REMEDIAL INVESTIGATION REPORT

CHEMSOL INC. SUPERFUND SITE

PREPARED FOR:
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION II

VOLUME IX

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CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

CHM 002 2085

Appendix M

4802 200 MHO

APPENDIX M

95 PERCENT UPPER CONFIDENCE LIMIT CALCULATIONS

PCB: **AROCLOR 1254**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	0.0215	U	-3.8
C1-SB-19-01	0.0195	U	-3.9
C1-SB-20-01	0.0195	U	-3.9
C1-SB-21-01	0.0195	U	-3.9
C1-SB-22-01	0.024	J	-3.7
C1-SB-23-01	0.019	U	-4.0
C1-SB-24-01	0.0205	U	-3.9
C1-SB-25-01	0.02	U	-3.9
C1-SB-26-01	0.0205	U	-3.9
C1-SB-27-01	0.02	U	-3.9
C1-SB-28-01	0.02	U	-3.9
C1-SB-59-01	0.03	J	-3.5
C1-SB-81-01	0.0205	U	-3.9

Frequency:	2/13		
Average:	0.02	Sample Std. Dev.	0.003
Average log:	-3.87	Sample Std. Dev. (log value)	0.12
UCL:	0.02		
Maximum:	0.03		

OHM 002 2088

7/21/95 LOT 1A - SURF JIL

INORGANIC: **ARSENIC**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01		R	
C1-SB-19-01	3.80	J	1.3
C1-SB-20-01	2.30	B	0.8
C1-SB-21-01	2.10		0.7
C1-SB-22-01	0.50	UJ	-0.7
C1-SB-23-01	0.50	U	-0.7
C1-SB-24-01	0.36	U	-1.0
C1-SB-25-01	0.36	UJ	-1.0
C1-SB-26-01	0.90	BJ	-0.1
C1-SB-27-01	0.93	BJ	-0.1
C1-SB-28-01	2.30	BJ	0.8
C1-SB-59-01	1.20	B	0.2
C1-SB-81-01	2.40	B	0.9

Frequency:	8/13		
Average:	1.47	Sample Std. Dev.	1.09
Average log:	0.10	Sample Std. Dev.	0.82
UCL:	2.94	(log value)	
Maximum:	3.80		

* - The 95% UCL exceeds the maximum concentration detected in the samples.

CHM 002 2089

INORGANIC: **BARIUM**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	79.5		4.4
C1-SB-19-01	37.7	B	3.6
C1-SB-20-01	92.8		4.5
C1-SB-21-01	119.5		4.8
C1-SB-22-01	89.2		4.5
C1-SB-23-01	84.5		4.4
C1-SB-24-01	69.8		4.2
C1-SB-25-01	51.7		3.9
C1-SB-26-01	41.3	B	3.7
C1-SB-27-01	25.0	B	3.2
C1-SB-28-01	43.0	B	3.8
C1-SB-59-01	78.8		4.4
C1-SB-81-01	79.6		4.4

Frequency:	13/13		
Average:	68.65	Sample Std. Dev.	26.99
Average log:	4.14	Sample Std. Dev. (log value)	0.45
UCL:	92.07		
Maximum:	119.50		

CHM 002 2070

INORGANIC: **BERYLLIUM**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	0.95	B	-0.1
C1-SB-19-01	0.25	B	-1.4
C1-SB-20-01	0.48	B	-0.7
C1-SB-21-01	1.20	B	0.2
C1-SB-22-01	0.45	B	-0.8
C1-SB-23-01	0.48	B	-0.7
C1-SB-24-01	0.96	B	0.0
C1-SB-25-01	0.33	B	-1.1
C1-SB-26-01	0.33	B	-1.1
C1-SB-27-01	0.25	B	-1.4
C1-SB-28-01	0.25	B	-1.4
C1-SB-59-01	0.88	B	-0.1
C1-SB-81-01	0.40	B	-0.9

Frequency:	13/13		
Average:	0.55	Sample Std. Dev.	0.33
Average log:	-0.74	Sample Std. Dev. (log value)	0.56
UCL:	0.81		
Maximum:	1.20		

* - The 95% UCL exceeds the maximum concentration detected in the samples.

INORGANIC: **MANGANESE**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	184		5.2
C1-SB-19-01	469		6.2
C1-SB-20-01	247		5.5
C1-SB-21-01	500		6.2
C1-SB-22-01	59		4.1
C1-SB-23-01	30		3.4
C1-SB-24-01	423		6.0
C1-SB-25-01	335		5.8
C1-SB-26-01	77.6		4.4
C1-SB-27-01	69.3		4.2
C1-SB-28-01	54.4		4.0
C1-SB-59-01	90.9		4.5
C1-SB-81-01	53.3		4.0

Frequency:	13/13		
Average:	199.48	Sample Std. Dev.	175.12
Average log:	4.89	Sample Std. Dev. (log value)	0.97
UCL:	481.37		
Maximum:	500.00		

* - The 95% UCL exceeds the maximum concentration detected in the samples.

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7/21/95

LOT 1A - SURFACE

INORGANIC: **MERCURY**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	0.065	U	-2.7
C1-SB-19-01	0.65		-0.4
C1-SB-20-01	0.06	U	-2.8
C1-SB-21-01	0.06	U	-2.8
C1-SB-22-01	0.07	U	-2.7
C1-SB-23-01	0.06	U	-2.8
C1-SB-24-01	0.06	U	-2.8
C1-SB-25-01	0.10	U	-2.3
C1-SB-26-01	3.3		1.2
C1-SB-27-01	0.06	U	-2.8
C1-SB-28-01	0.06	U	-2.8
C1-SB-59-01	0.06	U	-2.8
C1-SB-81-01	0.06	U	-2.8

Frequency:	2/13		
Average:	0.36	Sample Std. Dev.	0.90
Average log:	-2.27	Sample Std. Dev. (log value)	1.23
UCL:	0.73		
Maximum:	3.30		

* - The 95% UCL exceeds the maximum concentration detected in the samples.

CHM 002 2093

INORGANIC: **SILVER**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	0.90	U	-0.1
C1-SB-19-01	0.85	U	-0.2
C1-SB-20-01	14.5		2.7
C1-SB-21-01	8.8	J	2.2
C1-SB-22-01	5.2		1.6
C1-SB-23-01	11.9		2.5
C1-SB-24-01	0.85	U	-0.2
C1-SB-25-01	0.85	U	-0.2
C1-SB-26-01	1.9	B	0.6
C1-SB-27-01	0.85	U	-0.2
C1-SB-28-01	0.85	U	-0.2
C1-SB-59-01	11.2		2.4
C1-SB-81-01	1.7	UJ	0.5

Frequency:	6/13		
Average:	4.64	Sample Std. Dev.	5.10
Average log:	0.90	Sample Std. Dev. (log value)	1.24
UCL:	17.63 *		
Maximum:	14.50		

* - 95% UCL EXCEEDS MAXIMUM DETECTED VALUE

DHM 002 2094

INORGANIC: **VANADIUM**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	54.3		4.0
C1-SB-19-01	28.1		3.3
C1-SB-20-01	25.4		3.2
C1-SB-21-01	36.8	J	3.6
C1-SB-22-01	18.2		2.9
C1-SB-23-01	15.8		2.8
C1-SB-24-01	34.8		3.5
C1-SB-25-01	26.3		3.3
C1-SB-26-01	19.8		3.0
C1-SB-27-01	23.3		3.1
C1-SB-28-01	17.7		2.9
C1-SB-59-01	37.8	J	3.6
C1-SB-81-01	20.2		3.0

Frequency:	13/13		
Average:	27.58	Sample Std. Dev.	10.88
Average log:	3.25	Sample Std. Dev. (log value)	0.36
UCL:	34.12		
Maximum:	54.30		

CHM 002 2095

INORGANIC: **ARSENIC**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-02	0.34	U	-1.1
C1-SB-19-02	0.67	BJ	-0.4
C1-SB-20-02	0.45	U	-0.8
C1-SB-21-02	0.45	UJ	-0.8
C1-SB-22-02	1.40	B	0.3
C1-SB-23-02	3.00	J	1.1
C1-SB-24-02	0.34	U	-1.1
C1-SB-25-02	0.345	UJ	-1.1
C1-SB-26-02	0.345	UJ	-1.1
C1-SB-27-02	0.345	U	-1.1
C1-SB-28-02	0.98	BJ	0.0
C1-SB-81-02	1.90	B	0.6
C1-SB-85-02	1.10	BJ	0.1
C1-SB-86-02	0.345	U	-1.1
C1-SB-87-02	3.45	UJ	1.2

Frequency:	6/15		
Average:	1.03	Sample Std. Dev.	1.010
Average log:	-0.33	Sample Std. Dev. (log value)	0.84
UCL:	1.76 *		
Maximum:	1.10		

* 95% UCL EXCEEDS MAXIMUM DETECTED VALUE

CHH 002 2096

INORGANIC: **MANGANESE**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-02	460		6.1
C1-SB-19-02	425		6.1
C1-SB-20-02	1450		7.3
C1-SB-21-02	1060		7.0
C1-SB-22-02	560		6.3
C1-SB-23-02	553		6.3
C1-SB-24-02	1430		7.3
C1-SB-25-02	658		6.5
C1-SB-26-02	377		5.9
C1-SB-27-02	394		6.0
C1-SB-28-02	2300		7.7
C1-SB-81-02	835		6.7
C1-SB-85-02	296		5.7
C1-SB-86-02	352		5.9
C1-SB-87-02	592		6.4

Frequency:	15/15		
Average:	782.80	Sample Std. Dev.	558.73
Average log:	6.48	Sample Std. Dev. (log value)	0.60
UCL:	1104.05		
Maximum:	2300.00		

INORGANIC: **MERCURY**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-02	0.055	U	-2.9
C1-SB-19-02	1.00		0.0
C1-SB-20-02	0.06	U	-2.9
C1-SB-21-02	0.06	U	-2.8
C1-SB-22-02	0.06	U	-2.8
C1-SB-23-02	0.53	U	-0.6
C1-SB-24-02	0.61		-0.5
C1-SB-25-02	0.06	U	-2.8
C1-SB-26-02	1.90		0.6
C1-SB-27-02	2.20		0.8
C1-SB-28-02	0.56		-0.6
C1-SB-81-02	0.06	U	-2.8
C1-SB-85-02	0.06	U	-2.8
C1-SB-86-02	0.34		-1.1
C1-SB-87-02	0.16		-1.8

Frequency:	7/15		
Average:	0.51	Sample Std. Dev.	0.69
Average log:	-1.54	Sample Std. Dev. (log value)	1.40
UCL:	2.22 *		
Maximum:	2.20		

* The 95% UCL exceeds the maximum concentration detected in the samples.

CHM 002 2048

PCB: **ALDRIN**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-08-01	0.001	U	-6.9
C1-SB-09-01	0.002	J	-6.2
C1-SB-10-01	0.058	D	-2.8
C1-SB-11-01	0.00225	U	-6.1
C1-SB-12-01	0.00105	U	-6.9
C1-SB-13-01	0.00105	U	-6.9
C1-SB-14-01	0.0029		-5.8
C1-SB-15-01	0.44	D	-0.8
C1-SB-16-01-AV	0.11	J	-2.2
C1-SB-17-01	0.14		-2.0
C1-SB-38-01	R		
C1-SB-39-01	R		
C1-SB-43-01	0.05	U	-3.0
C1-SB-46-01	0.13	D	-2.0
C1-SB-51-01	0.0035		-5.7
C1-SB-69-01	0.0033		-5.7
C1-SB-71A	0.0012	U	-6.7
C1-SB-73-01	0.032	J	-3.4
C1-SB-74-01	0.13	D	-2.0
C1-SB-75-01	8.3	D	2.1
C1-SB-76-01	R		
C1-SB-82-01	0.001	J	-6.9
C1-SB-83-01	0.0039		-5.5
C1-SB-84-01	0.00095	U	-7.0
SS-3	0.00027	J	-8.2
SS-4	0.0016	JP	-6.4

Frequency:	16/26		
Average:	0.41	Sample Std. Dev.	1.723
Average log:	-4.66	Sample Std. Dev. (log value)	2.60
UCL:	4.53		
Maximum:	8.30		

CHM 002 2099

INORGANIC: **ANTIMONY**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-08-01	5.25	U	1.7
C1-SB-09-01	5.55	UJ	1.7
C1-SB-10-01	5.45	UJ	1.7
C1-SB-11-01	5.85	U	1.8
C1-SB-12-01	5.55	U	1.7
C1-SB-13-01	5.4	U	1.7
C1-SB-14-01	5.45	UJ	1.7
C1-SB-15-01	5.35	UJ	1.7
C1-SB-16-01-AV	5.325	U	1.7
C1-SB-17-01	6.15	U	1.8
C1-SB-38-01	29.7	J	3.4
C1-SB-39-01	26.4		3.3
C1-SB-43-01	5.4	UJ	1.7
C1-SB-46-01	5.55	U	1.7
C1-SB-51-01	5.35	U	1.7
C1-SB-69-01	5.95	U	1.8
C1-SB-71A	6.35	U	1.8
C1-SB-73-01	5.35	U	1.7
C1-SB-74-01	5.45	UJ	1.7
C1-SB-75-01	5.4	UJ	1.7
C1-SB-76-01	5.95	U	1.8
C1-SB-82-01	5.8	U	1.8
C1-SB-83-01	5.2	U	1.6
C1-SB-84-01	5.35	U	1.7
SS-3	1.2	UN	0.2
SS-4	1.25	UN	0.2

