); Maximum Detected Value (M); 95% Chebyshev (mean, std) UCL (95% Cheb-m); 95% KM BCA UCL (95% KM-BCA)
95% Student's-T test UCL (95% Stud-t); 95% Kaplan-Meier (t) UCL (95% KM-t)

UCL Rationale:
(1) Shapiro-Wilk W Test/Lilliefors test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.
(3) Test indicates data are gamma distributed.
(4) Distribution tests are inconclusive
(5) Max value used because 95% UCL greater than max.
(6) Constituent was retained as COPC for all Site 3 wells, however was not detected in wells selected for evaluation in the HHRA
(7) Maximum detected concentration used because constituent detected in only one sample.
(8) Maximum values used because not enough distinct values in dataset.

N = Normal
NP = Non-Parametric
G = Gamma
ug/L = micrograms per liter
J = Estimated Value
L = Estimated Low
N/A = not available/not applicable
ND = Not detected

Table 3.2

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Yorktown - Eastover Aquifer Water Vapors at Showerhead and in Excavation Pit	1,1-Dichloroethane	UG/L	N/A	N/A		8.2E+00	J	8.2E+00	UG/L	Max	6
	1,4-Dichlorobenzene	UG/L	2.6E-01	5.6E-01	NP	5.6E-01	J	5.6E-01	UG/L	95% KM-BCA	4
	cis-1,2-Dichloroethene[a]	UG/L	3.9E+02	2.0E+03	G	1.4E+03		1.4E+03	UG/L	Max	1, 3, 5
	Trichloroethene	UG/L	1.1E+02	2.0E+02	N	4.0E+02		2.0E+02	UG/L	95% Stud-t	1, 2, 3
	Vinyl chloride	UG/L	3.0E+02	1.1E+03	NP	1.2E+03		1.1E+03	UG/L	95% KM	1, 3

[a] Although 1,2-DCE, cis-1,2-DCE, and trans-1,2-DCE were identified as COPCs, assumes the majority of the 1,2-DCE is in the cis-1,2-DCE form based on the concentrations of cis- and trans-1,2-DCE.

Values were calculated using the results from the wells from the center of the plume. These wells included YS03-GW19-0309, YS03-GW19A-0409, YS03-GW21-0309, YS03-GW24-0309, YS31-GW25-0309, YS03-GW25P-0309, YS03-GW26-0309, YS03-GW27-0309, YS03-GW28-0309

ProUCL, Version 4.1.00 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. May 2010. Prepared by Lockheed Martin Environmental Services).

Options: Maximum Detected Value (M); 95% Student's-T test UCL (95% Stud-t); 95% Kaplan-Meier (t) UCL (95% KM-t); 95% KM BCA UCL (95% KM-BCA)

UCL Rationale:

(1) Shapiro-Wilk W Test/Lilliefors test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.
(3) Test indicates data are gamma distributed.
(4) Distribution tests are inconclusive
(5) Max value used because 95% UCL greater than max.
(6) Maximum detected concentration used because constituent detected in only one sample.

N = Normal
NP = Non-Parametric
G = Gamma
ug/L = micrograms per liter
J = Estimated Value
N/A = not available/not applicable

Table 3.3

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Yorktown - Eastover Aquifer Water in Excavation Pit	1,1-Dichloroethane	UG/L	N/A	N/A		8.2E+00	J	8.2E+00	UG/L	Max	6
	1,4-Dichlorobenzene	UG/L	2.6E-01	5.6E-01	NP	5.6E-01	J	5.6E-01	UG/L	95% KM-BCA	4
	cis-1,2-Dichloroethene[a]	UG/L	3.9E+02	2.0E+03	G	1.4E+03		1.4E+03	UG/L	Max	1, 3, 5
	Trichloroethene	UG/L	1.1E+02	2.0E+02	N	4.0E+02		2.0E+02	UG/L	95% Stud-t	1, 2, 3
	Vinyl chloride	UG/L	3.0E+02	1.1E+03	NP	1.2E+03		1.1E+03	UG/L	95% KM	1, 3
	Aluminum	UG/L	5.5E+03	1.8E+04	G	1.9E+04		1.8E+04	UG/L	G-App	1, 3
	Arsenic	UG/L	2.1E+01	3.7E+01	NP	6.1E+01		3.7E+01	UG/L	95% KM-t	1, 2, 3
	Chromium	UG/L	8.9E+01	3.7E+02	NP	5.2E+02		3.7E+02	UG/L	95% KM	1, 3
	Cobalt	UG/L	4.5E+00	6.6E+00	NP	1.1E+01		6.6E+00	UG/L	95% KM-t	1, 2, 3
	Iron	UG/L	1.4E+04	4.7E+04	G	5.0E+04		4.7E+04	UG/L	G-App	1, 3
	Manganese	UG/L	4.9E+02	1.3E+03	G	1.3E+03		1.3E+03	UG/L	Max	1, 3, 5
	Nickel	UG/L	3.9E+01	1.0E+02	NP	2.5E+02		1.0E+02	UG/L	95% KM-BCA	1, 3
	Vanadium	UG/L	2.6E+01	4.6E+01	NP	7.8E+01		4.6E+01	UG/L	95% KM-t	1, 2, 3
	Zinc	UG/L	3.7E+02	3.8E+03	NP	2.8E+03		2.8E+03	UG/L	Max	1, 5

[a] Although 1,2-DCE, cis-1,2-DCE, and trans-1,2-DCE were identified as COPCs, assumes the majority of the 1,2-DCE is in the cis-1,2-DCE form based on the concentrations of cis- and trans-1,2-DCE

Values were calculated using the results from the wells from the center of the plume. These wells included YS03-GW19-0309, YS03-GW19A-0409, YS03-GW21-0309, YS03-GW24-0309, YS31-GW25-0309, YS03-GW25P-0309, YS03-GW26-0309, YS03-GW27-0309, YS03-GW28-0309

ProUCL, Version 4.00.04 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. February 2009. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).
Options: Approximate Gamma UCL (G-App); Maximum Detected Value (M); 95% Kaplan-Meier (t) UCL (95% KM-t); 95% Student's-T test UCL (95% Stud-t); 95% Kaplan-Meier Chebyshev UCL (95% KM); 95% KM BCA UCL (95% KM-BCA)

UCL Rationale:
(1) Shapiro-Wilk W Test/Lilliefors test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.
(3) Test indicates data are gamma distributed.
(4) Distribution tests are inconclusive
(5) Max value used because 95% UCL greater than max.
(6) Maximum detected concentration used because constituent detected in only one sample.

N = Normal
T = Log-Transformed
NP = Non-Parametric
G = Gamma
ug/L = micrograms per liter
J = Estimated Value
NA = not available/not applicable
ND = Not detected

Table 3.4

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater to Indoor Air

Exposure Point	Chemical of Potential Concern	Maximum Detected Concentration (Groundwater)	Units	Exposure Medium	Exposure Medium Concentration	Units	Reference for Exposure Medium Calculation
Groundwater to Indoor Air	cis-1,2-Dichloroethene[a]	1.4E+03	ug/L	Groundwater to Indoor Air	1.6E-01	mg/m^3	EPA, 2002 & 2004
	Trichloroethene	2.0E+02	ug/L	Groundwater to Indoor Air	5.3E-02	mg/m^3	EPA, 2002 & 2004
	Vinyl chloride	1.1E+03	ug/L	Groundwater to Indoor Air	1.0E+00	mg/m^3	EPA, 2002 & 2004

[a] Although 1,2-DCE, cis-1,2-DCE, and trans-1,2-DCE are identified as COPCs, assumes the majority of the 1,2-DCE is in the cis-1,2-DCE form based on the concentrations of cis- and trans-1,2-DCE.

$C_{ia} = C_{gw} \times H'_{TS} \times \alpha \div 10^{-3}\ m^3/L * 10^{-3}\ mg/\mu g$

C_{ia} = Indoor air concentration (mg/m^3)

C_{gw} = groundwater concentration (µg/L)

H'_{TS} - System Temperature Henry's Law Constant (unitless); see Table 2.4 Supplement A.

α = attenuation factor (default, 0.001; USEPA 2002)

USEPA. 2002. OSWER Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance). November.

USEPA. 2004. User's Guide for Evaluating Subsurface Vapor Intrusion Into Buildings. Office of Emergency and Remedial Response. February.

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Water	2	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Child	Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				IR-W-A	Ingestion Rate of Water, Adult	2	liters/day	EPA, 1997	CW x IR-W-Adj x EF x CF2 x 1/AT
				IR-W-C	Ingestion Rate of Water, Child	1	liters/day	EPA, 1997	
				IR-W-Adj	Ingestion Rate of Water, Age-adjusted	1.09	liter-year/kg-day	calculated	IR-W-Adj (liter-year/kd-day) =
				EF	Exposure Frequency	350	days/year	EPA, 1991	(ED-C x IR-W-C / BW-C) +
				ED-A	Exposure Duration, Adult	24	years	EPA, 1991	(ED-A x IR-W-A / BW-A)
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inestion	Industrial Worker	Adult	Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1991	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	250	days/year	EPA, 1991	
				ED	Exposure Duration	25	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	
Dermal	Resident	Adult	Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	0.58	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	18,000	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	350	days/year	EPA, 2004	
				ED	Exposure Duration	24	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Child	Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	1.0	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	6,600	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	350	days/year	EPA, 2004	
				ED	Exposure Duration	6	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	
		Child/Adult	Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) = DA-Adj x EF x 1/AT
				DAevent-A	Dermally Absorbed Dose per Event, Adult	calculated	mg/cm^2-event	calculated	
				DAevent-C	Dermally Absorbed Dose per Event, Child	calculated	mg/cm^2-event	calculated	DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
				DA-Adj	Dermally Absorbed Dose, Age-adjusted	calculated	mg-year/event-kg	calculated	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}-A	Event Time, Adult	0.58	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				t_{event}-C	Event Time, Child	1.0	hr/event	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				SA-A	Skin Surface Area, Adult	18,000	cm^2	EPA, 2004	x CF2 x CF3
				SA-C	Skin Surface Area, Child	6,600	cm^2	EPA, 2004	
				EV	Event Frequency	1	events/day	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				EF	Exposure Frequency	350	days/year	EPA, 2004	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				ED-A	Exposure Duration, Adult	24	years	EPA, 2004	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				ED-C	Exposure Duration, Child	6	years	EPA, 2004	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Construction Worker	Adult	Yorktown-Eastover Aquifer - Excavation Pit	CW	Chemical Concentration in Water	See Table 3.3.RME	µg/l	See Table 3.3.RME	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	8	hr/day	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2004, (3)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	125	days/year	(2)	
				ED	Exposure Duration	1	years	EPA, 1991	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

(1) Professional judgment based on construction activities that would occur 8 hrs per day for the RME.

(2) Assumed contact with groundwater during construction project would be 125 days/year.

(3) Skin surface area in contact with groundwater assumed to be hands, forearms, lower legs, and feet.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE 4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	Yorktown-Eastover Aquifer - Water Vapors at Showerhead	CW	Chemical Concentration in Water	See Table 3.2	µg/l	See Table 3.2	Chronic Daily Intake (CDI) (mg/m3) =
				CAa	Chemical Concentration in Air from Show	Calculated	mg/m^3	Calculated	CAa x ETa x EDa x EF x CF1 x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				EDa	Exposure Duration	24	years	EPA, 1991	Use Foster & Chrostowski Shower model to
				ETa	Exposure Time	0.58	hr/day	EPA, 2004	calculate Ca-a and Ca-c
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
			Indoor Air	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	Chronic Daily Intake (CDI) (mg/m3) =
				CA	Chemical Concentration in Air	See Table 3.4	mg/m^3	See Table 3.4	CA x ET x EF x ED x CF1 x 1/AT
				ET	Exposure Time	24	hr/day	EPA, 1991	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	CA calculated using Johnson and Ettinger model
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Child	Yorktown-Eastover Aquifer - Water Vapors at Showerhead	CW	Chemical Concentration in Water	See Table 3.2	µg/l	See Table 3.2	Chronic Daily Intake (CDI) (mg/m3) =
				CAc	Chemical Concentration in Air from Show	Calculated	mg/m^3	Calculated	CA_c x ET_c x ED_c x EF x CF1 x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				EDc	Exposure Duration	6	years	EPA, 1991	Use Foster & Chrostowski Shower model to
				ETc	Exposure Time	1	hr/day	EPA, 2004	calculate Ca-a and Ca-c
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
			Indoor Air	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	Chronic Daily Intake (CDI) (mg/m3) =
				CA	Chemical Concentration in Air	See Table 3.4	mg/m^3	See Table 3.4	CA x ET x EF x ED x CF1 x 1/AT
				ET	Exposure Time	24	hr/day	EPA, 1991	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	CA calculated using Johnson and Ettinger model
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	

TABLE 4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
		Child/Adult	Yorktown-Eastover Aquifer - Water Vapors at Showerhead	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	Chronic Daily Intake (CDI) (mg/m3) =
				Ca-a	Air Concentration for shower, Adult	Calculated	mg/m^3	Calculated	(CAc x ETc x EDc + CAa x ETa x EDa) x EF x CF1 x 1/AT
				Ca-c	Air Concentration for shower, child	Calculated	mg/m^3	Calculated	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				EDa	Exposure Duration, Adult	24	years	EPA, 1991	Use Foster & Chrostowski Shower model to
				EDc	Exposure Duration, Child	6	years	EPA, 1991	calculate Ca-a and Ca-c
				ETa	Exposure Time	0.58	hr/day	EPA, 2004	
				ETc	Exposure Time	1	hr/day	EPA, 2004	
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
			Indoor Air	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	Chronic Daily Intake (CDI) (mg/m3) =
				CA	Chemical Concentration in Air	See Table 3.4	mg/m^3	See Table 3.4	CA x ET x EF x ED x CF1 x 1/AT
				ET	Exposure Time	24	hr/day	EPA, 1991	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration, Resident	30	years	EPA, 1991	CA calculated using Johnson and Ettinger model
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
	Industrial Worker	Adult	Indoor Air	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	Chronic Daily Intake (CDI) (mg/m3) =
				CA	Chemical Concentration in Air	See Table 3.4	mg/m^3	See Table 3.4	CA x ET x EF x ED x CF1 x 1/AT
				ET	Exposure Time	8	hr/day	(1)	
				EF	Exposure Frequency	250	days/year	EPA, 1991	CA calculated using Johnson and Ettinger model
				ED	Exposure Duration	25	years	EPA, 1991	
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	

TABLE 4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Construction Worker	Adult	Yorktown-Eastover Aquifer - Water Vapors at Excavation Pit	CW	Chemical Concentration in Water	See Table 3.3	µg/l	See Table 3.3	Chronic Daily Intake (CDI) (mg/m3) =
				CA	Chemical Concentration in Air	calculated	mg/m^3		CA x ET x EF x ED x CF1 x 1/AT
				ET	Exposure Time	8	hr/day	(1)	
				EF	Exposure Frequency	125	days/year	(2)	
				ED	Exposure Duration	1	years	EPA, 1991	CA calculated using Virginia Voluntary Remediation
				CF1	Conversion Factor 1	1/24	day/hour	- -	Program Method
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

Notes:

(1) Professional judgment based on construction activities that would occur 8 hrs per day for the RME.

(2) Assumed contact with groundwater during construction project would be 125 days/year.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE 4.1.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1.4	liters/day	EPA, 1993	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 1993	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Child	Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				IR-W-A	Ingestion Rate of Water, Adult	1.4	liters/day	EPA, 1993	CW x IR-W-Adj x EF x CF2 x 1/AT
				IR-W-C	Ingestion Rate of Water, Child	1	liters/day	EPA, 1997	
				IR-W-Adj	Ingestion Rate of Water, Age-adjusted	0.58	liter-year/kg-day	calculated	IR-W-Adj (liter-year/kd-day) =
				EF	Exposure Frequency	234	days/year	EPA, 1993	(ED-C x IR-W-C / BW-C) +
				ED-A	Exposure Duration, Adult	9	years	EPA, 1993	(ED-A x IR-W-A / BW-A)
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.1.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inestion	Industrial Worker	Adult	Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1991	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	219	days/year	EPA, 2004	
				ED	Exposure Duration	9	years	EPA, 2004	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
Dermal	Resident	Adult	Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	Calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	Chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	Chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	Chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	0.25	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	18,000	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

TABLE 4.1.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Child	Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	Calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	Chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	Chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	Chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	0.33	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	6,600	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 2001	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	
		Child/Adult	Yorktown-Eastover Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	CDI (mg/kg-day) = DA-Adj x EF x 1/AT
				DAevent-A	Dermally Absorbed Dose per Event, Adult	Calculated	mg/cm^2-event	calculated	
				DAevent-C	Dermally Absorbed Dose per Event, Child	Calculated	mg/cm^2-event	calculated	DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
				DA-Adj	Dermally Absorbed Dose, Age-adjusted	Calculated	mg-year/event-kg	calculated	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
				FA	Fraction absorbed water	Chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	Chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	Chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}-A	Event Time, Adult	0.25	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				t_{event}-C	Event Time, Child	0.33	hr/event	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				SA-A	Skin Surface Area, Adult	18,000	cm^2	EPA, 2004	x CF2 x CF3
				SA-C	Skin Surface Area, Child	6,600	cm^2	EPA, 2004	
				EV	Event Frequency	1	events/day	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				EF	Exposure Frequency	234	days/year	EPA, 1993	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				ED-A	Exposure Duration, Adult	9	years	EPA, 2001	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				ED-C	Exposure Duration, Child	6	years	EPA, 2001	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

TABLE 4.1.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Construction Worker	Adult	Yorktown-Eastover Aquifer - Excavation Pit	CW	Chemical Concentration in Water	See Table 3.2.CTE	µg/l	See Table 3.2.CTE	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	Calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	Chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	Chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	Chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	4	hr/day	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2004, (3)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	125	days/year	(2)	
				ED	Exposure Duration	1	years	EPA, 1991	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

(1) Professional judgment assuming 1/2 RME value for CT.

(2) Assumed duration of construction project may be 1/2 a year.

(3) Skin surface area in contact with groundwater assumed to be hands, forearms, lower legs, and feet.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE 4.2.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	Yorktown-Eastover Aquifer - Water Vapors at Showerhead	CW	Chemical Concentration in Water	See Table 3.2	µg/l	See Table 3.2	Chronic Daily Intake (CDI) (mg/m3) =
				CAa	Chemical Concentration in Air from Show	Calculated	mg/m^3	Calculated	CAa x ETa x EDa x EF x CF1 x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				EDa	Exposure Duration	9	years	EPA, 1993	Use Foster & Chrostowski Shower model to
				ETa	Exposure Time	0.25	hr/day	EPA, 2004	calculate Ca-a and Ca-c
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Child	Yorktown-Eastover Aquifer - Water Vapors at Showerhead	CW	Chemical Concentration in Water	See Table 3.2	µg/l	See Table 3.2	Chronic Daily Intake (CDI) (mg/m3) =
				CAc	Chemical Concentration in Air from Show	Calculated	mg/m^3	Calculated	CA_c x ET_c x ED_c x EF x CF1 x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				EDc	Exposure Duration	6	years	EPA, 1991	Use Foster & Chrostowski Shower model to
				ETc	Exposure Time	0.33	hr/day	EPA, 2004	calculate Ca-a and Ca-c
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Yorktown-Eastover Aquifer - Water Vapors at Showerhead	CW	Chemical Concentration in Water	See Table 3.2	µg/l	See Table 3.2	Chronic Daily Intake (CDI) (mg/m3) =
				Ca-a	Air Concentration for shower, Adult	Calculated	mg/m^3	Calculated	(CAc x ETc x EDc + CAa x ETa x EDa) x EF x CF1 x 1/AT
				Ca-c	Air Concentration for shower, child	Calculated	mg/m^3	Calculated	
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				EDa	Exposure Duration, Adult	9	years	EPA, 1993	Use Foster & Chrostowski Shower model to
				EDc	Exposure Duration, Child	6	years	EPA, 1991	calculate Ca-a and Ca-c
				ETa	Exposure Time	0.25	hr/day	EPA, 2004	
				ETc	Exposure Time	0.33	hr/day	EPA, 2004	
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.2.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	Yorktown-Eastover Aquifer - Vapor Intrusion to Indoor Air	CW	Chemical Concentration in Water	See Table 3.3.CTE	µg/l	See Table 3.3.CTE	Chronic Daily Intake (CDI) (mg/m3) =
				CA	Chemical Concentration in Air	See Table 3.4.CTE	mg/m^3	See Table 3.4.CTE	CA x ET x ED x EF x CF1 x 1/AT
				ET	Exposure Time	24	hr/day	EPA, 1991	
				EF	Exposure Frequency	234	days/year	EPA, 1993	CA calculated using Johnson and Ettinger model
				ED	Exposure Duration	9	years	EPA, 1993	
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Child	Yorktown-Eastover Aquifer - Vapor Intrusion to Indoor Air	CW	Chemical Concentration in Water	See Table 3.3.CTE	µg/l	See Table 3.3.CTE	Chronic Daily Intake (CDI) (mg/m3) =
				CA	Chemical Concentration in Air	See Table 3.4.CTE	mg/m3	See Table 3.4.CTE	CA x ET x ED x EF x CF1 x 1/AT
				ET	Exposure Time	24	hr/day	EPA, 1991	
				EF	Exposure Frequency	234	days/year	EPA, 1993	CA calculated using Johnson and Ettinger model
				ED	Exposure Duration	6	years	EPA, 1991	
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Indoor Air	CW	Chemical Concentration in Water	See Table 3.1	µg/l	See Table 3.1	Chronic Daily Intake (CDI) (mg/m3) =
				CA	Chemical Concentration in Air	See Table 3.2	mg/m^3	See Table 3.2	CA x ET x ED x EF x CF1 x 1/AT
				ET	Exposure Time	24	hr/day	EPA, 1991	
				EF	Exposure Frequency	234	days/year	EPA, 1993	CA calculated using Johnson and Ettinger model
				ED	Exposure Duration, Resident	15	years	EPA, 1993	
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.2.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Industrial Worker	Adult	Yorktown-Eastover Aquifer - Vapor Intrusion to Indoor Air	CW	Chemical Concentration in Water	See Table 3.1.RME	µg/l	See Table 3.1.RME	Chronic Daily Intake (CDI) (mg/m3) =
				CA	Chemical Concentration in Air	See Table 3.2.RME	mg/m^3	See Table 3.2.RME	CA x ET x EF x ED x CF1 x 1/AT
				ET	Exposure Time	8	hr/day	(3)	
				EF	Exposure Frequency	219	days/year	EPA, 2004	CA calculated using Johnson and Ettinger model
				ED	Exposure Duration	9	years	EPA, 2004	
				CF1	Conversion Factor 1	1/24	day/hour	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
	Construction Worker	Adult	Yorktown-Eastover Aquifer - Water Vapors at Excavation Pit	CW	Chemical Concentration in Water	See Table 3.2	µg/l	See Table 3.2	Chronic Daily Intake (CDI) (mg/m3) =
				CA	Chemical Concentration in Air	calculated	mg/m^3		CA x ET x EF x ED x CF1 x 1/AT
				ET	Exposure Time	4	hr/day	(1)	
				EF	Exposure Frequency	125	days/year	(2)	
				ED	Exposure Duration	1	years	EPA, 1991	CA calculated using Virginia Voluntary Remediation
				CF1	Conversion Factor 1	1/24	day/hour	- -	Program Method
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

Notes:

(1) Professional judgment assuming 1/2 RME value for CT.

(2) Assumed contact with groundwater during construction project would be 125 days/year.

(3) Assumed that worker would be present 8 hrs per day.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Site 3

NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
1,1-Dichloroethane	Chronic	2.0E-01	mg/kg/day	Generally > 50%	2.0E-01	mg/kg/day	Kidney	3000	PPRTV	9/27/2006
	Subchronic	2.0E+00	mg/kg/day	Generally > 50%	2.0E+00	mg/kg/day	Kidney	300	PPRTV	9/27/2006
1,4-Dichlorobenzene	Chronic	7.0E-02	mg/kg/day	Generally > 50%	7.0E-02	mg/kg/day	Liver	100	ATSDR	8/2006
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
cis-1,2-Dichloroethene	Chronic	2.0E-03	mg/kg/day	Generally > 50%	2.0E-03	mg/kg/day	Kidney	3000/1	IRIS	4/24/2012
	Subchronic	2.0E-02	mg/kg/day	Generally > 50%	2.0E-02	mg/kg/day	Kidney	300	PPRTV	2/3/2011
Trichloroethene	Chronic	5.0E-04	mg/kg-day	Generally > 50%	5.0E-04	mg/kg-day	Heart, Immunotoxicity	10-1000	IRIS	4/24/2012
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vinyl chloride	Chronic	3.0E-03	mg/kg-day	Generally > 50%	3.0E-03	mg/kg-day	Liver	30/1	IRIS	4/24/2012
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aluminum	Chronic	1.0E+00	mg/kg-day	NA	1.0E+00	mg/kg-day	Neurological, Developmental	100	PPRTV	10/23/2006
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	Chronic	3.0E-04	mg/kg-day	95%	3.0E-04	mg/kg-day	Skin, Vascular	3/1	IRIS	4/24/2012
	Subchronic	3.0E-04	mg/kg-day	95%	3.0E-04	mg/kg-day	Skin, Vascular	3	HEAST	7/1/1997
Chromium (hexavalent)	Chronic	3.0E-03	mg/kg-day	2.5%	7.5E-05	mg/kg-day	Not identified	300/3	IRIS	4/24/2012
	Subchronic	2.0E-02	mg/kg-day	2.5%	5.0E-04	mg/kg-day	Not identified	100	HEAST	7/1/1997
Cobalt	Chronic	3.0E-04	mg/kg-day	N/A	3.0E-04	mg/kg/day	Thyroid	1000	PPRTV	8/25/2008
	Subchronic	3.0E-03	mg/kg-day	N/A	3.0E-03	mg/kg/day	Thyroid	300	PPRTV	8/25/2008
Iron	Chronic	7.0E-01	mg/kg-day	NA	7.0E-01	mg/kg-day	Gastrointestinal	1.5	PPRTV	9/11/2006
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	Chronic	2.4E-02	mg/kg-day	4%	9.6E-04	mg/kg-day	CNS	1/1	IRIS	4/24/2012
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	Chronic	2.0E-02	mg/kg-day	4%	8.0E-04	mg/kg-day	Decreased Body Weight, Decreased Organ Weights	300	IRIS	4/25/2012
	Subchronic	2.0E-02	mg/kg-day	4%	8.0E-04	mg/kg-day	Whole body	300	HEAST	7/1/1997
Selenium	Chronic	5.0E-03	mg/kg-day	30% - 80%	5.0E-03	mg/kg-day	Whole Body	3/1	IRIS	4/24/2012
	Subchronic	5.0E-03	mg/kg-day	30% - 80%	5.0E-03	mg/kg-day	Whole Body	3	HEAST	7/1/1997
Vanadium	Chronic	5.0E-03	mg/kg-day	2.6%	1.3E-04	mg/kg-day	Hair, Blood	100	RSL	11/2011
	Subchronic	7.0E-03	mg/kg-day	2.6%	1.8E-04	mg/kg-day	Lifetime	100	HEAST	7/1/1997
Zinc	Chronic	3.0E-01	mg/kg-day	Variable	3.0E-01	mg/kg-day	Blood	3/1	IRIS	4/24/2012
	Subchronic	3.0E-01	mg/kg-day	Variable	3.0E-01	mg/kg-day	Blood	3	HEAST	7/1/1997

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evalution Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Final. Section 4.2 and Exhibit 4-1. USEPA recommends that the oral RfD should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 50%. Constituents that do not have oral absorption efficiencies reported on this table were assumed to have an oral absorption efficiency of 100%.

(2) Adjusted Dermal RfD = RfD (oral) x Absorption Efficiency or ABS_{GI}

(3) For IRIS values, the date IRIS was searched.
For HEAST values, the date of HEAST.
For PPRTV values, the date of the PPRTV document.
For RSL values, the date of the RSL Table.