Frequency:	2/26		
Average:	6.96	Sample Std. Dev.	6.34
Average log:	1.72	Sample Std. Dev. (log value)	0.63
UCL:	8.87		
Maximum:	29.70		

LOT 1B - SURF, OIL

PCB:	AROCLOR 1248		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-09-01	0.07	J	-2.7
C1-SB-09-01	0.019	U	-4.0
C1-SB-10-01	1.2	D	0.2
C1-SB-11-01	0.0435	U	-3.1
C1-SB-12-01	0.0205	U	-3.9
C1-SB-13-01	0.019	U	-4.0
C1-SB-14-01	0.0195	U	-3.9
C1-SB-15-01	11	DJ	2.4
C1-SB-16-01-AV	0.2	U	-1.6
C1-SB-17-01	3.6		1.3
C1-SB-38-01	0.195	U	-1.6
C1-SB-39-01	0.97		0.0
C1-SB-43-01	2.1	J	0.7
C1-SB-46-01	3.6		1.3
C1-SB-51-01	0.085		-2.5
C1-SB-69-01	0.059		-2.8
C1-SB-71A	0.023	U	-3.8
C1-SB-73-01	0.68	J	-0.4
C1-SB-74-01	6.1	D	1.8
C1-SB-75-01	310	D	5.7
C1-SB-76-01	0.37		-1.0
C1-SB-82-01	0.021	U	-3.9
C1-SB-83-01	0.055	J	-2.9
C1-SB-84-01	0.0185	U	-4.0
SS-3	0.018	U	-4.0
SS-4	0.086		-2.5

Frequency:	15/26		
Average:	13.10	Sample Std. Dev.	60.61
Average log:	-1.50	Sample Std. Dev. (log value)	2.55
UCL:	73.26		
Maximum:	310.00		

CHM 002 2101

PCB: **AROCLOR 1254**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-8-01	0.019	U	-4.0
C1-SB-09-01	R		
C1-SB-10-01	2.3	D	0.8
C1-SB-11-01	0.35		-1.0
C1-SB-12-01	0.0205	U	-3.9
C1-SB-13-01	0.019	U	-4.0
C1-SB-14-01	0.085		-2.5
C1-SB-15-01	4.5	D	1.5
C1-SB-16-01-AV	0.495	J	-0.7
C1-SB-17-01	1.6	J	0.5
C1-SB-38-01	3.1	J	1.1
C1-SB-39-01	6.6	D	1.9
C1-SB-43-01	3.9	J	1.4
C1-SB-46-01	0.095	U	-2.4
C1-SB-51-01	0.051		-3.0
C1-SB-69-01	0.14		-2.0
C1-SB-71A	0.023	U	-3.8
C1-SB-73-01	0.64	J	-0.4
C1-SB-74-01	1.5		0.4
C1-SB-75-01	47	J	3.9
C1-SB-76-01	0.19		-1.7
C1-SB-82-01	0.033	J	-3.4
C1-SB-83-01	0.13		-2.0
C1-SB-84-01	0.0185	U	-4.0
SS-3	0.018	U	-4.0
SS-4	0.019	U	-4.0

Frequency:	18/26		
Average:	2.91	Sample Std. Dev.	9.35
Average log:	-1.41	Sample Std. Dev. (log value)	2.31
UCL:	8.47		
Maximum:	47.00		

CHM 002 2102

PCB: **AROCLOR 1260**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-08-01	0.019	U	-4.0
C1-SB-09-01	0.044	J	-3.1
C1-SB-10-01	1.4	D	0.3
C1-SB-11-01	0.27	J	-1.3
C1-SB-12-01	0.0205	U	-3.9
C1-SB-13-01	0.019	U	-4.0
C1-SB-14-01	0.08		-2.5
C1-SB-15-01	4.1	D	1.4
C1-SB-16-01-AV	1.9	DJ	0.6
C1-SB-17-01	0.82		-0.2
C1-SB-38-01	2	J	0.7
C1-SB-39-01	8.6	D	2.2
C1-SB-43-01	43	J	3.8
C1-SB-46-01	0.095	U	-2.4
C1-SB-51-01	0.062		-2.8
C1-SB-69-01	0.084	J	-2.5
C1-SB-71A	0.1	J	-2.3
C1-SB-73-01	0.53	J	-0.6
C1-SB-74-01	3.2	D	1.2
C1-SB-75-01	170	D	5.1
C1-SB-76-01	0.19		-1.7
C1-SB-82-01	0.029	J	-3.5
C1-SB-83-01	0.087		-2.4
C1-SB-84-01	0.0185	U	-4.0
SS-3	0.018	UP	-4.0
SS-4	0.085	P	-2.5

Frequency:	20/26		
Average:	9.11	Sample Std. Dev.	33.88
Average log:	-1.24	Sample Std. Dev. (log value)	2.52
UCL:	84.91		
Maximum:	170.00		

CHM 002 2103

INORGANIC: **ARSENIC**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-08-01	0.69	UJ	-0.4
C1-SB-09-01	2.1	BJ	0.7
C1-SB-10-01	8		2.1
C1-SB-11-01	2.4	BJ	0.9
C1-SB-12-01	1.5	BJ	0.4
C1-SB-13-01	0.35	UJ	-1.0
C1-SB-14-01	2.2	B	0.8
C1-SB-15-01	1.3	B	0.3
C1-SB-16-01-AV	1.6	BJ	0.5
C1-SB-17-01	7.4		2.0
C1-SB-38-01	3.9		1.4
C1-SB-39-01	3		1.1
C1-SB-43-01	4.7		1.5
C1-SB-46-01	1.6	B	0.5
C1-SB-51-01	1.1	B	0.1
C1-SB-69-01	2.9		1.1
C1-SB-71A	4.9		1.6
C1-SB-73-01	1.5	BJ	0.4
C1-SB-74-01	1.9	B	0.6
C1-SB-75-01	0.92	B	-0.1
C1-SB-76-01	1.7	BJ	0.5
C1-SB-82-01	2.8		1.0
C1-SB-83-01	1.3	BJ	0.3
C1-SB-84-01	2.4		0.9
SS-3	5.3	S	1.7
SS-4	3.5	S	1.3

Frequency:	24/26		
Average:	2.73	Sample Std. Dev.	1.95
Average log:	0.77	Sample Std. Dev. (log value)	0.72
UCL:	3.84		
Maximum:	8.00		

INORGANIC: **CADMIUM**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-08-01	1.3		0.3
C1-SB-09-01	0.48	U	-0.7
C1-SB-10-01	6.2		1.8
C1-SB-11-01	0.5	U	-0.7
C1-SB-12-01	0.485	U	-0.7
C1-SB-13-01	3		1.1
C1-SB-14-01	1	BJ	0.0
C1-SB-15-01	0.465	U	-0.8
C1-SB-16-01-AV	1.33	J	0.3
C1-SB-17-01	0.55	U	-0.6
C1-SB-38-01	30		3.4
C1-SB-39-01	8.2		2.1
C1-SB-43-01	6.9		1.9
C1-SB-46-01	0.475	U	-0.7
C1-SB-51-01	0.465	U	-0.8
C1-SB-69-01	0.5	U	-0.7
C1-SB-71A	1.4	B	0.3
C1-SB-73-01	0.465	U	-0.8
C1-SB-74-01	5.1		1.6
C1-SB-75-01	3.7	J	1.3
C1-SB-76-01	0.5	U	-0.7
C1-SB-82-01	0.5	U	-0.7
C1-SB-83-01	0.45	U	-0.8
C1-SB-84-01	1.1	B	0.1
SS-3	0.55	U	-0.6
SS-4	0.55	U	-0.6

Frequency:	12/26		
Average:	2.93	Sample Std. Dev.	5.97
Average log:	0.17	Sample Std. Dev. (log value)	1.19
UCL:	4.79		
Maximum:	30.00		

CHM 002 2105

INORGANIC: **CHROMIUM VI**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-08-01	23.5		3.2
C1-SB-09-01	3.8		1.3
C1-SB-10-01	61.43		4.1
C1-SB-11-01	6.87		1.9
C1-SB-12-01	2.84		1.0
C1-SB-13-01	3.41		1.2
C1-SB-14-01	4.21		1.4
C1-SB-15-01	7.34		2.0
C1-SB-16-01-AV	17.7	J	2.9
C1-SB-17-01	13.03	J	2.6
C1-SB-38-01	25.71		3.2
C1-SB-39-01	8.44	J	2.1
C1-SB-43-01	6.71		1.9
C1-SB-46-01	27.14	J	3.3
C1-SB-51-01	4.57	J	1.5
C1-SB-69-01	8.26	J	2.1
C1-SB-71A	3.81		1.3
C1-SB-73-01	3.67		1.3
C1-SB-74-01	24.14		3.2
C1-SB-75-01	8.67		2.2
C1-SB-76-01	6.54	J	1.9
C1-SB-82-01	1.57		0.5
C1-SB-83-01	3.67		1.3
C1-SB-84-01	4.83		1.6
SS-3	3.17		1.2
SS-4	4.59		1.5

Frequency:	26/26		
Average:	11.14	Sample Std. Dev.	12.87
Average log:	1.99	Sample Std. Dev. (log value)	0.87
UCL:	16.40		
Maximum:	61.43		

CHM 002 2106

LOT 1B - SURFACE SOIL

PCB: **DIELDRIN**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-08-01	1.9	U	0.6
C1-SB-09-01	0.044	J	-3.1
C1-SB-10-01	0.064	D	-2.7
C1-SB-11-01	0.0053	JN	-5.2
C1-SB-12-01	0.00205	U	-6.2
C1-SB-13-01	0.0019	U	-6.3
C1-SB-14-01	0.043		-3.1
C1-SB-15-01	0.019	U	-4.0
C1-SB-16-01-AV	0.0275	J	-3.6
C1-SB-17-01	0.023	U	-3.8
C1-SB-38-01	R		
C1-SB-39-01	0.058	JN	-2.8
C1-SB-43-01	13	D	2.6
C1-SB-46-01	0.0095	U	-4.7
C1-SB-51-01	0.0019	U	-6.3
C1-SB-69-01	0.0087		-4.7
C1-SB-71A	0.0038	J	-5.6
C1-SB-73-01	0.051	J	-3.0
C1-SB-74-01	0.057		-2.9
C1-SB-75-01	R		
C1-SB-76-01	R		
C1-SB-82-01	0.0021	U	-6.2
C1-SB-83-01	0.0023	JN	-6.1
C1-SB-84-01	0.00185	U	-6.3
SS-3	0.00075	JP	-7.2
SS-4	0.06		-2.8

Frequency:	15/26		
Average:	0.67	Sample Std. Dev.	2.716
Average log:	-4.06	Sample Std. Dev. (log value)	2.31
UCL:	2.95		
Maximum:	13.00		

INORGANIC: **MANGANESE**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-08-01	282		5.6
C1-SB-09-01	814		6.7
C1-SB-10-01	746		6.6
C1-SB-11-01	1670		7.4
C1-SB-12-01	388		6.0
C1-SB-13-01	518		6.2
C1-SB-14-01	957		6.9
C1-SB-15-01	537		6.3
C1-SB-16-01-AV	1104	J	7.0
C1-SB-17-01	189		5.2
C1-SB-38-01	823		6.7
C1-SB-39-01	996		6.9
C1-SB-43-01	258		5.6
C1-SB-46-01	387		6.0
C1-SB-51-01	606		6.4
C1-SB-69-01	1840		7.5
C1-SB-71A	256		5.5
C1-SB-73-01	578		6.4
C1-SB-74-01	1010		6.9
C1-SB-75-01	679		6.5
C1-SB-76-01	1370		7.2
C1-SB-82-01	102		4.6
C1-SB-83-01	806		6.7
C1-SB-84-01	565		6.3
SS-3	166	N	5.1
SS-4	1030	N	6.9

Frequency:	26/26		
Average:	718.35	Sample Std. Dev.	447.77
Average log:	6.36	Sample Std. Dev. (log value)	0.73
UCL:	1034.28		
Maximum:	1840.00		

INORGANIC: **MERCURY**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-08-01	0.055	U	-2.9
C1-SB-09-01	2.7		1.0
C1-SB-10-01	2.8		1.0
C1-SB-11-01	0.16		-1.8
C1-SB-12-01	0.06	U	-2.8
C1-SB-13-01	0.06	U	-2.8
C1-SB-14-01	0.69		-0.4
C1-SB-15-01	2.6		1.0
C1-SB-16-01-AV	0.84	J	-0.2
C1-SB-17-01	0.065	U	-2.7
C1-SB-38-01	0.71		-0.3
C1-SB-39-01	0.06	U	-2.8
C1-SB-43-01	3.7		1.3
C1-SB-46-01	0.06	U	-2.8
C1-SB-51-01	0.06	U	-2.8
C1-SB-69-01	0.19		-1.7
C1-SB-71A	0.36		-1.0
C1-SB-73-01	0.06	U	-2.8
C1-SB-74-01	7.7		2.0
C1-SB-75-01	0.56		-0.6
C1-SB-76-01	0.17		-1.8
C1-SB-82-01	0.14		-2.0
C1-SB-83-01	1.2		0.2
C1-SB-84-01	0.06	U	-2.8
SS-3	0.02	U	-3.9
SS-4	0.13		-2.0

Frequency:	16/26		
Average:	0.97	Sample Std. Dev.	1.72
Average log:	-1.33	Sample Std. Dev. (log value)	1.66
UCL:	3.59		
Maximum:	7.70		

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INORGANIC: **THALLIUM**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-08-01	0.12	U	-2.1
C1-SB-09-01	0.12	U	-2.1
C1-SB-10-01	0.12	U	-2.1
C1-SB-11-01	0.125	U	-2.1
C1-SB-12-01	0.485	U	-0.7
C1-SB-13-01	0.115	UJ	-2.2
C1-SB-14-01	0.12	U	-2.1
C1-SB-15-01	0.115	U	-2.2
C1-SB-16-01-AV	0.115	U	-2.2
C1-SB-17-01	0.135	U	-2.0
C1-SB-38-01	0.12	U	-2.1
C1-SB-39-01	0.125	U	-2.1
C1-SB-43-01	0.115	U	-2.2
C1-SB-46-01	0.12	U	-2.1
C1-SB-51-01	0.465	U	-0.8
C1-SB-69-01	0.58	B	-0.5
C1-SB-71A	1.9	BJ	0.6
C1-SB-73-01	1.8	B	0.6
C1-SB-74-01	0.12	UJ	-2.1
C1-SB-75-01	0.115	U	-2.2
C1-SB-76-01	0.13	U	-2.0
C1-SB-82-01	0.125	U	-2.1
C1-SB-83-01	0.115	U	-2.2
C1-SB-84-01	0.465	U	-0.8
SS-3	0.44	UW	-0.8
SS-4	0.455	U	-0.8

Frequency:	3/26		
Average:	0.34	Sample Std. Dev.	0.47
Average log:	-1.59	Sample Std. Dev. (log value)	0.88
UCL:	0.46		
Maximum:	1.90		

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INORGANIC: **VANADIUM**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-08-01	22.5		3.1
C1-SB-09-01	27.6		3.3
C1-SB-10-01	40.7	J	3.7
C1-SB-11-01	219		5.4
C1-SB-12-01	36.4	J	3.6
C1-SB-13-01	33.5		3.5
C1-SB-14-01	35.6	J	3.6
C1-SB-15-01	34.4	J	3.5
C1-SB-16-01-AV	28.3		3.3
C1-SB-17-01	56.2		4.0
C1-SB-38-01	34.15	UJ	3.5
C1-SB-39-01	37.2		3.6
C1-SB-43-01	49.7	J	3.9
C1-SB-46-01	29.8		3.4
C1-SB-51-01	34.2	J	3.5
C1-SB-69-01	230	J	5.4
C1-SB-71A	47.2	J	3.9
C1-SB-73-01	28.3		3.3
C1-SB-74-01	27.5		3.3
C1-SB-75-01	32.8	J	3.5
C1-SB-76-01	200		5.3
C1-SB-82-01	18.5		2.9
C1-SB-83-01	26.1		3.3
C1-SB-84-01	219	J	5.4
SS-3	21.7		3.1
SS-4	48		3.9

Frequency:	25/26		
Average:	62.24	Sample Std. Dev.	68.00
Average log:	3.78	Sample Std. Dev. (log value)	0.74
UCL:	81.23		
Maximum:	230.00		

LOT 1A AND LC (SITE-WIDE)- SURFACE SOIL

PESTICIDE/PCB: **ALDRIN**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	0.0011	U	-6.8
C1-SB-19-01	0.001	U	-6.9
C1-SB-24-01	0.00105	U	-6.9
C1-SB-25-01	0.001	U	-6.9
C1-SB-26-01	0.00105	U	-6.9
C1-SB-27-01	0.00105	U	-6.9
C1-SB-28-01	0.001	U	-6.9
C1-SB-59-01	0.00105	U	-6.9
C1-SB-09-01	0.002	J	-6.2
C1-SB-10-01	0.058	D	-2.8
C1-SB-11-01	0.00225	U	-6.1
C1-SB-12-01	0.00105	U	-6.9
C1-SB-13-01	0.001	U	-6.9
C1-SB-14-01	0.0029		-5.8
C1-SB-15-01	0.44	D	-0.8
C1-SB-16-01-AV	0.11	J	-2.2
C1-SB-17-01	0.14		-2.0
C1-SB-20-01	0.001	U	-6.9
C1-SB-21-01-AV	0.001025	U	-6.9
C1-SB-22-01	0.00105	U	-6.9
C1-SB-23-01	0.001	U	-6.9
C1-SB-38-01	R		
C1-SB-39-01	R		
C1-SB-43-01	0.05	U	-3.0
C1-SB-46-01	0.13	D	-2.0
C1-SB-51-01	0.0035		-5.7
C1-SB-69-01	0.0033		-5.7
C1-SB-71A	0.0012	U	-6.7
C1-SB-73-01	0.032	J	-3.4
C1-SB-74-01	0.13	D	-2.0
C1-SB-75-01	8.3	D	2.1
C1-SB-76-01	R		
C1-SB-81-01	0.00105	U	-6.9
C1-SB-82-01	0.001	J	-6.9

Frequency:	16/35		
Average:	0.27	Sample Std. Dev.	1.40
Average log:	-5.42	Sample Std. Dev.	2.35
UCL:	0.38	(log value)	
Maximum:	8.30		

CHM 002 2112

C1-SB-83-01	0.0039	-5.5
C1-SB-84-01	0.00095 U	-7.0
SS-3	0.00027 J	-8.2
SS-4	0.0016 JP	-6.4

CHM 002 2113

LOT 1A AND LO SITE-WIDE)- SURFACE SOIL

PESTICIDE/PCB: DIELDRIN

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	0.00215	U	-6.1
C1-SB-19-01	0.00195	U	-6.2
C1-SB-24-01	0.00205	U	-6.2
C1-SB-25-01	0.002	U	-6.2
C1-SB-26-01	0.00205	U	-6.2
C1-SB-27-01	0.002	U	-6.2
C1-SB-28-01	0.002	U	-6.2
C1-SB-59-01	0.002	U	-6.2
C1-SB-09-01	0.044	J	-3.1
C1-SB-10-01	0.064	D	-2.7
C1-SB-11-01	0.0053	JN	-5.2
C1-SB-12-01	0.00205	U	-6.2
C1-SB-13-01	0.0019	U	-6.3
C1-SB-14-01	0.043		-3.1
C1-SB-15-01	0.019	U	-4.0
C1-SB-16-01-AV	0.0275	J	-3.6
C1-SB-17-01	0.023	U	-3.8
C1-SB-20-01	0.017		-4.1
C1-SB-21-01-AV	0.00195	U	-6.2
C1-SB-22-01	0.002	U	-6.2
C1-SB-23-01	0.00195	U	-6.2
C1-SB-38-01	R		
C1-SB-39-01	0.058	JN	-2.8
C1-SB-43-01	13	D	2.6
C1-SB-46-01	0.0095	U	-4.7
C1-SB-51-01	0.0019	U	-6.3
C1-SB-69-01	0.0087		-4.7
C1-SB-71A	0.0038	J	-5.6
C1-SB-73-01	0.051	J	-3.0
C1-SB-74-01	0.057		-2.9
C1-SB-75-01	R		
C1-SB-76-01	R		
C1-SB-81-01	0.00205	U	-6.2
C1-SB-82-01	0.0021	U	-6.2

Frequency:	15/35		
Average:	0.39	Sample Std. Dev.	2.19
Average log:	-4.93	Sample Std. Dev. (log value)	1.91
UCL:	0.16		
Maximum:	13.00		

C1-SB-83-01	0.0023 JN	-6.1
C1-SB-84-01	0.00185 U	-6.3
SS-3	0.00075 JP	-7.2
SS-4	0.06	-2.8

CHM 002 2115

LOT 1A AND LOT ,TE-WIDE)- SURFACE SOIL

PESTICIDE/PCB: **AROCLOR 1248**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	0.0215	U	-3.8
C1-SB-19-01	0.0195	U	-3.9
C1-SB-24-01	0.0205	U	-3.9
C1-SB-25-01	0.02	U	-3.9
C1-SB-26-01	0.0205	U	-3.9
C1-SB-27-01	0.02	U	-3.9
C1-SB-28-01	0.02	U	-3.9
C1-SB-59-01	0.02	U	-3.9
C1-SB-09-01	0.07	J	-2.7
C1-SB-10-01	1.2	D	0.2
C1-SB-11-01	0.0435	U	-3.1
C1-SB-12-01	0.0205	U	-3.9
C1-SB-13-01	0.019	U	-4.0
C1-SB-14-01	0.0195	U	-3.9
C1-SB-15-01	11	DJ	2.4
C1-SB-16-01-AV	0.2	U	-1.6
C1-SB-17-01	3.6		1.3
C1-SB-20-01	0.0195	U	-3.9
C1-SB-21-01-AV	0.0195	U	-3.9
C1-SB-22-01	0.02	U	-3.9
C1-SB-23-01	0.0195	U	-3.9
C1-SB-38-01	0.195	U	-1.6
C1-SB-39-01	0.97		0.0
C1-SB-43-01	2.1	J	0.7
C1-SB-46-01	3.6		1.3
C1-SB-51-01	0.085		-2.5
C1-SB-69-01	0.059		-2.8
C1-SB-71A	0.023	U	-3.8
C1-SB-73-01	0.68	J	-0.4
C1-SB-74-01	6.1	D	1.8
C1-SB-75-01	310	D	5.7
C1-SB-76-01	0.37		-1.0
C1-SB-81-01	0.0205	U	-3.9
C1-SB-82-01	0.021	U	-3.9

Frequency:	15/38		
Average:	8.97	Sample Std. Dev.	50.20
Average log:	-2.26	Sample Std. Dev. (log value)	2.38
UCL:	9.92		
Maximum:	310.00		

OHM 002 2116

C1-SB-83-01	0.055 J	-2.9
C1-SB-84-01	0.0185 U	-4.0
SS-3	0.018 U	-4.0
SS-4	0.086	-2.5

CHM 002 2117

LOT 1A AND LC (SITE-WIDE)- SURFACE SOIL

PESTICIDE/PCB: AROCLOR 1254

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	0.0215	U	-3.8
C1-SB-19-01	0.0195	U	-3.9
C1-SB-24-01	0.0205	U	-3.9
C1-SB-25-01	0.02	U	-3.9
C1-SB-26-01	0.0205	U	-3.9
C1-SB-27-01	0.02	U	-3.9
C1-SB-28-01	0.02	U	-3.9
C1-SB-59-01	0.03	J	-3.5
C1-SB-09-01	R		
C1-SB-10-01	2.3	D	0.8
C1-SB-11-01	0.35		-1.0
C1-SB-12-01	0.0205	U	-3.9
C1-SB-13-01	0.019	U	-4.0
C1-SB-14-01	0.085		-2.5
C1-SB-15-01	4.5	D	1.5
C1-SB-16-01-AV	0.495	J	-0.7
C1-SB-17-01	1.6	J	0.5
C1-SB-20-01	0.0195	U	-3.9
C1-SB-21-01-AV	0.0195	U	-3.9
C1-SB-22-01	0.024	J	-3.7
C1-SB-23-01	0.0195	U	-3.9
C1-SB-38-01	3.1	J	1.1
C1-SB-39-01	6.6	D	1.9
C1-SB-43-01	3.9	J	1.4
C1-SB-46-01	0.095	U	-2.4
C1-SB-51-01	0.051		-3.0
C1-SB-69-01	0.14		-2.0
C1-SB-71A	0.023	U	-3.8
C1-SB-73-01	0.64	J	-0.4
C1-SB-74-01	1.5	D	0.4
C1-SB-75-01	47	J	3.9
C1-SB-76-01	0.19		-1.7
C1-SB-81-01	0.0205	U	-3.9
C1-SB-82-01	0.033	J	-3.4

Frequency:	19/37		
Average:	1.98	Sample Std. Dev.	7.75
Average log:	-2.20	Sample Std. Dev. (log value)	2.22
UCL:	5.79		
Maximum:	47.00		

CHM 002 2116

C1-SB-83-01	0.13	-2.0
C1-SB-84-01	0.0185 U	-4.0
SS-3	0.018 U	-4.0
SS-4	0.019 U	-4.0

LOT 1A AND LC SITE-WIDE)- SURFACE SOIL

PESTICIDE/PCB: **AROCLOR 1260**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	0.0215	U	-3.8
C1-SB-19-01	0.0195	U	-3.9
C1-SB-24-01	0.0205	U	-3.9
C1-SB-25-01	0.02	U	-3.9
C1-SB-26-01	0.0205	U	-3.9
C1-SB-27-01	0.02	U	-3.9
C1-SB-28-01	0.02	U	-3.9
C1-SB-59-01	0.02	U	-3.9
C1-SB-09-01	0.044	J	-3.1
C1-SB-10-01	1.4	D	0.3
C1-SB-11-01	0.27	J	-1.3
C1-SB-12-01	0.0205	U	-3.9
C1-SB-13-01	0.019	U	-4.0
C1-SB-14-01	0.08		-2.5
C1-SB-15-01	4.1	D	1.4
C1-SB-16-01-AV	1.9	DJ	0.6
C1-SB-17-01	0.82		-0.2
C1-SB-20-01	0.0195	U	-3.9
C1-SB-21-01-AV	0.0195	U	-3.9
C1-SB-22-01	0.023	J	-3.8
C1-SB-23-01	0.0195	U	-3.9
C1-SB-38-01	2	J	0.7
C1-SB-39-01	8.6	D	2.2
C1-SB-43-01	43	J	3.8
C1-SB-46-01	0.095	U	-2.4
C1-SB-51-01	0.062		-2.8
C1-SB-69-01	0.084	J	-2.5
C1-SB-71A	0.1	J	-2.3
C1-SB-73-01	0.53	J	-0.6
C1-SB-74-01	3.2	D	1.2
C1-SB-75-01	170	D	5.1
C1-SB-76-01	0.19		-1.7
C1-SB-81-01	0.0205	U	-3.9
C1-SB-82-01	0.029	J	-3.5