Definitions:
HEAST= Health Effects Assessment Summary Tables
IRIS = Integrated Risk Information System
RSL = Region Screening Level Table
PPRTV = Provisional Peer-Reviewed Toxicity Values
CNS = Central Nervous System
N/A = Not Applicable or Not Available

TABLE 5.2
NON-CANCER TOXICITY DATA -- INHALATION
Site 3
NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ	Dates (MM/DD/YY)
1,1-Dichloroethane	Chronic	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
1,4-Dichlorobenzene	Chronic	8.0E-01	mg/m^3	Liver	100/1	IRIS	4/24/2012
	Subchronic	7.1E-01	mg/m^3	Liver	30	HEAST	7/1/1997
cis-1,2-Dichloroethene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Trichloroethene	Chronic	2.0E-03	mg/m^3	Heart, Immunotoxicity	10-1000	IRIS	4/24/2012
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Vinyl chloride	Chronic	1.0E-01	mg/m^3	Liver	30/1	IRIS	4/24/2012
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Aluminum	Chronic	5.0E-03	mg/m^3	Neurological	300	PPRTV	10/23/2006
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	Chronic	1.5E-05	mg/m^3	Developmental, Cardiovascular, Nervous System	3/1	Cal EPA	4/24/2012
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Chromium (hexavalent)	Chronic	1.0E-04	mg/m^3	Respiratory System	300/1	IRIS	4/24/2012
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	Chronic	6.0E-06	mg/m^3	Respiratory System	100	PPRTV	8/25/2008
	Subchronic	2.0E-05	mg/m^3	Respiratory System	100	PPRTV	8/25/2008
Iron	Chronic	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	Chronic	5.0E-05	mg/m^3	CNS	1000/1	IRIS	4/24/2012
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Nickel	Chronic	9.0E-05	mg/m^3	Respiratory System	N/A	ATSDR	08/01/05
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	Chronic	2.0E-02	mg/m^3	Respiratory System	30/1	CalEPA	11/23/2010
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	Chronic	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	Chronic	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A

Cal EPA = California EPA

IRIS = Integrated Risk Information System

N/A = Not Applicable or Not Available.

ATSDR = Agency for Toxic Substances and Disease Registry

CNS = Central Nervous System

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

Site 3

NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	EPA Carcinogen Group	Source	Date (MM/DD/YY)
1,1-Dichloroethane	5.7E-03	Generally > 50%	5.7E-03	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA	4/25/2012
1,4-Dichlorobenzene	5.4E-03	Generally > 50%	5.4E-03	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA	4/25/2012
cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Trichloroethene (3)	4.6E-02	Generally > 50%	4.6E-02	$(mg/kg\text{-}day)^{-1}$	2A	IRIS	4/24/2012
Vinyl Chloride (3)	7.2E-01	Generally > 50%	7.2E-01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	4/24/2012
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	1.5E+00	95%	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	4/24/2012
Chromium (3)	5.0E-01	2.5%	1.3E-02	N/A	D	New Jersey	4/24/2012
Cobalt	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. Section 4.2 and Exhibit 4-1. USEPA recommends that the oral slope factor should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 50%. Constituents that do not have oral absorption efficiencies reported on this table were assumed to have an oral absorption efficiency of 100%.

(2) Adjusted based on RAGS Part E.

(3) This chemical operates with a mutagenic mode of action.
Chemical-specific data are not available; therefore, default age-dependant adjustment factors (ADAF) will be applied to the slope factor as follows:

AGE	AGE ADAF
0-<2	10
2-<16	3
16-<30	1

Definitions:

N/A = Not Available

IRIS = Integrated Risk Information System

NCEA = National Center for Environmental Assessment

PPRTV = Provisional Peer-Reviewed Toxicity Value

Weight of Evidence definitions:

Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans and cancer.

Group B1 chemicals (probable human carcinogens) are agents for which there is limited evidence of possible carcinogenicity in humans.

Group B2 chemicals (probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate or a lack of evidence in humans.

Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.

Group D chemicals (not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.

Group E chemicals (evidence of noncarcinogenicity in humans) are agents for which there is no evidence of carcinogenicity from human or animal studies, or both.

2A - Probably carcinogenic to humans

2B - Possibly carcinogenic to humans

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

Site 3

NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Unit Risk	Units	Weight of Evidence/ Cancer Guidance Description	Source	Date (MM/DD/YY)
1,1-Dichloroethane	1.1E-05	$(ug/m3)^{-1}$	B2	CalEPA	4/25/2012
1,4-Dichlorobenzene	1.6E-06	$(ug/m3)^{-1}$	B2	CalEPA	4/25/2012
cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	N/A
Trichloroethene (1)	4.1E-06	$(ug/m3)^{-1}$	2A	IRIS	4/24/2012
Vinyl chloride (1)	4.4E-06	$(ug/m3)^{-1}$	A	IRIS	4/24/2012
Aluminum	N/A	N/A	N/A	N/A	N/A
Arsenic	4.3E-03	$(ug/m3)^{-1}$	A	IRIS	4/24/2012
Chromium (1)	8.4E-02	$(ug/m3)^{-1}$	A	IRIS	4/24/2012
Cobalt	9.0E-03	$(ug/m3)^{-1}$	B1	PPRTV	8/25/2008
Iron	N/A	N/A	N/A	N/A	N/A
Manganese	N/A	N/A	N/A	N/A	N/A
Selenium	N/A	N/A	N/A	N/A	N/A
Vanadium	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A

Definitions:

N/A = Not Available

IRIS = Integrated Risk Information System

CalEPA = California EPA

(1) This chemical operates with a mutagenic mode of action.

Chemical-specific data are not available; therefore, default age-dependant adjustment factors (ADAF) will be applied to the slope factor as follows:

AGE	AGE ADAF
0-<2	10
2-<16	3
16-<30	1

Weight of Evidence definitions:

Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans and cancer.

Group B1 chemicals (probable human carcinogens) are agents for which there is limited evidence of possible carcinogenicity in humans.

Group B2 chemicals (probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate or a lack of evidence in humans.

Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.

Group D chemicals (not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.

Group E chemicals (evidence of noncarcinogenicity in humans) are agents for which there is no evidence of carcinogenicity fron

2A - Probably carcinogenic to humans

2B - Possibly carcinogenic to humans

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
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	
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water	Ingestion	1,1-Dichloroethane	8.2E+00	µg/L	N/A		N/A		N/A	2.2E-04	mg/kg/day	2.0E-01	mg/kg/day	1.1E-03
				1,4-Dichlorobenzene	5.6E-01	µg/L	N/A		N/A		N/A	1.5E-05	mg/kg/day	7.0E-02	mg/kg/day	2.2E-04
				cis-1,2-Dichloroethene	1.4E+03	µg/L	N/A		N/A		N/A	3.8E-02	mg/kg/day	2.0E-03	mg/kg/day	1.9E+01
				Trichloroethene	2.0E+02	µg/L	N/A		N/A		N/A	5.6E-03	mg/kg/day	5.0E-04	mg/kg/day	1.1E+01
				Vinyl chloride	1.1E+03	µg/L	N/A		N/A		N/A	3.1E-02	mg/kg/day	3.0E-03	mg/kg/day	1.0E+01
				Aluminum, Dissolved	2.0E+03	µg/L	N/A		N/A		N/A	5.6E-02	mg/kg/day	1.0E+00	mg/kg/day	5.6E-02
				Arsenic, Dissolved	2.5E+01	µg/L	N/A		N/A		N/A	6.9E-04	mg/kg/day	3.0E-04	mg/kg/day	2.3E+00
				Iron, Dissolved	1.8E+03	µg/L	N/A		N/A		N/A	5.0E-02	mg/kg/day	7.0E-01	mg/kg/day	7.1E-02
				Manganese, Dissolved	8.7E+02	µg/L	N/A		N/A		N/A	2.4E-02	mg/kg/day	2.4E-02	mg/kg/day	9.9E-01
				Selenium, Dissolved	8.2E+00	µg/L	N/A		N/A		N/A	2.3E-04	mg/kg/day	5.0E-03	mg/kg/day	4.5E-02
			Exp. Route Total								N/A					4.4E+01
			Dermal	1,1-Dichloroethane	8.2E+00	µg/L	N/A		N/A		N/A	1.8E-05	mg/kg/day	2.0E-01	mg/kg/day	8.8E-05
				1,4-Dichlorobenzene	5.6E-01	µg/L	N/A		N/A		N/A	1.0E-05	mg/kg/day	7.0E-02	mg/kg/day	1.5E-04
				cis-1,2-Dichloroethene	1.4E+03	µg/L	N/A		N/A		N/A	3.4E-03	mg/kg/day	2.0E-03	mg/kg/day	1.7E+00
				Trichloroethene	2.0E+02	µg/L	N/A		N/A		N/A	9.4E-04	mg/kg/day	5.0E-04	mg/kg/day	1.9E+00
				Vinyl chloride	1.1E+03	µg/L	N/A		N/A		N/A	1.6E-03	mg/kg/day	3.0E-03	mg/kg/day	5.5E-01
				Aluminum, Dissolved	2.0E+03	µg/L	N/A		N/A		N/A	2.9E-04	mg/kg/day	1.0E+00	mg/kg/day	2.9E-04
				Arsenic, Dissolved	2.5E+01	µg/L	N/A		N/A		N/A	3.6E-06	mg/kg/day	3.0E-04	mg/kg/day	1.2E-02
				Iron, Dissolved	1.8E+03	µg/L	N/A		N/A		N/A	2.6E-04	mg/kg/day	7.0E-01	mg/kg/day	3.7E-04
				Manganese, Dissolved	8.7E+02	µg/L	N/A		N/A		N/A	1.2E-04	mg/kg/day	9.6E-04	mg/kg/day	1.3E-01
				Selenium, Dissolved	8.2E+00	µg/L	N/A		N/A		N/A	1.2E-06	mg/kg/day	5.0E-03	mg/kg/day	2.3E-04
			Exp. Route Total								N/A					4.3E+00
		Exposure Point Total									N/A					4.8E+01
	Exposure Medium Total										N/A					4.8E+01
	Air	Yorktown-Eastover Aquifer Water Vapors at Showerhead	Inhalation	1,1-Dichloroethane	8.2E+00	µg/L	N/A		N/A		N/A	4.4E-04	mg/m^3	N/A	mg/m^3	N/A
				1,4-Dichlorobenzene	5.6E-01	µg/L	N/A		N/A		N/A	2.4E-05	mg/m^3	8.0E-01	mg/m^3	2.9E-05
				cis-1,2-Dichloroethene	1.4E+03	µg/L	N/A		N/A		N/A	7.4E-02	mg/m^3	N/A		N/A
				Trichloroethene	2.0E+02	µg/L	N/A		N/A		N/A	9.7E-03	mg/m^3	2.0E-03	mg/m^3	4.8E+00
				Vinyl chloride	1.1E+03	µg/L	N/A		N/A		N/A	7.7E-02	mg/m^3	1.0E-01	mg/m^3	7.7E-01
			Exp. Route Total								N/A					5.6E+00
		Exposure Point Total									N/A					5.6E+00

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
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	
Groundwater (cont'd)	Air	Indoor Air	Inhalation	cis-1,2-Dichloroethene	1.6E-01	mg/m^3	N/A		N/A		N/A	5.4E-02	mg/m^3	N/A		N/A
				Trichloroethene	5.3E-02	mg/m^3	N/A		N/A		N/A	1.7E-02	mg/m^3	2.0E-03	mg/m^3	8.7E+00
				Vinyl chloride	1.0E+00	mg/m^3	N/A		N/A		N/A	3.4E-01	mg/m^3	1.0E-01	mg/m^3	3.4E+00
			Exp. Route Total								N/A					1.2E+01
		Exposure Point Total									N/A					1.2E+01
	Exposure Medium Total										N/A					1.8E+01
Groundwater Total											N/A					6.6E+01

N/A - Not available.

DA_{event} for dermal exposure to groundwater calculated on Table 7.1.RME Supplement A

Inhalation exposure while showering calculated on Table 7.1.RME Supplement B

Table 7.1.RME Supplement A
Calculation of DA_{event}
Residential Adult Groundwater
Site 3, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient (K_p) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (t_{event}) (hr)	DA_{event} (mg/cm^2-event)	Eq
1,1-Dichloroethane	8.2E+00	6.7E-03	2.6E-02	3.8E-01	9.2E-01	1.0E+00	0.58	7.1E-08	2
1,4-Dichlorobenzene	5.6E-01	4.2E-02	2.0E-01	7.1E-01	1.7E+00	1.0E+00	0.58	4.2E-08	2
cis-1,2-Dichloroethene[1]	1.4E+03	7.7E-03	2.9E-02	3.7E-01	8.9E-01	1.0E+00	0.58	1.4E-05	2
Trichloroethene	2.0E+02	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	0.58	3.8E-06	2
Vinyl chloride	1.1E+03	5.6E-03	1.7E-02	2.4E-01	5.7E-01	1.0E+00	0.58	6.7E-06	3
Aluminum, Dissolved	2.0E+03	1.0E-03	NA	NA	NA	NA	0.58	1.2E-06	1
Arsenic, Dissolved	2.5E+01	1.0E-03	NA	NA	NA	NA	0.58	1.5E-08	1
Iron, Dissolved	1.8E+03	1.0E-03	NA	NA	NA	NA	0.58	1.0E-06	1
Manganese, Dissolved	8.7E+02	1.0E-03	NA	NA	NA	NA	0.58	5.0E-07	1
Selenium, Dissolved	8.2E+00	1.0E-03	NA	NA	NA	NA	0.58	4.8E-09	1

[1] trans-1,2-Dichloroethane used as a surrogate.

Inorganics: DA_{event} (mg/cm^2-event) =

K_p x CW x t_{event} x 0.001 mg/µg x 0.001 l/cm^3 (eq 1)

Organics: DA_{event} (mg/cm^2-event) =

If t_{event}<t*, then DA_{event} =

2 x FA x K_p x CW x (sqrt((6 x τ_{event} x t_{event})/π)) x 0.001 mg/µg x 0.001 l/cm^3 (eq 2)

If t_{event}>t*, then DA_{event} =

FA x K_p x CW x (t_{event}/(1+B) + 2 x τ_{event} x ((1 + 3xB + 3xB^2)/(1+B)^2) x 0.001 mg/µg x 0.001 l/cm^3 (eq 3)

Notes:

NA - Not applicable

Permeability constants and other input parameter values from EPA 2004,*Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document

B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).

t* - Time to reach steady-state

Table 7.1.RME Supplement B

Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model

Adult Resident

Site 3, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Exposure Point Concentration Cwo (µg/L)	Molecular weight (MW) (g/mole)	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl (VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/L)	S (µg/m^3 -min)	Ca (mg/m^3)
1,1-Dichloroethane	8.2E+00	9.9E+01	5.6E-03	1.3E+03	1.3E+01	1.3E+01	1.7E+01	1.1E+00	9.1E-01	1.9E-02
1,4-Dichlorobenzene	5.6E-01	1.5E+02	2.4E-03	1.0E+03	1.1E+01	9.9E+00	1.3E+01	5.9E-02	4.9E-02	1.0E-03
cis-1,2-Dichloroethene	1.4E+03	9.7E+01	4.1E-03	1.3E+03	1.3E+01	1.3E+01	1.7E+01	1.9E+02	1.6E+02	3.2E+00
Trichloroethene	2.0E+02	1.3E+02	9.9E-03	1.1E+03	1.2E+01	1.1E+01	1.5E+01	2.4E+01	2.0E+01	4.2E-01
Vinyl chloride	1.1E+03	6.3E+01	2.8E-02	1.6E+03	1.7E+01	1.7E+01	2.2E+01	1.9E+02	1.6E+02	3.3E+00

Variables	Units	Exposure Assumptions
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4
Tl = Calibration temp. of water	K (20C +273)	293
Ts = Shower water temperature	k (45C)	318
Us = water viscosity at Ts	centipoise	0.596
Ul = water viscosity at Tl	cp	1.002
Cwd = conc. leaving droplets after time sdt	µg/l	Solved by Eq 5
sdt = shower droplet drop time	sec	0.5
d = shower droplet diameter	mm	1
FR = shower water flow rate	l/min	10
SV = shower room air volume	m^3	12
S = indoor VOC generation rate	µg/m^3-min	Solved by Eq 6
Ds = duration of shower	min	34.8
Dt = total duration in shower room	min	60
R = air exchange rate	min^{-1}	0.0083
Ca = indoor air concentration of VOCs	µg/m^3	Solved by Eq 7

Equation 1:	Kg(VOC) =	3000 * (18 / MW)$^{0.5}$
Equation 2:	Kl(VOC) =	20 * (44 / MW)$^{0.5}$
Equation 3:	KL =	((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))$^{-1}$
Equation 4:	Kal =	(KL * (((Tl * Us) / (Ts * Ul))$^{-0.5}$))
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))
Equation 6:	S =	(Cwd * FR / SV)
Equation 7:	Ca =	If t>Ds [(S / R) * (Ds + (EXP(-R * Dt) / R) -(EXP(R *(Ds - Dt)) / R)] / Dt * 1/1000

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: 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	
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water	Ingestion	1,1-Dichloroethane	8.2E+00	µg/L	N/A		N/A		N/A	5.2E-04	mg/kg/day	2.0E-01	mg/kg/day	2.6E-03
				1,4-Dichlorobenzene	5.6E-01	µg/L	N/A		N/A		N/A	3.6E-05	mg/kg/day	7.0E-02	mg/kg/day	5.1E-04
				cis-1,2-Dichloroethene	1.4E+03	µg/L	N/A		N/A		N/A	8.9E-02	mg/kg/day	2.0E-03	mg/kg/day	4.5E+01
				Trichloroethene	2.0E+02	µg/L	N/A		N/A		N/A	1.3E-02	mg/kg/day	5.0E-04	mg/kg/day	2.6E+01
				Vinyl chloride	1.1E+03	µg/L	N/A		N/A		N/A	7.2E-02	mg/kg/day	3.0E-03	mg/kg/day	2.4E+01
				Aluminum, Dissolved	2.0E+03	µg/L	N/A		N/A		N/A	1.3E-01	mg/kg/day	1.0E+00	mg/kg/day	1.3E-01
				Arsenic, Dissolved	2.5E+01	µg/L	N/A		N/A		N/A	1.6E-03	mg/kg/day	3.0E-04	mg/kg/day	5.4E+00
				Iron, Dissolved	1.8E+03	µg/L	N/A		N/A		N/A	1.2E-01	mg/kg/day	7.0E-01	mg/kg/day	1.7E-01
				Manganese, Dissolved	8.7E+02	µg/L	N/A		N/A		N/A	5.5E-02	mg/kg/day	2.4E-02	mg/kg/day	2.3E+00
				Selenium, Dissolved	8.2E+00	µg/L	N/A		N/A		N/A	5.3E-04	mg/kg/day	5.0E-03	mg/kg/day	1.1E-01
			Exp. Route Total								N/A					1.0E+02
			Dermal	1,1-Dichloroethane	8.2E+00	µg/L	N/A		N/A		N/A	4.1E-05	mg/kg/day	2.0E-01	mg/kg/day	2.0E-04
				1,4-Dichlorobenzene	5.6E-01	µg/L	N/A		N/A		N/A	2.3E-05	mg/kg/day	7.0E-02	mg/kg/day	3.3E-04
				cis-1,2-Dichloroethene	1.4E+03	µg/L	N/A		N/A		N/A	7.9E-03	mg/kg/day	2.0E-03	mg/kg/day	4.0E+00
				Trichloroethene	2.0E+02	µg/L	N/A		N/A		N/A	2.1E-03	mg/kg/day	5.0E-04	mg/kg/day	4.2E+00
				Vinyl chloride	1.1E+03	µg/L	N/A		N/A		N/A	3.9E-03	mg/kg/day	3.0E-03	mg/kg/day	1.3E+00
				Aluminum, Dissolved	2.0E+03	µg/L	N/A		N/A		N/A	8.6E-04	mg/kg/day	1.0E+00	mg/kg/day	8.6E-04
				Arsenic, Dissolved	2.5E+01	µg/L	N/A		N/A		N/A	1.1E-05	mg/kg/day	3.0E-04	mg/kg/day	3.5E-02
				Iron, Dissolved	1.8E+03	µg/L	N/A		N/A		N/A	7.6E-04	mg/kg/day	7.0E-01	mg/kg/day	1.1E-03
				Manganese, Dissolved	8.7E+02	µg/L	N/A		N/A		N/A	3.7E-04	mg/kg/day	9.6E-04	mg/kg/day	3.8E-01
				Selenium, Dissolved	8.2E+00	µg/L	N/A		N/A		N/A	3.5E-06	mg/kg/day	5.0E-03	mg/kg/day	6.9E-04
			Exp. Route Total								N/A					9.9E+00
		Exposure Point Total									N/A					1.1E+02
	Exposure Medium Total										N/A					1.1E+02
	Air	Yorktown-Eastover Aquifer Water Vapors at Showerhead	Inhalation	1,1-Dichloroethane	8.2E+00	µg/L	N/A		N/A		N/A	1.1E-03	mg/m^3	N/A	mg/m^3	N/A
				1,4-Dichlorobenzene	5.6E-01	µg/L	N/A		N/A		N/A	5.9E-05	mg/m^3	8.0E-01	mg/m^3	7.4E-05
				cis-1,2-Dichloroethene	1.4E+03	µg/L	N/A		N/A		N/A	1.9E-01	mg/m^3	N/A		N/A
				Trichloroethene	2.0E+02	µg/L	N/A		N/A		N/A	2.4E-02	mg/m^3	2.0E-03	mg/m^3	1.2E+01
				Vinyl chloride	1.1E+03	µg/L	N/A		N/A		N/A	1.4E-01	mg/m^3	1.0E-01	mg/m^3	1.4E+00
			Exp. Route Total								N/A					1.4E+01
		Exposure Point Total									N/A					1.4E+01

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: 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	
Groundwater (cont'd)	Air	Indoor Air	Inhalation	cis-1,2-Dichloroethene	1.6E-01	mg/m^3	N/A		N/A		N/A	2.5E-01	mg/m^3	N/A		N/A
				Trichloroethene	5.3E-02	mg/m^3	N/A		N/A		N/A	8.1E-02	mg/m^3	2.0E-03	mg/m^3	4.1E+01
				Vinyl chloride	1.0E+00	mg/m^3	N/A		N/A		N/A	1.6E+00	mg/m^3	1.0E-01	mg/m^3	1.6E+01
			Exp. Route Total								N/A					5.6E+01
		Exposure Point Total									N/A					5.6E+01
	Exposure Medium Total										N/A					7.0E+01
Groundwater Total											N/A					1.8E+02

N/A - Not available.

DA_{event} for dermal exposure to groundwater calculated on Table 7.2.RME Supplement A

Inhalation exposure while showering calculated on Table 7.2.RME Supplement B

Table 7.2.RME Supplement A
Calculation of DA_{event}
Residential Child Groundwater
Site 3, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient (K_p) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (t_{event}) (hr)	DA_{event} (mg/cm^2-event)	Eq
1,1-Dichloroethane	8.2E+00	6.7E-03	2.6E-02	3.8E-01	9.2E-01	1.0E+00	1	9.6E-08	3
1,4-Dichlorobenzene	5.6E-01	4.2E-02	2.0E-01	7.1E-01	1.7E+00	1.0E+00	1	5.5E-08	2
cis-1,2-Dichloroethene[1]	1.4E+03	7.7E-03	2.9E-02	3.7E-01	8.9E-01	1.0E+00	1	1.9E-05	3
Trichloroethene	2.0E+02	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	1	5.0E-06	2
Vinyl chloride	1.1E+03	5.6E-03	1.7E-02	2.4E-01	5.7E-01	1.0E+00	1	9.3E-06	3
Aluminum, Dissolved	2.0E+03	1.0E-03	NA	NA	NA	NA	1	2.0E-06	1
Arsenic, Dissolved	2.5E+01	1.0E-03	NA	NA	NA	NA	1	2.5E-08	1
Iron, Dissolved	1.8E+03	1.0E-03	NA	NA	NA	NA	1	1.8E-06	1
Manganese, Dissolved	8.7E+02	1.0E-03	NA	NA	NA	NA	1	8.7E-07	1
Selenium, Dissolved	8.2E+00	1.0E-03	NA	NA	NA	NA	1	8.2E-09	1

[1] trans-1,2-Dichloroethane used as a surrogate.