Frequency:	21/38		
Average:	6.24	Sample Std. Dev.	28.18
Average log:	-2.08	Sample Std. Dev. (log value)	2.42
UCL:	13.28		
Maximum:	170.00		

CHM 002 2120

C1-SB-83-01	0.087	-2.4
C1-SB-84-01	0.0185 U	-4.0
SS-3	0.018 UP	-4.0
SS-4	0.085 P	-2.5

CHM 002 2121

LOT 1A AND LC ,SITE-WIDE)- SURFACE SOIL

INORGANIC:	ANTIMONY		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	5.85	U	1.8
C1-SB-19-01	5.45	U	1.7
C1-SB-24-01	5.5	U	1.7
C1-SB-25-01	5.55	U	1.7
C1-SB-26-01	5.6	U	1.7
C1-SB-27-01	5.6	U	1.7
C1-SB-28-01	5.45	U	1.7
C1-SB-59-01	5.6	U	1.7
C1-SB-09-01	5.55	UJ	1.7
C1-SB-10-01	5.45	UJ	1.7
C1-SB-11-01	5.85	U	1.8
C1-SB-12-01	5.55	U	1.7
C1-SB-13-01	5.4	U	1.7
C1-SB-14-01	5.45	UJ	1.7
C1-SB-15-01	5.35	UJ	1.7
C1-SB-16-01-AV	5.325	U	1.7
C1-SB-17-01	6.15	U	1.8
C1-SB-20-01	5.55	U	1.7
C1-SB-21-01-AV	5.55	U	1.7
C1-SB-22-01	5.75	U	1.7
C1-SB-23-01	5.45	U	1.7
C1-SB-38-01	29.7	J	3.4
C1-SB-39-01	26.4		3.3
C1-SB-43-01	5.4	UJ	1.7
C1-SB-46-01	5.55	U	1.7
C1-SB-51-01	5.35	U	1.7
C1-SB-69-01	5.95	UJ	1.8
C1-SB-71A	6.35	U	1.8
C1-SB-73-01	5.35	U	1.7
C1-SB-74-01	5.45	UJ	1.7
C1-SB-75-01	5.4	UJ	1.7
C1-SB-76-01	5.95	U	1.8
C1-SB-81-01	5.55	U	1.7
C1-SB-82-01	5.8	U	1.8

Frequency:	2/38		
Average:	6.53	Sample Std. Dev.	5.25
Average log:	1.72	Sample Std. Dev. (log value)	0.52
UCL:	7.52		
Maximum:	29.70		

C1-SB-83-01	5.2 U	1.6
C1-SB-84-01	5.35 U	1.7
SS-3	1.2 UN	0.2
SS-4	1.25 UN	0.2

LOT 1A AND L (SITE-WIDE)- SURFACE SOIL

INORGANIC:	ARSENIC		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	R		
C1-SB-19-01	3.8	J	1.3
C1-SB-24-01	0.36	U	-1.0
C1-SB-25-01	0.36	UJ	-1.0
C1-SB-26-01	0.9	BJ	-0.1
C1-SB-27-01	0.93	BJ	-0.1
C1-SB-28-01	2.3	BJ	0.8
C1-SB-59-01	1.2	B	0.2
C1-SB-09-01	2.1	BJ	0.7
C1-SB-10-01	8		2.1
C1-SB-11-01	2.4	BJ	0.9
C1-SB-12-01	1.5	BJ	0.4
C1-SB-13-01	0.35	UJ	-1.0
C1-SB-14-01	2.2	B	0.8
C1-SB-15-01	1.3	B	0.3
C1-SB-16-01-AV	1.6	BJ	0.5
C1-SB-17-01	7.4		2.0
C1-SB-20-01	2.3	B	0.8
C1-SB-21-01-AV	3.2		1.2
C1-SB-22-01	0.5	UJ	-0.7
C1-SB-23-01	0.475	U	-0.7
C1-SB-38-01	3.9		1.4
C1-SB-39-01	3		1.1
C1-SB-43-01	4.7		1.5
C1-SB-46-01	1.6	B	0.5
C1-SB-51-01	1.1	B	0.1
C1-SB-69-01	2.9		1.1
C1-SB-71A	4.9		1.6
C1-SB-73-01	1.5	BJ	0.4
C1-SB-74-01	1.9	B	0.6
C1-SB-75-01	0.92	B	-0.1
C1-SB-76-01	1.7	BJ	0.5
C1-SB-81-01	2.4	B	0.9
C1-SB-82-01	2.8		1.0

Frequency:	32/37		
Average:	2.41	Sample Std. Dev.	1.82
Average log:	0.59	Sample Std. Dev. (log value)	0.81
UCL:	3.37		
Maximum:	8.00		

CHM 002 2124

C1-SB-83-01	1.3 BJ	0.3
C1-SB-84-01	2.4	0.9
SS-3	5.3 S	1.7
SS-4	3.5 S	1.3

CHM 002 2125

LOT 1A AND B (SITE-WIDE)- SURFACE SOIL

INORGANIC:	CADMIUM		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	0.5	U	-0.7
C1-SB-19-01	0.475	U	-0.7
C1-SB-24-01	0.48	U	-0.7
C1-SB-25-01	0.48	U	-0.7
C1-SB-26-01	0.485	U	-0.7
C1-SB-27-01	0.485	U	-0.7
C1-SB-28-01	0.475	U	-0.7
C1-SB-59-01	0.49	U	-0.7
C1-SB-09-01	0.48	U	-0.7
C1-SB-10-01	6.2		1.8
C1-SB-11-01	0.5	U	-0.7
C1-SB-12-01	0.485	U	-0.7
C1-SB-13-01	3		1.1
C1-SB-14-01	1	BJ	0.0
C1-SB-15-01	0.465	U	-0.8
C1-SB-16-01-AV	1.33	J	0.3
C1-SB-17-01	0.55	U	-0.6
C1-SB-20-01	0.48	U	-0.7
C1-SB-21-01-AV	0.485	U	-0.7
C1-SB-22-01	0.5	U	-0.7
C1-SB-23-01	0.475	U	-0.7
C1-SB-38-01	30		3.4
C1-SB-39-01	8.2		2.1
C1-SB-43-01	6.9		1.9
C1-SB-46-01	0.475	U	-0.7
C1-SB-51-01	0.465	U	-0.8
C1-SB-69-01	0.5	U	-0.7
C1-SB-71A	1.4	B	0.3
C1-SB-73-01	0.465	U	-0.8
C1-SB-74-01	5.1		1.6
C1-SB-75-01	3.7	J	1.3
C1-SB-76-01	0.5	U	-0.7
C1-SB-81-01	0.48	U	-0.7
C1-SB-82-01	0.5	U	-0.7

Frequency:	11/38		
Average:	2.14	Sample Std. Dev.	5.04
Average log:	-0.14	Sample Std. Dev.	1.06
UCL:	2.32	(log value)	
Maximum:	30.00		

CHH 002 2126

C1-SB-83-01	0.45 U	-0.8
C1-SB-84-01	1.1 B	0.1
SS-3	0.55 U	-0.6
SS-4	0.55 U	-0.6

LOT 1A AND LC , (SITE-WIDE)- SURFACE SOIL

INORGANIC:	CHROMIUM VI		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	2.84		1.0
C1-SB-19-01	1.61		0.5
C1-SB-24-01	3.03		1.1
C1-SB-25-01	1.97		0.7
C1-SB-26-01	2.04		0.7
C1-SB-27-01	1.66		0.5
C1-SB-28-01	1.21		0.2
C1-SB-59-01	2.53		0.9
C1-SB-09-01	3.8		1.3
C1-SB-10-01	61.4		4.1
C1-SB-11-01	6.87		1.9
C1-SB-12-01	2.84		1.0
C1-SB-13-01	3.41		1.2
C1-SB-14-01	4.21		1.4
C1-SB-15-01	7.34		2.0
C1-SB-16-01-AV	17.7	J	2.9
C1-SB-17-01	13	J	2.6
C1-SB-20-01	2.03		0.7
C1-SB-21-01-AV	3.81	J	1.3
C1-SB-22-01	1.37		0.3
C1-SB-23-01	1.36		0.3
C1-SB-38-01	25.7		3.2
C1-SB-39-01	8.44	J	2.1
C1-SB-43-01	6.71		1.9
C1-SB-46-01	27.1	J	3.3
C1-SB-51-01	4.57	J	1.5
C1-SB-69-01	8.26		2.1
C1-SB-71A	3.81		1.3
C1-SB-73-01	3.67		1.3
C1-SB-74-01	24.1		3.2
C1-SB-75-01	8.67		2.2
C1-SB-76-01	6.54	J	1.9
C1-SB-81-01	1.67		0.5
C1-SB-82-01	1.57		0.5

Frequency:	38/38		
Average:	7.71	Sample Std. Dev.	11.16
Average log:	1.51	Sample Std. Dev.	0.94
UCL:	10.09	(log value)	
Maximum:	61.40		

CHM 002 2128

C1-SB-83-01	3.67	1.3
C1-SB-84-01	4.82	1.6
SS-3	3.17	1.2
SS-4	4.59	1.5

LOT 1A AND LO .SITE-WIDE)- SURFACE SOIL

INORGANIC:	MANGANESE		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	184		5.2
C1-SB-19-01	469		6.2
C1-SB-24-01	423		6.0
C1-SB-25-01	335		5.8
C1-SB-26-01	77.6		4.4
C1-SB-27-01	69.3		4.2
C1-SB-28-01	54.4		4.0
C1-SB-59-01	90.9		4.5
C1-SB-09-01	814		6.7
C1-SB-10-01	746		6.6
C1-SB-11-01	1670		7.4
C1-SB-12-01	388		6.0
C1-SB-13-01	518		6.2
C1-SB-14-01	957		6.9
C1-SB-15-01	537		6.3
C1-SB-16-01-AV	1104	J	7.0
C1-SB-17-01	189		5.2
C1-SB-20-01	247		5.5
C1-SB-21-01-AV	500		6.2
C1-SB-22-01	59.4		4.1
C1-SB-23-01	30.4		3.4
C1-SB-38-01	823		6.7
C1-SB-39-01	996		6.9
C1-SB-43-01	258		5.6
C1-SB-46-01	387		6.0
C1-SB-51-01	606		6.4
C1-SB-69-01	1840		7.5
C1-SB-71A	256		5.5
C1-SB-73-01	578		6.4
C1-SB-74-01	1010		6.9
C1-SB-75-01	679		6.5
C1-SB-76-01	1370		7.2
C1-SB-81-01	53.3		4.0
C1-SB-82-01	102		4.6

Frequency:	38/38		
Average:	552.32	Sample Std. Dev.	454.48
Average log:	5.87	Sample Std. Dev. (log value)	1.08
UCL:	997.11		
Maximum:	1840.00		

CHM 002 2130

C1-SB-83-01	806	6.7
C1-SB-84-01	565	6.3
SS-3	166 N	5.1
SS-4	1030 N	6.9

LOT 1A AND (SITE-WIDE)- SURFACE SOIL

INORGANIC: MERCURY

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	0.065	U	-2.7
C1-SB-19-01	0.65		-0.4
C1-SB-24-01	0.06	U	-2.8
C1-SB-25-01	0.1	U	-2.3
C1-SB-26-01	3.3		1.2
C1-SB-27-01	0.06	U	-2.8
C1-SB-28-01	0.06	U	-2.8
C1-SB-59-01	0.06	U	-2.8
C1-SB-09-01	2.7		1.0
C1-SB-10-01	2.8		1.0
C1-SB-11-01	0.16		-1.8
C1-SB-12-01	0.06	U	-2.8
C1-SB-13-01	0.06	U	-2.8
C1-SB-14-01	0.69		-0.4
C1-SB-15-01	2.6		1.0
C1-SB-16-01-AV	0.84	J	-0.2
C1-SB-17-01	0.065	U	-2.7
C1-SB-20-01	0.06	U	-2.8
C1-SB-21-01-AV	0.06	U	-2.8
C1-SB-22-01	0.065	U	-2.7
C1-SB-23-01	0.06	U	-2.8
C1-SB-38-01	0.71		-0.3
C1-SB-39-01	0.06	U	-2.8
C1-SB-43-01	3.7		1.3
C1-SB-46-01	0.06	U	-2.8
C1-SB-51-01	0.06	U	-2.8
C1-SB-69-01	0.19		-1.7
C1-SB-71A	0.36		-1.0
C1-SB-73-01	0.06	U	-2.8
C1-SB-74-01	7.7		2.0
C1-SB-75-01	0.56		-0.6
C1-SB-76-01	0.17		-1.8
C1-SB-81-01	0.06	U	-2.8
C1-SB-82-01	0.14		-2.0

Frequency:	18/38		
Average:	0.78	Sample Std. Dev.	1.53
Average log:	-1.61	Sample Std. Dev.	1.58
UCL:	1.60	(log value)	
Maximum:	7.70		