Inorganics: DA_{event} (mg/cm^2-event) =

K_p x CW x t_{event} x 0.001 mg/µg x 0.001 l/cm^3 (eq 1)

Organics: DA_{event} (mg/cm^2-event) =

If t_{event}<t*, then DA_{event} =

2 x FA x K_p x CW x (sqrt((6 x τ_{event} x t_{event})/π)) x 0.001 mg/µg x 0.001 l/cm^3 (eq 2)

If t_{event}>t*, then DA_{event} =

FA x K_p x CW x (t_{event}/(1+B) + 2 x τ_{event} x ((1 + 3xB + 3xB^2)/(1+B)^2) x 0.001 mg/µg x 0.001 l/cm^3 (eq 3)

Notes:

NA - Not applicable

Permeability constants and other input parameter values from EPA 2004,*Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document

B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).

t* - Time to reach steady-state

Table 7.2.RME Supplement B

Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model

Child Resident

Site 3, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Exposure Point Concentration Cwo (µg/L)	Molecular weight (MW) (g/mole)	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl (VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/L)	S (µg/m^3 -min)	Ca (mg/m^3)
1,1-Dichloroethane	8.2E+00	9.9E+01	5.6E-03	1.3E+03	1.3E+01	1.3E+01	1.7E+01	1.1E+00	9.1E-01	2.8E-02
1,4-Dichlorobenzene	5.6E-01	1.5E+02	2.4E-03	1.0E+03	1.1E+01	9.9E+00	1.3E+01	5.9E-02	4.9E-02	1.5E-03
cis-1,2-Dichloroethene	1.4E+03	9.7E+01	4.1E-03	1.3E+03	1.3E+01	1.3E+01	1.7E+01	1.9E+02	1.6E+02	4.7E+00
Trichloroethene	2.0E+02	1.3E+02	9.9E-03	1.1E+03	1.2E+01	1.1E+01	1.5E+01	2.4E+01	2.0E+01	6.1E-01
Vinyl chloride	1.1E+03	1.3E+02	2.8E-02	1.1E+03	1.2E+01	1.1E+01	1.5E+01	1.4E+02	1.1E+02	3.4E+00

Variables	Units	Exposure Assumptions
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4
Tl = Calibration temp. of water	K (20C +273)	293
Ts = Shower water temperature	k (45C)	318
Us = water viscosity at Ts	centipoise	0.596
Ul = water viscosity at Tl	cp	1.002
Cwd = conc. leaving droplets after time sdt	µg/l	Solved by Eq 5
sdt = shower droplet drop time	sec	0.5
d = shower droplet diameter	mm	1
FR = shower water flow rate	l/min	10
SV = shower room air volume	m^3	12
S = indoor VOC generation rate	µg/m^3-min	Solved by Eq 6
Ds = duration of shower	min	60
Dt = total duration in shower room	min	80
R = air exchange rate	min^{-1}	0.0083
Ca = indoor air concentration of VOCs	µg/m^3	Solved by Eq 7

Equation 1:	Kg(VOC) =	$3000 * (18 / MW)^{0.5}$
Equation 2:	Kl(VOC) =	$20 * (44 / MW)^{0.5}$
Equation 3:	KL =	$((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))^{-1}$
Equation 4:	Kal =	$(KL * (((Tl * Us) / (Ts * Ul))^{-0.3}))$
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))
Equation 6:	S =	(Cwd * FR / SV)
Equation 7:	Ca =	If t>Ds [(S / R) * (Ds + (EXP(-R * Dt) / R) -(EXP(R *(Ds - Dt)) / R)] / Dt * 1/1000

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/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	
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water	Ingestion	1,1-Dichloroethane	8.2E+00	µg/L	1.2E-04	mg/kg/day	5.7E-03	$(mg/kg\text{-}day)^{-1}$	7.0E-07	N/A		N/A		N/A
				1,4-Dichlorobenzene	5.6E-01	µg/L	8.4E-06	mg/kg/day	5.4E-03	$(mg/kg\text{-}day)^{-1}$	4.5E-08	N/A		N/A		N/A
				cis-1,2-Dichloroethene	1.4E+03	µg/L	2.1E-02	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Trichloroethene (1)	2.0E+02	µg/L			4.6E-02	$(mg/kg\text{-}day)^{-1}$	4.4E-04	N/A		N/A		N/A
				Vinyl chloride (1)	1.1E+03	µg/L			7.2E-01	$(mg/kg\text{-}day)^{-1}$	1.7E-02	N/A		N/A		N/A
				Aluminum, Dissolved	2.0E+03	µg/L	3.0E-02	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Arsenic, Dissolved	2.5E+01	µg/L	3.8E-04	mg/kg/day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.6E-04	N/A		N/A		N/A
				Iron, Dissolved	1.8E+03	µg/L	2.7E-02	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Manganese, Dissolved	8.7E+02	µg/L	1.3E-02	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Selenium, Dissolved	8.2E+00	µg/L	1.2E-04	mg/kg/day	N/A		N/A	N/A		N/A		N/A
			Exp. Route Total								1.8E-02					N/A
			Dermal	1,1-Dichloroethane	8.2E+00	µg/L	9.5E-06	mg/kg/day	5.7E-03	$(mg/kg\text{-}day)^{-1}$	5.4E-08	N/A		N/A		N/A
				1,4-Dichlorobenzene	5.6E-01	µg/L	5.5E-06	mg/kg/day	5.4E-03	$(mg/kg\text{-}day)^{-1}$	3.0E-08	N/A		N/A		N/A
				cis-1,2-Dichloroethene	1.4E+03	µg/L	1.9E-03	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Trichloroethene (1)	2.0E+02	µg/L			4.6E-02	$(mg/kg\text{-}day)^{-1}$	7.2E-05	N/A		N/A		N/A
				Vinyl chloride (1)	1.1E+03	µg/L			7.2E-01	$(mg/kg\text{-}day)^{-1}$	3.6E-03	N/A		N/A		N/A
				Aluminum, Dissolved	2.0E+03	µg/L	1.7E-04	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Arsenic, Dissolved	2.5E+01	µg/L	2.1E-06	mg/kg/day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.2E-06	N/A		N/A		N/A
				Iron, Dissolved	1.8E+03	µg/L	1.5E-04	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Manganese, Dissolved	8.7E+02	µg/L	7.4E-05	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Selenium, Dissolved	8.2E+00	µg/L	7.0E-07	mg/kg/day	N/A		N/A	N/A		N/A		N/A
			Exp. Route Total								3.7E-03					N/A
		Exposure Point Total									2.2E-02					N/A
	Exposure Medium Total										2.2E-02					N/A
	Air	Yorktown-Eastover Aquifer Water Vapors at Showerhead	Inhalation	1,1-Dichloroethane	8.2E+00	µg/L	2.4E-04	$\mu g/m^3$	1.1E-05	$(\mu g/m^3)^{-1}$	2.7E-06	N/A		N/A		N/A
				1,4-Dichlorobenzene	5.6E-01	µg/L	1.3E-05	$\mu g/m^3$	1.6E-06	$(\mu g/m^3)^{-1}$	2.1E-08	N/A		N/A		N/A
				cis-1,2-Dichloroethene	1.4E+03	µg/L	4.1E-02	$\mu g/m^3$	N/A		N/A	N/A		N/A		N/A
				Trichloroethene (1)	2.0E+02	µg/L			4.1E-06	$(\mu g/m^3)^{-1}$	8.9E-05	N/A		N/A		N/A
				Vinyl chloride (1)	1.1E+03	µg/L			4.4E-06	$(\mu g/m^3)^{-1}$	3.0E-04	N/A		N/A		N/A
			Exp. Route Total								3.9E-04					N/A
		Exposure Point Total									3.9E-04					N/A

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/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	
Groundwater (cont'd)	Air	Indoor Air	Inhalation	cis-1,2-Dichloroethene	1.6E-01	mg/m^3	6.8E-02	mg/m^3	N/A		N/A			N/A		N/A
				Trichloroethene (1)	5.3E-02	mg/m^3			4.1E-06	$(\mu g/m^3)^{-1}$	2.3E-04			N/A		N/A
				Vinyl chloride (1)	1.0E+00	mg/m^3			4.4E-06	$(\mu g/m^3)^{-1}$	2.2E-03			N/A		N/A
			Exp. Route Total								2.5E-03					N/A
		Exposure Point Total									2.5E-03					N/A
	Exposure Medium Total										2.9E-03					N/A
Groundwater Total											2.4E-02					N/A

N/A - Not available.

DA_{event} for dermal exposure to groundwater calculated on Tables 7.1.RME and 7.2.RME Supplement A.

Inhalation exposure while showering calculated on Tables 7.1.RME and 7.2.RME Supplement B

1. See Table 7.3.RME Supplement A for calculation of intake and cancer risk following MMOA method.

TABLE 7.3.RME Supplement A

CALCULATION OF CHEMICAL CANCER RISKS FOR COPC WITH MUTAGENIC MODE OF ACTION

REASONABLE MAXIMUM EXPOSURE

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations										
							Intake					CSF/Unit Risk					Cancer Risk
							Value				Units	Value				Units	
					Value	Units	0-2 yrs	2-6 yrs	6-16 years	16-30 yrs		0-2 yrs (ADAF=10)	2-6 yrs (ADAF=3)	6-16 yrs (ADAF=3)	16-30 yrs (ADAF=1)		
Groundwater	Groundwater	Tap Water	Ingestion	Trichloroethene	2.0E+02	ug/l	3.7E-04	7.4E-04	8.0E-04	1.1E-03	mg/kg/day	4.6E-01	1.4E-01	1.4E-01	4.6E-02	1/(mg/kg-day)	4.4E-04
				Vinyl chloride	1.1E+03	ug/l	6.2E-03		1.1E-02		mg/kg/day	1.5E+00		7.2E-01		1/(mg/kg-day)	1.7E-02
			Dermal	Trichloroethene	2.0E+02	ug/l	6.0E-05	1.2E-04	1.3E-04	1.9E-04	mg/kg/day	4.6E-01	1.4E-01	1.4E-01	4.6E-02	1/(mg/kg-day)	7.2E-05
				Vinyl chloride	1.1E+03	ug/l	3.4E-04		5.6E-04		mg/kg/day	7.2E+00	2.2E+00	2.2E+00	7.2E-01	1/(mg/kg-day)	3.6E-03
	Air	Columbia and Yorktown - Eastover Aquifer Water Vapors at Showerhead	Inhalation	Trichloroethene	2.0E+02	ug/l	7.0E-01	1.4E+00	2.4E+00	3.3E+00	$\mu g/m^3$	4.1E-05	1.2E-05	1.2E-05	4.1E-06	$(\mu g/m^3)^{-1}$	8.9E-05
				Vinyl chloride	1.1E+03	ug/l	1.2E+01		4.5E+01		$\mu g/m^3$	8.8E-06		4.4E-06		$(\mu g/m^3)^{-1}$	3.0E-04
		Indoor Air	Inhalation	Trichloroethene	5.3E-02	mg/m^3	1.4E+00	2.9E+00	7.2E+00	1.0E+01	$\mu g/m^3$	4.1E-05	1.2E-05	1.2E-05	4.1E-06	$(\mu g/m^3)^{-1}$	2.3E-04
				Vinyl chloride	1.0E+00	mg/m^3	8.5E+01		3.4E+02		$\mu g/m^3$	8.8E-06		4.4E-06		$(\mu g/m^3)^{-1}$	2.2E-03

Cancer risk = $(Intake_{0-2} \times CSF_{0-2}) + (Intake_{2-6} \times CSF_{2-6}) + (Intake_{6-16} \times CSF_{6-16}) + (Intake_{16-30} \times CSF_{16-30})$

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial 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	
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water	Ingestion	1,1-Dichloroethane	8.2E+00	µg/L	2.9E-05	mg/kg/day	5.7E-03	$(mg/kg\text{-}day)^{-1}$	1.6E-07	8.0E-05	mg/kg/day	2.0E-01	mg/kg/day	4.0E-04
				1,4-Dichlorobenzene	5.6E-01	µg/L	2.0E-06	mg/kg/day	5.4E-03	$(mg/kg\text{-}day)^{-1}$	1.1E-08	5.5E-06	mg/kg/day	7.0E-02	mg/kg/day	7.8E-05
				cis-1,2-Dichloroethene	1.4E+03	µg/L	4.9E-03	mg/kg/day	N/A		N/A	1.4E-02	mg/kg/day	2.0E-03	mg/kg/day	6.8E+00
				Trichloroethene	2.0E+02	µg/L	7.1E-04	mg/kg/day	4.6E-02	$(mg/kg\text{-}day)^{-1}$	3.3E-05	2.0E-03	mg/kg/day	5.0E-04	mg/kg/day	4.0E+00
				Vinyl chloride	1.1E+03	µg/L	3.9E-03	mg/kg/day	7.2E-01	$(mg/kg\text{-}day)^{-1}$	2.8E-03	1.1E-02	mg/kg/day	3.0E-03	mg/kg/day	3.7E+00
				Aluminum, Dissolved	2.0E+03	µg/L	7.1E-03	mg/kg/day	N/A	$(mg/kg\text{-}day)^{-1}$	N/A	2.0E-02	mg/kg/day	1.0E+00	mg/kg/day	2.0E-02
				Arsenic, Dissolved	2.5E+01	µg/L	8.8E-05	mg/kg/day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.3E-04	2.5E-04	mg/kg/day	3.0E-04	mg/kg/day	8.2E-01
				Iron, Dissolved	1.8E+03	µg/L	6.3E-03	mg/kg/day	N/A		N/A	1.8E-02	mg/kg/day	7.0E-01	mg/kg/day	2.5E-02
				Manganese, Dissolved	8.7E+02	µg/L	3.0E-03	mg/kg/day	N/A		N/A	8.5E-03	mg/kg/day	2.4E-02	mg/kg/day	3.5E-01
				Selenium, Dissolved	8.2E+00	µg/L	2.9E-05	mg/kg/day	N/A		N/A	8.0E-05	mg/kg/day	5.0E-03	mg/kg/day	1.6E-02
			Exp. Route Total								3.0E-03					1.6E+01
		Exposure Point Total									3.0E-03					1.6E+01
	Exposure Medium Total										3.0E-03					1.6E+01
	Air	Indoor Air	Inhalation													
				cis-1,2-Dichloroethene	1.6E-01	mg/m^3	1.3E-02	mg/m^3	N/A	$(\mu g/m^3)^{-1}$	N/A	3.8E-02	mg/m^3	N/A		N/A
				Trichloroethene	1.0E-01	mg/m^3	8.5E-03	mg/m^3	2.0E-06	$(\mu g/m^3)^{-1}$	1.7E-05	2.4E-02	mg/m^3	2.0E-03	mg/m^3	1.2E+01
				Vinyl chloride	1.1E+00	mg/m^3	9.0E-02	mg/m^3	4.4E-06	$(\mu g/m^3)^{-1}$	3.9E-04	2.5E-01	mg/m^3	1.0E-01	mg/m^3	2.5E+00
			Exp. Route Total								4.1E-04					1.4E+01
		Exposure Point Total									4.1E-04					1.4E+01
	Exposure Medium Total										4.1E-04					1.4E+01
Groundwater Total											3.4E-03					3.0E+01

N/A - Not available.

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 3

NWS Yorktown, Yorktown, Virginia

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	
Groundwater	Groundwater	Yorktown-Eastover Aquifer Water in Excavation Pit	Dermal	1,1-Dichloroethane	8.2E+00	µg/L	1.9E-07	mg/kg/day	5.7E-03	$(mg/kg\text{-}day)^{-1}$	1.1E-09	1.3E-05	mg/kg/day	2.0E+00	mg/kg/day	6.6E-06
				1,4-Dichlorobenzene	5.6E-01	µg/L	7.9E-08	mg/kg/day	5.4E-03	$(mg/kg\text{-}day)^{-1}$	4.2E-10	5.5E-06	mg/kg/day	7.0E-02	mg/kg/day	7.9E-05
				cis-1,2-Dichloroethene	1.4E+03	µg/L	3.7E-05	mg/kg/day	N/A		N/A	2.6E-03	mg/kg/day	2.0E-02	mg/kg/day	1.3E-01
				Trichloroethene	2.0E+02	µg/L	8.3E-06	mg/kg/day	4.6E-02	$(mg/kg\text{-}day)^{-1}$	3.8E-07	5.8E-04	mg/kg/day	5.0E-04	mg/kg/day	1.2E+00
				Vinyl chloride	1.1E+03	µg/L	2.1E-05	mg/kg/day	7.2E-01	$(mg/kg\text{-}day)^{-1}$	1.5E-05	1.5E-03	mg/kg/day	3.0E-03	mg/kg/day	4.9E-01
				Aluminum	1.8E+04	µg/L	5.9E-05	mg/kg/day	N/A		N/A	4.1E-03	mg/kg/day	1.0E+00	mg/kg/day	4.1E-03
				Arsenic	3.7E+01	µg/L	1.2E-07	mg/kg/day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.8E-07	8.2E-06	mg/kg/day	3.0E-04	mg/kg/day	2.7E-02
				Chromium	3.7E+02	µg/L	2.4E-06	mg/kg/day	5.0E-01	$(mg/kg\text{-}day)^{-1}$	1.2E-06	1.7E-04	mg/kg/day	5.0E-04	mg/kg/day	3.3E-01
				Cobalt	6.6E+00	µg/L	8.4E-09	mg/kg/day	N/A		N/A	5.8E-07	mg/kg/day	3.0E-03	mg/kg/day	1.9E-04
				Iron	4.7E+04	µg/L	1.5E-04	mg/kg/day	N/A		N/A	1.1E-02	mg/kg/day	7.0E-01	mg/kg/day	1.5E-02
				Manganese	1.3E+03	µg/L	4.2E-06	mg/kg/day	N/A		N/A	2.9E-04	mg/kg/day	9.6E-04	mg/kg/day	3.1E-01
				Nickel	1.0E+02	µg/L	6.6E-08	mg/kg/day	N/A		N/A	4.6E-06	mg/kg/day	8.0E-04	mg/kg/day	5.8E-03
				Vanadium	4.6E+01	µg/L	1.5E-07	mg/kg/day	N/A		N/A	1.0E-05	mg/kg/day	1.8E-04	mg/kg/day	5.6E-02
				Zinc	2.8E+03	µg/L	5.3E-06	mg/kg/day	N/A		N/A	3.7E-04	mg/kg/day	3.0E-01	mg/kg/day	1.2E-03
			Exp. Route Total								1.7E-05					2.5E+00
		Exposure Point Total									1.7E-05					2.5E+00
	Exposure Medium Total										1.7E-05					2.5E+00
	Air	Yorktown - Eastover Aquifer Water Vapors in Excavation Pit	Inhalation	1,1-Dichloroethane	8.2E+00	µg/L	6.2E-04	$\mu g/m^3$	1.1E-05	$(\mu g/m^3)^{-1}$	6.8E-09	4.3E-05	mg/m^3	N/A		N/A
				1,4-Dichlorobenzene	5.6E-01	µg/L	3.4E-05	$\mu g/m^3$	1.6E-06	$(\mu g/m^3)^{-1}$	5.5E-11	2.4E-06	mg/m^3	7.1E-01	mg/m^3	3.4E-06
				cis-1,2-Dichloroethene	1.4E+03	µg/L	1.1E-01	$\mu g/m^3$	N/A	$(\mu g/m^3)^{-1}$	N/A	7.4E-03	mg/m^3	N/A		N/A
				Trichloroethene	2.0E+02	µg/L	1.3E-02	$\mu g/m^3$	4.1E-06	$(\mu g/m^3)^{-1}$	5.5E-08	9.4E-04	mg/m^3	2.0E-03	mg/m^3	4.7E-01
				Vinyl chloride	1.1E+03	µg/L	1.1E-01	$\mu g/m^3$	4.4E-06	$(\mu g/m^3)^{-1}$	4.7E-07	7.6E-03	mg/m^3	1.0E-01	mg/m^3	7.6E-02
			Exp. Route Total								5.4E-07					5.4E-01
		Exposure Point Total									5.4E-07					5.4E-01
	Exposure Medium Total										5.4E-07					5.4E-01
Groundwater Total											1.7E-05					3.1E+00

N/A - Not available.

DA_{event} for dermal exposure to groundwater calculated on Tables 7.5.RME Supplement A

Air concentration above excavation calculated on Table 7.5.RME Supplement B

Table 7.5.RME Supplement A
Calculation of DA_{event}
Construction Worker Groundwater
Site 3, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient (K_p) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (t_{event}) (hr)	DA_{event} (mg/cm^2-event)	Eq
1,1-Dichloroethane	8.2E+00	6.7E-03	2.6E-02	3.8E-01	9.2E-01	1.0E+00	8	4.7E-07	3
1,4-Dichlorobenzene	5.6E-01	4.2E-02	2.0E-01	7.1E-01	1.7E+00	1.0E+00	8	2.0E-07	3
cis-1,2-Dichloroethene	1.4E+03	7.7E-03	2.9E-02	3.7E-01	8.9E-01	1.0E+00	8	9.2E-05	3
Trichloroethene	2.0E+02	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	8	2.1E-05	3
Vinyl chloride	1.1E+03	5.6E-03	1.7E-02	2.4E-01	5.7E-01	1.0E+00	8	5.3E-05	3
Aluminum	1.8E+04	1.0E-03	NA	NA	NA	NA	8	1.5E-04	1
Arsenic	3.7E+01	1.0E-03	NA	NA	NA	NA	8	3.0E-07	1
Chromium	3.7E+02	2.0E-03	NA	NA	NA	NA	8	6.0E-06	1
Cobalt	6.6E+00	4.0E-04	NA	NA	NA	NA	8	2.1E-08	1
Iron	4.7E+04	1.0E-03	NA	NA	NA	NA	8	3.8E-04	1
Manganese	1.3E+03	1.0E-03	NA	NA	NA	NA	8	1.1E-05	1
Nickel	1.0E+02	2.0E-04	NA	NA	NA	NA	8	1.7E-07	1
Vanadium	4.6E+01	1.0E-03	NA	NA	NA	NA	8	3.7E-07	1
Zinc	2.8E+03	6.0E-04	NA	NA	NA	NA	8	1.3E-05	1

Inorganics: DA_{event} (mg/cm^2-event) =
K_p x CW x t_{event} x 0.001 mg/µg x 0.001 l/cm^3 (eq 1)

Organics: DA_{event} (mg/cm^2-event) =
If t_{event}<t*, then DA_{event} =
2 x FA x K_p x CW x (sqrt((6 x τ_{event} x t_{event})/π)) x 0.001 mg/µg x 0.001 l/cm^3 (eq 2)

If t_{event}>t*, then DA_{event} =
FA x K_p x CW x (t_{event}/(1+B) + 2 x τ_{event} x ((1 + 3xB + 3xB^2)/(1+B)^2) x 0.001 mg/µg x 0.001 l/cm^3 (eq 3)

Notes:
NA - Not applicable
Permeability constants from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state

Table 7.5.RME Supplement B
Calculation of Inhalation Concentration in Excavation Trench
Construction Worker
Site 3, NWS Yorktown, Yorktown, Virginia

Exposure-point concentrations (inhalation) for construction/utility workers in a trench: Groundwater less than 15 feet deep	CAS No.	Molecular Weight MWi g/mol	Henry's Law Constant Hi atm-m3/mol	Gas-Phase Mass Transfer Coefficient KiG cm/s	Liquid-Phase Mass Transfer Coefficient KiL cm/s	Overall Mass Transfer Coefficient Ki cm/s	Concentration of Contaminant in Groundwater Cgw ug/L	Volatilization Factor VF L/m3	Concentration of Contaminant in Trench Ctrench ug/m3	Concentration of Contaminant in Trench Ctrench mg/m3
1,1-Dichloroethane	75-34-3	98.96	5.6E-03	4.7E-01	1.1E-03	1.1E-03	8.2E+00	4.6E-02	3.8E-01	3.8E-04
Benzene	71-43-2	78.11	5.6E-03	5.1E-01	1.3E-03	1.3E-03	4.8E+00	5.2E-02	2.5E-01	2.5E-04
Trichloroethene	79-01-6	131.39	1.0E-02	4.3E-01	9.9E-04	9.8E-04	2.0E+02	4.0E-02	8.2E+00	8.2E-03
Vinyl Chloride (commercial, construction)	75-01-4	62.50	2.7E-02	5.5E-01	1.4E-03	1.4E-03	1.1E+03	5.9E-02	6.6E+01	6.6E-02
cis-1,2-Dichloroethene	156-59-2	96.94	4.1E-03	4.7E-01	1.1E-03	1.1E-03	1.4E+03	4.6E-02	6.5E+01	6.5E-02
1,4-Dichlorobenzene (para)	106-46-7	147.00	2.43E-03	4.12E-01	9.33E-04	9.12E-04	5.60E-01	3.74E-02	2.10E-02	2.10E-05

Equations

$$VF = (K_i \times A \times F \times 10^{-3} \times 10^{4} \times 3600) / (ACH \times V)$$

$$K_i = 1 / \{(1/k_{iL}) + [(R\ T) / (H_i\ k_{iG})]\}$$

$$k_{iL} = (MW_{O2}/MW_i)^{0.5} \times (T/298) \times k_{L,}O_2$$

$$k_{iG} = (MW_{H2O}/MW_i)^{0.335} \times (T/298)^{1.005} \times k_G,\ H_2O$$

Parameter Value

For Mass-Transfer Coefficients			For Emission Flux and Concentration in Trench			Trench dimensions		
Kg,H2O	0.833	cm/s	CF1	1.00E-03	L/cm3	Length	**10**	ft
MWH2O	18		CF2	1.00E+04	cm2/m2		3.05	m
Kg,O2	0.002	cm/s	CF3	3600	s/hr	Width	**10**	ft
MWO2	32		F	**1**			3.05	m
T	**77**	F	ACH	360	hr-1	Depth	**8**	ft
T	298	K					2.44	m
R	8.20E-05	atm-m3/mol-K				Width/Depth	1.25	

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
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	
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water	Ingestion	1,1-Dichloroethane	8.2E+00	µg/L	N/A		N/A		N/A	1.1E-04	mg/kg/day	2.0E-01	mg/kg/day	5.3E-04
				1,4-Dichlorobenzene	5.6E-01	µg/L	N/A		N/A		N/A	7.2E-06	mg/kg/day	7.0E-02	mg/kg/day	1.0E-04
				cis-1,2-Dichloroethene	1.4E+03	µg/L	N/A		N/A		N/A	1.8E-02	mg/kg/day	2.0E-03	mg/kg/day	9.0E+00
				Trichloroethene	2.0E+02	µg/L	N/A		N/A		N/A	2.6E-03	mg/kg/day	5.0E-04	mg/kg/day	5.2E+00
				Vinyl chloride	1.1E+03	µg/L	N/A		N/A		N/A	1.4E-02	mg/kg/day	3.0E-03	mg/kg/day	4.8E+00
				Aluminum, Dissolved	2.0E+03	µg/L	N/A		N/A		N/A	2.6E-02	mg/kg/day	1.0E+00	mg/kg/day	2.6E-02
				Arsenic, Dissolved	2.5E+01	µg/L	N/A		N/A		N/A	3.2E-04	mg/kg/day	3.0E-04	mg/kg/day	1.1E+00
				Iron, Dissolved	1.8E+03	µg/L	N/A		N/A		N/A	2.3E-02	mg/kg/day	7.0E-01	mg/kg/day	3.3E-02
				Manganese, Dissolved	8.7E+02	µg/L	N/A		N/A		N/A	1.1E-02	mg/kg/day	2.4E-02	mg/kg/day	4.6E-01
				Selenium, Dissolved	8.2E+00	µg/L	N/A		N/A		N/A	1.1E-04	mg/kg/day	5.0E-03	mg/kg/day	2.1E-02
			Exp. Route Total								N/A					2.1E+01
			Dermal	1,1-Dichloroethane	8.2E+00	µg/L	N/A		N/A		N/A	7.7E-06	mg/kg/day	2.0E-01	mg/kg/day	3.9E-05
				1,4-Dichlorobenzene	5.6E-01	µg/L	N/A		N/A		N/A	4.5E-06	mg/kg/day	7.0E-02	mg/kg/day	6.5E-05
				cis-1,2-Dichloroethene	1.4E+03	µg/L	N/A		N/A		N/A	1.5E-03	mg/kg/day	2.0E-03	mg/kg/day	7.5E-01
				Trichloroethene	2.0E+02	µg/L	N/A		N/A		N/A	4.1E-04	mg/kg/day	5.0E-04	mg/kg/day	8.2E-01
				Vinyl chloride	1.1E+03	µg/L	N/A		N/A		N/A	7.6E-04	mg/kg/day	3.0E-03	mg/kg/day	2.5E-01
				Aluminum, Dissolved	2.0E+03	µg/L	N/A		N/A		N/A	8.4E-05	mg/kg/day	1.0E+00	mg/kg/day	8.4E-05
				Arsenic, Dissolved	2.5E+01	µg/L	N/A		N/A		N/A	1.0E-06	mg/kg/day	3.0E-04	mg/kg/day	3.5E-03
				Iron, Dissolved	1.8E+03	µg/L	N/A		N/A		N/A	7.5E-05	mg/kg/day	7.0E-01	mg/kg/day	1.1E-04
				Manganese, Dissolved	8.7E+02	µg/L	N/A		N/A		N/A	3.6E-05	mg/kg/day	9.6E-04	mg/kg/day	3.7E-02
				Selenium, Dissolved	8.2E+00	µg/L	N/A		N/A		N/A	3.4E-07	mg/kg/day	5.0E-03	mg/kg/day	6.8E-05
			Exp. Route Total								N/A					1.9E+00
		Exposure Point Total									N/A					2.3E+01
	Exposure Medium Total										N/A					2.3E+01
	Air	Yorktown-Eastover Aquifer Water Vapors at Showerhead	Inhalation	1,1-Dichloroethane	8.2E+00	µg/L	N/A		N/A		N/A	1.5E-03	mg/m^3	N/A	mg/m^3	N/A
				1,4-Dichlorobenzene	5.6E-01	µg/L	N/A		N/A		N/A	8.1E-05	mg/m^3	8.0E-01	mg/m^3	1.0E-04
				cis-1,2-Dichloroethene	1.4E+03	µg/L	N/A		N/A		N/A	2.5E-01	mg/m^3	N/A	mg/m^3	N/A
				Trichloroethene	2.0E+02	µg/L	N/A		N/A		N/A	3.3E-02	mg/m^3	N/A	mg/m^3	N/A
				Vinyl chloride	1.1E+03	µg/L	N/A		N/A		N/A	2.6E-01	mg/m^3	1.0E-01	mg/m^3	2.6E+00
			Exp. Route Total								N/A					2.6E+00
		Exposure Point Total									N/A					2.6E+00

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
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	
Groundwater (cont'd)	Air	Indoor Air	Inhalation	cis-1,2-Dichloroethene	1.6E-01	mg/m^3	N/A		N/A		N/A	1.1E-01	mg/m^3	N/A		N/A
				Trichloroethene	5.3E-02	mg/m^3	N/A		N/A		N/A	3.4E-02	mg/m^3	2.0E-03	mg/m^3	1.7E+01
				Vinyl chloride	1.0E+00	mg/m^3	N/A		N/A		N/A	6.6E-01	mg/m^3	1.0E-01	mg/m^3	6.6E+00
			Exp. Route Total								N/A					2.4E+01
		Exposure Point Total									N/A					2.4E+01
	Exposure Medium Total										N/A					2.6E+01
Groundwater Total											N/A					4.9E+01

N/A - Not available.

DA_{event} for dermal exposure to groundwater calculated on Table 7.1.CTE Supplement A

Inhalation exposure while showering calculated on Table 7.1.CTE Supplement B

Table 7.1.CTE Supplement A
Calculation of DA_{event}
Residential Adult Groundwater
Site 3, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient (K_p) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (t_{event}) (hr)	DA_{event} (mg/cm^2-event)	Eq
1,1-Dichloroethane	8.2E+00	6.7E-03	2.6E-02	3.8E-01	9.2E-01	1.0E+00	0.25	4.7E-08	2
1,4-Dichlorobenzene	5.6E-01	4.2E-02	2.0E-01	7.1E-01	1.7E+00	1.0E+00	0.25	2.7E-08	2
cis-1,2-Dichloroethene[1]	1.4E+03	7.7E-03	2.9E-02	3.7E-01	8.9E-01	1.0E+00	0.25	9.1E-06	2
Trichloroethene	2.0E+02	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	0.25	2.5E-06	2
Vinyl chloride	1.1E+03	5.6E-03	1.7E-02	2.4E-01	5.7E-01	1.0E+00	0.25	4.6E-06	2
Aluminum, Dissolved	2.0E+03	1.0E-03	NA	NA	NA	NA	0.25	5.1E-07	1
Arsenic, Dissolved	2.5E+01	1.0E-03	NA	NA	NA	NA	0.25	6.3E-09	1
Iron, Dissolved	1.8E+03	1.0E-03	NA	NA	NA	NA	0.25	4.5E-07	1
Manganese, Dissolved	8.7E+02	1.0E-03	NA	NA	NA	NA	0.25	2.2E-07	1
Selenium, Dissolved	8.2E+00	1.0E-03	NA	NA	NA	NA	0.25	2.1E-09	1

[1] trans-1,2-Dichloroethane used as a surrogate.

Inorganics: DA_{event} (mg/cm^2-event) =

K_p x CW x t_{event} x 0.001 mg/µg x 0.001 l/cm^3 (eq 1)

Organics: DA_{event} (mg/cm^2-event) =

If t_{event}<t*, then DA_{event} =

2 x FA x K_p x CW x (sqrt((6 x τ_{event} x t_{event})/π)) x 0.001 mg/µg x 0.001 l/cm^3 (eq 2)

If t_{event}>t*, then DA_{event} =

FA x K_p x CW x (t_{event}/(1+B) + 2 x τ_{event} x ((1 + 3xB + 3xB^2)/(1+B)^2) x 0.001 mg/µg x 0.001 l/cm^3 (eq 3)

Notes:

NA - Not applicable

Permeability constants and other input parameter values from EPA 2004,*Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document

B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).

t* - Time to reach steady-state

Table 7.1.CTE Supplement B

Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model

Adult Resident

Site 3, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Exposure Point Concentration Cwo (µg/L)	Molecular weight (MW) (g/mole)	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl (VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/L)	S (µg/m^3 -min)	Ca (mg/m^3)
1,1-Dichloroethane	8.2E+00	9.9E+01	5.6E-03	1.3E+03	1.3E+01	1.3E+01	1.7E+01	1.1E+00	9.1E-01	9.4E-03
1,4-Dichlorobenzene	5.6E-01	1.5E+02	2.4E-03	1.0E+03	1.1E+01	9.9E+00	1.3E+01	5.9E-02	4.9E-02	5.0E-04
cis-1,2-Dichloroethene	1.4E+03	9.7E+01	4.1E-03	1.3E+03	1.3E+01	1.3E+01	1.7E+01	1.9E+02	1.6E+02	1.6E+00
Trichloroethene	2.0E+02	1.3E+02	9.9E-03	1.1E+03	1.2E+01	1.1E+01	1.5E+01	2.4E+01	2.0E+01	2.1E-01
Vinyl chloride	1.1E+03	6.3E+01	2.8E-02	1.6E+03	1.7E+01	1.7E+01	2.2E+01	1.9E+02	1.6E+02	1.6E+00

Variables	Units	Exposure Assumptions
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4
Tl = Calibration temp. of water	K (20C +273)	293
Ts = Shower water temperature	k (45C)	318
Us = water viscosity at Ts	centipoise	0.596
Ul = water viscosity at Tl	cp	1.002
Cwd = conc. leaving droplets after time sdt	µg/l	Solved by Eq 5
sdt = shower droplet drop time	sec	0.5
d = shower droplet diameter	mm	1
FR = shower water flow rate	l/min	10
SV = shower room air volume	m^3	12
S = indoor VOC generation rate	µg/m^3-min	Solved by Eq 6
Ds = duration of shower	min	15
Dt = total duration in shower room	min	30
R = air exchange rate	min^{-1}	0.0083
Ca = indoor air concentration of VOCs	µg/m^3	Solved by Eq 7

Equation 1:	Kg(VOC) =	$3000 * (18 / MW)^{0.5}$
Equation 2:	Kl(VOC) =	$20 * (44 / MW)^{0.5}$
Equation 3:	KL =	$((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))^{-1}$
Equation 4:	Kal =	$(KL * (((Tl * Us) / (Ts * Ul))^{-0.5}))$
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))
Equation 6:	S =	(Cwd * FR / SV)
Equation 7:	Ca =	If t>Ds [(S / R) * (Ds + (EXP(-R * Dt) / R) -(EXP(R *(Ds - Dt)) / R)] / Dt * 1/1000

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: 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	
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water	Ingestion	1,1-Dichloroethane	8.2E+00	µg/L	N/A		N/A		N/A	3.5E-04	mg/kg/day	2.0E-01	mg/kg/day	1.8E-03
				1,4-Dichlorobenzene	5.6E-01	µg/L	N/A		N/A		N/A	2.4E-05	mg/kg/day	7.0E-02	mg/kg/day	3.4E-04
				cis-1,2-Dichloroethene	1.4E+03	µg/L	N/A		N/A		N/A	6.0E-02	mg/kg/day	2.0E-03	mg/kg/day	3.0E+01
				Trichloroethene	2.0E+02	µg/L	N/A		N/A		N/A	8.7E-03	mg/kg/day	5.0E-04	mg/kg/day	1.7E+01
				Vinyl chloride	1.1E+03	µg/L	N/A		N/A		N/A	4.8E-02	mg/kg/day	3.0E-03	mg/kg/day	1.6E+01
				Aluminum, Dissolved	2.0E+03	µg/L	N/A		N/A		N/A	8.7E-02	mg/kg/day	1.0E+00	mg/kg/day	8.7E-02
				Arsenic, Dissolved	2.5E+01	µg/L	N/A		N/A		N/A	1.1E-03	mg/kg/day	3.0E-04	mg/kg/day	3.6E+00
				Iron, Dissolved	1.8E+03	µg/L	N/A		N/A		N/A	7.7E-02	mg/kg/day	7.0E-01	mg/kg/day	1.1E-01
				Manganese, Dissolved	8.7E+02	µg/L	N/A		N/A		N/A	3.7E-02	mg/kg/day	2.4E-02	mg/kg/day	1.5E+00
				Selenium, Dissolved	8.2E+00	µg/L	N/A		N/A		N/A	3.5E-04	mg/kg/day	5.0E-03	mg/kg/day	7.0E-02
			Exp. Route Total								N/A					6.9E+01
			Dermal	1,1-Dichloroethane	8.2E+00	µg/L	N/A		N/A		N/A	2.3E-05	mg/kg/day	2.0E-01	mg/kg/day	1.1E-04
				1,4-Dichlorobenzene	5.6E-01	µg/L	N/A		N/A		N/A	1.3E-05	mg/kg/day	7.0E-02	mg/kg/day	1.9E-04
				cis-1,2-Dichloroethene	1.4E+03	µg/L	N/A		N/A		N/A	4.4E-03	mg/kg/day	2.0E-03	mg/kg/day	2.2E+00
				Trichloroethene	2.0E+02	µg/L	N/A		N/A		N/A	1.2E-03	mg/kg/day	5.0E-04	mg/kg/day	2.4E+00
				Vinyl chloride	1.1E+03	µg/L	N/A		N/A		N/A	2.1E-03	mg/kg/day	3.0E-03	mg/kg/day	6.9E-01
				Aluminum, Dissolved	2.0E+03	µg/L	N/A		N/A		N/A	2.8E-04	mg/kg/day	1.0E+00	mg/kg/day	2.8E-04
				Arsenic, Dissolved	2.5E+01	µg/L	N/A		N/A		N/A	3.5E-06	mg/kg/day	3.0E-04	mg/kg/day	1.2E-02
				Iron, Dissolved	1.8E+03	µg/L	N/A		N/A		N/A	2.5E-04	mg/kg/day	7.0E-01	mg/kg/day	3.6E-04
				Manganese, Dissolved	8.7E+02	µg/L	N/A		N/A		N/A	1.2E-04	mg/kg/day	9.6E-04	mg/kg/day	1.3E-01
				Selenium, Dissolved	8.2E+00	µg/L	N/A		N/A		N/A	1.1E-06	mg/kg/day	5.0E-03	mg/kg/day	2.3E-04
			Exp. Route Total								N/A					5.5E+00
		Exposure Point Total									N/A					7.4E+01
	Exposure Medium Total										N/A					7.4E+01
	Air	Yorktown-Eastover Aquifer Water Vapors at Showerhead	Inhalation	1,1-Dichloroethane	8.2E+00	µg/L	N/A		N/A		N/A	1.1E-04	mg/m^3	N/A	mg/m^3	N/A
				1,4-Dichlorobenzene	5.6E-01	µg/L	N/A		N/A		N/A	5.7E-06	mg/m^3	8.0E-01	mg/m^3	7.1E-06
				cis-1,2-Dichloroethene	1.4E+03	µg/L	N/A		N/A		N/A	1.8E-02	mg/m^3	N/A		N/A
				Trichloroethene	2.0E+02	µg/L	N/A		N/A		N/A	2.3E-03	mg/m^3	2.0E-03	mg/m^3	1.2E+00
				Vinyl chloride	1.1E+03	µg/L	N/A		N/A		N/A	1.9E-02	mg/m^3	1.0E-01	mg/m^3	1.9E-01
			Exp. Route Total								N/A					1.4E+00
		Exposure Point Total									N/A					1.4E+00

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: 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	
Groundwater (cont'd)	Air	Indoor Air	Inhalation	cis-1,2-Dichloroethene	1.6E-01	mg/m^3	N/A		N/A		N/A	1.1E-01	mg/m^3	N/A		N/A
				Trichloroethene	5.3E-02	mg/m^3	N/A		N/A		N/A	3.4E-02	mg/m^3	2.0E-03	mg/m^3	1.7E+01
				Vinyl chloride	1.0E+00	mg/m^3	N/A		N/A		N/A	6.6E-01	mg/m^3	1.0E-01	mg/m^3	6.6E+00
			Exp. Route Total								N/A					2.4E+01
		Exposure Point Total									N/A					2.4E+01
	Exposure Medium Total										N/A					2.5E+01
Groundwater Total											N/A					9.9E+01

N/A - Not available.

DA_{event} for dermal exposure to groundwater calculated on Table 7.2.CTE Supplement A

Inhalation exposure while showering calculated on Table 7.2.CTE Supplement B

Table 7.2.CTE Supplement A
Calculation of DA_{event}
Residential Child Groundwater
Site 3, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient (K_p) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (t_{event}) (hr)	DA_{event} (mg/cm^2-event)	Eq
1,1-Dichloroethane	8.2E+00	6.7E-03	2.6E-02	3.8E-01	9.2E-01	1.0E+00	0.33	5.4E-08	2
1,4-Dichlorobenzene	5.6E-01	4.2E-02	2.0E-01	7.1E-01	1.7E+00	1.0E+00	0.33	3.1E-08	2
cis-1,2-Dichloroethene[1]	1.4E+03	7.7E-03	2.9E-02	3.7E-01	8.9E-01	1.0E+00	0.33	1.0E-05	2
Trichloroethene	2.0E+02	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	0.33	2.9E-06	2
Vinyl chloride	1.1E+03	5.6E-03	1.7E-02	2.4E-01	5.7E-01	1.0E+00	0.33	4.9E-06	2
Aluminum, Dissolved	2.0E+03	1.0E-03	NA	NA	NA	NA	0.33	6.7E-07	1
Arsenic, Dissolved	2.5E+01	1.0E-03	NA	NA	NA	NA	0.33	8.3E-09	1
Iron, Dissolved	1.8E+03	1.0E-03	NA	NA	NA	NA	0.33	6.0E-07	1
Manganese, Dissolved	8.7E+02	1.0E-03	NA	NA	NA	NA	0.33	2.9E-07	1
Selenium, Dissolved	8.2E+00	1.0E-03	NA	NA	NA	NA	0.33	2.7E-09	1

[1] trans-1,2-Dichloroethane used as a surrogate.

Inorganics: DA_{event} (mg/cm^2-event) =

K_p x CW x t_{event} x 0.001 mg/µg x 0.001 l/cm^3 (eq 1)

Organics: DA_{event} (mg/cm^2-event) =

If t_{event}<t*, then DA_{event} =

2 x FA x K_p x CW x (sqrt((6 x τ_{event} x t_{event})/π)) x 0.001 mg/µg x 0.001 l/cm^3 (eq 2)

If t_{event}>t*, then DA_{event} =

FA x K_p x CW x (t_{event}/(1+B) + 2 x τ_{event} x ((1 + 3xB + 3xB^2)/(1+B)^2) x 0.001 mg/µg x 0.001 l/cm^3 (eq 3)

Notes:

NA - Not applicable

Permeability constants and other input parameter values from EPA 2004,*Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document

B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).

t* - Time to reach steady-state

Table 7.2.CTE Supplement B

Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model

Child Resident

Site 3, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Exposure Point Concentration Cwo (µg/L)	Molecular weight (MW) (g/mole)	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl (VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/L)	S (µg/m^3 -min)	Ca (mg/m^3)
1,1-Dichloroethane	8.2E+00	9.9E+01	5.6E-03	1.3E+03	1.3E+01	1.3E+01	1.7E+01	1.1E+00	9.1E-01	1.2E-02
1,4-Dichlorobenzene	5.6E-01	1.5E+02	2.4E-03	1.0E+03	1.1E+01	9.9E+00	1.3E+01	5.9E-02	4.9E-02	6.5E-04
cis-1,2-Dichloroethene	1.4E+03	9.7E+01	4.1E-03	1.3E+03	1.3E+01	1.3E+01	1.7E+01	1.9E+02	1.6E+02	2.0E+00
Trichloroethene	2.0E+02	1.3E+02	9.9E-03	1.1E+03	1.2E+01	1.1E+01	1.5E+01	2.4E+01	2.0E+01	2.7E-01
Vinyl chloride	1.1E+03	6.3E+01	2.8E-02	1.6E+03	1.7E+01	1.7E+01	2.2E+01	1.9E+02	1.6E+02	2.1E+00

Variables	Units	Exposure Assumptions
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4
Tl = Calibration temp. of water	K (20C +273)	293
Ts = Shower water temperature	k (45C)	318
Us = water viscosity at Ts	centipoise	0.596
Ul = water viscosity at Tl	cp	1.002
Cwd = conc. leaving droplets after time sdt	µg/l	Solved by Eq 5
sdt = shower droplet drop time	sec	0.5
d = shower droplet diameter	mm	1
FR = shower water flow rate	l/min	10
SV = shower room air volume	m^3	12
S = indoor VOC generation rate	µg/m^3-min	Solved by Eq 6
Ds = duration of shower	min	19.8
Dt = total duration in shower room	min	40
R = air exchange rate	min^{-1}	0.0083
Ca = indoor air concentration of VOCs	µg/m^3	Solved by Eq 7

Equation 1:	Kg(VOC) =	$3000 * (18 / MW)^{0.5}$
Equation 2:	Kl(VOC) =	$20 * (44 / MW)^{0.5}$
Equation 3:	KL =	$((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))^{-1}$
Equation 4:	Kal =	$(KL * (((Tl * Us) / (Ts * Ul))^{-0.5}))$
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))
Equation 6:	S =	(Cwd * FR / SV)
Equation 7:	Ca =	If t>Ds [(S / R) * (Ds + (EXP(-R * Dt) / R) -(EXP(R *(Ds - Dt)) / R)] / Dt * 1/1000

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/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	
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water	Ingestion	1,1-Dichloroethane	8.2E+00	µg/L	4.4E-05	mg/kg/day	5.7E-03	$(mg/kg\text{-}day)^{-1}$	2.5E-07	N/A		N/A		N/A
				1,4-Dichlorobenzene	5.6E-01	µg/L	3.0E-06	mg/kg/day	5.4E-03	$(mg/kg\text{-}day)^{-1}$	1.6E-08	N/A		N/A		N/A
				cis-1,2-Dichloroethene	1.4E+03	µg/L	7.4E-03	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Trichloroethene (1)	2.0E+02	µg/L			4.6E-02	$(mg/kg\text{-}day)^{-1}$	2.3E-04	N/A		N/A		N/A
				Vinyl chloride (1)	1.1E+03	µg/L			7.2E-01	$(mg/kg\text{-}day)^{-1}$	7.6E-03	N/A		N/A		N/A
				Aluminum, Dissolved	2.0E+03	µg/L	1.1E-02	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Arsenic, Dissolved	2.5E+01	µg/L	1.3E-04	mg/kg/day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.0E-04	N/A		N/A		N/A
				Iron, Dissolved	1.8E+03	µg/L	9.6E-03	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Manganese, Dissolved	8.7E+02	µg/L	4.6E-03	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Selenium, Dissolved	8.2E+00	µg/L	4.4E-05	mg/kg/day	N/A		N/A	N/A		N/A		N/A
			Exp. Route Total								8.0E-03					N/A
			Dermal	1,1-Dichloroethane	8.2E+00	µg/L	2.3E-06	mg/kg/day	5.7E-03	$(mg/kg\text{-}day)^{-1}$	1.3E-08	N/A		N/A		N/A
				1,4-Dichlorobenzene	5.6E-01	µg/L	1.3E-06	mg/kg/day	5.4E-03	$(mg/kg\text{-}day)^{-1}$	7.2E-09	N/A		N/A		N/A
				cis-1,2-Dichloroethene	1.4E+03	µg/L	4.5E-04	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Trichloroethene (1)	2.0E+02	µg/L			4.6E-02	$(mg/kg\text{-}day)^{-1}$	2.5E-05	N/A		N/A		N/A
				Vinyl chloride (1)	1.1E+03	µg/L			7.2E-01	$(mg/kg\text{-}day)^{-1}$	2.5E-04	N/A		N/A		N/A
				Aluminum, Dissolved	2.0E+03	µg/L	2.7E-05	mg/kg/day	N/A	$(mg/kg\text{-}day)^{-1}$	N/A	N/A		N/A		N/A
				Arsenic, Dissolved	2.5E+01	µg/L	3.3E-07	mg/kg/day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.0E-07	N/A		N/A		N/A
				Iron, Dissolved	1.8E+03	µg/L	2.4E-05	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Manganese, Dissolved	8.7E+02	µg/L	1.2E-05	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Selenium, Dissolved	8.2E+00	µg/L	1.1E-07	mg/kg/day	N/A		N/A	N/A		N/A		N/A
			Exp. Route Total								2.8E-04					N/A
		Exposure Point Total									8.3E-03					N/A
	Exposure Medium Total										8.3E-03					N/A
	Air	Yorktown-Eastover Aquifer Water Vapors at Showerhead	Inhalation	1,1-Dichloroethane	8.2E+00	µg/L	3.1E-03	mg/m^3	1.1E-05	$(\mu g/m^3)^{-1}$	3.4E-05	N/A		N/A		N/A
				1,4-Dichlorobenzene	5.6E-01	µg/L	2.1E-04	mg/m^3	1.6E-06	$(\mu g/m^3)^{-1}$	3.4E-07	N/A		N/A		N/A
				cis-1,2-Dichloroethene	1.4E+03	µg/L	5.3E-01	mg/m^3	N/A		N/A	N/A		N/A		N/A
				Trichloroethene (1)	2.0E+02	µg/L			4.1E-06	$(\mu g/m^3)^{-1}$	3.3E-05	N/A		N/A		N/A
				Vinyl chloride (1)	1.1E+03	µg/L			4.4E-06	$(\mu g/m^3)^{-1}$	9.4E-05	N/A		N/A		N/A
			Exp. Route Total								1.6E-04					N/A
		Exposure Point Total									1.6E-04					N/A

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/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	
Groundwater (cont'd)	Air	Indoor Air	Inhalation	cis-1,2-Dichloroethene	1.6E-01	mg/m^3	2.3E-02	mg/m^3	N/A		N/A	N/A		N/A		N/A
				Trichloroethene (1)	5.3E-02	mg/m^3			4.1E-06	(µg/m^3)$^{-1}$	1.2E-04	N/A		N/A		N/A
				Vinyl chloride (1)	1.0E+00	mg/m^3			4.4E-06	(µg/m^3)$^{-1}$	8.8E-04	N/A		N/A		N/A
			Exp. Route Total								9.9E-04					N/A
		Exposure Point Total									9.9E-04					N/A
	Exposure Medium Total										1.2E-03					N/A
Groundwater Total											9.4E-03					N/A

N/A - Not available.

DA_{event} for dermal exposure to groundwater calculated on Tables 7.1.CTE and 7.1.CTE Supplement A.

Inhalation exposure while showering calculated on Tables 7.1.CTE and 7.2.CTE Supplement B

TABLE 7.3.CTE Supplement A

CALCULATION OF CHEMICAL CANCER RISKS FOR COPC WITH MUTAGENIC MODE OF ACTION

CENTRAL TENDENCY EXPOSURE

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations										
							Intake					CSF/Unit Risk					Cancer Risk
							Value				Units	Value				Units	
					Value	Units	0-2 yrs	2-6 yrs	6-16 years	16-30 yrs		0-2 yrs (ADAF=10)	2-6 yrs (ADAF=3)	6-16 yrs (ADAF=3)	16-30 yrs (ADAF=1)		
Groundwater	Groundwater	Tap Water	Ingestion	Trichloroethene	2.0E+02	ug/l	2.5E-04	5.0E-04	3.4E-04		mg/kg/day	4.6E-01	1.4E-01	1.4E-01	4.6E-02	1/(mg/kg-day)	2.3E-04
				Vinyl chloride	1.1E+03	ug/l	4.1E-03		1.9E-03		mg/kg/day	1.5E+00		7.2E-01		1/(mg/kg-day)	7.6E-03
			Dermal	Trichloroethene	2.0E+02	ug/l	2.3E-05	4.6E-05	6.1E-05		mg/kg/day	4.6E-01	1.4E-01	1.4E-01	4.6E-02	1/(mg/kg-day)	2.5E-05
				Vinyl chloride	1.1E+03	ug/l	1.2E-04		1.0E-04		mg/kg/day	1.5E+00		7.2E-01		1/(mg/kg-day)	2.5E-04
	Air	Columbia and Yorktown - Eastover Aquifer Water Vapors at Showerhead	Inhalation	Trichloroethene	2.0E+02	ug/l	6.7E-02	1.3E-01	2.3E+00		$\mu g/m^3$	4.1E-05	1.2E-05	1.2E-05	4.1E-06	$(\mu g/m^3)^{-1}$	3.3E-05
				Vinyl chloride	1.1E+03	ug/l	1.6E+00		1.8E+01		$\mu g/m^3$	8.8E-06		4.4E-06		$(\mu g/m^3)^{-1}$	9.4E-05
		Indoor Air	Inhalation	Trichloroethene	5.3E-02	mg/m^3	9.7E-01	1.9E+00	4.4E+00		$\mu g/m^3$	4.1E-05	1.2E-05	1.2E-05	4.1E-06	$(\mu g/m^3)^{-1}$	1.2E-04
				Vinyl chloride	1.0E+00	mg/m^3	5.7E+01		8.5E+01		$\mu g/m^3$	8.8E-06		4.4E-06		$(\mu g/m^3)^{-1}$	8.8E-04

Cancer risk = $(Intake_{0-2} \times CSF_{0-2}) + (Intake_{2-6} \times CSF_{2-6}) + (Intake_{6-16} \times CSF_{6-16}) + (Intake_{16-30} \times CSF_{16-30})$

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial 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	
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water	Ingestion	1,1-Dichloroethane	8.2E+00	µg/L	9.0E-06	mg/kg/day	5.7E-03	$(mg/kg\text{-}day)^{-1}$	5.2E-08	7.0E-05	mg/kg/day	2.0E-01	mg/kg/day	3.5E-04
				1,4-Dichlorobenzene	5.6E-01	µg/L	6.2E-07	mg/kg/day	5.4E-03	$(mg/kg\text{-}day)^{-1}$	3.3E-09	4.8E-06	mg/kg/day	7.0E-02	mg/kg/day	6.9E-05
				cis-1,2-Dichloroethene	1.4E+03	µg/L	1.5E-03	mg/kg/day	N/A		N/A	1.2E-02	mg/kg/day	2.0E-03	mg/kg/day	6.0E+00
				Trichloroethene	2.0E+02	µg/L	2.2E-04	mg/kg/day	4.6E-02	$(mg/kg\text{-}day)^{-1}$	1.0E-05	1.7E-03	mg/kg/day	5.0E-04	mg/kg/day	3.5E+00
				Vinyl chloride	1.1E+03	µg/L	1.2E-03	mg/kg/day	7.2E-01	$(mg/kg\text{-}day)^{-1}$	9.0E-04	9.7E-03	mg/kg/day	3.0E-03	mg/kg/day	3.2E+00
				Aluminum, Dissolved	2.0E+03	µg/L	2.2E-03	mg/kg/day	N/A	$(mg/kg\text{-}day)^{-1}$	N/A	1.7E-02	mg/kg/day	1.0E+00	mg/kg/day	1.7E-02
				Arsenic, Dissolved	2.5E+01	µg/L	2.8E-05	mg/kg/day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.2E-05	2.2E-04	mg/kg/day	3.0E-04	mg/kg/day	7.2E-01
				Iron, Dissolved	1.8E+03	µg/L	2.0E-03	mg/kg/day	N/A		N/A	1.6E-02	mg/kg/day	7.0E-01	mg/kg/day	2.2E-02
				Manganese, Dissolved	8.7E+02	µg/L	9.6E-04	mg/kg/day	N/A		N/A	7.4E-03	mg/kg/day	2.4E-02	mg/kg/day	3.1E-01
				Selenium, Dissolved	8.2E+00	µg/L	9.1E-06	mg/kg/day	N/A		N/A	7.0E-05	mg/kg/day	5.0E-03	mg/kg/day	1.4E-02
			Exp. Route Total								9.5E-04					1.4E+01
		Exposure Point Total									9.5E-04					1.4E+01
	Exposure Medium Total										9.5E-04					1.4E+01
	Air	Indoor Air	Inhalation	cis-1,2-Dichloroethene	1.6E-01	mg/m^3	1.3E-02	mg/m^3	N/A		N/A	3.8E-02	mg/m^3	N/A	mg/m^3	N/A
				Trichloroethene	5.3E-02	mg/m^3	4.3E-03	mg/m^3	4.1E-06	$(\mu g/m^3)^{-1}$	1.8E-05	1.2E-02	mg/m^3	2.0E-03	mg/m^3	6.0E+00
				Vinyl chloride	1.0E+00	mg/m^3	8.5E-02	mg/m^3	4.4E-06	$(\mu g/m^3)^{-1}$	3.7E-04	2.4E-01	mg/m^3	1.0E-01	mg/m^3	2.4E+00
			Exp. Route Total								3.9E-04					8.4E+00
		Exposure Point Total									3.9E-04					8.4E+00
	Exposure Medium Total										3.9E-04					8.4E+00
Groundwater Total											1.3E-03					2.2E+01

N/A - Not available.