C1-SB-83-01	1.2	0.2
C1-SB-84-01	0.06 U	-2.8
SS-3	0.02 U	-3.9
SS-4	0.13	-2.0

CHM 002 2133

LOT 1A AND LO(ITE-WIDE)- SURFACE SOIL

INORGANIC:	THALLIUM		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	0.125	U	-2.1
C1-SB-19-01	0.1	U	-2.3
C1-SB-24-01	0.12	U	-2.1
C1-SB-25-01	0.12	U	-2.1
C1-SB-26-01	0.12	U	-2.1
C1-SB-27-01	0.12	U	-2.1
C1-SB-28-01	0.12	U	-2.1
C1-SB-59-01	0.49	U	-0.7
C1-SB-09-01	0.12	U	-2.1
C1-SB-10-01	0.12	U	-2.1
C1-SB-11-01	0.125	U	-2.1
C1-SB-12-01	0.485	U	-0.7
C1-SB-13-01	0.115	UJ	-2.2
C1-SB-14-01	0.12	U	-2.1
C1-SB-15-01	0.115	U	-2.2
C1-SB-16-01-AV	0.115	U	-2.2
C1-SB-17-01	0.135	U	-2.0
C1-SB-20-01	0.48	U	-0.7
C1-SB-21-01-AV	0.485	U	-0.7
C1-SB-22-01	0.5	U	-0.7
C1-SB-23-01	0.475	U	-0.7
C1-SB-38-01	0.12	U	-2.1
C1-SB-39-01	0.125	U	-2.1
C1-SB-43-01	0.115	U	-2.2
C1-SB-46-01	0.12	U	-2.1
C1-SB-51-01	0.465	U	-0.8
C1-SB-69-01	0.58	B	-0.5
C1-SB-71A	1.9	BJ	0.6
C1-SB-73-01	1.8	B	0.6
C1-SB-74-01	0.12	UJ	-2.1
C1-SB-75-01	0.115	U	-2.2
C1-SB-76-01	0.13	U	-2.0
C1-SB-81-01	0.12	U	-2.1
C1-SB-82-01	0.125	U	-2.1

Frequency:	3/38		
Average:	0.32	Sample Std. Dev.	0.40
Average log:	-1.58	Sample Std. Dev. (log value)	0.82
UCL:	0.39		
Maximum:	1.90		

C1-SB-83-01	0.115 U	-2.2
C1-SB-84-01	0.465 U	-0.8
SS-3	0.44 UW	-0.8
SS-4	0.455 U	-0.8

LOT 1A AND LC SITE-WIDE)- SURFACE SOIL

INORGANIC: **VANADIUM**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-01	54.3		4.0
C1-SB-19-01	28.1		3.3
C1-SB-24-01	34.8		3.5
C1-SB-25-01	26.3		3.3
C1-SB-26-01	19.8		3.0
C1-SB-27-01	23.3		3.1
C1-SB-28-01	17.7		2.9
C1-SB-59-01	37.8	J	3.6
C1-SB-09-01	27.6		3.3
C1-SB-10-01	40.7	J	3.7
C1-SB-11-01	219		5.4
C1-SB-12-01	36.4	J	3.6
C1-SB-13-01	33.5		3.5
C1-SB-14-01	35.6	J	3.6
C1-SB-15-01	34.4	J	3.5
C1-SB-16-01-AV	28.3		3.3
C1-SB-17-01	56.2		4.0
C1-SB-20-01	25.4		3.2
C1-SB-21-01-AV	36.9	J	3.6
C1-SB-22-01	18.2		2.9
C1-SB-23-01	15.8		2.8
C1-SB-38-01	34.15	UJ	3.5
C1-SB-39-01	37.2		3.6
C1-SB-43-01	49.7	J	3.9
C1-SB-46-01	29.8		3.4
C1-SB-51-01	34.2	J	3.5
C1-SB-69-01	230	J	5.4
C1-SB-71A	47.2	J	3.9
C1-SB-73-01	28.3		3.3
C1-SB-74-01	27.5		3.3
C1-SB-75-01	32.8	J	3.5
C1-SB-76-01	200		5.3
C1-SB-81-01	20.2		3.0
C1-SB-82-01	18.5		2.9

Frequency:	37/38		
Average:	51.43	Sample Std. Dev.	58.50
Average log:	3.62	Sample Std. Dev. (log value)	0.69
UCL:	59.58		
Maximum:	230.00		

CHM 002 2136

C1-SB-83-01	26.1	3.3
C1-SB-84-01	219 J	5.4
SS-3	21.7	3.1
SS-4	48	3.9

CHM 002 2137

VOCS: 1,1,2,2-TETRACHLOROETHANE

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-02	0.0055	UJ	-5.2
C1-SB-19-02	0.0055	U	-5.2
C1-SB-24-02	0.0055	U	-5.2
C1-SB-25-02	0.0055	U	-5.2
C1-SB-26-02	0.0055	U	-5.2
C1-SB-27-02	0.006	U	-5.1
C1-SB-28-02	0.006	U	-5.1
C1-SB-85-02	0.0055	U	-5.2
C1-SB-86-02	0.006	U	-5.1
C1-SB-87-02	0.006	U	-5.1
C1-SB-08-01	0.006	U	-5.1
C1-SB-08-02	0.0055	U	-5.2
C1-SB-09-02	0.0055	U	-5.2
C1-SB-10-02	0.0055	U	-5.2
C1-SB-11-02	0.0305	UJ	-3.5
C1-SB-11E-02	0.006	U	-5.1
C1-SB-12-02	0.006	U	-5.1
C1-SB-13-02	0.0055	U	-5.2
C1-SB-14-02	0.0055	U	-5.2
C1-SB-15-02	0.0055	U	-5.2
C1-SB-15N-02	0.006	U	-5.1
C1-SB-16-02	0.004	J	-5.5
C1-SB-17-02	0.058		-2.8
C1-SB-17S-02	0.0055	U	-5.2
C1-SB-20-02	0.0055	U	-5.2
C1-SB-21-02	0.0055	U	-5.2
C1-SB-22-02	0.0055	U	-5.2
C1-SB-23-02	0.0055	U	-5.2
C1-SB-35E-02	0.028	UJ	-3.6
C1-SB-35W-02	0.006	U	-5.1
C1-SB-37N-02	0.006	U	-5.1
C1-SB-37W-02	0.0055	U	-5.2
C1-SB-38-02	0.0055	U	-5.2
C1-SB-41N-02	0.0055	U	-5.2

Frequency:	3/52		
Average:	0.19	Sample Std. Dev.	1.25
Average log:	-4.84	Sample Std. Dev. (log value)	1.27
UCL:	0.03		
Maximum:	9.00		

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C1-SB-43N-02	0.0055 U	-5.2
C1-SB-43W-02	0.0055 U	-5.2
C1-SB-44N-02	0.0055 U	-5.2
C1-SB-45S-02	0.0055 U	-5.2
C1-SB-51S-02	0.006 U	-5.1
C1-SB-52S-02AV	0.0055 U	-5.2
C1-SB-63-02	0.0055 U	-5.2
C1-SB-72-02	0.0055 U	-5.2
C1-SB-73-02	0.0055 U	-5.2
C1-SB-74-02	0.7 U	-0.4
C1-SB-75-02	0.0055 U	-5.2
C1-SB-76-02	9	2.2
C1-SB-81-02	0.0055 U	-5.2
C1-SB-82-02	0.006 U	-5.1
C1-SB-83-02-AV	0.00575 U	-5.2
C1-SB-84-02	0.006 U	-5.1
SS-1	0.0055 U	-5.2
SS-2	0.0055 U	-5.2

CHM 002 2139

LOT 1A AND LC .B (SITE-WIDE)- SUBSURFACE SOIL

PESTICIDES/PCBs: **ALDRIN**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-02	0.00095	U	-7.0
C1-SB-19-02	0.00095	U	-7.0
C1-SB-24-02	0.00095	U	-7.0
C1-SB-25-02	0.001	U	-6.9
C1-SB-26-02	0.001	U	-6.9
C1-SB-27-02	0.001	U	-6.9
C1-SB-28-02	0.001	U	-6.9
C1-SB-85-02	0.0021		-6.2
C1-SB-86-02	0.001	U	-6.9
C1-SB-87-02	0.001	U	-6.9
C1-SB-08-01	0.001	U	-6.9
C1-SB-08-02	0.00095	U	-7.0
C1-SB-09-02	0.00095	U	-7.0
C1-SB-10-02	0.0024		-6.0
C1-SB-11-02	0.001	U	-6.9
C1-SB-11E-02	0.0016	J	-6.4
C1-SB-12-02	0.001	U	-6.9
C1-SB-13-02	0.00095	U	-7.0
C1-SB-14-02	0.00095	U	-7.0
C1-SB-15-02	0.0051		-5.3
C1-SB-15N-02	0.001	U	-6.9
C1-SB-16-02	0.0049	U	-5.3
C1-SB-17-02	0.0053		-5.2
C1-SB-17S-02	0.00095	U	-7.0
C1-SB-20-02	0.00095	U	-7.0
C1-SB-21-02	0.00095	U	-7.0
C1-SB-22-02	0.00095	U	-7.0
C1-SB-23-02	0.00095	U	-7.0
C1-SB-35E-02	0.001	U	-6.9
C1-SB-35W-02	0.0028		-5.9
C1-SB-37N-02	0.001	U	-6.9
C1-SB-37W-02	0.00095	U	-7.0
C1-SB-38-02	R		
C1-SB-41N-02	0.00095	U	-7.0

Frequency:	10/50		
Average:	0.005	Sample Std. Dev.	0.02
Average log:	-6.59	Sample Std. Dev. (log value)	0.99
UCL:	0.003		
Maximum:	0.140		

CHM 002 2140

C1-SB-43N-02	0.00095 U	-7.0
C1-SB-43W-02	0.00095 U	-7.0
C1-SB-44N-02	0.00095 U	-7.0
C1-SB-45S-02	0.00095 U	-7.0
C1-SB-51S-02	0.001 U	-6.9
C1-SB-52S-02AV	0.00095 U	-7.0
C1-SB-63-02	0.00095 U	-7.0
C1-SB-72-02	0.00095 U	-7.0
C1-SB-73-02	0.0093 J	-4.7
C1-SB-74-02	R	
C1-SB-75-02	0.033	-3.4
C1-SB-76-02	0.14 J	-2.0
C1-SB-81-02	0.00095 U	-7.0
C1-SB-82-02	0.00095 U	-7.0
C1-SB-83-02-AV	0.00095 U	-7.0
C1-SB-84-02	0.001 U	-6.9
SS-1	0.0003 J	-8.1
SS-2	0.0009 U	-7.0

CHM 002 2141

LOT 1A AND L. J (SITE-WIDE)- SUBSURFACE SOIL

PESTICIDES/PCBs: DIELDRIN

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-02	0.00185	U	-6.3
C1-SB-19-02	0.00185	U	-6.3
C1-SB-24-02	0.00185	U	-6.3
C1-SB-25-02	0.0019	U	-6.3
C1-SB-26-02	0.0019	U	-6.3
C1-SB-27-02	0.0019	U	-6.3
C1-SB-28-02	0.00195	U	-6.2
C1-SB-85-02	0.0019	U	-6.3
C1-SB-86-02	0.0019	U	-6.3
C1-SB-87-02	0.0019	U	-6.3
C1-SB-08-01	0.0019	U	-6.3
C1-SB-08-02	0.00185	U	-6.3
C1-SB-09-02	0.00185	UJ	-6.3
C1-SB-10-02	0.0021	J	-6.2
C1-SB-11-02	0.0019	U	-6.3
C1-SB-11E-02	0.0019	U	-6.3
C1-SB-12-02	0.00195	U	-6.2
C1-SB-13-02	0.00185	U	-6.3
C1-SB-14-02	0.0018	U	-6.3
C1-SB-15-02	0.00175	U	-6.3
C1-SB-15N-02	0.00195	U	-6.2
C1-SB-16-02	0.043		-3.1
C1-SB-17-02	0.00185	U	-6.3
C1-SB-17S-02	0.00185	U	-6.3
C1-SB-20-02	0.00185	U	-6.3
C1-SB-21-02	0.00185	U	-6.3
C1-SB-22-02	0.0018	U	-6.3
C1-SB-23-02	0.00185	U	-6.3
C1-SB-35E-02	0.0019	U	-6.3
C1-SB-35W-02	0.0048		-5.3
C1-SB-37N-02	R		
C1-SB-37W-02	0.00185	U	-6.3
C1-SB-38-02	R		
C1-SB-41N-02	0.034		-3.4

Frequency:	9/49		
Average:	0.007	Sample Std. Dev.	0.02
Average log:	-5.87	Sample Std. Dev.	1.00
UCL:	0.006	(log value)	
Maximum:	0.130		

CHW 002 2142

C1-SB-43N-02	0.0051	-5.3
C1-SB-43W-02	0.0095 J	-4.7
C1-SB-44N-02	0.017 JN	-4.1
C1-SB-45S-02	0.00185 U	-6.3
C1-SB-51S-02	0.00195 U	-6.2
C1-SB-52S-02AV	0.00185 U	-6.3
C1-SB-63-02	0.00185 U	-6.3
C1-SB-72-02	0.00185 U	-6.3
C1-SB-73-02	0.13 J	-2.0
C1-SB-74-02	R	
C1-SB-75-02	0.0095 U	-4.7
C1-SB-76-02	0.0275 UJ	-3.6
C1-SB-81-02	0.00185 U	-6.3
C1-SB-82-02	0.00185 U	-6.3
C1-SB-83-02-AV	0.0019 U	-6.3
C1-SB-84-02	0.00195 U	-6.2
SS-1	0.0011 JPB	-6.8
SS-2	0.00185 U	-6.3