TABLE 7.5.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 3

NWS Yorktown, Yorktown, Virginia

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	
Groundwater	Groundwater	Yorktown-Eastover Aquifer Water in Excavation Pit	Dermal	1,1-Dichloroethane	8.2E+00	µg/L	1.0E-07	mg/kg/day	5.7E-03	$(mg/kg\text{-}day)^{-1}$	5.8E-10	7.2E-06	mg/kg/day	2.0E+00	mg/kg/day	3.6E-06
				1,4-Dichlorobenzene	5.6E-01	µg/L	4.7E-08	mg/kg/day	5.4E-03	$(mg/kg\text{-}day)^{-1}$	2.5E-10	3.3E-06	mg/kg/day	7.0E-02	mg/kg/day	4.7E-05
				cis-1,2-Dichloroethene	1.4E+03	µg/L	2.0E-05	mg/kg/day	N/A		N/A	1.4E-03	mg/kg/day	2.0E-02	mg/kg/day	7.0E-02
				Trichloroethene	2.0E+02	µg/L	4.8E-06	mg/kg/day	4.6E-02	$(mg/kg\text{-}day)^{-1}$	2.2E-07	3.3E-04	mg/kg/day	5.0E-04	mg/kg/day	6.7E-01
				Vinyl chloride	1.1E+03	µg/L	1.1E-05	mg/kg/day	7.2E-01	$(mg/kg\text{-}day)^{-1}$	8.0E-06	7.8E-04	mg/kg/day	3.0E-03	mg/kg/day	2.6E-01
				Aluminum	1.8E+04	µg/L	2.9E-05	mg/kg/day	N/A		N/A	2.1E-03	mg/kg/day	1.0E+00	mg/kg/day	2.1E-03
				Arsenic	3.7E+01	µg/L	5.9E-08	mg/kg/day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.8E-08	4.1E-06	mg/kg/day	3.0E-04	mg/kg/day	1.4E-02
				Chromium	3.7E+02	µg/L	1.2E-06	mg/kg/day	5.0E-01	$(mg/kg\text{-}day)^{-1}$	6.0E-07	8.3E-05	mg/kg/day	5.0E-04	mg/kg/day	1.7E-01
				Cobalt	6.6E+00	µg/L	4.2E-09	mg/kg/day	N/A		N/A	2.9E-07	mg/kg/day	3.0E-03	mg/kg/day	9.7E-05
				Iron	4.7E+04	µg/L	7.5E-05	mg/kg/day	N/A		N/A	5.3E-03	mg/kg/day	7.0E-01	mg/kg/day	7.5E-03
				Manganese	1.3E+03	µg/L	2.1E-06	mg/kg/day	N/A		N/A	1.5E-04	mg/kg/day	9.6E-04	mg/kg/day	1.5E-01
				Nickel	1.0E+02	µg/L	3.3E-08	mg/kg/day	N/A		N/A	2.3E-06	mg/kg/day	8.0E-04	mg/kg/day	2.9E-03
				Vanadium	4.6E+01	µg/L	7.3E-08	mg/kg/day	N/A		N/A	5.1E-06	mg/kg/day	1.8E-04	mg/kg/day	2.8E-02
				Zinc	2.8E+03	µg/L	2.7E-06	mg/kg/day	N/A		N/A	1.9E-04	mg/kg/day	3.0E-01	mg/kg/day	6.2E-04
			Exp. Route Total								8.9E-06					1.4E+00
		Exposure Point Total									8.9E-06					1.4E+00
	Exposure Medium Total										8.9E-06					1.4E+00
	Air	Yorktown-Eastover Aquifer Water Vapors in Excavation Pit	Inhalation	1,1-Dichloroethane	8.2E+00	µg/L	3.1E-04	$\mu g/m^3$	1.1E-05	$(\mu g/m^3)^{-1}$	3.4E-09	2.2E-05	mg/m^3	N/A		N/A
				1,4-Dichlorobenzene	5.6E-01	µg/L	1.7E-05	$\mu g/m^3$	1.6E-06	$(\mu g/m^3)^{-1}$	2.7E-11	1.2E-06	mg/m^3	7.1E-01	mg/m^3	1.7E-06
				cis-1,2-Dichloroethene	1.4E+03	µg/L	5.3E-02	$\mu g/m^3$	N/A		N/A	3.7E-03	mg/m^3	N/A		N/A
				Trichloroethene	2.0E+02	µg/L	6.7E-03	$\mu g/m^3$	4.1E-06	$(\mu g/m^3)^{-1}$	2.7E-08	4.7E-04	mg/m^3	2.0E-03	mg/m^3	2.3E-01
				Vinyl chloride	1.1E+03	µg/L	5.4E-02	$\mu g/m^3$	4.4E-06	$(\mu g/m^3)^{-1}$	2.4E-07	3.8E-03	mg/m^3	1.0E-01	mg/m^3	3.8E-02
			Exp. Route Total								2.7E-07					2.7E-01
		Exposure Point Total									2.7E-07					2.7E-01
	Exposure Medium Total										2.7E-07					2.7E-01
Groundwater Total											9.2E-06					1.6E+00

N/A - Not available.

DA_{event} for dermal exposure to groundwater calculated on Tables 7.5.CTE Supplement A

Air concentration above excavation calculated on Table 7.5.CTE Supplement B

Table 7.5.CTE Supplement A
Calculation of DA_{event}
Construction Worker Groundwater
Site 3, NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient (K_p) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (t_{event}) (hr)	DA_{event} (mg/cm^2-event)	Eq
1,1-Dichloroethane	8.2E+00	6.7E-03	2.6E-02	3.8E-01	9.2E-01	1.0E+00	4	2.6E-07	3
1,4-Dichlorobenzene	5.6E-01	4.2E-02	2.0E-01	7.1E-01	1.7E+00	1.0E+00	4	1.2E-07	3
cis-1,2-Dichloroethene	1.4E+03	7.7E-03	2.9E-02	3.7E-01	8.9E-01	1.0E+00	4	5.0E-05	3
Trichloroethene	2.0E+02	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	4	1.2E-05	3
Vinyl chloride	1.1E+03	5.6E-03	1.7E-02	2.4E-01	5.7E-01	1.0E+00	4	2.8E-05	3
Aluminum	1.8E+04	1.0E-03	NA	NA	NA	NA	4	7.4E-05	1
Arsenic	3.7E+01	1.0E-03	NA	NA	NA	NA	4	1.5E-07	1
Chromium	3.7E+02	2.0E-03	NA	NA	NA	NA	4	3.0E-06	1
Cobalt	6.6E+00	4.0E-04	NA	NA	NA	NA	4	1.0E-08	1
Iron	4.7E+04	1.0E-03	NA	NA	NA	NA	4	1.9E-04	1
Manganese	1.3E+03	1.0E-03	NA	NA	NA	NA	4	5.3E-06	1
Nickel	1.0E+02	2.0E-04	NA	NA	NA	NA	4	8.3E-08	1
Vanadium	4.6E+01	1.0E-03	NA	NA	NA	NA	4	1.8E-07	1
Zinc	2.8E+03	6.0E-04	NA	NA	NA	NA	4	6.7E-06	1

Inorganics: DA_{event} (mg/cm^2-event) =
K_p x CW x t_{event} x 0.001 mg/µg x 0.001 l/cm^3 (eq 1)

Organics: DA_{event} (mg/cm^2-event) =
If t_{event}<t*, then DA_{event} =
2 x FA x K_p x CW x (sqrt((6 x τ_{event} x t_{event})/π)) x 0.001 mg/µg x 0.001 l/cm^3 (eq 2)

If t_{event}>t*, then DA_{event} =
FA x K_p x CW x (t_{event}/(1+B) + 2 x τ_{event} x ((1 + 3xB + 3xB^2)/(1+B)^2) x 0.001 mg/µg x 0.001 l/cm^3 (eq 3)

Notes:
NA - Not applicable
Permeability constants from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state

Table 7.5.CTE Supplement B
Calculation of Inhalation Concentration in Excavation Trench
Construction Worker
Site 3, NWS Yorktown, Yorktown, Virginia

Exposure-point concentrations (inhalation) for construction/utility workers in a trench: Groundwater less than 15 feet deep	CAS No.	Molecular Weight MWi g/mol	Henry's Law Constant Hi atm-m3/mol	Gas-Phase Mass Transfer Coefficient KiG cm/s	Liquid-Phase Mass Transfer Coefficient KiL cm/s	Overall Mass Transfer Coefficient Ki cm/s	Concentration of Contaminant in Groundwater Cgw ug/L	Volatilization Factor VF L/m3	Concentration of Contaminant in Trench Ctrench ug/m3	Concentration of Contaminant in Trench Ctrench mg/m3
1,1-Dichloroethane	75-34-3	98.96	5.6E-03	4.7E-01	1.1E-03	1.1E-03	8.2E+00	4.6E-02	3.8E-01	3.8E-04
Trichloroethene	79-01-6	131.39	1.0E-02	4.3E-01	9.9E-04	9.8E-04	2.0E+02	4.0E-02	8.2E+00	8.2E-03
Vinyl Chloride (commercial, construction)	75-01-4	62.50	2.7E-02	5.5E-01	1.4E-03	1.4E-03	1.1E+03	5.9E-02	6.6E+01	6.6E-02
cis-1,2-Dichloroethene	156-59-2	96.94	4.1E-03	4.7E-01	1.1E-03	1.1E-03	1.4E+03	4.6E-02	6.5E+01	6.5E-02
1,4-Dichlorobenzene (para)	106-46-7	147.00	2.43E-03	4.12E-01	9.33E-04	9.12E-04	5.60E-01	3.74E-02	2.10E-02	2.10E-05

Equations

$$VF = (K_i \times A \times F \times 10^{-3} \times 10^{4} \times 3600) / (ACH \times V)$$

$$K_i = 1 / \{(1/k_{iL}) + [(R\ T) / (H_i\ k_{iG})]\}$$

$$k_{iL} = (MW_{O2}/MW_i)^{0.5} \times (T/298) \times k_{L},O_2$$

$$k_{iG} = (MW_{H2O}/MW_i)^{0.335} \times (T/298)^{1.005} \times k_G,\ H_2O$$

Parameter Value

For Mass-Transfer Coefficients

Kg,H2O	0.833	cm/s
MWH2O	18	
Kg,O2	0.002	cm/s
MWO2	32	
T	**77**	F
T	298	K
R	8.20E-05	atm-m3/mol-K

For Emission Flux and Concentration in Trench

CF1	1.00E-03	L/cm3
CF2	1.00E+04	cm2/m2
CF3	3600	s/hr
F	**1**	
ACH	360	hr-1

Trench dimensions

Length	**10**	ft
	3.05	m
Width	**10**	ft
	3.05	m
Depth	**8**	ft
	2.44	m
Width/Depth	1.25	

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water										
			1,1-Dichloroethane	N/A	N/A	N/A	N/A	Kidney	1.1E-03	N/A	8.8E-05	1.2E-03
			1,4-Dichlorobenzene	N/A	N/A	N/A	N/A	Liver	2.2E-04	N/A	1.5E-04	3.7E-04
			cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	Kidney	1.9E+01	N/A	1.7E+00	2.1E+01
			Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	1.1E+01	N/A	1.9E+00	1.3E+01
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	1.0E+01	N/A	5.5E-01	1.1E+01
			Aluminum, Dissolved	N/A	N/A	N/A	N/A	Neurological, Developmental	5.6E-02	N/A	2.9E-04	5.6E-02
			Arsenic, Dissolved	N/A	N/A	N/A	N/A	Skin, Vascular	2.3E+00	N/A	1.2E-02	2.3E+00
			Iron, Dissolved	N/A	N/A	N/A	N/A	Gastrointestinal	7.1E-02	N/A	3.7E-04	7.1E-02
			Manganese, Dissolved	N/A	N/A	N/A	N/A	CNS	9.9E-01	N/A	1.3E-01	1.1E+00
			Selenium, Dissolved	N/A	N/A	N/A	N/A	Whole Body	4.5E-02	N/A	2.3E-04	4.5E-02
							N/A					
			Chemical Total	N/A	N/A	N/A	N/A		4.4E+01	N/A	4.3E+00	4.8E+01
		Exposure Point Total					N/A					4.8E+01
	Exposure Medium Total						N/A					4.8E+01
	Air	Yorktown-Eastover Aquifer Water Vapors at Showerhead										
			1,1-Dichloroethane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0E+00
			1,4-Dichlorobenzene	N/A	N/A	N/A	N/A	Liver	N/A	2.9E-05	N/A	2.9E-05
			cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0E+00
			Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	N/A	4.8E+00	N/A	4.8E+00
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	N/A	7.7E-01	N/A	7.7E-01
			Chemical Total	N/A	N/A	N/A	N/A		N/A	5.6E+00	N/A	5.6E+00
		Exposure Point Total					N/A					5.6E+00
		Yorktown-Eastover Aquifer-Vapor Intrusion to Indoor Air										
			cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0E+00
			Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	N/A	8.7E+00	N/A	8.7E+00
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	N/A	3.4E+00	N/A	3.4E+00
			Chemical Total	N/A	N/A	N/A	N/A		N/A	1.2E+01	N/A	1.2E+01
		Exposure Point Total					N/A					1.2E+01
	Exposure Medium Total						N/A					1.8E+01
Medium Total							N/A					6.6E+01
Receptor Total							N/A				Receptor HI Total	6.6E+01

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Kidney HI Across All Media =	7.7E-01
Total Liver HI Across All Media =	1.5E+01
Total Heart HI Across All Media =	2.7E+01
Total Immuntoxicity HI Across All Media =	2.7E+01
Total Neurological/Nervous System HI Across All Media =	1.2E+00
Total Developmental HI Across All Media =	5.6E-02
Total Skin HI Across All Media=	2.3E+00
Total Vascular HI Across All Media=	2.3E+00
Total Gastrointestinal HI Across All Media =	7.1E-02
Total Whole Body HI Across All Media =	4.5E-02

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water										
			1,1-Dichloroethane	N/A	N/A	N/A	N/A	Kidney	2.6E-03	N/A	2.0E-04	2.8E-03
			1,4-Dichlorobenzene	N/A	N/A	N/A	N/A	Liver	5.1E-04	N/A	3.3E-04	8.4E-04
			cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	Kidney	4.5E+01	N/A	4.0E+00	4.9E+01
			Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	2.6E+01	N/A	4.2E+00	3.0E+01
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	2.4E+01	N/A	1.3E+00	2.5E+01
			Aluminum, Dissolved	N/A	N/A	N/A	N/A	Neurological, Developmental	1.3E-01	N/A	8.6E-04	1.3E-01
			Arsenic, Dissolved	N/A	N/A	N/A	N/A	Skin, Vascular	5.4E+00	N/A	3.5E-02	5.4E+00
			Iron, Dissolved	N/A	N/A	N/A	N/A	Gastrointestinal	1.7E-01	N/A	1.1E-03	1.7E-01
			Manganese, Dissolved	N/A	N/A	N/A	N/A	CNS	2.3E+00	N/A	3.8E-01	2.7E+00
			Selenium, Dissolved	N/A	N/A	N/A	N/A	Whole Body	1.1E-01	N/A	6.9E-04	1.1E-01
							N/A					
			Chemical Total	N/A	N/A	N/A	N/A		1.0E+02	N/A	9.9E+00	1.1E+02
		Exposure Point Total					N/A					1.1E+02
	Exposure Medium Total						N/A					1.1E+02
	Air	Yorktown-Eastover Aquifer Water Vapors at Showerhead										
			1,1-Dichloroethane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0E+00
			1,4-Dichlorobenzene	N/A	N/A	N/A	N/A	Liver	N/A	7.4E-05	N/A	7.4E-05
			cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0E+00
			Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	N/A	1.2E+01	N/A	1.2E+01
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	N/A	1.4E+00	N/A	1.4E+00
			Chemical Total	N/A	N/A	N/A	N/A		N/A	1.4E+01	N/A	1.4E+01
		Exposure Point Total					N/A					1.4E+01
		Yorktown-Eastover Aquifer-Vapor Intrusion to Indoor Air										
			cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0E+00
			Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	N/A	4.1E+01	N/A	4.1E+01
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	N/A	1.6E+01	N/A	1.6E+01
			Chemical Total	N/A	N/A	N/A	N/A		N/A	5.6E+01	N/A	5.6E+01
		Exposure Point Total					N/A					5.6E+01
	Exposure Medium Total						N/A					7.0E+01
Medium Total							N/A					1.8E+02
Receptor Total							N/A				Receptor HI Total	1.8E+02

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Kidney HI Across All Media =	1.4E+00
Total Liver HI Across All Media =	4.3E+01
Total Heart HI Across All Media =	8.3E+01
Total Immuntoxicity HI Across All Media =	8.3E+01
Total Neurological/Nervous System HI Across All Media =	2.8E+00
Total Developmental HI Across All Media =	1.3E-01
Total Skin HI Across All Media=	5.4E+00
Total Vascular HI Across All Media=	5.4E+00
Total Gastrointestinal HI Across All Media =	1.7E-01
Total Whole Body HI Across All Media =	1.1E-01

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water										
			1,1-Dichloroethane	7.0E-07	N/A	5.4E-08	7.5E-07	Kidney	N/A	N/A	N/A	N/A
			1,4-Dichlorobenzene	4.5E-08	N/A	3.0E-08	7.5E-08	Liver	N/A	N/A	N/A	N/A
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	N/A	N/A	N/A	N/A
			Trichloroethene	4.4E-04	N/A	7.2E-05	5.1E-04	Heart, Immunotoxicity	N/A	N/A	N/A	N/A
			Vinyl chloride	1.7E-02	N/A	3.6E-03	2.0E-02	Liver	N/A	N/A	N/A	N/A
			Aluminum, Dissolved	N/A	N/A	N/A	0.0E+00	Neurological, Developmental	N/A	N/A	N/A	N/A
			Arsenic, Dissolved	5.6E-04	N/A	3.2E-06	5.7E-04	Skin, Vascular	N/A	N/A	N/A	N/A
			Iron, Dissolved	N/A	N/A	N/A	0.0E+00	Gastrointestinal	N/A	N/A	N/A	N/A
			Manganese, Dissolved	N/A	N/A	N/A	0.0E+00	CNS	N/A	N/A	N/A	N/A
			Selenium, Dissolved	N/A	N/A	N/A	0.0E+00	Whole Body	N/A	N/A	N/A	N/A
			Chemical Total	1.8E-02	N/A	3.7E-03	2.2E-02		N/A	N/A	N/A	N/A
		Exposure Point Total					2.2E-02					N/A
	Exposure Medium Total						2.2E-02					N/A
	Air	Yorktown-Eastover Aquifer Water Vapors at Showerhead										
			1,1-Dichloroethane	N/A	2.7E-06	N/A	2.7E-06	N/A	N/A	N/A	N/A	N/A
			1,4-Dichlorobenzene	N/A	2.1E-08	N/A	2.1E-08	Liver	N/A	N/A	N/A	N/A
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	N/A	N/A	N/A	N/A	N/A
			Trichloroethene	N/A	8.9E-05	N/A	8.9E-05	Heart, Immunotoxicity	N/A	N/A	N/A	N/A
			Vinyl chloride	N/A	3.0E-04	N/A	3.0E-04	Liver	N/A	N/A	N/A	N/A
			Chemical Total	N/A	3.9E-04	N/A	3.9E-04		N/A	N/A	N/A	N/A
		Exposure Point Total					3.9E-04					N/A
		Yorktown-Eastover Aquifer-Vapor Intrusion to Indoor Air										
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	N/A	N/A	N/A	N/A	N/A
			Trichloroethene	N/A	2.3E-04	N/A	2.3E-04	Heart, Immunotoxicity	N/A	N/A	N/A	N/A
			Vinyl chloride	N/A	2.2E-03	N/A	2.2E-03	Liver	N/A	N/A	N/A	N/A
			Chemical Total	N/A	2.5E-03	N/A	2.5E-03		N/A	N/A	N/A	N/A
		Exposure Point Total					2.5E-03					N/A
	Exposure Medium Total						2.9E-03					N/A
Medium Total							2.9E-03					N/A
Receptor Total							2.4E-02				Receptor HI Total	N/A

HI - Hazard Index

N/A - Not applicable

CNS - Central Nervous System

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water										
			1,1-Dichloroethane	1.6E-07	N/A	N/A	1.6E-07	Kidney	4.0E-04	N/A	N/A	4.0E-04
			1,4-Dichlorobenzene	1.1E-08	N/A	N/A	1.1E-08	Liver	7.8E-05	N/A	N/A	7.8E-05
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	6.8E+00	N/A	N/A	6.8E+00
			Trichloroethene	3.3E-05	N/A	N/A	3.3E-05	Heart, Immunotoxicity	4.0E+00	N/A	N/A	4.0E+00
			Vinyl chloride	2.8E-03	N/A	N/A	2.8E-03	Liver	3.7E+00	N/A	N/A	3.7E+00
			Aluminum, Dissolved	N/A	N/A	N/A	0.0E+00	Neurological, Developmental	2.0E-02	N/A	N/A	2.0E-02
			Arsenic, Dissolved	1.3E-04	N/A	N/A	1.3E-04	Skin, Vascular	8.2E-01	N/A	N/A	8.2E-01
			Iron, Dissolved	N/A	N/A	N/A	0.0E+00	Gastrointestinal	2.5E-02	N/A	N/A	2.5E-02
			Manganese, Dissolved	N/A	N/A	N/A	0.0E+00	CNS	3.5E-01	N/A	N/A	3.5E-01
			Selenium, Dissolved	N/A	N/A	N/A	0.0E+00	Whole Body	1.6E-02	N/A	N/A	1.6E-02
			Chemical Total	3.0E-03	0.0E+00	0.0E+00	3.0E-03		1.6E+01	0.0E+00	0.0E+00	1.6E+01
		Exposure Point Total					3.0E-03					1.6E+01
	Exposure Medium Total						3.0E-03					1.6E+01
		Indoor Air	cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	N/A	N/A	N/A	N/A	0.0E+00
			Trichloroethene	N/A	1.7E-05	N/A	1.7E-05	Heart, Immunotoxicity	N/A	1.2E+01	N/A	1.2E+01
			Vinyl chloride	N/A	3.9E-04	N/A	3.9E-04	Liver	N/A	2.5E+00	N/A	2.5E+00
			Chemical Total	N/A	4.1E-04	N/A	4.1E-04		N/A	1.4E+01	N/A	1.4E+01
		Exposure Point Total					4.1E-04					1.4E+01
	Exposure Medium Total						4.1E-04					1.4E+01
Medium Total							3.4E-03					3.0E+01
Receptor Total							3.4E-03				Receptor HI Total	3.0E+01

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Kidney HI Across All Media =	4.0E-04
Total Liver HI Across All Media =	6.2E+00
Total Heart HI Across All Media =	1.6E+01
Total Immuntoxicity HI Across All Media =	1.6E+01
Total Neurological/Nervous System HI Across All Media =	3.7E-01
Total Developmental HI Across All Media =	2.0E-02
Total Skin HI Across All Media=	8.2E-01
Total Vascular HI Across All Media=	8.2E-01
Total Gastrointestinal HI Across All Media =	2.5E-02
Total Whole Body HI Across All Media =	1.6E-02

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Water in Excavation Pit										
			1,1-Dichloroethane	N/A	N/A	1.1E-09	1.1E-09	Kidney	N/A	N/A	6.6E-06	6.6E-06
			1,4-Dichlorobenzene	N/A	N/A	4.2E-10	4.2E-10	Liver	N/A	N/A	7.9E-05	7.9E-05
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	N/A	N/A	1.3E-01	1.3E-01
			Trichloroethene	N/A	N/A	3.8E-07	3.8E-07	Heart, Immunotoxicity	N/A	N/A	1.2E+00	1.2E+00
			Vinyl chloride	N/A	N/A	1.5E-05	1.5E-05	Liver	N/A	N/A	4.9E-01	4.9E-01
			Aluminum	N/A	N/A	N/A	0.0E+00	Neurological, Developmental	N/A	N/A	4.1E-03	4.1E-03
			Arsenic	N/A	N/A	1.8E-07	1.8E-07	Skin, Vascular	N/A	N/A	2.7E-02	2.7E-02
			Chromium	N/A	N/A	1.2E-06	1.2E-06	Not identified	N/A	N/A	3.3E-01	3.3E-01
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	N/A	N/A	1.9E-04	1.9E-04
			Iron	N/A	N/A	N/A	0.0E+00	Gastrointestinal	N/A	N/A	1.5E-02	1.5E-02
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	N/A	N/A	3.1E-01	3.1E-01
			Nickel	N/A	N/A	N/A	0.0E+00	Whole body	N/A	N/A	5.8E-03	5.8E-03
			Vanadium	N/A	N/A	N/A	0.0E+00	Lifetime	N/A	N/A	5.6E-02	5.6E-02
			Zinc	N/A	N/A	N/A	0.0E+00	Blood	N/A	N/A	1.2E-03	1.2E-03
			Chemical Total	N/A	N/A	1.7E-05	1.7E-05		N/A	N/A	2.5E+00	2.5E+00
		Exposure Point Total					1.7E-05					2.5E+00
	Exposure Medium Total						1.7E-05					2.5E+00
	Air	Yorktown - Eastover Aquifer Water Vapors in Excavation Pit										
			1,1-Dichloroethane	N/A	6.8E-09	N/A	6.8E-09	N/A	N/A	N/A	N/A	0.0E+00
			1,4-Dichlorobenzene	N/A	5.5E-11	N/A	5.5E-11	Liver	N/A	3.4E-06	N/A	3.4E-06
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	N/A	N/A	N/A	N/A	0.0E+00
			Trichloroethene	N/A	5.5E-08	N/A	5.5E-08	Heart, Immunotoxicity	N/A	4.7E-01	N/A	4.7E-01
			Vinyl chloride	N/A	4.7E-07	N/A	4.7E-07	Liver	N/A	7.6E-02	N/A	7.6E-02
			Chemical Total	N/A	5.4E-07	N/A	5.4E-07		N/A	5.4E-01	N/A	5.4E-01
		Exposure Point Total					5.4E-07					5.4E-01
	Exposure Medium Total						5.4E-07					5.4E-01
Medium Total							1.7E-05					3.1E+00
Receptor Total							1.7E-05				Receptor HI Total	3.1E+00

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Kidney HI Across All Media =	1.3E-01
Total Lifetime HI Across All Media =	5.6E-02
Total Heart HI Across All Media =	1.2E+00
Total Immuntoxicity HI Across All Media =	1.2E+00
Total Developmental HI Across All Media =	4.1E-03
Total Gastrointestinal HI Across All Media =	1.5E-02
Total Liver HI Across All Media =	5.7E-01
Total Neurological/Nervous System HI Across All Media =	3.1E-01
Total Skin HI Across All Media=	2.7E-02
Total Thyroid HI Across All Media=	1.9E-04
Total Vascular HI Across All Media=	2.7E-02
Total Whole Body HI Across All Media=	5.8E-03

TABLE 9.1.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water										
			1,1-Dichloroethane	N/A	N/A	N/A	N/A	Kidney	5.3E-04	N/A	3.9E-05	5.6E-04
			1,4-Dichlorobenzene	N/A	N/A	N/A	N/A	Liver	1.0E-04	N/A	6.5E-05	1.7E-04
			cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	Kidney	9.0E+00	N/A	7.5E-01	9.7E+00
			Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	5.2E+00	N/A	8.2E-01	6.1E+00
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	4.8E+00	N/A	2.5E-01	5.1E+00
			Aluminum, Dissolved	N/A	N/A	N/A	N/A	Neurological, Developmental	2.6E-02	N/A	8.4E-05	2.6E-02
			Arsenic, Dissolved	N/A	N/A	N/A	N/A	Skin, Vascular	1.1E+00	N/A	3.5E-03	1.1E+00
			Iron, Dissolved	N/A	N/A	N/A	N/A	Gastrointestinal	3.3E-02	N/A	1.1E-04	3.3E-02
			Manganese, Dissolved	N/A	N/A	N/A	N/A	CNS	4.6E-01	N/A	3.7E-02	5.0E-01
			Selenium, Dissolved	N/A	N/A	N/A	N/A	Whole Body	2.1E-02	N/A	6.8E-05	2.1E-02
							N/A					
			Chemical Total	N/A	N/A	N/A	N/A		2.1E+01	N/A	1.9E+00	2.3E+01
		Exposure Point Total					N/A					2.3E+01
	Exposure Medium Total						N/A					2.3E+01
	Air	Yorktown-Eastover Aquifer Water Vapors at Showerhead										
			1,1-Dichloroethane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0E+00
			1,4-Dichlorobenzene	N/A	N/A	N/A	N/A	Liver	N/A	1.0E-04	N/A	1.0E-04
			cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0E+00
			Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	N/A	N/A	N/A	0.0E+00
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	N/A	2.6E+00	N/A	2.6E+00
			Chemical Total	N/A	N/A	N/A	N/A		N/A	2.6E+00	N/A	2.6E+00
		Exposure Point Total					N/A					2.6E+00
		Yorktown-Eastover Aquifer-Vapor Intrusion to Indoor Air										
			cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0E+00
			Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	N/A	1.7E+01	N/A	1.7E+01
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	N/A	6.6E+00	N/A	6.6E+00
			Chemical Total	N/A	N/A	N/A	N/A		N/A	2.4E+01	N/A	2.4E+01
		Exposure Point Total					N/A					2.4E+01
	Exposure Medium Total						N/A					2.6E+01
Medium Total							N/A					4.9E+01
Receptor Total							N/A				Receptor HI Total	4.9E+01