LOT 1A AND , (SITE-WIDE)- SUBSURFACE SOIL

PESTICIDES/PCBs: **TOXAPHENE**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-02	0.095	U	-2.4
C1-SB-19-02	0.095	U	-2.4
C1-SB-24-02	0.095	U	-2.4
C1-SB-25-02	0.1	U	-2.3
C1-SB-26-02	0.1	U	-2.3
C1-SB-27-02	0.1	U	-2.3
C1-SB-28-02	0.1	U	-2.3
C1-SB-85-02	0.1	U	-2.3
C1-SB-86-02	0.1	U	-2.3
C1-SB-87-02	0.1	U	-2.3
C1-SB-08-01	0.1	U	-2.3
C1-SB-08-02	0.095	U	-2.4
C1-SB-09-02	0.095	UJ	-2.4
C1-SB-10-02	0.09	U	-2.4
C1-SB-11-02	0.1	U	-2.3
C1-SB-11E-02	0.1	U	-2.3
C1-SB-12-02	0.1	U	-2.3
C1-SB-13-02	0.095	U	-2.4
C1-SB-14-02	0.095	U	-2.4
C1-SB-15-02	0.09	U	-2.4
C1-SB-15N-02	0.1	U	-2.3
C1-SB-16-02	0.49	U	-0.7
C1-SB-17-02	0.095	U	-2.4
C1-SB-17S-02	0.095	U	-2.4
C1-SB-20-02	0.095	U	-2.4
C1-SB-21-02	0.095	U	-2.4
C1-SB-22-02	0.095	U	-2.4
C1-SB-23-02	0.095	U	-2.4
C1-SB-35E-02	0.1	U	-2.3
C1-SB-35W-02	0.1	U	-2.3
C1-SB-37N-02	0.1	U	-2.3
C1-SB-37W-02	0.095	U	-2.4
C1-SB-38-02	0.5	U	-0.7
C1-SB-41N-02	0.095	U	-2.4

Frequency:	1/51		
Average:	0.56	Sample Std. Dev.	3.06
Average log:	-2.10	Sample Std. Dev. (log value)	0.86
UCL:	0.23		
Maximum:	22.00		

C1-SB-43N-02	0.095 U	-2.4
C1-SB-43W-02	0.095 U	-2.4
C1-SB-44N-02	0.095 U	-2.4
C1-SB-45S-02	0.095 U	-2.4
C1-SB-51S-02	0.1 U	-2.3
C1-SB-52S-02AV	0.095 U	-2.4
C1-SB-63-02	0.095 U	-2.4
C1-SB-72-02	0.095 U	-2.4
C1-SB-73-02	0.47 UJ	-0.8
C1-SB-74-02	22 D	3.1
C1-SB-75-02	0.49 U	-0.7
C1-SB-76-02	R	
C1-SB-81-02	0.095 U	-2.4
C1-SB-82-02	0.095 U	-2.4
C1-SB-83-02-AV	0.095 U	-2.4
C1-SB-84-02	0.1 U	-2.3
SS-1	0.095 U	-2.4
SS-2	0.09 U	-2.4

CHM 002 2145

LOT 1A AND LOT 1B (SITE-WIDE)- SUBSURFACE SOIL

PESTICIDES/PCBs: **AROCLOR 1248**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-02	0.0185	U	-4.0
C1-SB-19-02	0.0185	U	-4.0
C1-SB-24-02	0.0185	U	-4.0
C1-SB-25-02	0.019	U	-4.0
C1-SB-26-02	0.019	U	-4.0
C1-SB-27-02	0.019	U	-4.0
C1-SB-28-02	0.0195	U	-3.9
C1-SB-85-02	0.054	J	-2.9
C1-SB-86-02	0.019	U	-4.0
C1-SB-87-02	0.019	U	-4.0
C1-SB-08-01	0.019	U	-4.0
C1-SB-08-02	0.0185	U	-4.0
C1-SB-09-02	0.0185	UJ	-4.0
C1-SB-10-02	0.052	J	-3.0
C1-SB-11-02	R		
C1-SB-11E-02	0.019	U	-4.0
C1-SB-12-02	0.0195	U	-3.9
C1-SB-13-02	0.0185	U	-4.0
C1-SB-14-02	0.018	U	-4.0
C1-SB-15-02	0.13		-2.0
C1-SB-15N-02	1.5		0.4
C1-SB-16-02	R		
C1-SB-17-02	0.12		-2.1
C1-SB-17S-02	0.3		-1.2
C1-SB-20-02	0.0185	U	-4.0
C1-SB-21-02	0.0185	U	-4.0
C1-SB-22-02	0.018	U	-4.0
C1-SB-23-02	0.0185	U	-4.0
C1-SB-35E-02	0.019	U	-4.0
C1-SB-35W-02	0.043	J	-3.1
C1-SB-37N-02	0.0195	U	-3.9
C1-SB-37W-02	0.0185	U	-4.0
C1-SB-38-02	0.1	U	-2.3
C1-SB-41N-02	0.0185	U	-4.0

Frequency:	12/50		
Average:	0.21	Sample Std. Dev.	0.85
Average log:	-3.31	Sample Std. Dev. (log value)	1.31
UCL:	0.14		
Maximum:	5.80		

CHM 002 2146

C1-SB-43N-02	0.0185 U	-4.0
C1-SB-43W-02	0.0185 U	-4.0
C1-SB-44N-02	0 0185 U	-4.0
C1-SB-45S-02	0.0185 U	-4.0
C1-SB-51S-02	0.086	-2.5
C1-SB-52S-02AV	0.145 J	-1.9
C1-SB-63-02	0 0185 U	-4.0
C1-SB-72-02	0.0185 U	-4.0
C1-SB-73-02	0.14 J	-2.0
C1-SB-74-02	0.19 U	-1.7
C1-SB-75-02	1.2	0.2
C1-SB-76-02	5.8 DJ	1.8
C1-SB-81-02	0.0185 U	-4.0
C1-SB-82-02	0.0185 U	-4.0
C1-SB-83-02-AV	0.019 U	-4.0
C1-SB-84-02	0.0195 U	-3.9
SS-1	0.019 U	-4.0
SS-2	0.0185 U	-4.0

LOT 1A AND LC (SITE-WIDE)- SUBSURFACE SOIL

PESTICIDES/PCBs: **AROCLOR 1254**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-02	0.0185	U	-4.0
C1-SB-19-02	0.0185	U	-4.0
C1-SB-24-02	0.0185	U	-4.0
C1-SB-25-02	0.019	U	-4.0
C1-SB-26-02	0.019	U	-4.0
C1-SB-27-02	0.019	U	-4.0
C1-SB-28-02	0.0195	U	-3.9
C1-SB-85-02	0.032	J	-3.4
C1-SB-86-02	0.019	U	-4.0
C1-SB-87-02	0.019	U	-4.0
C1-SB-08-01	0.019	U	-4.0
C1-SB-08-02	0.0185	U	-4.0
C1-SB-09-02	0.0185	UJ	-4.0
C1-SB-10-02	0.07	J	-2.7
C1-SB-11-02	0.019	U	-4.0
C1-SB-11E-02	0.019	U	-4.0
C1-SB-12-02	0.0195	U	-3.9
C1-SB-13-02	0.0185	U	-4.0
C1-SB-14-02	0.018	U	-4.0
C1-SB-15-02	0.086	J	-2.5
C1-SB-15N-02	0.0195	U	-3.9
C1-SB-16-02	1.4	JD	
C1-SB-17-02	R		
C1-SB-17S-02	0.0185	U	-4.0
C1-SB-20-02	0.0185	U	-4.0
C1-SB-21-02	0.0185	U	-4.0
C1-SB-22-02	0.018	U	-4.0
C1-SB-23-02	0.0185	U	-4.0
C1-SB-35E-02	0.019	U	-4.0
C1-SB-35W-02	0.093	J	-2.4
C1-SB-37N-02	0.52		-0.7
C1-SB-37W-02	0.0185	U	-4.0
C1-SB-38-02	1.5		0.4
C1-SB-41N-02	0.0185	U	-4.0

Frequency:	14/50		
Average:	0.15	Sample Std. Dev.	0.37
Average log:	-3.32	Sample Std. Dev.	1.23
UCL:	0.12	(log value)	
Maximum:	1.70		

CHM 002 2148

C1-SB-43N-02	0.043 J	-3.1
C1-SB-43W-02	0.22	-1.5
C1-SB-44N-02	0.48	-0.7
C1-SB-45S-02	0.0185 U	-4.0
C1-SB-51S-02	0.0195 U	-3.9
C1-SB-52S-02AV	0.0185 U	-4.0
C1-SB-63-02	0.0185 U	-4.0
C1-SB-72-02	0.0185 U	-4.0
C1-SB-73-02	0.21 J	-1.6
C1-SB-74-02	0.19 U	-1.7
C1-SB-75-02	0.2	-1.6
C1-SB-76-02	R	
C1-SB-81-02	0.0185 U	-4.0
C1-SB-82-02	0.0185 U	-4.0
C1-SB-83-02-AV	0.019 U	-4.0
C1-SB-84-02	0.0195 U	-3.9
SS-1	0.062	-2.8
SS-2	1.7	0.5

CHM 002 2149

LOT 1A AND LOT 1B (SITE-WIDE)- SUBSURFACE SOIL

PESTICIDES/PCBs: **AROCLOR 1260**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-02	0.0185	U	-4.0
C1-SB-19-02	0.0185	U	-4.0
C1-SB-24-02	0.0185	U	-4.0
C1-SB-25-02	0.019	U	-4.0
C1-SB-26-02	0.019	U	-4.0
C1-SB-27-02	0.019	U	-4.0
C1-SB-28-02	0.0195	U	-3.9
C1-SB-85-02	0.021	J	-3.9
C1-SB-86-02	0.019	U	-4.0
C1-SB-87-02	0.019	U	-4.0
C1-SB-08-01	0.019	U	-4.0
C1-SB-08-02	0.0185	U	-4.0
C1-SB-09-02	0.0185	UJ	-4.0
C1-SB-10-02	0.059		-2.8
C1-SB-11-02	0.058		-2.8
C1-SB-11E-02	0.068		-2.7
C1-SB-12-02	0.0195	U	-3.9
C1-SB-13-02	0.0185	U	-4.0
C1-SB-14-02	0.018	U	-4.0
C1-SB-15-02	0.068		-2.7
C1-SB-15N-02	0.19		-1.7
C1-SB-16-02	2.6	D	1.0
C1-SB-17-02	0.04		-3.2
C1-SB-17S-02	0.0185	U	-4.0
C1-SB-20-02	0.0185	U	-4.0
C1-SB-21-02	0.0185	U	-4.0
C1-SB-22-02	0.018	U	-4.0
C1-SB-23-02	0.0185	U	-4.0
C1-SB-35E-02	0.019	U	-4.0
C1-SB-35W-02	0.045		-3.1
C1-SB-37N-02	0.0195	U	-3.9
C1-SB-37W-02	0.0185	U	-4.0
C1-SB-38-02	0.42		-0.9
C1-SB-41N-02	0.0185	U	-4.0

Frequency:	14/51		
Average:	0.11	Sample Std. Dev.	0.38
Average log:	-3.45	Sample Std. Dev. (log value)	1.08
UCL:	0.08		
Maximum:	2.60		

C1-SB-43N-02	0.0185 U	-4.0
C1-SB-43W-02	0.0185 U	-4.0
C1-SB-44N-02	0.0185 U	-4.0
C1-SB-45S-02	0.0185 U	-4.0
C1-SB-51S-02	0.03 J	-3.5
C1-SB-52S-02AV	0.0575	-2.9
C1-SB-63-02	0.0185 U	-4.0
C1-SB-72-02	0.0185 U	-4.0
C1-SB-73-02	0.2 J	-1.6
C1-SB-74-02	0.19 U	-1.7
C1-SB-75-02	0.73	-0.3
C1-SB-76-02	R	
C1-SB-81-02	0.0185 U	-4.0
C1-SB-82-02	0.0185 U	-4.0
C1-SB-83-02-AV	0.019 U	-4.0
C1-SB-84-02	0.0195 U	-3.9
SS-1	0.019 U	-4.0
SS-2	0.0185 U	-4.0

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LOT 1A AND LOT 1B (SITE-WIDE)- SUBSURFACE SOIL

INORGANIC:	ANTIMONY		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-02	5.25	U	1.7
C1-SB-19-02	5.1	U	1.6
C1-SB-24-02	5.2	U	1.6
C1-SB-25-02	5.3	U	1.7
C1-SB-26-02	5.3	U	1.7
C1-SB-27-02	5.3	U	1.7
C1-SB-28-02	5.5	U	1.7
C1-SB-85-02	5.3	U	1.7
C1-SB-86-02	5.3	U	1.7
C1-SB-87-02	5.3	U	1.7
C1-SB-08-01	5.25	U	1.7
C1-SB-08-02	5.2	U	1.6
C1-SB-09-02	5.15	UJ	1.6
C1-SB-10-02	5	UJ	1.6
C1-SB-11-02	5.35	U	1.7
C1-SB-11E-02	5.35	U	1.7
C1-SB-12-02	5.3	U	1.7
C1-SB-13-02	5.15	U	1.6
C1-SB-14-02	5.1	UJ	1.6
C1-SB-15-02	5	UJ	1.6
C1-SB-15N-02	5.45	U	1.7
C1-SB-16-02	5.35	U	1.7
C1-SB-17-02	5.3	U	1.7
C1-SB-17S-02	5.2	U	1.6
C1-SB-20-02	5.25	U	1.7
C1-SB-21-02	5.15	U	1.6
C1-SB-22-02	5.1	U	1.6
C1-SB-23-02	5.2	U	1.6
C1-SB-35E-02	5.3	U	1.7
C1-SB-35W-02	5.5	U	1.7
C1-SB-37N-02	5.4	U	1.7
C1-SB-37W-02	5.15	U	1.6
C1-SB-38-02	5.5	UJ	1.7
C1-SB-41N-02	5.2	U	1.6

Frequency:	2/52		
Average:	5.17	Sample Std. Dev.	0.43
Average log:	1.64	Sample Std. Dev. (log value)	0.11
UCL:	5.31 *		
Maximum:	3.90		

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C1-SB-43N-02	5.25 U	1.7
C1-SB-43W-02	4.75 U	1.6
C1-SB-44N-02	5.3 U	1.7
C1-SB-45S-02	5.15 U	1.6
C1-SB-51S-02	5.25 U	1.7
C1-SB-52S-02AV	5.25 U	1.7
C1-SB-63-02	5.2 U	1.6
C1-SB-72-02	5.2 U	1.6
C1-SB-73-02	5.1 U	1.6
C1-SB-74-02	5.3 UJ	1.7
C1-SB-75-02	5.35 UJ	1.7
C1-SB-76-02	5.1 U	1.6
C1-SB-81-02	5.1 U	1.6
C1-SB-82-02	5.25 U	1.7
C1-SB-83-02-AV	5.275 U	1.7
C1-SB-84-02	5.6 U	1.7
SS-1	2.6 N*	1.0
SS-2	3.9 N*	1.4

* - The 95% UCL exceeds the maximum concentration detected in the samples.

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LOT 1A AND LOT 1B (SITE-WIDE)- SUBSURFACE SOIL

INORGANIC:	ARSENIC		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-02	0.34	U	-1.1
C1-SB-19-02	0.67	BJ	-0.4
C1-SB-24-02	0.34	U	-1.1
C1-SB-25-02	0.345	UJ	-1.1
C1-SB-26-02	0.345	UJ	-1.1
C1-SB-27-02	0.34	U	-1.1
C1-SB-28-02	0.98	BJ	0.0
C1-SB-85-02	1.1	BJ	0.1
C1-SB-86-02	0.345	U	-1.1
C1-SB-87-02	3.45	UJ	1.2
C1-SB-08-01	0.345	UJ	-1.1
C1-SB-08-02	1.1	BJ	0.1
C1-SB-09-02	1.8	B	0.6
C1-SB-10-02	1.5	B	0.4
C1-SB-11-02	1.4	BJ	0.3
C1-SB-11E-02	0.85	B	-0.2
C1-SB-12-02	1.4	BJ	0.3
C1-SB-13-02	0.335	UJ	-1.1
C1-SB-14-02	0.33	U	-1.1
C1-SB-15-02	1.2	B	0.2
C1-SB-15N-02	0.96	BJ	0.0
C1-SB-16-02	1.6	B	0.5
C1-SB-17-02	1.6	B	0.5
C1-SB-17S-02	1.6	BJ	0.5
C1-SB-20-02	0.455	U	-0.8
C1-SB-21-02	0.445	UJ	-0.8
C1-SB-22-02	1.4	B	0.3
C1-SB-23-02	3	J	1.1
C1-SB-35E-02	0.9	BJ	-0.1
C1-SB-35W-02	0.355	U	-1.0
C1-SB-37N-02	3.55	U	1.3
C1-SB-37W-02	0.335	U	-1.1
C1-SB-38-02	1.3	B	0.3
C1-SB-41N-02	1.5	BJ	0.4

Frequency:	33/52		
Average:	1.11	Sample Std. Dev.	0.82
Average log:	-0.15	Sample Std. Dev. (log value)	0.73
UCL:	1.39		
Maximum:	3.40		

C1-SB-43N-02	1.1 B	0.1
C1-SB-43W-02	1.5 BJ	0.4
C1-SB-44N-02	0.345 U	-1.1
C1-SB-45S-02	1 BJ	0.0
C1-SB-51S-02	0.88 B	-0.1
C1-SB-52S-02AV	0.79 BJ	-0.2
C1-SB-63-02	0.34 UJ	-1.1
C1-SB-72-02	0.34 UJ	-1.1
C1-SB-73-02	0.335 UJ	-1.1
C1-SB-74-02	1.6 B	0.5
C1-SB-75-02	0.89 B	-0.1
C1-SB-76-02	1 B	0.0
C1-SB-81-02	1.9 B	0.6
C1-SB-82-02	1.2 B	0.2
C1-SB-83-02-AV	0.56 BJ	-0.6
C1-SB-84-02	1.2 B	0.2
SS-1	1.8 B	0.6
SS-2	3.4	1.2

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LOT 1A AND LC . . . (SITE-WIDE)- SUBSURFACE SOIL

INORGANIC:	BARIUM		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-02	130		4.9
C1-SB-19-02	101		4.6
C1-SB-24-02	139		4.9
C1-SB-25-02	113		4.7
C1-SB-26-02	62.6		4.1
C1-SB-27-02	51		3.9
C1-SB-28-02	180		5.2
C1-SB-85-02	81.6		4.4
C1-SB-86-02	96		4.6
C1-SB-87-02	95.1		4.6
C1-SB-08-01	64.1		4.2
C1-SB-08-02	96.1		4.6
C1-SB-09-02	163		5.1
C1-SB-10-02	114		4.7
C1-SB-11-02	215		5.4
C1-SB-11E-02	135		4.9
C1-SB-12-02	221		5.4
C1-SB-13-02	99		4.6
C1-SB-14-02	117		4.8
C1-SB-15-02	184		5.2
C1-SB-15N-02	116		4.8
C1-SB-16-02	102		4.6
C1-SB-17-02	170		5.1
C1-SB-17S-02	183		5.2
C1-SB-20-02	144		5.0
C1-SB-21-02	116		4.8
C1-SB-22-02	158		5.1
C1-SB-23-02	121		4.8
C1-SB-35E-02	117		4.8
C1-SB-35W-02	52.8		4.0
C1-SB-37N-02	127		4.8
C1-SB-37W-02	84.7		4.4
C1-SB-38-02	145		5.0
C1-SB-41N-02	178		5.2

Frequency:	52/52		
Average:	168.10	Sample Std. Dev.	226.69
Average log:	4.90	Sample Std. Dev.	0.52
UCL:	177.17	(log value)	
Maximum:	1730.00		

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C1-SB-43N-02	146	5.0
C1-SB-43W-02	127	4.8
C1-SB-44N-02	109	4.7
C1-SB-45S-02	116	4.8
C1-SB-51S-02	268	5.6
C1-SB-52S-02AV	185	5.2
C1-SB-63-02	102	4.6
C1-SB-72-02	103	4.6
C1-SB-73-02	86.3	4.5
C1-SB-74-02	218	5.4
C1-SB-75-02	171	5.1
C1-SB-76-02	1730	7.5
C1-SB-81-02	173	5.2
C1-SB-82-02	301	5.7
C1-SB-83-02-AV	173	5.2
C1-SB-84-02	195	5.3
SS-1	120	4.8
SS-2	146	5.0

CHM 002 2157

LOT 1A AND LO. .B (SITE-WIDE)- SUBSURFACE SOIL

INORGANIC:	BERYLLIUM						
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)	Frequency:	52/52		
				Average:	1.33	Sample Std. Dev.	0.41
				Average log:	0.23	Sample Std. Dev.	0.33
C1-SB-18-02	0.85	B	-0.2	UCL:	1.45	(log value)	
C1-SB-19-02	0.84	B	-0.2	Maximum:	2.30		
C1-SB-24-02	1.5		0.4				
C1-SB-25-02	1.4		0.3				
C1-SB-26-02	0.75	B	-0.3				
C1-SB-27-02	0.64	B	-0.4				
C1-SB-28-02	0.89	B	-0.1				
C1-SB-85-02	1	B	0.0				
C1-SB-86-02	1.4		0.3				
C1-SB-87-02	1.5		0.4				
C1-SB-08-01	0.68	B	-0.4				
C1-SB-08-02	1	B	0.0				
C1-SB-09-02	1.1	B	0.1				
C1-SB-10-02	1	B	0.0				
C1-SB-11-02	1.9		0.6				
C1-SB-11E-02	1.7		0.5				
C1-SB-12-02	1.2		0.2				
C1-SB-13-02	1.3		0.3				
C1-SB-14-02	1.6		0.5				
C1-SB-15-02	1.5		0.4				
C1-SB-15N-02	1.6		0.5				
C1-SB-16-02	0.49	B	-0.7				
C1-SB-17-02	1.2		0.2				
C1-SB-17S-02	1.7		0.5				
C1-SB-20-02	2.1		0.7				
C1-SB-21-02	1.7		0.5				
C1-SB-22-02	1.8		0.6				
C1-SB-23-02	1.5		0.4				
C1-SB-35E-02	1.4		0.3				
C1-SB-35W-02	0.88	B	-0.1				
C1-SB-37N-02	1.8		0.6				
C1-SB-37W-02	1.1		0.1				
C1-SB-38-02	0.95	B	-0.1				
C1-SB-41N-02	1.7		0.5				

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C1-SB-43N-02	1.7	0.5
C1-SB-43W-02	2.3	0.8
C1-SB-44N-02	1.7	0.5
C1-SB-45S-02	1.6	0.5
C1-SB-51S-02	1.7	0.5
C1-SB-52S-02AV	1.5	0.4
C1-SB-63-02	0.86 B	-0.2
C1-SB-72-02	1.3	0.3
C1-SB-73-02	0.98 B	0.0
C1-SB-74-02	1.7	0.5
C1-SB-75-02	1.1 B	0.1
C1-SB-76-02	1.3	0.3
C1-SB-81-02	1.1	0.1
C1-SB-82-02	0.98 B	0.0
C1-SB-83-02-AV	0.86 B	-0.2
C1-SB-84-02	2.1	0.7
SS-1	1.3	0.3
SS-2	1.3	0.3

CHM 002 2159

LOT 1A AND LC. J (SITE-WIDE)- SUBSURFACE SOIL

INORGANIC:	CHROMIUM VI		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-02	2.87		1.1
C1-SB-19-02	2.76		1.0
C1-SB-24-02	4.63		1.5
C1-SB-25-02	4.31		1.5
C1-SB-26-02	2.54		0.9
C1-SB-27-02	2.56		0.9
C1-SB-28-02	2.21		0.8
C1-SB-85-02	3.54		1.3
C1-SB-86-02	4.17		1.4
C1-SB-87-02	4.31		1.5
C1-SB-08-01	3.36		1.2
C1-SB-08-02	3.4		1.2
C1-SB-09-02	3.9		1.4
C1-SB-10-02	7.44		2.0
C1-SB-11-02	5.33		1.7
C1-SB-11E-02	3.83		1.3
C1-SB-12-02	3.09	J	1.1
C1-SB-13-02	3.66		1.3
C1-SB-14-02	4.13		1.4
C1-SB-15-02	3.76		1.3
C1-SB-15N-02	4.46		1.5
C1-SB-16-02	29.4	J	3.4
C1-SB-17-02	4.77	J	1.6
C1-SB-17S-02	4.34		1.5
C1-SB-20-02	6.07	J	1.8
C1-SB-21-02	5.46	J	1.7
C1-SB-22-02	4.26	J	1.4
C1-SB-23-02	4.17	J	1.4
C1-SB-35E-02	4.44		1.5
C1-SB-35W-02	3.64		1.3
C1-SB-37N-02	3.77		1.3
C1-SB-37W-02	3.61		1.3
C1-SB-38-02	4.6		1.5
C1-SB-41N-02	2.37		0.9

Frequency:	52/52		
Average:	5.10	Sample Std. Dev.	4.18
Average log:	1.49	Sample Std. Dev.	0.45
UCL:	5.51	(log value)	
Maximum:	29.4		

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C1-SB-43N-02	3.1	1.1
C1-SB-43W-02	4.96	1.6
C1-SB-44N-02	6.63	1.9
C1-SB-45S-02	11.1	2.4
C1-SB-51S-02	5.76	1.8
C1-SB-52S-02AV	4.5	1.5
C1-SB-63-02	3.34	1.2
C1-SB-72-02	4.1	1.4
C1-SB-73-02	3.79	1.3
C1-SB-74-02	17.7	2.9
C1-SB-75-02	5.59	1.7
C1-SB-76-02	4.74 J	1.6
C1-SB-81-02	3.6 J	1.3
C1-SB-82-02	3.47 J	1.2
C1-SB-83-02-AV	3.49	1.2
C1-SB-84-02	5.81	1.8
SS-1	5.21	1.7
SS-2	7.1	2.0