TABLE 9.1.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Kidney HI Across All Media =	2.6E+00
Total Liver HI Across All Media =	1.4E+01
Total Heart HI Across All Media =	2.3E+01
Total Immuntoxicity HI Across All Media =	2.3E+01
Total Neurological/Nervous System HI Across All Media =	5.3E-01
Total Developmental HI Across All Media =	2.6E-02
Total Skin HI Across All Media=	1.1E+00
Total Vascular HI Across All Media=	1.1E+00
Total Gastrointestinal HI Across All Media =	3.3E-02
Total Whole Body HI Across All Media =	2.1E-02

TABLE 9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water										
			1,1-Dichloroethane	N/A	N/A	N/A	N/A	Kidney	1.8E-03	N/A	1.1E-04	1.9E-03
			1,4-Dichlorobenzene	N/A	N/A	N/A	N/A	Liver	3.4E-04	N/A	1.9E-04	5.3E-04
			cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	Kidney	3.0E+01	N/A	2.2E+00	3.2E+01
			Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	1.7E+01	N/A	2.4E+00	2.0E+01
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	1.6E+01	N/A	6.9E-01	1.7E+01
			Aluminum, Dissolved	N/A	N/A	N/A	N/A	Neurological, Developmental	8.7E-02	N/A	2.8E-04	8.7E-02
			Arsenic, Dissolved	N/A	N/A	N/A	N/A	Skin, Vascular	3.6E+00	N/A	1.2E-02	3.6E+00
			Iron, Dissolved	N/A	N/A	N/A	N/A	Gastrointestinal	1.1E-01	N/A	3.6E-04	1.1E-01
			Manganese, Dissolved	N/A	N/A	N/A	N/A	CNS	1.5E+00	N/A	1.3E-01	1.7E+00
			Selenium, Dissolved	N/A	N/A	N/A	N/A	Whole Body	7.0E-02	N/A	2.3E-04	7.0E-02
							N/A					
			Chemical Total	N/A	N/A	N/A	N/A		6.9E+01	N/A	5.5E+00	7.4E+01
		Exposure Point Total					N/A					7.4E+01
	Exposure Medium Total						N/A					7.4E+01
	Air	Yorktown-Eastover Aquifer Water Vapors at Showerhead										
			1,1-Dichloroethane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0E+00
			1,4-Dichlorobenzene	N/A	N/A	N/A	N/A	Liver	N/A	7.1E-06	N/A	7.1E-06
			cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0E+00
			Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	N/A	1.2E+00	N/A	1.2E+00
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	N/A	1.9E-01	N/A	1.9E-01
			Chemical Total	N/A	N/A	N/A	N/A		N/A	1.4E+00	N/A	1.4E+00
		Exposure Point Total					N/A					1.4E+00
		Yorktown-Eastover Aquifer-Vapor Intrusion to Indoor Air										
			cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0E+00
			Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	N/A	1.7E+01	N/A	1.7E+01
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	N/A	6.6E+00	N/A	6.6E+00
			Chemical Total	N/A	N/A	N/A	N/A		N/A	2.4E+01	N/A	2.4E+01
		Exposure Point Total					N/A					2.4E+01
	Exposure Medium Total						N/A					2.5E+01
Medium Total							N/A					9.9E+01
Receptor Total							N/A				Receptor HI Total	9.9E+01

TABLE 9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Kidney HI Across All Media =	1.9E-01
Total Liver HI Across All Media =	2.4E+01
Total Heart HI Across All Media =	3.8E+01
Total Immuntoxicity HI Across All Media =	3.8E+01
Total Neurological/Nervous System HI Across All Media =	1.8E+00
Total Developmental HI Across All Media =	8.7E-02
Total Skin HI Across All Media=	3.6E+00
Total Vascular HI Across All Media=	3.6E+00
Total Gastrointestinal HI Across All Media =	1.1E-01
Total Whole Body HI Across All Media =	7.0E-02

TABLE 9.3.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water										
			1,1-Dichloroethane	2.5E-07	N/A	1.3E-08	2.6E-07	Kidney	N/A	N/A	N/A	N/A
			1,4-Dichlorobenzene	1.6E-08	N/A	7.2E-09	2.3E-08	Liver	N/A	N/A	N/A	N/A
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	N/A	N/A	N/A	N/A
			Trichloroethene	2.3E-04	N/A	2.5E-05	2.6E-04	Heart, Immunotoxicity	N/A	N/A	N/A	N/A
			Vinyl chloride	7.6E-03	N/A	2.5E-04	7.8E-03	Liver	N/A	N/A	N/A	N/A
			Aluminum, Dissolved	N/A	N/A	N/A	0.0E+00	Neurological, Developmental	N/A	N/A	N/A	N/A
			Arsenic, Dissolved	2.0E-04	N/A	5.0E-07	2.0E-04	Skin, Vascular	N/A	N/A	N/A	N/A
			Iron, Dissolved	N/A	N/A	N/A	0.0E+00	Gastrointestinal	N/A	N/A	N/A	N/A
			Manganese, Dissolved	N/A	N/A	N/A	0.0E+00	CNS	N/A	N/A	N/A	N/A
			Selenium, Dissolved	N/A	N/A	N/A	0.0E+00	Whole Body	N/A	N/A	N/A	N/A
			Chemical Total	8.0E-03	N/A	2.8E-04	8.3E-03		N/A	N/A	N/A	N/A
		Exposure Point Total					8.3E-03					N/A
	Exposure Medium Total						8.3E-03					N/A
	Air	Yorktown-Eastover Aquifer Water Vapors at Showerhead										
			1,1-Dichloroethane	N/A	3.4E-05	N/A	3.4E-05	N/A	N/A	N/A	N/A	N/A
			1,4-Dichlorobenzene	N/A	3.4E-07	N/A	3.4E-07	Liver	N/A	N/A	N/A	N/A
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	N/A	N/A	N/A	N/A	N/A
			Trichloroethene	N/A	3.3E-05	N/A	3.3E-05	Heart, Immunotoxicity	N/A	N/A	N/A	N/A
			Vinyl chloride	N/A	9.4E-05	N/A	9.4E-05	Liver	N/A	N/A	N/A	N/A
			Chemical Total	N/A	1.6E-04	N/A	1.6E-04		N/A	N/A	N/A	N/A
		Exposure Point Total					1.6E-04					N/A
		Yorktown-Eastover Aquifer-Vapor Intrusion to Indoor Air										
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	N/A	N/A	N/A	N/A	N/A
			Trichloroethene	N/A	1.2E-04	N/A	1.2E-04	Heart, Immunotoxicity	N/A	N/A	N/A	N/A
			Vinyl chloride	N/A	8.8E-04	N/A	8.8E-04	Liver	N/A	N/A	N/A	N/A
			Chemical Total	N/A	9.9E-04	N/A	9.9E-04		N/A	N/A	N/A	N/A
		Exposure Point Total					9.9E-04					N/A
	Exposure Medium Total						1.2E-03					N/A
Medium Total							1.2E-03					N/A
Receptor Total							9.4E-03				Receptor HI Total	N/A

HI - Hazard Index

N/A - Not applicable

CNS - Central Nervous System

TABLE 9.4.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water										
			1,1-Dichloroethane	5.2E-08	N/A	N/A	5.2E-08	Kidney	3.5E-04	N/A	N/A	3.5E-04
			1,4-Dichlorobenzene	3.3E-09	N/A	N/A	3.3E-09	Liver	6.9E-05	N/A	N/A	6.9E-05
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	6.0E+00	N/A	N/A	6.0E+00
			Trichloroethene	1.0E-05	N/A	N/A	1.0E-05	Heart, Immunotoxicity	3.5E+00	N/A	N/A	3.5E+00
			Vinyl chloride	9.0E-04	N/A	N/A	9.0E-04	Liver	3.2E+00	N/A	N/A	3.2E+00
			Aluminum, Dissolved	N/A	N/A	N/A	0.0E+00	Neurological, Developmental	1.7E-02	N/A	N/A	1.7E-02
			Arsenic, Dissolved	4.2E-05	N/A	N/A	4.2E-05	Skin, Vascular	7.2E-01	N/A	N/A	7.2E-01
			Iron, Dissolved	N/A	N/A	N/A	0.0E+00	Gastrointestinal	2.2E-02	N/A	N/A	2.2E-02
			Manganese, Dissolved	N/A	N/A	N/A	0.0E+00	CNS	3.1E-01	N/A	N/A	3.1E-01
			Selenium, Dissolved	N/A	N/A	N/A	0.0E+00	Whole Body	1.4E-02	N/A	N/A	1.4E-02
			Chemical Total	9.5E-04	N/A	N/A	9.5E-04		1.4E+01	N/A	N/A	1.4E+01
		Exposure Point Total					9.5E-04					1.4E+01
	Exposure Medium Total						9.5E-04					1.4E+01
		Indoor Air	cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	N/A	N/A	N/A	N/A	0.0E+00
			Trichloroethene	N/A	1.8E-05	N/A	1.8E-05	Heart, Immunotoxicity	N/A	6.0E+00	N/A	6.0E+00
			Vinyl chloride	N/A	3.7E-04	N/A	3.7E-04	Liver	N/A	2.4E+00	N/A	2.4E+00
			Chemical Total	N/A	3.9E-04	N/A	3.9E-04		N/A	8.4E+00	N/A	8.4E+00
		Exposure Point Total					3.9E-04					8.4E+00
	Exposure Medium Total						3.9E-04					8.4E+00
Medium Total							1.3E-03					2.2E+01
Receptor Total							1.3E-03				Receptor HI Total	2.2E+01

TABLE 9.4.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Kidney HI Across All Media =	3.5E-04
Total Liver HI Across All Media =	5.6E+00
Total Heart HI Across All Media =	9.5E+00
Total Immuntoxicity HI Across All Media =	9.5E+00
Total Neurological/Nervous System HI Across All Media =	3.3E-01
Total Developmental HI Across All Media =	1.7E-02
Total Skin HI Across All Media=	7.2E-01
Total Vascular HI Across All Media=	7.2E-01
Total Gastrointestinal HI Across All Media =	2.2E-02
Total Whole Body HI Across All Media =	1.4E-02

TABLE 9.5.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Water in Excavation Pit										
			1,1-Dichloroethane	N/A	N/A	5.8E-10	5.8E-10	Kidney	N/A	N/A	3.6E-06	3.6E-06
			1,4-Dichlorobenzene	N/A	N/A	2.5E-10	2.5E-10	Liver	N/A	N/A	4.7E-05	4.7E-05
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	N/A	N/A	7.0E-02	7.0E-02
			Trichloroethene	N/A	N/A	2.2E-07	2.2E-07	Heart, Immunotoxicity	N/A	N/A	6.7E-01	6.7E-01
			Vinyl chloride	N/A	N/A	8.0E-06	8.0E-06	Liver	N/A	N/A	2.6E-01	2.6E-01
			Aluminum	N/A	N/A	N/A	0.0E+00	Neurological, Developmental	N/A	N/A	2.1E-03	2.1E-03
			Arsenic	N/A	N/A	8.8E-08	8.8E-08	Skin, Vascular	N/A	N/A	1.4E-02	1.4E-02
			Chromium	N/A	N/A	6.0E-07	6.0E-07	Not identified	N/A	N/A	1.7E-01	1.7E-01
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	N/A	N/A	9.7E-05	9.7E-05
			Iron	N/A	N/A	N/A	0.0E+00	Gastrointestinal	N/A	N/A	7.5E-03	7.5E-03
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	N/A	N/A	1.5E-01	1.5E-01
			Nickel	N/A	N/A	N/A	0.0E+00	Whole body	N/A	N/A	2.9E-03	2.9E-03
			Vanadium	N/A	N/A	N/A	0.0E+00	Lifetime	N/A	N/A	2.8E-02	2.8E-02
			Zinc	N/A	N/A	N/A	0.0E+00	Blood	N/A	N/A	6.2E-04	6.2E-04
			Chemical Total	N/A	N/A	8.9E-06	8.9E-06		N/A	N/A	1.4E+00	1.4E+00
		Exposure Point Total					8.9E-06					1.4E+00
	Exposure Medium Total						8.9E-06					1.4E+00
	Air	Yorktown - Eastover Aquifer Water Vapors in Excavation Pit										
			1,1-Dichloroethane	N/A	3.4E-09	N/A	3.4E-09	N/A	N/A	N/A	N/A	0.0E+00
			1,4-Dichlorobenzene	N/A	2.7E-11	N/A	2.7E-11	Liver	N/A	1.7E-06	N/A	1.7E-06
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	N/A	N/A	N/A	N/A	0.0E+00
			Trichloroethene	N/A	2.7E-08	N/A	2.7E-08	Heart, Immunotoxicity	N/A	2.3E-01	N/A	2.3E-01
			Vinyl chloride	N/A	2.4E-07	N/A	2.4E-07	Liver	N/A	3.8E-02	N/A	3.8E-02
			Chemical Total	N/A	2.7E-07	N/A	2.7E-07		N/A	2.7E-01	N/A	2.7E-01
		Exposure Point Total					2.7E-07					2.7E-01
	Exposure Medium Total						2.7E-07					2.7E-01
Medium Total							9.2E-06					1.6E+00
Receptor Total							9.2E-06				Receptor HI Total	1.6E+00

TABLE 9.5.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Kidney HI Across All Media =	7.0E-02
Total Lifetime HI Across All Media =	2.8E-02
Total Heart HI Across All Media =	6.7E-01
Total Immuntoxicity HI Across All Media =	6.7E-01
Total Developmental HI Across All Media =	2.1E-03
Total Gastrointestinal HI Across All Media =	7.5E-03
Total Liver HI Across All Media =	3.0E-01
Total Neurological/Nervous System HI Across All Media =	1.6E-01
Total Skin HI Across All Media=	1.4E-02
Total Thyroid HI Across All Media=	9.7E-05
Total Vascular HI Across All Media=	1.4E-02
Total Whole Body HI Across All Media=	2.9E-03

TABLE 10.1.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water	cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	Kidney	1.9E+01	N/A	1.7E+00	2.1E+01
			Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	1.1E+01	N/A	1.9E+00	1.3E+01
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	1.0E+01	N/A	5.5E-01	1.1E+01
			Arsenic, Dissolved	N/A	N/A	N/A	N/A	Skin, Vascular	2.3E+00	N/A	1.2E-02	2.3E+00
			Manganese, Dissolved	N/A	N/A	N/A	N/A	CNS	9.9E-01	N/A	1.3E-01	1.1E+00
							N/A					
			Chemical Total	N/A	N/A	N/A	N/A		4.4E+01	N/A	4.3E+00	4.8E+01
		Exposure Point Total					N/A					4.8E+01
	Exposure Medium Total						N/A					4.8E+01
	Air	Yorktown-Eastover Aquifer Water Vapors at Showerhead	Vinyl chloride	N/A	N/A	N/A	N/A	Liver	N/A	7.7E-01	N/A	7.7E-01
			Chemical Total	N/A	N/A	N/A	N/A		N/A	7.7E-01	N/A	7.7E-01
		Exposure Point Total					N/A					7.7E-01
		Yorktown-Eastover Aquifer-Vapor Intrusion to Indoor Air	Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	N/A	8.7E+00	N/A	8.7E+00
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	N/A	3.4E+00	N/A	3.4E+00
			Chemical Total	N/A	N/A	N/A	N/A		N/A	1.2E+01	N/A	1.2E+01
		Exposure Point Total					N/A					1.2E+01
	Exposure Medium Total						N/A					1.3E+01
Medium Total							N/A					6.1E+01
Receptor Total							N/A				Receptor HI Total	6.1E+01

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Kidney HI Across All Media =	7.7E-01
Total Liver HI Across All Media =	1.5E+01
Total Heart HI Across All Media =	2.2E+01
Total Immuntoxicity HI Across All Media =	2.2E+01
Total Neurological/Nervous System HI Across All Media =	1.1E+00
Total Skin HI Across All Media=	2.3E+00
Total Vascular HI Across All Media=	2.3E+00

TABLE 10.2.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water										
			cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	Kidney	4.5E+01	N/A	4.0E+00	4.9E+01
			Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	2.6E+01	N/A	4.2E+00	3.0E+01
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	2.4E+01	N/A	1.3E+00	2.5E+01
			Aluminum, Dissolved	N/A	N/A	N/A	N/A	Neurological, Developmental	1.3E-01	N/A	8.6E-04	1.3E-01
			Arsenic, Dissolved	N/A	N/A	N/A	N/A	Skin, Vascular	5.4E+00	N/A	3.5E-02	5.4E+00
			Iron, Dissolved	N/A	N/A	N/A	N/A	Gastrointestinal	1.7E-01	N/A	1.1E-03	1.7E-01
			Manganese, Dissolved	N/A	N/A	N/A	N/A	CNS	2.3E+00	N/A	3.8E-01	2.7E+00
			Selenium, Dissolved	N/A	N/A	N/A	N/A	Whole Body	1.1E-01	N/A	6.9E-04	1.1E-01
							N/A					
			Chemical Total	N/A	N/A	N/A	N/A		1.0E+02	N/A	9.9E+00	1.1E+02
		Exposure Point Total					N/A					1.1E+02
	Exposure Medium Total						N/A					1.1E+02
	Air	Yorktown-Eastover Aquifer Water Vapors at Showerhead										
			Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	N/A	1.2E+01	N/A	1.2E+01
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	N/A	1.4E+00	N/A	1.4E+00
			Chemical Total	N/A	N/A	N/A	N/A		N/A	1.4E+01	N/A	1.4E+01
		Exposure Point Total					N/A					1.4E+01
		Yorktown-Eastover Aquifer-Vapor Intrusion to Indoor Air						Heart, Immunotoxicity				
			Trichloroethene	N/A	N/A	N/A	N/A		N/A	4.1E+01	N/A	4.1E+01
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	N/A	1.6E+01	N/A	1.6E+01
			Chemical Total	N/A	N/A	N/A	N/A		N/A	5.6E+01	N/A	5.6E+01
		Exposure Point Total					N/A					5.6E+01
	Exposure Medium Total						N/A					7.0E+01
Medium Total							N/A					1.8E+02
Receptor Total							N/A				Receptor HI Total	1.8E+02

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Kidney HI Across All Media =	1.4E+00
Total Liver HI Across All Media =	4.3E+01
Total Heart HI Across All Media =	8.3E+01
Total Immuntoxicity HI Across All Media =	8.3E+01
Total Neurological/Nervous System HI Across All Media =	2.8E+00
Total Developmental HI Across All Media =	1.3E-01
Total Skin HI Across All Media=	5.4E+00
Total Vascular HI Across All Media=	5.4E+00
Total Gastrointestinal HI Across All Media =	1.7E-01
Total Whole Body HI Across All Media =	1.1E-01

TABLE 10.3.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water	Trichloroethene	4.4E-04	N/A	7.2E-05	5.1E-04	Heart, Immunotoxicity	N/A	N/A	N/A	N/A
			Vinyl chloride	1.7E-02	N/A	3.6E-03	2.0E-02	Liver	N/A	N/A	N/A	N/A
			Aluminum, Dissolved	N/A	N/A	N/A	0.0E+00	Neurological, Developmental	N/A	N/A	N/A	N/A
			Arsenic, Dissolved	5.6E-04	N/A	3.2E-06	5.7E-04	Skin, Vascular	N/A	N/A	N/A	N/A
			Chemical Total	1.8E-02	N/A	3.7E-03	2.2E-02		N/A	N/A	N/A	N/A
		Exposure Point Total					2.2E-02					N/A
	Exposure Medium Total						2.2E-02					N/A
	Air	Yorktown-Eastover Aquifer Water Vapors at Showerhead	1,1-Dichloroethane	N/A	2.7E-06	N/A	2.7E-06	N/A	N/A	N/A	N/A	N/A
			Trichloroethene	N/A	8.9E-05	N/A	8.9E-05	Heart, Immunotoxicity	N/A	N/A	N/A	N/A
			Vinyl chloride	N/A	3.0E-04	N/A	3.0E-04	Liver	N/A	N/A	N/A	N/A
			Chemical Total	N/A	3.9E-04	N/A	3.9E-04		N/A	N/A	N/A	N/A
		Exposure Point Total					3.9E-04					N/A
		Yorktown-Eastover Aquifer-Vapor Intrusion to Indoor Air	Trichloroethene	N/A	2.3E-04	N/A	2.3E-04	Heart, Immunotoxicity	N/A	N/A	N/A	N/A
			Vinyl chloride	N/A	2.2E-03	N/A	2.2E-03	Liver	N/A	N/A	N/A	N/A
			Chemical Total	N/A	2.5E-03	N/A	2.5E-03		N/A	N/A	N/A	N/A
		Exposure Point Total					2.5E-03					N/A
	Exposure Medium Total						2.9E-03					N/A
Medium Total							2.9E-03					N/A
Receptor Total							2.4E-02				Receptor HI Total	N/A

HI - Hazard Index

N/A - Not applicable

CNS - Central Nervous System

TABLE 10.4.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water										
			cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	6.8E+00	N/A	N/A	6.8E+00
			Trichloroethene	3.3E-05	N/A	N/A	3.3E-05	Heart, Immunotoxicity	4.0E+00	N/A	N/A	4.0E+00
			Vinyl chloride	2.8E-03	N/A	N/A	2.8E-03	Liver	3.7E+00	N/A	N/A	3.7E+00
			Arsenic, Dissolved	1.3E-04	N/A	N/A	1.3E-04	Skin, Vascular	8.2E-01	N/A	N/A	8.2E-01
			Manganese, Dissolved	N/A	N/A	N/A	0.0E+00	CNS	3.5E-01	N/A	N/A	3.5E-01
			Chemical Total	3.0E-03	0.0E+00	0.0E+00	3.0E-03		1.6E+01	0.0E+00	0.0E+00	1.6E+01
		Exposure Point Total					3.0E-03					1.6E+01
	Exposure Medium Total						3.0E-03					1.6E+01
		Indoor Air	Trichloroethene	N/A	1.7E-05	N/A	1.7E-05	Heart, Immunotoxicity	N/A	1.2E+01	N/A	1.2E+01
			Vinyl chloride	N/A	3.9E-04	N/A	3.9E-04	Liver	N/A	2.5E+00	N/A	2.5E+00
			Chemical Total	N/A	4.1E-04	N/A	4.1E-04		N/A	1.4E+01	N/A	1.4E+01
		Exposure Point Total					4.1E-04					1.4E+01
	Exposure Medium Total						4.1E-04					1.4E+01
Medium Total							3.4E-03					3.0E+01
Receptor Total							3.4E-03				Receptor HI Total	3.0E+01

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Liver HI Across All Media =	6.2E+00
Total Heart HI Across All Media =	1.6E+01
Total Immuntoxicity HI Across All Media =	1.6E+01
Total Neurological/Nervous System HI Across All Media =	3.5E-01
Total Skin HI Across All Media=	8.2E-01
Total Vascular HI Across All Media=	8.2E-01

TABLE 10.5.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Water in Excavation Pit	cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	N/A	N/A	1.3E-01	1.3E-01
			Trichloroethene	N/A	N/A	3.8E-07	3.8E-07	Heart, Immunotoxicity	N/A	N/A	1.2E+00	1.2E+00
			Vinyl chloride	N/A	N/A	1.5E-05	1.5E-05	Liver	N/A	N/A	4.9E-01	4.9E-01
			Chromium	N/A	N/A	1.2E-06	1.2E-06	Not identified	N/A	N/A	3.3E-01	3.3E-01
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	N/A	N/A	3.1E-01	3.1E-01
			Chemical Total	N/A	N/A	1.7E-05	1.7E-05		N/A	N/A	2.4E+00	2.4E+00
		Exposure Point Total					1.7E-05					2.4E+00
	Exposure Medium Total						1.7E-05					2.4E+00
	Air	Yorktown - Eastover Aquifer Water Vapors in Excavation Pit	Trichloroethene	N/A	5.5E-08	N/A	5.5E-08	Heart, Immunotoxicity	N/A	4.7E-01	N/A	4.7E-01
			Chemical Total	N/A	5.5E-08	N/A	5.5E-08		N/A	4.7E-01	N/A	4.7E-01
		Exposure Point Total					5.5E-08					4.7E-01
	Exposure Medium Total						5.5E-08					4.7E-01
Medium Total							1.7E-05					2.9E+00
Receptor Total							1.7E-05				Receptor HI Total	2.9E+00

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Kidney HI Across All Media =	1.3E-01
Total Heart HI Across All Media =	1.2E+00
Total Immuntoxicity HI Across All Media =	1.2E+00
Total Liver HI Across All Media =	4.9E-01
Total Neurological/Nervous System HI Across All Media =	3.1E-01

TABLE 10.1.CTE
RISK SUMMARY
CENTRAL TENDENCY EXPOSURE
Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water	cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	Kidney	9.0E+00	N/A	7.5E-01	9.7E+00
			Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	5.2E+00	N/A	8.2E-01	6.1E+00
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	4.8E+00	N/A	2.5E-01	5.1E+00
			Arsenic, Dissolved	N/A	N/A	N/A	N/A	Skin, Vascular	1.1E+00	N/A	3.5E-03	1.1E+00
			Manganese, Dissolved	N/A	N/A	N/A	N/A	CNS	4.6E-01	N/A	3.7E-02	5.0E-01
							N/A					
			Chemical Total	N/A	N/A	N/A	N/A		2.1E+01	N/A	1.9E+00	2.2E+01
		Exposure Point Total					N/A					2.2E+01
	Exposure Medium Total						N/A					2.2E+01
	Air	Yorktown-Eastover Aquifer Water Vapors at Showerhead	Vinyl chloride	N/A	N/A	N/A	N/A	Liver	N/A	2.6E+00	N/A	2.6E+00
			Chemical Total	N/A	N/A	N/A	N/A		N/A	2.6E+00	N/A	2.6E+00
		Exposure Point Total					N/A					2.6E+00
		Yorktown-Eastover Aquifer-Vapor Intrusion to Indoor Air	Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	N/A	1.7E+01	N/A	1.7E+01
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	N/A	6.6E+00	N/A	6.6E+00
			Chemical Total	N/A	N/A	N/A	N/A		N/A	2.4E+01	N/A	2.4E+01
		Exposure Point Total					N/A					2.4E+01
	Exposure Medium Total						N/A					2.6E+01
Medium Total							N/A					4.9E+01
Receptor Total							N/A				Receptor HI Total	4.9E+01

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Kidney HI Across All Media =	2.6E+00
Total Liver HI Across All Media =	1.4E+01
Total Heart HI Across All Media =	2.3E+01
Total Immuntoxicity HI Across All Media =	2.3E+01
Total Neurological/Nervous System HI Across All Media =	5.0E-01
Total Skin HI Across All Media=	1.1E+00
Total Vascular HI Across All Media=	1.1E+00

TABLE 10.2.CTE
RISK SUMMARY
CENTRAL TENDENCY EXPOSURE
Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water										
			cis-1,2-Dichloroethene	N/A	N/A	N/A	N/A	Kidney	3.0E+01	N/A	2.2E+00	3.2E+01
			Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	1.7E+01	N/A	2.4E+00	2.0E+01
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	1.6E+01	N/A	6.9E-01	1.7E+01
			Arsenic, Dissolved	N/A	N/A	N/A	N/A	Skin, Vascular	3.6E+00	N/A	1.2E-02	3.6E+00
			Iron, Dissolved	N/A	N/A	N/A	N/A	Gastrointestinal	1.1E-01	N/A	3.6E-04	1.1E-01
			Manganese, Dissolved	N/A	N/A	N/A	N/A	CNS	1.5E+00	N/A	1.3E-01	1.7E+00
							N/A					
			Chemical Total	N/A	N/A	N/A	N/A		6.9E+01	N/A	5.5E+00	7.4E+01
		Exposure Point Total					N/A					7.4E+01
	Exposure Medium Total						N/A					7.4E+01
	Air	Yorktown-Eastover Aquifer Water Vapors at Showerhead										
			Trichloroethene	N/A	N/A	N/A	N/A	Heart, Immunotoxicity	N/A	1.2E+00	N/A	1.2E+00
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	N/A	1.9E-01	N/A	1.9E-01
			Chemical Total	N/A	N/A	N/A	N/A		N/A	1.4E+00	N/A	1.4E+00
		Exposure Point Total					N/A					1.4E+00
		Yorktown-Eastover Aquifer-Vapor Intrusion to Indoor Air						Heart, Immunotoxicity				
			Trichloroethene	N/A	N/A	N/A	N/A		N/A	1.7E+01	N/A	1.7E+01
			Vinyl chloride	N/A	N/A	N/A	N/A	Liver	N/A	6.6E+00	N/A	6.6E+00
			Chemical Total	N/A	N/A	N/A	N/A		N/A	2.4E+01	N/A	2.4E+01
		Exposure Point Total					N/A					2.4E+01
	Exposure Medium Total						N/A					2.5E+01
Medium Total							N/A					9.9E+01
Receptor Total							N/A				Receptor HI Total	9.9E+01

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Kidney HI Across All Media =	1.9E-01
Total Liver HI Across All Media =	2.4E+01
Total Heart HI Across All Media =	3.8E+01
Total Immuntoxicity HI Across All Media =	3.8E+01
Total Neurological/Nervous System HI Across All Media =	1.7E+00
Total Skin HI Across All Media=	3.6E+00
Total Vascular HI Across All Media=	3.6E+00
Total Gastrointestinal HI Across All Media =	1.1E-01

TABLE 10.3.CTE

RISK SUMMARY

CENTRAL TENDENCY EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water										
			Trichloroethene	2.3E-04	N/A	2.5E-05	2.6E-04	Heart, Immunotoxicity	N/A	N/A	N/A	N/A
			Vinyl chloride	7.6E-03	N/A	2.5E-04	7.8E-03	Liver	N/A	N/A	N/A	N/A
			Aluminum, Dissolved	N/A	N/A	N/A	0.0E+00	Neurological, Developmental	N/A	N/A	N/A	N/A
			Arsenic, Dissolved	2.0E-04	N/A	5.0E-07	2.0E-04	Skin, Vascular	N/A	N/A	N/A	N/A
			Chemical Total	8.0E-03	N/A	2.8E-04	8.3E-03		N/A	N/A	N/A	N/A
		Exposure Point Total					8.3E-03					N/A
	Exposure Medium Total						8.3E-03					N/A
	Air	Yorktown-Eastover Aquifer Water Vapors at Showerhead										
			1,1-Dichloroethane	N/A	3.4E-05	N/A	3.4E-05	N/A	N/A	N/A	N/A	N/A
			1,4-Dichlorobenzene	N/A	3.4E-07	N/A	3.4E-07	Liver	N/A	N/A	N/A	N/A
			Trichloroethene	N/A	3.3E-05	N/A	3.3E-05	Heart, Immunotoxicity	N/A	N/A	N/A	N/A
			Vinyl chloride	N/A	9.4E-05	N/A	9.4E-05	Liver	N/A	N/A	N/A	N/A
			Chemical Total	N/A	1.6E-04	N/A	1.6E-04		N/A	N/A	N/A	N/A
		Exposure Point Total					1.6E-04					N/A
		Yorktown-Eastover Aquifer-Vapor Intrusion to Indoor Air										
			Trichloroethene	N/A	1.2E-04	N/A	1.2E-04	Heart, Immunotoxicity	N/A	N/A	N/A	N/A
			Vinyl chloride	N/A	8.8E-04	N/A	8.8E-04	Liver	N/A	N/A	N/A	N/A
			Chemical Total	N/A	9.9E-04	N/A	9.9E-04		N/A	N/A	N/A	N/A
		Exposure Point Total					9.9E-04					N/A
	Exposure Medium Total						1.2E-03					N/A
Medium Total							1.2E-03					N/A
Receptor Total							9.4E-03				Receptor HI Total	N/A

HI - Hazard Index

N/A - Not applicable

CNS - Central Nervous System

TABLE 10.4.CTE

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Tap Water	cis-1,2-Dichloroethene	N/A	N/A	N/A	0.0E+00	Kidney	6.0E+00	N/A	N/A	6.0E+00
			Trichloroethene	1.0E-05	N/A	N/A	1.0E-05	Heart, Immunotoxicity	3.5E+00	N/A	N/A	3.5E+00
			Vinyl chloride	9.0E-04	N/A	N/A	9.0E-04	Liver	3.2E+00	N/A	N/A	3.2E+00
			Arsenic, Dissolved	4.2E-05	N/A	N/A	4.2E-05	Skin, Vascular	7.2E-01	N/A	N/A	7.2E-01
			Manganese, Dissolved	N/A	N/A	N/A	0.0E+00	CNS	3.1E-01	N/A	N/A	3.1E-01
			Chemical Total	9.5E-04	N/A	N/A	9.5E-04		1.4E+01	N/A	N/A	1.4E+01
		Exposure Point Total					9.5E-04					1.4E+01
	Exposure Medium Total						9.5E-04					1.4E+01
		Indoor Air	Trichloroethene	N/A	1.8E-05	N/A	1.8E-05	Heart, Immunotoxicity	N/A	6.0E+00	N/A	6.0E+00
			Vinyl chloride	N/A	3.7E-04	N/A	3.7E-04	Liver	N/A	2.4E+00	N/A	2.4E+00
			Chemical Total	N/A	3.9E-04	N/A	3.9E-04		N/A	8.4E+00	N/A	8.4E+00
		Exposure Point Total					3.9E-04					8.4E+00
	Exposure Medium Total						3.9E-04					8.4E+00
Medium Total							1.3E-03					2.2E+01
Receptor Total							1.3E-03				Receptor HI Total	2.2E+01

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Kidney HI Across All Media =	6.0E+00
Total Liver HI Across All Media =	5.6E+00
Total Heart HI Across All Media =	9.5E+00
Total Immuntoxicity HI Across All Media =	9.5E+00
Total Neurological/Nervous System HI Across All Media =	3.1E-01
Total Skin HI Across All Media=	7.2E-01
Total Vascular HI Across All Media=	7.2E-01

TABLE 10.5.CTE

RISK SUMMARY

CENTRAL TENDENCY EXPOSURE

Site 3, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Yorktown-Eastover Aquifer Water in Excavation Pit	Trichloroethene	N/A	N/A	2.2E-07	2.2E-07	Heart, Immunotoxicity	N/A	N/A	6.7E-01	6.7E-01
			Vinyl chloride	N/A	N/A	8.0E-06	8.0E-06	Liver	N/A	N/A	2.6E-01	2.6E-01
			Chromium	N/A	N/A	6.0E-07	6.0E-07	Not identified	N/A	N/A	1.7E-01	1.7E-01
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	N/A	N/A	1.5E-01	1.5E-01
			Chemical Total	N/A	N/A	8.8E-06	8.8E-06		N/A	N/A	1.2E+00	1.2E+00
		Exposure Point Total					8.8E-06					1.2E+00
	Exposure Medium Total						8.8E-06					1.2E+00
Medium Total							8.8E-06					1.2E+00
Receptor Total							8.8E-06				Receptor HI Total	1.2E+00

HI - Hazard Index
N/A - Not applicable
CNS - Central Nervous System

Total Heart HI Across All Media =	6.7E-01
Total Immuntoxicity HI Across All Media =	6.7E-01
Total Liver HI Across All Media =	2.6E-01
Total Neurological/Nervous System HI Across All Media =	1.5E-01

Table 11.1
Comparison of Non-Detected Chemicals to Regional Screening Levels
Groundwater at Site 3, Yorktown

CAS Number	Chemical	Range of Detection Limits ug/L	Concentration Used for Screening ug/L	Screening [1] Toxicity Value ug/L		Exceeds Screening Value?	Rationale for Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	0.5 - 36	3.6E+01	7.5E+02	N	NO	DLBSL
79-34-5	1,1,2,2-Tetrachloroethane	0.5 - 36	3.6E+01	6.7E-02	C	YES	DLASL
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5 - 36	3.6E+01	5.9E+03	N	NO	DLBSL
79-00-5	1,1,2-Trichloroethane	0.5 - 36	3.6E+01	4.1E-02	N	YES	DLASL
120-82-1	1,2,4-Trichlorobenzene	0.5 - 36	3.6E+01	3.9E-01	N	YES	DLASL
96-12-8	1,2-Dibromo-3-chloropropane	0.5 - 36	3.6E+01	3.2E-04	C	YES	DLASL
106-93-4	1,2-Dibromoethane	0.5 - 36	3.6E+01	6.5E-03	C	YES	DLASL
95-50-1	1,2-Dichlorobenzene	0.5 - 36	3.6E+01	2.8E+01	N	YES	DLASL
107-06-2	1,2-Dichloroethane	0.5 - 36	3.6E+01	1.5E-01	C	YES	DLASL
78-87-5	1,2-Dichloropropane	0.5 - 36	3.6E+01	3.8E-01	C	YES	DLASL
541-73-1	1,3-Dichlorobenzene	0.5 - 36	3.6E+01	4.3E-01	C	YES	DLASL
78-93-3	2-Butanone	2.5 - 42	4.2E+01	4.9E+02	N	NO	DLBSL
591-78-6	2-Hexanone	2.5 - 180	1.8E+02	3.4E+00	N	YES	DLASL
108-10-1	4-Methyl-2-pentanone	2.5 - 180	1.8E+02	1.0E+02	N	YES	DLASL
67-64-1	Acetone	2.5 - 180	1.8E+02	1.2E+03	N	NO	DLBSL
71-43-2	Benzene	0.5 - 36	3.6E+01	3.9E-01	C	YES	DLASL
75-27-4	Bromodichloromethane	0.5 - 36	3.6E+01	1.2E-01	C	YES	DLASL
75-25-2	Bromoform	0.5 - 36	3.6E+01	7.9E+00	C	YES	DLASL
74-83-9	Bromomethane	0.5 - 36	3.6E+01	7.0E-01	N	YES	DLASL
56-23-5	Carbon tetrachloride	0.5 - 36	3.6E+01	3.9E-01	C	YES	DLASL
108-90-7	Chlorobenzene	0.5 - 36	3.6E+01	7.2E+00	N	YES	DLASL
75-00-3	Chloroethane	0.5 - 36	3.6E+01	2.1E+03	N	NO	DLBSL
67-66-3	Chloroform	0.5 - 36	3.6E+01	1.9E-01	C	YES	DLASL
74-87-3	Chloromethane	0.5 - 36	3.6E+01	1.9E+01	N	YES	DLASL
10061-01-5	cis-1,3-Dichloropropene	0.5 - 36	3.6E+01	4.1E-01	C	YES	DLASL
110-82-7	Cyclohexane	0.5 - 36	3.6E+01	1.3E+03	N	NO	DLBSL
124-48-1	Dibromochloromethane	0.5 - 36	3.6E+01	1.5E-01	C	YES	DLASL
98-82-8	Isopropylbenzene	0.5 - 36	3.6E+01	3.9E+01	N	NO	DLBSL
m&pXYLENE	m- and p-Xylene	1 - 71	7.1E+01	1.9E+01	N	YES	DLASL
108-87-2	Methylcyclohexane	0.5 - 36	3.6E+01	5.7E+01	N	NO	NTX
75-09-2	Methylene chloride	0.5 - 36	3.6E+01	4.7E+00	C	YES	DLASL
1634-04-4	Methyl-tert-butyl ether (MTBE)	0.5 - 36	3.6E+01	1.2E+01	C	YES	DLASL
95-47-6	o-Xylene	0.5 - 36	3.6E+01	1.9E+01	N	YES	DLASL
100-42-5	Styrene	0.5 - 36	3.6E+01	1.1E+02	N	NO	DLBSL
127-18-4	Tetrachloroethene	0.5 - 36	3.6E+01	7.2E-02	C	YES	DLASL
108-88-3	Toluene	0.5 - 36	3.6E+01	8.6E+01	N	NO	DLBSL
10061-02-6	trans-1,3-Dichloropropene	0.5 - 36	3.6E+01	4.1E-01	C	YES	DLASL
75-69-4	Trichlorofluoromethane(Freon-11)	0.5 - 36	3.6E+01	1.1E+02	N	NO	DLBSL
1330-20-7	Xylene, total	0.5 - 36	3.6E+01	1.9E+01	N	YES	DLASL
7440-36-0	Antimony	10 - 10	1.0E+01	6.0E-01	N	YES	DLASL
7440-43-9	Cadmium	5 - 5	5.0E+00	6.9E-01	N	YES	DLASL
7440-22-4	Silver	5 - 5	5.0E+00	7.1E+00	N	NO	DLBSL
7440-28-0	Thallium	10 - 10	1.0E+01	1.6E-02	N	YES	NTX
7440-36-0	Antimony, Dissolved	10 - 10	1.0E+01	6.0E-01	N	YES	DLASL
7440-41-7	Beryllium, Dissolved	5 - 5	5.0E+00	1.6E+00	N	YES	DLASL
7440-47-3	Chromium, Dissolved	10 - 10	1.0E+01	3.1E-02	C	YES	DLASL
7440-48-4	Cobalt, Dissolved	5 - 5	5.0E+00	4.7E-01	N	YES	DLASL
7439-92-1	Lead, Dissolved	3 - 3	3.0E+00	1.5E+01	N	NO	DLBSL

[1] Oak Ridge National Laboratory (ORNL). November 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites. Tap Water RSL. [Online]. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml

RSL value for 1,4-dichlorobenzene used as surrogate for 1,3-dichlorobenzene

RSL value for total Xylene used as surrogate for m- and p-xylene.

RSL value for Manganese (water) used as surrogate for manganese.

RSL value for Mercury (inorganic salts) used as surrogate for mercury.

RSL value for 1,3-dichloropropene used as a surrogate for cis-1,3-dichloropropene and trans-1,3-dichloropropene.

Definitions:
C = Carcinogenic
N = Noncarcinogenic
NTX = No Toxicity Information
DLBSL = Detection limit below screening level
DLASL = Detection limit above screening level
ug/L = microgram per liter

Appendix K
Surface Water/Sediment
Human Health Risk Assessment Tables

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 1 and 3

NWS Yorktown, Yorktown, Virginia

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Indian Field Creek	75-15-0	Carbon disulfide	1.1E-01 J	1.4E-01 J	UG/L	YS03-SW05-0709 : YS03-SW06-0709	6/13	0.5 - 0.5	1.4E-01	N/A	7.2E+02 N			NO	BSL
	74-87-3	Chloromethane	1.2E-01 J	1.3E-01 J	UG/L	YS03-SW05P-0709	2/13	0.5 - 0.5	1.3E-01	N/A	1.9E+02 N			NO	BSL
	108-88-3	Toluene	1.0E-01 L	1.3E-01 J	UG/L	YS03-SW04-0709	3/13	0.5 - 0.5	1.3E-01	N/A	8.6E+02 N			NO	BSL
	7429-90-5	Aluminum	5.6E+02 J	3.0E+03 J	UG/L	YS01-SW31P-0709	11/13	200 - 200	3.0E+03	N/A	1.6E+04 N			NO	BSL
	7440-39-3	Barium	2.7E+01 J	4.1E+01 J	UG/L	YS01-SW31P-0709	13/13	200 - 200	4.1E+01	N/A	2.9E+03 N			NO	BSL
	7440-70-2	Calcium	2.2E+05	2.3E+05	UG/L	YS03-SW06-0709 : YS03-SW08-0709 : YS03-SW11-0709	13/13	5000 - 5000	2.3E+05	N/A	N/A			NO	NUT
	7440-48-4	Cobalt	9.1E-01 L	1.9E+00 L	UG/L	YS01-SW31P-0709	2/13	5 - 5	1.9E+00	N/A	4.7E+00 N			NO	BSL
	7440-50-8	Copper	9.6E+00 L	9.6E+00 L	UG/L	YS01-SW31-0709	1/13	5 - 5	9.6E+00	N/A	6.2E+02 N	1.3E+03	AWQC	NO	BSL
	7439-89-6	Iron	5.1E+02	5.0E+03 J	UG/L	YS01-SW31P-0709	13/13	100 - 100	5.0E+03	N/A	1.1E+04 N			NO	BSL
	7439-92-1	Lead	4.2E+00 L	4.2E+00 L	UG/L	YS03-SW11-0709	1/13	3 - 3	4.2E+00	N/A	1.5E+01			NO	BSL
	7439-95-4	Magnesium	6.4E+05	7.5E+05	UG/L	YS03-SW08-0709	13/13	5000 - 10000	7.5E+05	N/A	N/A			NO	NUT
	7439-96-5	Manganese	4.8E+01	2.4E+02	UG/L	YS01-SW31P-0709	13/13	10 - 10	2.4E+02	N/A	3.2E+02 N			NO	BSL
	7439-97-6	Mercury	1.0E-01 J	1.0E-01 J	UG/L	YS01-SW32-0709	1/13	0.2 - 0.2	1.0E-01	N/A	4.3E+00 N			NO	BSL
	7440-09-7	Potassium	3.1E+05	3.5E+05	UG/L	YS03-SW08-0709	13/13	5000 - 5000	3.5E+05	N/A	N/A			NO	NUT
	7440-23-5	Sodium	5.0E+06 J	5.5E+06 J	UG/L	YS03-SW05P-0709	13/13	100000 - 100000	5.5E+06	N/A	N/A			NO	NUT
	7440-62-2	Vanadium	3.2E+00 J	9.4E+00 J	UG/L	YS01-SW31P-0709	13/13	20 - 20	9.4E+00	N/A	7.8E+01 N			NO	BSL
	7440-66-6	Zinc	3.4E+01	3.4E+01	UG/L	YS03-SW08-0709	1/13	20 - 20	3.4E+01	N/A	4.7E+03 N	7.4E+03	AWQC	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Oak Ridge National Laboratory (ORNL). Nov., 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites. [Online].
Available: http://epa-prgs.ornl.gov/chemicals/index.shtml. Ten times adjusted (nc RSLs adjusted by dividing by 10) tap water RSLs.
Safe Drinking Water Act Action Level for lead used as screening level for lead.
RSL value for Manganese (non-diet) used as surrogate for manganese.

[5] RSL value for Mercury (inorganic salts) used as surrogate for mercury.

Rationale C(Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
AWQC = National Ambient Water Quality Criteria

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 1 and 3

NWS Yorktown, Yorktown, Virginia

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Indian Field Creek	78-93-3	2-Butanone	6.6E-03 J	6.6E-03 J	MG/KG	YS01-SD30-0709	1/14	0.016 - 0.089	6.6E-03	N/A	2.8E+04 N			NO	BSL
	75-15-0	Carbon disulfide	3.0E-03 J	3.8E-02	MG/KG	YS03-SD08-0709	14/14	0.0063 - 0.035	3.8E-02	N/A	8.2E+02 N			NO	BSL
	100-42-5	Styrene	4.6E-03 L	4.6E-03 L	MG/KG	YS03-SD12-0709	1/14	0.0063 - 0.035	4.6E-03	N/A	6.3E+03 N			NO	BSL
	7429-90-5	Aluminum	4.0E+02	2.8E+04	MG/KG	YS03-SD08-0709	14/14	23.1 - 83	2.8E+04	N/A	7.7E+04 N			NO	BSL
	7440-38-2	**Arsenic**	**1.6E+00 L**	**1.2E+01 L**	**MG/KG**	**YS01-SD33-0709**	**12/14**	**1.2 - 4.1**	**1.2E+01**	**N/A**	**3.9E+00 C**			**YES**	**ASL**
	7440-39-3	Barium	2.1E+00 J	5.1E+01 J	MG/KG	YS03-SD08-0709	14/14	23.1 - 83	5.1E+01	N/A	1.5E+04 N			NO	BSL
	7440-41-7	Beryllium	1.2E+00 J	1.5E+00 J	MG/KG	YS01-SD32-0709	7/14	0.58 - 2.1	1.5E+00	N/A	1.6E+02 N			NO	BSL
	7440-70-2	Calcium	1.8E+02 J	8.9E+03	MG/KG	YS03-SD03-0709	14/14	578 - 2070	8.9E+03	N/A	N/A			NO	NUT
	7440-47-3	**Chromium**	**8.8E-01 L**	**5.5E+01 L**	**MG/KG**	**YS03-SD08-0709**	**14/14**	**1.2 - 4.1**	**5.5E+01**	**N/A**	**2.9E+00 C**			**YES**	**ASL**
	7440-48-4	Cobalt	1.1E-01 J	1.0E+01	MG/KG	YS03-SD08-0709	14/14	0.58 - 2.1	1.0E+01	N/A	2.3E+01 N			NO	BSL
	7440-50-8	Copper	4.7E-01 L	3.0E+01	MG/KG	YS03-SD08-0709	14/14	0.58 - 2.1	3.0E+01	N/A	3.1E+03 N			NO	BSL
	7439-89-6	Iron	4.7E+02	4.2E+04	MG/KG	YS03-SD09-0709	14/14	11.6 - 41.5	4.2E+04	N/A	5.5E+04 N			NO	BSL
	7439-92-1	Lead	1.6E+00 J	3.6E+01 J	MG/KG	YS03-SD08-0709	14/14	0.35 - 1.2	3.6E+01	N/A	4.0E+02 N			NO	BSL
	7439-95-4	Magnesium	3.7E+01 J	8.7E+03	MG/KG	YS03-SD08-0709	14/14	578 - 2070	8.7E+03	N/A	N/A			NO	NUT
	7439-96-5	Manganese	1.6E+00 L	3.5E+02 L	MG/KG	YS03-SD09-0709	14/14	1.2 - 4.1	3.5E+02	N/A	1.8E+03 N			NO	BSL
	7439-97-6	Mercury	3.0E-02 J	1.2E-01 J	MG/KG	YS03-SD03-0709	11/14	0.037 - 0.14	1.2E-01	N/A	2.3E+01 N			NO	BSL
	7440-02-0	Nickel	2.3E-01 J	2.7E+01	MG/KG	YS03-SD08-0709	14/14	4.6 - 16.6	2.7E+01	N/A	1.5E+03 N			NO	BSL
	7440-09-7	Potassium	2.9E+01 J	5.4E+03	MG/KG	YS03-SD08-0709	14/14	578 - 2070	5.4E+03	N/A	N/A			NO	NUT
	7440-23-5	Sodium	6.6E+02	1.5E+04	MG/KG	YS03-SD08-0709	13/14	578 - 2070	1.5E+04	N/A	N/A			NO	NUT
	7440-62-2	Vanadium	7.9E-01 L	7.4E+01 L	MG/KG	YS03-SD08-0709	14/14	2.3 - 8.3	7.4E+01	N/A	3.9E+02 N			NO	BSL
	7440-66-6	Zinc	2.5E+00 L	1.3E+02 L	MG/KG	YS01-SD32-0709	14/14	2.3 - 8.3	1.3E+02	N/A	2.3E+04 N			NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Oak Ridge National Laboratory (ORNL). Nov. 20110. Regional Screening Levels for Chemical Contaminants at Superfund Sites. [Online]. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml. Ten times the adjusted (nc RSLs adjusted by dividing by 10) residential soil RSLs.
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RSL value for chromium VI used as surrogate for chromium.
RSL value for Manganese (water) used as surrogate for manganese.
RSL value for mercuric chloride used as surrogate for mercury.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered

J = Estimated Value

K = Biased High

L = Biased Low

C = Carcinogenic

N = Noncarcinogenic

Table 3.1

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Sites 1 and 3

NWS Yorktown, Yorktown, Virginia

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

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Indian Field Creek											
	Arsenic	MG/KG	6.6E+00	1.1E+01	NP	1.2E+01	L	1.1E+01	MG/KG	95% KM-c	4
	Chromium	MG/KG	3.2E+01	5.6E+01	NP	5.5E+01	L	5.5E+01	MG/KG	Max	4, 5

ProUCL, Version 4.1.00 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. May 2010. Prepared by Lockheed Martin Environmental Services).

Options: 95% Kaplan-Meier (KM) Chebyshev (95% KM-c): Maximum Detected Concentration (Max)

mg/kg=milligrame per kilogram

L = Biased Low

NP = Non-Parametric

UCL Rationale:

(1) Shapiro-Wilk W Test/Lilliefors test indicates data are log-normally distributed.

(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.

(3) Test indicates data are gamma distributed.

(4) Distribution tests are inconclusive

(5) Max value used because 95% UCL greater than max.

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Sites 1 and 3, NWS Yorktown, Yorktown, Virginia

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Trespasser/Visitor	Adult	Sediment	CSed	Chemical Concentration in Sediment	See Table 3.1.RME	mg/kg	See Table 3.1.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-Sed	Ingestion Rate of Sediment	50	mg/day	EPA, 1991, (1)	CSed x IR-Sed x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	Prof Judgment (2)	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Adolescent	Sediment	CSed	Chemical Concentration in Sediment	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				IR-Sed	Ingestion Rate of Sediment	50	mg/day	EPA, 1991, (1)	CSed x IR-Sed x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	Prof Judgment (2)	
				ED	Exposure Duration	9	years	(3)	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	51	kg	EPA, 1997, (4)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
	Construction Worker	Adult	Sediment	CSed	Chemical Concentration in Sediment	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				IR-Sed	Ingestion Rate of Sediment	240	mg/day	EPA, 1997, (1)	CSed x IR-Sed x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	10	days/year	Prof Judgment (5)	
				ED	Exposure Duration	1	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Sites 1 and 3, NWS Yorktown, Yorktown, Virginia

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Trespasser/Visitor	Adult	Sediment	CSed	Chemical Concentration in Sediment	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2004, (6)	CSed x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm^2-day	EPA, 2004, (7)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	Chemical specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Adolescent	Sediment	CSed	Chemical Concentration in Sediment	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	4,046	cm^2	EPA, 2004, (6)	CSed x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm^2-day	EPA, 2004, (8)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	9	years	(3)	
				BW	Body Weight	51	kg	EPA, 1997, (4)	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	days	EPA, 1989	

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Sites 1 and 3, NWS Yorktown, Yorktown, Virginia

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
	Construction Worker	Adult	Sediment	CSed	Chemical Concentration in Sediment	See Table 3.1.RME	mg/kg	See Table 3.1.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2004, (6)	CSed x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm^2-day	EPA, 2004, (7)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	10	days/year	Prof Judgment (5)	
				ED	Exposure Duration	1	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

(1) Professional Judgement assuming 1/2 the default adult residential soil ingestion rate for the trespasser/visitor and 1/2 the default construction worker soil ingestion rate for the construction worker.

(2) Professional Judgment assuming 1 day per week for 52 weeks per year

(3) Professional Judgement assuming adolescents from 9 to 18 years of age.

(4) Body weight is average of the mean values for boys and girls for the ages 9 through 18.

(5) Professional judgment assuming construction worker in contact with sediment 10 days (2 weeks) per construction activity.

(6) The skin surface area includes hands, forearms, lower legs, and feet.

(7) RME SSAF is geometric mean soil adherence factor for reed gatherers.

(8) RME SSAF is geometric mean soil adherence factor for children playing in wet soil.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Sites 1 and 3

NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Arsenic	Chronic	3.0E-04	mg/kg-day	95%	3.0E-04	mg/kg-day	Skin, Vascular	3/1	IRIS	4/26/2012
	Subchronic	3.0E-04	mg/kg-day	95%	3.0E-04	mg/kg-day	Skin, Vascular	3	HEAST	7/1/1997
Chromium	Chronic	3.0E-03	mg/kg-day	2.5%	7.5E-05	mg/kg-day	Not identified	300/3	IRIS	4/26/2012
	Subchronic	2.0E-02	mg/kg-day	2.5%	5.0E-04	mg/kg-day	Not identified	100	HEAST	7/01/1997

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evalution Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Final.

Section 4.2 and Exhibit 4-1. USEPA recommends that the oral RfD should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 50%.

Constituents that do not have oral absorption efficiencies reported on this table were assumed to have an oral absorption efficiency of 100%.

(2) Adjusted Dermal RfD = RfD (oral) x Absorption Efficiency or ABS_{GI}

(3) For IRIS values, the date IRIS was searched.

For HEAST values, the date of HEAST.

Definitions: HEAST= Health Effects Assessment Summary Tables

IRIS = Integrated Risk Information System

N/A = Not Applicable or Not Available.

TABLE 5.2
NON-CANCER TOXICITY DATA -- INHALATION
Sites 1 and 3
NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ	Dates (2) (MM/DD/YY)
Arsenic	Chronic	1.5E-05	mg/m^3	4.3E-06	mg/kg-day	Developmental, Cardiovascular, Nervous System	3/1	Cal EPA	4/26/2012
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	Chronic	1.0E-04	mg/m^3	2.9E-05	mg/kg-day	Respiratory System	300/1	IRIS	4/26/2012
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

N/A = Not Applicable

(1) Inhalation RfD = RfC x 20 m3/day x 1/70 kg

(2) For IRIS values, the date IRIS was searched.

For Cal EPA values, the date Cal EPA database was searched.

Definitions: Cal EPA = California EPA

N/A = Not Applicable or Not Available.

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

Sites 1 and 3

NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	EPA Carcinogen Group	Source	Date (MM/DD/YY)
Arsenic	1.5E+00	95%	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	4/26/2012
Chromium	5.0E-01	2.5%	1.3E-02	$(mg/kg\text{-}day)^{-1}$	D	New Jersey	4/26/2012

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. Section 4.2 and Exhibit 4-1. USEPA recommends that the oral slope factor should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 50%. Constituents that do not have oral absorption efficiencies reported on this table were assumed to have an oral absorption efficiency of 100%.

(2) Adjusted based on RAGS Part E.

Definitions:

N/A = Not Available

IRIS = Integrated Risk Information System

NCEA = National Center for Environmental Assessment

PPRTV = Provisional Peer-Reviewed Toxicity Value

Weight of Evidence definitions:

Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans and cancer.

Group B1 chemicals (probable human carcinogens) are agents for which there is limited evidence of possible carcinogenicity in humans.

Group B2 chemicals (probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate or a lack of evidence in humans.

Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.

Group D chemicals (not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.

Group E chemicals (evidence of noncarcinogenicity in humans) are agents for which there is no evidence of carcinogenicity from human or animal studies, or both.

2A - Probably carcinogenic to humans

2B - Possibly carcinogenic to humans

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

Sites 1 and 3

NWS Yorktown, Yorktown, Virginia

Chemical of Potential Concern	Unit Risk	Units	Weight of Evidence/ Cancer Guidance Description	Source	Date (2) (MM/DD/YY)
Arsenic	4.3E-03	$(\mu g/m^3)^{-1}$	A	IRIS	4/26/2012
Chromium	8.4E-02	$(\mu g/m^3)^{-1}$	A	IRIS	4/26/2012

IRIS = Integrated Risk Information System

PPRTV = Provisional Peer-Reviewed Toxicity Value

CalEPA = California EPA

N/A = Not Available

Weight of Evidence definitions:

Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans and cancer.

Group B1 chemicals (probable human carcinogens) are agents for which there is limited evidence of possible carcinogenicity in humans.

Group B2 chemicals (probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate or a lack of evidence in humans.

Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.

Group D chemicals (not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.

Group E chemicals (evidence of noncarcinogenicity in humans) are agents for which there is no evidence of carcinogenicity from

2A - Probably carcinogenic to humans

2B - Possibly carcinogenic to humans

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Sites 1 and 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor
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	
Sediment	Sediment	Indian Field Creek	Ingestion	Arsenic	1.1E+01	mg/kg	3.9E-07	mg/kg/day	1.5E+00	1/mg/kg/day	5.8E-07	1.1E-06	mg/kg/day	3.0E-04	mg/kg/day	3.8E-03
				Chromium	5.5E+01	mg/kg	1.9E-06	mg/kg/day	5.0E-01	1/mg/kg/day	9.6E-07	5.6E-06	mg/kg/day	3.0E-03	mg/kg/day	1.9E-03
			Exp. Route Total								1.5E-06					5.6E-03
			Dermal Absorption	Arsenic	1.1E+01	mg/kg	4.0E-07	mg/kg/day	1.5E+00	1/mg/kg/day	6.0E-07	1.2E-06	mg/kg/day	3.0E-04	mg/kg/day	3.9E-03
				Chromium	5.5E+01	mg/kg	6.6E-07	mg/kg/day	1.3E-02	1/mg/kg/day	8.2E-09	1.9E-06	mg/kg/day	7.5E-05	mg/kg/day	2.6E-02
			Exp. Route Total								6.0E-07					2.9E-02
		Exposure Point Total									2.1E-06					3.5E-02
	Exposure Medium Total										2.1E-06					3.5E-02
Medium Total											2.1E-06					3.5E-02
Total of Receptor Risks Across All Media											2.1E-06	Total of Receptor Hazards Across All Media				3.5E-02

Notes-

N/A = Not applicable.

1. Dermal absorption factors (DABs) used to calculated dermal absorption intake from sediment are chemical specific as shown in RAGS Part E, Exhibit 3-4. DABS of 0.03 used for arsenic, and 0.01 for chromium.

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Sites 1 and 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

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	
Sediment	Sediment	Indian Field Creek	Ingestion	Arsenic	1.1E+01	mg/kg	2.0E-07	mg/kg/day	1.5E+00	1/mg/kg/day	3.0E-07	1.6E-06	mg/kg/day	3.0E-04	mg/kg/day	5.2E-03
				Chromium	5.5E+01	mg/kg	9.9E-07	mg/kg/day	5.0E-01	1/mg/kg/day	4.9E-07	7.7E-06	mg/kg/day	3.0E-03	mg/kg/day	2.6E-03
			Exp. Route Total								7.9E-07					7.7E-03
			Dermal Absorption	Arsenic	1.1E+01	mg/kg	9.7E-08	mg/kg/day	1.5E+00	1/mg/kg/day	1.5E-07	1.1E-06	mg/kg/day	3.0E-04	mg/kg/day	3.8E-03
				Chromium	5.5E+01	mg/kg	1.6E-07	mg/kg/day	1.3E-02	1/mg/kg/day	2.0E-09	1.9E-06	mg/kg/day	7.5E-05	mg/kg/day	2.5E-02
			Exp. Route Total								1.5E-07					2.9E-02
		Exposure Point Total									9.4E-07					3.6E-02
	Exposure Medium Total										9.4E-07					3.6E-02
Medium Total											9.4E-07					3.6E-02
Total of Receptor Risks Across All Media											9.4E-07	Total of Receptor Hazards Across All Media				3.6E-02

Notes-

N/A = Not applicable.

1. Dermal absorption factors (DABs) used to calculated dermal absorption intake from sediment are chemical specific as shown in RAGS Part E, Exhibit 3-4. DABS of 0.03 used for arsenic, and 0.01 for chromium.

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Sites 1 and 3

NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Current/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	
Sediment	Sediment	Indian Field Creek	Ingestion	Arsenic	1.1E+01	mg/kg	1.5E-08	mg/kg/day	1.5E+00	1/mg/kg/day	2.2E-08	1.0E-06	mg/kg/day	3.0E-04	mg/kg/day	3.5E-03
				Chromium	5.5E+01	mg/kg	7.4E-08	mg/kg/day	5.0E-01	1/mg/kg/day	3.7E-08	5.2E-06	mg/kg/day	2.0E-02	mg/kg/day	2.6E-04
			Exp. Route Total								5.9E-08					3.7E-03
			Dermal Absorption	Arsenic	1.1E+01	mg/kg	3.2E-09	mg/kg/day	1.5E+00	1/mg/kg/day	4.8E-09	2.2E-07	mg/kg/day	3.0E-04	mg/kg/day	7.4E-04
				Chromium	5.5E+01	mg/kg	5.3E-09	mg/kg/day	1.3E-02	1/mg/kg/day	6.6E-11	3.7E-07	mg/kg/day	5.0E-04	mg/kg/day	7.4E-04
			Exp. Route Total								4.8E-09					1.5E-03
		Exposure Point Total									6.4E-08					5.2E-03
	Exposure Medium Total										6.4E-08					5.2E-03
Medium Total											6.4E-08					5.2E-03
Total of Receptor Risks Across All Media											6.4E-08	Total of Receptor Hazards Across All Media				5.2E-03

Notes-

N/A = Not applicable.

1. Dermal absorption factors (DABs) used to calculated dermal absorption intake from sediment are chemical specific as shown in RAGS Part E, Exhibit 3-4. DABS of 0.03 used for arsenic, and 0.01 for chromium.

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 1 and 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Indian Field Creek	Arsenic	6.E-07	N/A	6.E-07	1.E-06	Skin, Vascular	4.E-03	N/A	4.E-03	8.E-03
			Chromium	1.E-06	N/A	8.E-09	1.E-06	Not identified	2.E-03	N/A	3.E-02	3.E-02
			Chemical Total	2.E-06	0.E+00	6.E-07	2.E-06		6.E-03	0.E+00	3.E-02	4.E-02
		Exposure Point Total					2.E-06					4.E-02
	Exposure Medium Total						2.E-06					4.E-02
Medium Total							2.E-06					4.E-02
Receptor Total							2.E-06	Receptor HI Total				4.E-02

HI - Hazard Index

Total Skin HI Across All Media=	8.E-03
Total Vascular HI Across All Media=	8.E-03

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 1 and 3, NWS Yorktown, Yorktown, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Indian Field Creek	Arsenic	3.E-07	N/A	1.E-07	4.E-07	Skin, Vascular	5.E-03	N/A	4.E-03	9.E-03
			Chromium	5.E-07	N/A	2.E-09	5.E-07	Not idenitified	3.E-03	N/A	2.E-02	3.E-02
			Chemical Total	8.E-07	0.E+00	1.E-07	9.E-07		8.E-03	0.E+00	3.E-02	4.E-02
		Exposure Point Total					9.E-07					4.E-02
	Exposure Medium Total						9.E-07					4.E-02
Medium Total							9.E-07					4.E-02
Receptor Total							9.E-07				Receptor HI Total	4.E-02

HI - Hazard Index

Total Skin HI Across All Media=	9.E-03
Total Vascular HI Across All Media=	9.E-03

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 1 and 3, NWS Yorktown, Yorktown, Virginia

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Indian Field Creek	Arsenic	2.E-08	N/A	5.E-09	3.E-08	Skin, Vascular	3.E-03	N/A	7.E-04	4.E-03
			Chromium	4.E-08	N/A	7.E-11	4.E-08	Not identified	3.E-04	N/A	7.E-04	1.E-03
			Chemical Total	6.E-08	0.E+00	5.E-09	6.E-08		4.E-03	0.E+00	1.E-03	5.E-03
		Exposure Point Total					6.E-08					5.E-03
	Exposure Medium Total						6.E-08					5.E-03
Medium Total							6.E-08					5.E-03
Receptor Total							6.E-08	Receptor HI Total				5.E-03

HI - Hazard Index

Total Skin HI Across All Media=	4.2E-03
Total Vascular HI Across All Media=	4.2E-03

Table 10
Comparison of Non-Detected Chemicals to Regional Screening Levels
Surface Water at Sites 1 and 3, Yorktown

CAS Number	Chemical	Range of Detection Limits ug/L	Concentration Used for Screening ug/L	Screening [1] Toxicity Value ug/L		Exceeds Screening Value?	Rationale for Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	0.5 - 0.5	5.0E-01	7.5E+03	N	NO	DLBSL
79-34-5	1,1,2,2-Tetrachloroethane	0.5 - 0.5	5.0E-01	6.6E-01	C	NO	DLBSL
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5 - 0.5	5.0E-01	5.3E+04	N	NO	DLBSL
79-00-5	1,1,2-Trichloroethane	0.5 - 0.5	5.0E-01	4.1E-01	N	YES	DLASL
75-34-3	1,1-Dichloroethane	0.5 - 0.5	5.0E-01	2.4E+01	C	NO	DLBSL
75-35-4	1,1-Dichloroethene	0.5 - 0.5	5.0E-01	2.6E+02	N	NO	DLBSL
120-82-1	1,2,4-Trichlorobenzene	0.5 - 0.5	5.0E-01	3.9E+00	N	NO	DLBSL
96-12-8	1,2-Dibromo-3-chloropropane	0.5 - 0.5	5.0E-01	3.2E-03	C	YES	DLASL
106-93-4	1,2-Dibromoethane	0.5 - 0.5	5.0E-01	6.5E-02	C	YES	DLASL
95-50-1	1,2-Dichlorobenzene	0.5 - 0.5	5.0E-01	2.8E+02	N	NO	DLBSL
107-06-2	1,2-Dichloroethane	0.5 - 0.5	5.0E-01	1.5E+00	C	NO	DLBSL
540-59-0	1,2-Dichloroethene (total)	0.5 - 0.5	5.0E-01	1.3E+02	N	NO	DLBSL
78-87-5	1,2-Dichloropropane	0.5 - 0.5	5.0E-01	3.8E+00	C	NO	DLBSL
541-73-1	1,3-Dichlorobenzene	0.5 - 0.5	5.0E-01	4.2E+00	C	NO	DLBSL
106-46-7	1,4-Dichlorobenzene	0.5 - 0.5	5.0E-01	4.2E+00	C	NO	DLBSL
591-78-6	2-Hexanone	2.5 - 2.5	2.5E+00	3.4E+01	N	NO	DLBSL
108-10-1	4-Methyl-2-pentanone	2.5 - 2.5	2.5E+00	1.0E+03	N	NO	DLBSL
67-64-1	Acetone	2.5 - 2.5	2.5E+00	1.2E+04	N	NO	DLBSL
71-43-2	Benzene	0.5 - 0.5	5.0E-01	3.9E+00	C	NO	DLBSL
75-27-4	Bromodichloromethane	0.5 - 0.5	5.0E-01	1.2E+00	C	NO	DLBSL
75-25-2	Bromoform	0.5 - 0.5	5.0E-01	7.9E+01	C	NO	DLBSL
74-83-9	Bromomethane	0.5 - 0.5	5.0E-01	7.0E+00	N	NO	DLBSL
56-23-5	Carbon tetrachloride	0.5 - 0.5	5.0E-01	3.9E+00	C	NO	DLBSL
108-90-7	Chlorobenzene	0.5 - 0.5	5.0E-01	7.2E+01	N	NO	DLBSL
75-00-3	Chloroethane	0.5 - 0.5	5.0E-01	2.1E+04	N	NO	DLBSL
67-66-3	Chloroform	0.5 - 0.5	5.0E-01	1.9E+00	C	NO	DLBSL
156-59-2	cis-1,2-Dichloroethene	0.5 - 0.5	5.0E-01	2.8E+01	N	NO	DLBSL
10061-01-5	cis-1,3-Dichloropropene	0.5 - 0.5	5.0E-01	4.1E+00	C	NO	DLBSL
110-82-7	Cyclohexane	0.5 - 0.5	5.0E-01	1.3E+04	N	NO	DLBSL
124-48-1	Dibromochloromethane	0.5 - 0.5	5.0E-01	1.5E+00	C	NO	DLBSL
75-71-8	Dichlorodifluoromethane (Freon-12)	0.5 - 0.5	5.0E-01	1.9E+02	N	NO	DLBSL
100-41-4	Ethylbenzene	0.5 - 0.5	5.0E-01	1.3E+01	C	NO	DLBSL
98-82-8	Isopropylbenzene	0.5 - 0.5	5.0E-01	3.9E+02	N	NO	DLBSL
m&pXYLENE	m- and p-Xylene	1 - 1	1.0E+00	1.9E+02	N	NO	DLBSL
79-20-9	Methyl acetate	0.5 - 0.5	5.0E-01	1.6E+04	N	NO	DLBSL
108-87-2	Methylcyclohexane	0.5 - 0.5	5.0E-01	2.5E+03	N	NO	DLBSL
75-09-2	Methylene chloride	0.5 - 0.5	5.0E-01	4.7E+01	C	NO	DLBSL
1634-04-4	Methyl-tert-butyl ether (MTBE)	0.5 - 0.5	5.0E-01	1.2E+02	C	NO	DLBSL
95-47-6	o-Xylene	0.5 - 0.5	5.0E-01	1.9E+02	N	NO	DLBSL
100-42-5	Styrene	0.5 - 0.5	5.0E-01	1.1E+03	N	NO	DLBSL
127-18-4	Tetrachloroethene	0.5 - 0.5	5.0E-01	7.2E-01	C	NO	DLBSL
156-60-5	trans-1,2-Dichloroethene	0.5 - 0.5	5.0E-01	8.6E+01	N	NO	DLBSL
10061-02-6	trans-1,3-Dichloropropene	0.5 - 0.5	5.0E-01	4.1E+00	C	NO	DLBSL
79-01-6	Trichloroethene	0.5 - 0.5	5.0E-01	2.6E+00	N	NO	DLBSL
75-69-4	Trichlorofluoromethane(Freon-11)	0.5 - 0.5	5.0E-01	1.1E+03	N	NO	DLBSL
75-01-4	Vinyl chloride	0.5 - 0.5	5.0E-01	1.5E-01	C	YES	DLASL
1330-20-7	Xylene, total	0.5 - 0.5	5.0E-01	1.9E+02	N	NO	DLBSL
7440-36-0	Antimony	10 - 10	1.0E+01	6.0E+00	N	YES	DLASL
7440-38-2	Arsenic	10 - 10	1.0E+01	4.5E-01	C	YES	DLASL
7440-41-7	Beryllium	5 - 5	5.0E+00	1.6E+01	N	NO	DLBSL
7440-43-9	Cadmium	5 - 5	5.0E+00	6.9E+00	N	NO	DLBSL
7440-47-3	Chromium	10 - 10	1.0E+01	3.1E-01	C	YES	DLASL
7440-02-0	Nickel	40 - 40	4.0E+01	3.0E+02	N	NO	DLBSL

Table 10
Comparison of Non-Detected Chemicals to Regional Screening Levels
Surface Water at Sites 1 and 3, Yorktown

CAS Number	Chemical	Range of Detection Limits ug/L	Concentration Used for Screening ug/L	Screening [1] Toxicity Value ug/L		Exceeds Screening Value?	Rationale for Contaminant Deletion or Selection
7782-49-2	Selenium	5 - 5	5.0E+00	7.8E+01	N	NO	DLBSL
7440-22-4	Silver	5 - 5	5.0E+00	7.1E+01	N	NO	DLBSL
7440-28-0	Thallium	10 - 10	1.0E+01	1.6E-01	N	YES	NTX
7429-90-5	Aluminum, Dissolved	200 - 200	2.0E+02	1.6E+04	N	NO	DLBSL
7440-36-0	Antimony, Dissolved	10 - 10	1.0E+01	6.0E+00	N	YES	DLASL
7440-41-7	Beryllium, Dissolved	5 - 5	5.0E+00	1.6E+01	N	NO	DLBSL
7440-47-3	Chromium, Dissolved	10 - 10	1.0E+01	3.1E-01	C	YES	DLASL
7440-50-8	Copper, Dissolved	5 - 5	5.0E+00	6.2E+02	N	NO	DLBSL
7439-92-1	Lead, Dissolved	3 - 3	3.0E+00	1.5E+01	N	NO	NTX
7439-97-6	Mercury, Dissolved	0.2 - 0.2	2.0E-01	4.3E+00	N	NO	DLBSL
7440-02-0	Nickel, Dissolved	40 - 40	4.0E+01	3.0E+02	N	NO	DLBSL
7440-22-4	Silver, Dissolved	5 - 5	5.0E+00	7.1E+01	N	NO	DLBSL
7440-28-0	Thallium, Dissolved	10 - 10	1.0E+01	1.6E-01	N	YES	NTX

[1]Oak Ridge National Laboratory (ORNL). Nov., 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites. [Online].
Available: http://epa-prgs.ornl.gov/chemicals/index.shtml. Ten times adjusted (nc RSLs adjusted by dividing by 10) tap water RSLs.
RSL value for n-Hexane used as surrogate for Methylcyclohexane.
RSL value for 1,4-Dichlorobenzene used as surrogate for 1,3-Dichlorobenzene.

Definitions:
C = Carcinogenic
N = Noncarcinogenic
NTX = No Toxicity Information
DLBSL = Detection limit below screening level
DLASL = Detection limit above screening level
ug/L = microgram per liter
NA = Not applicable/not available

Table 11
Comparison of Non-Detected Chemicals to Regional Screening Levels
Sediment at Sites 1 and 3, Yorktown

CAS Number	Chemical	Range of Detection Limits mg/kg	Concentration [2] Used for Screening mg/kg	Screening [1] Toxicity Value mg/kg		Exceeds Screening Value?	Rationale for Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	0.0063 - 0.035	3.5E-02	6.4E+02	NS	NO	DLBSL
79-34-5	1,1,2,2-Tetrachloroethane	0.0063 - 0.035	3.5E-02	5.6E+00	C	NO	DLBSL
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.0063 - 0.035	3.5E-02	9.1E+02	NS	NO	DLBSL
79-00-5	1,1,2-Trichloroethane	0.0063 - 0.035	3.5E-02	1.6E+00	N	NO	DLBSL
75-34-3	1,1-Dichloroethane	0.0063 - 0.035	3.5E-02	3.3E+01	C	NO	DLBSL
75-35-4	1,1-Dichloroethene	0.0063 - 0.035	3.5E-02	2.4E+02	N	NO	DLBSL
120-82-1	1,2,4-Trichlorobenzene	0.0063 - 0.035	3.5E-02	6.2E+01	N	NO	DLBSL
96-12-8	1,2-Dibromo-3-chloropropane	0.0063 - 0.035	3.5E-02	5.4E-02	C	NO	DLBSL
106-93-4	1,2-Dibromoethane	0.0063 - 0.035	3.5E-02	3.4E-01	C	NO	DLBSL
95-50-1	1,2-Dichlorobenzene	0.0063 - 0.035	3.5E-02	1.9E+03	N	NO	DLBSL
107-06-2	1,2-Dichloroethane	0.0063 - 0.035	3.5E-02	4.3E+00	C	NO	DLBSL
78-87-5	1,2-Dichloropropane	0.0063 - 0.035	3.5E-02	9.4E+00	C	NO	DLBSL
541-73-1	1,3-Dichlorobenzene	0.0063 - 0.035	3.5E-02	2.4E+01	C	NO	DLBSL
106-46-7	1,4-Dichlorobenzene	0.0063 - 0.035	3.5E-02	2.4E+01	C	NO	DLBSL
591-78-6	2-Hexanone	0.016 - 0.089	8.9E-02	2.1E+02	N	NO	DLBSL
108-10-1	4-Methyl-2-pentanone	0.016 - 0.089	8.9E-02	5.3E+03	N	NO	DLBSL
67-64-1	Acetone	0.016 - 0.089	8.9E-02	6.1E+04	N	NO	DLBSL
71-43-2	Benzene	0.0063 - 0.035	3.5E-02	1.1E+01	C	NO	DLBSL
75-27-4	Bromodichloromethane	0.0063 - 0.035	3.5E-02	2.7E+00	C	NO	DLBSL
75-25-2	Bromoform	0.0063 - 0.035	3.5E-02	6.1E+02	C	NO	DLBSL
74-83-9	Bromomethane	0.0063 - 0.035	3.5E-02	7.3E+00	N	NO	DLBSL
56-23-5	Carbon tetrachloride	0.0063 - 0.035	3.5E-02	6.1E+00	C	NO	DLBSL
108-90-7	Chlorobenzene	0.0063 - 0.035	3.5E-02	2.9E+02	N	NO	DLBSL
75-00-3	Chloroethane	0.0063 - 0.035	3.5E-02	1.5E+04	N	NO	DLBSL
67-66-3	Chloroform	0.0063 - 0.035	3.5E-02	2.9E+00	C	NO	DLBSL
74-87-3	Chloromethane	0.0063 - 0.035	3.5E-02	1.2E+02	N	NO	DLBSL
156-59-2	cis-1,2-Dichloroethene	0.0063 - 0.035	3.5E-02	1.6E+02	N	NO	DLBSL
10061-01-5	cis-1,3-Dichloropropene	0.0063 - 0.035	3.5E-02	1.7E+01	C	NO	DLBSL
110-82-7	Cyclohexane	0.0063 - 0.035	3.5E-02	1.2E+02	NS	NO	DLBSL
124-48-1	Dibromochloromethane	0.0063 - 0.035	3.5E-02	6.8E+00	C	NO	DLBSL
75-71-8	Dichlorodifluoromethane (Freon-12)	0.0063 - 0.035	3.5E-02	9.4E+01	N	NO	DLBSL
100-41-4	Ethylbenzene	0.0063 - 0.035	3.5E-02	5.4E+01	C	NO	DLBSL
98-82-8	Isopropylbenzene	0.0063 - 0.035	3.5E-02	2.1E+03	N	NO	DLBSL
m&pXYLENE	m- and p-Xylene	0.013 - 0.071	7.1E-02	5.9E+02	N	NO	DLBSL
79-20-9	Methyl acetate	0.0063 - 0.035	3.5E-02	7.8E+04	N	NO	DLBSL
108-87-2	Methylcyclohexane	0.0063 - 0.035	3.5E-02	5.7E+02	N	NO	DLBSL
75-09-2	Methylene chloride	0.0063 - 0.035	3.5E-02	1.1E+02	C	NO	DLBSL
1634-04-4	Methyl-tert-butyl ether (MTBE)	0.0063 - 0.035	3.5E-02	4.3E+02	C	NO	DLBSL
95-47-6	o-Xylene	0.0063 - 0.035	3.5E-02	6.9E+02	N	NO	DLBSL
127-18-4	Tetrachloroethene	0.0063 - 0.035	3.5E-02	5.5E+00	C	NO	DLBSL
108-88-3	Toluene	0.0063 - 0.035	3.5E-02	5.0E+03	N	NO	DLBSL
156-60-5	trans-1,2-Dichloroethene	0.0063 - 0.035	3.5E-02	1.5E+02	N	NO	DLBSL
10061-02-6	trans-1,3-Dichloropropene	0.0063 - 0.035	3.5E-02	1.7E+01	C	NO	DLBSL
79-01-6	Trichloroethene	0.0063 - 0.035	3.5E-02	4.4E+00	N	NO	DLBSL
75-69-4	Trichlorofluoromethane(Freon-11)	0.0063 - 0.035	3.5E-02	7.9E+02	N	NO	DLBSL
75-01-4	Vinyl chloride	0.0063 - 0.035	3.5E-02	6.0E-01	C	NO	DLBSL
1330-20-7	Xylene, total	0.0063 - 0.035	3.5E-02	6.3E+02	N	NO	DLBSL
7440-36-0	Antimony	1.2 - 4.1	4.1E+00	3.1E+01	N	NO	DLBSL
7440-43-9	Cadmium	0.58 - 2.1	2.1E+00	7.0E+01	N	NO	DLBSL
7782-49-2	Selenium	0.69 - 2.1	2.1E+00	3.9E+02	N	NO	DLBSL
7440-22-4	Silver	0.58 - 2.1	2.1E+00	3.9E+02	N	NO	DLBSL
7440-28-0	Thallium	1.2 - 4.1	4.1E+00	7.8E-01	N	NO	DLBSL

[1]Oak Ridge National Laboratory (ORNL). Nov. 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites. [Online]. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml. Ten times the adjusted (nc RSLs adjusted by dividing by 10) residential soil RSLs.

RSL value for 1,4-Dichlorobenzene used as surrogate for 1,3-Dichlorobenzene

Definitions:
C = Carcinogenic
N = Noncarcinogenic
NTX = No Toxicity Information
DLBSL = Detection limit below screening level
DLASL = Detection limit above screening level
mg/kg = milligrams per kilogram
NS - Concentration may exceeds Csat
C_{sat} - The contaminant concentration in soil at which the absorptive limits of the soil particles, the solubility limits of the soil pore water, and saturation of soil pore air have been reached