CHM 002 2161

LOT 1A AND LOT 1B (SITE-WIDE)- SUBSURFACE SOIL

INORGANIC:	MANGANESE		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-02	460		6.1
C1-SB-19-02	425		6.1
C1-SB-24-02	1430		7.3
C1-SB-25-02	658		6.5
C1-SB-26-02	377		5.9
C1-SB-27-02	394		6.0
C1-SB-28-02	2300		7.7
C1-SB-85-02	296		5.7
C1-SB-86-02	352		5.9
C1-SB-87-02	592		6.4
C1-SB-08-01	282		5.6
C1-SB-08-02	603		6.4
C1-SB-09-02	1750		7.5
C1-SB-10-02	755		6.6
C1-SB-11-02	884		6.8
C1-SB-11E-02	926		6.8
C1-SB-12-02	1580		7.4
C1-SB-13-02	564		6.3
C1-SB-14-02	513		6.2
C1-SB-15-02	668		6.5
C1-SB-15N-02	349		5.9
C1-SB-16-02	322		5.8
C1-SB-17-02	623		6.4
C1-SB-17S-02	577		6.4
C1-SB-20-02	1450		7.3
C1-SB-21-02	1060		7.0
C1-SB-22-02	560		6.3
C1-SB-23-02	553		6.3
C1-SB-35E-02	661		6.5
C1-SB-35W-02	643		6.5
C1-SB-37N-02	642		6.5
C1-SB-37W-02	468		6.1
C1-SB-38-02	660		6.5
C1-SB-41N-02	877		6.8

Frequency:	52/52		
Average:	768.58	Sample Std. Dev.	398.37
Average log:	6.54	Sample Std. Dev. (log value)	0.46
UCL:	861.53		
Maximum:	2300.00		

C1-SB-43N-02	675	6.5
C1-SB-43W-02	741	6.6
C1-SB-44N-02	1010	6.9
C1-SB-45S-02	734	6.6
C1-SB-51S-02	573	6.4
C1-SB-52S-02AV	498	6.2
C1-SB-63-02	739	6.6
C1-SB-72-02	594	6.4
C1-SB-73-02	547	6.3
C1-SB-74-02	1050	7.0
C1-SB-75-02	1030	6.9
C1-SB-76-02	905	6.8
C1-SB-81-02	835	6.7
C1-SB-82-02	1540	7.3
C1-SB-83-02-AV	748	6.6
C1-SB-84-02	671	6.5
SS-1	823	6.7
SS-2	999	6.9

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LOT 1A AND LOT 1B (SITE-WIDE)- SUBSURFACE SOIL

INORGANIC:	MERCURY		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-02	0.055	U	-2.9
C1-SB-19-02	1		0.0
C1-SB-24-02	0.61		-0.5
C1-SB-25-02	0.06	U	-2.8
C1-SB-26-02	1.9		0.6
C1-SB-27-02	2.2		0.8
C1-SB-28-02	0.56		-0.6
C1-SB-85-02	0.06	U	-2.8
C1-SB-86-02	0.34		-1.1
C1-SB-87-02	0.16		-1.8
C1-SB-08-01	0.055	U	-2.9
C1-SB-08-02	0.055	U	-2.9
C1-SB-09-02	0.25		-1.4
C1-SB-10-02	0.28		-1.3
C1-SB-11-02	0.06	U	-2.8
C1-SB-11E-02	0.22		-1.5
C1-SB-12-02	0.06	U	-2.8
C1-SB-13-02	0.055	U	-2.9
C1-SB-14-02	0.13		-2.0
C1-SB-15-02	0.16		-1.8
C1-SB-15N-02	0.61		-0.5
C1-SB-16-02	0.25		-1.4
C1-SB-17-02	0.055	U	-2.9
C1-SB-17S-02	0.055	U	-2.9
C1-SB-20-02	0.055	U	-2.9
C1-SB-21-02	0.055	U	-2.9
C1-SB-22-02	0.055	U	-2.9
C1-SB-23-02	0.53		-0.6
C1-SB-35E-02	0.06	U	-2.8
C1-SB-35W-02	0.8		-0.2
C1-SB-37N-02	0.06	U	-2.8
C1-SB-37W-02	0.055	U	-2.9
C1-SB-38-02	0.44		-0.8
C1-SB-41N-02	0.055	U	-2.9

Frequency:	25/52		
Average:	0.31	Sample Std. Dev.	0.57
Average log:	-2.02	Sample Std. Dev. (log value)	1.19
UCL:	0.41		
Maximum:	3.00		

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C1-SB-43N-02	0.19	-1.7
C1-SB-43W-02	0.05 U	-3.0
C1-SB-44N-02	0.06 U	-2.8
C1-SB-45S-02	0.055 U	-2.9
C1-SB-51S-02	3	1.1
C1-SB-52S-02AV	0.09	-2.4
C1-SB-63-02	0.055 U	-2.9
C1-SB-72-02	0.14	-2.0
C1-SB-73-02	0.055 U	-2.9
C1-SB-74-02	0.17	-1.8
C1-SB-75-02	0.17	-1.8
C1-SB-76-02	0.055 U	-2.9
C1-SB-81-02	0.055 U	-2.9
C1-SB-82-02	0.055 U	-2.9
C1-SB-83-02-AV	0.31	-1.2
C1-SB-84-02	0.2	-1.6
SS-1	0.02 U	-3.9
SS-2	0.02 U	-3.9

LOT 1A AND LOT 1B (SITE-WIDE)- SUBSURFACE SOIL

INORGANIC:	THALLIUM						
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)	Frequency:	3/52		
				Average:	0.20	Sample Std. Dev.	0.20
				Average log:	-1.86	Sample Std. Dev.	0.62
C1-SB-18-02	0.115	U	-2.2	UCL:	0.22	(log value)	
C1-SB-19-02	0.11	U	-2.2	Maximum:	1.20		
C1-SB-24-02	0.115	U	-2.2				
C1-SB-25-02	0.115	U	-2.2				
C1-SB-26-02	0.115	U	-2.2				
C1-SB-27-02	0.115	U	-2.2				
C1-SB-28-02	0.12	U	-2.1				
C1-SB-85-02	0.115	U	-2.2				
C1-SB-86-02	0.115	U	-2.2				
C1-SB-87-02	0.115	U	-2.2				
C1-SB-08-01	0.115	U	-2.2				
C1-SB-08-02	0.52	B	-0.7				
C1-SB-09-02	0.11	U	-2.2				
C1-SB-10-02	0.11	U	-2.2				
C1-SB-11-02	0.115	U	-2.2				
C1-SB-11E-02	0.115	U	-2.2				
C1-SB-12-02	0.46	U	-0.8				
C1-SB-13-02	0.11	U	-2.2				
C1-SB-14-02	0.11	U	-2.2				
C1-SB-15-02	0.11	U	-2.2				
C1-SB-15N-02	0.12	U	-2.1				
C1-SB-16-02	0.115	U	-2.2				
C1-SB-17-02	0.115	U	-2.2				
C1-SB-17S-02	0.115	U	-2.2				
C1-SB-20-02	0.455	U	-0.8				
C1-SB-21-02	0.445	U	-0.8				
C1-SB-22-02	0.44	U	-0.8				
C1-SB-23-02	0.455	U	-0.8				
C1-SB-35E-02	0.115	U	-2.2				
C1-SB-35W-02	0.12	U	-2.1				
C1-SB-37N-02	0.12	U	-2.1				
C1-SB-37W-02	0.11	U	-2.2				
C1-SB-38-02	0.4	B	-0.9				
C1-SB-41N-02	0.115	UJ	-2.2				

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C1-SB-43N-02	0.115 UJ	-2.2
C1-SB-43W-02	0.105 U	-2.3
C1-SB-44N-02	0.115 U	-2.2
C1-SB-45S-02	0.11 UJ	-2.2
C1-SB-51S-02	0.115 U	-2.2
C1-SB-52S-02AV	0.115 U	-2.2
C1-SB-63-02	0.115 U	-2.2
C1-SB-72-02	0.115 UJ	-2.2
C1-SB-73-02	1.2 B	0.2
C1-SB-74-02	0.115 U	-2.2
C1-SB-75-02	0.115 U	-2.2
C1-SB-76-02	0.11 U	-2.2
C1-SB-81-02	0.11 U	-2.2
C1-SB-82-02	0.115 U	-2.2
C1-SB-83-02-AV	0.115 U	-2.2
C1-SB-84-02	0.49 U	-0.7
SS-1	0.455 U	-0.8
SS-2	0.435 U	-0.8

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LOT 1A AND LOT 1B (SITE-WIDE)- SUBSURFACE SOIL

INORGANIC:	VANADIUM		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-18-02	19.3		3.0
C1-SB-19-02	21.7		3.1
C1-SB-24-02	31.1		3.4
C1-SB-25-02	33.2		3.5
C1-SB-26-02	18.9		2.9
C1-SB-27-02	21.5		3.1
C1-SB-28-02	16.3		2.8
C1-SB-85-02	24.8		3.2
C1-SB-86-02	30.4		3.4
C1-SB-87-02	31.2		3.4
C1-SB-08-01	22.5		3.1
C1-SB-08-02	25.2		3.2
C1-SB-09-02	31.4	J	3.4
C1-SB-10-02	29.8		3.4
C1-SB-11-02	52		4.0
C1-SB-11E-02	27.8		3.3
C1-SB-12-02	18.3		2.9
C1-SB-13-02	29.2		3.4
C1-SB-14-02	27.9		3.3
C1-SB-15-02	30.6	J	3.4
C1-SB-15N-02	35.4		3.6
C1-SB-16-02	23.3		3.1
C1-SB-17-02	30.1		3.4
C1-SB-17S-02	35.7		3.6
C1-SB-20-02	53.2	J	4.0
C1-SB-21-02	38.6	J	3.7
C1-SB-22-02	33.4	J	3.5
C1-SB-23-02	27		3.3
C1-SB-35E-02	35.1		3.6
C1-SB-35W-02	25.5		3.2
C1-SB-37N-02	27.1		3.3
C1-SB-37W-02	29.2		3.4
C1-SB-38-02	27.3		3.3
C1-SB-41N-02	16.3		2.8

Frequency:	52/52		
Average:	30.05	Sample Std. Dev.	8.40
Average log:	3.37	Sample Std. Dev. (log value)	0.27
UCL:	32.11		
Maximum:	53.20		

C1-SB-43N-02	28.1	3.3
C1-SB-43W-02	40.3	3.7
C1-SB-44N-02	52.1	4.0
C1-SB-45S-02	33.2	3.5
C1-SB-51S-02	38.5	3.7
C1-SB-52S-02AV	22.2	3.1
C1-SB-63-02	25.6	3.2
C1-SB-72-02	27.8	3.3
C1-SB-73-02	24	3.2
C1-SB-74-02	27.7	3.3
C1-SB-75-02	29.1	3.4
C1-SB-76-02	31	3.4
C1-SB-81-02	25.9	3.3
C1-SB-82-02	23.8	3.2
C1-SB-83-02-AV	28	3.3
C1-SB-84-02	44.6 J	3.8
SS-1	40.5	3.7
SS-2	40	3.7

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EFFLUENT DISCHARGE LINE

SVOC:	BENZO(A)PYRENE		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-01-01	0.25	J	-1.4
C1-SB-01-02	0.60	W	-0.5
C1-SB-02-01-AV	0.024	J	-3.7
C1-SB-02-02	0.18	W	-1.7
C1-SB-03-01	0.41	W	-0.9
C1-SB-03-02	0.365	W	-1.0
C1-SB-04-01	1.4	U	0.3
C1-SB-04-02	0.24	U	-1.4
C1-SB-04N-02	0.20	U	-1.6
C1-SB-05-01-AV	0.0325	J	-3.4
C1-SB-05-02	0.19	W	-1.7
C1-SB-06-01	0.195	U	-1.6
C1-SB-06-02	0.185	U	-1.7
C1-SB-07-01	0.081	J	-2.5
C1-SB-07-02	0.185	U	-1.7
C1-SB-30-01	0.19	W	-1.7
C1-SB-31-01	0.19	W	-1.7

Frequency:	4/17		
Average:	0.29	Sample Std. Dev.	0.32
Average log:	-1.64	Sample Std. Dev.	0.95
UCL:	0.58 *	(log value)	
Maximum:	0.25		

* - The 95% UCL exceeds the maximum concentration detected in the samples.

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EFFLUENT DISCHARGE LINE

PCB:	AROCLOR 1248		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-01-01	R		
C1-SB-01-02	0.018	UJ	-4.0
C1-SB-02-01-AV	0.01975	UJ	-3.9
C1-SB-02-02	0.018	UJ	-4.0
C1-SB-03-01	0.0205	UJ	-3.9
C1-SB-03-02	0.12	JN	-2.1
C1-SB-04-01	0.17		-1.8
C1-SB-04-02	0.0195	U	-3.9
C1-SB-04N-02	0.071		-2.6
C1-SB-05-01-AV	0.0195	U	-3.9
C1-SB-05-02	R		
C1-SB-06-01	0.0195	U	-3.9
C1-SB-06-02	0.0185	U	-4.0
C1-SB-07-01	0.0205	U	-3.9
C1-SB-07-02	0.0185	U	-4.0
C1-SB-30-01	0.019	UJ	-4.0
C1-SB-31-01	0.019	UJ	-4.0

Frequency:	3/15		
Average:	0.04	Sample Std. Dev.	0.05
Average log:	-3.60	Sample Std. Dev. (log value)	0.75
UCL:	0.06		
Maximum:	0.17		

EFFLUEN. .CHARGE LINE

PCB:	AROCLOR 1254		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-01-01	R		
C1-SB-01-02	0.018	UJ	-4.0
C1-SB-02-01-AV	0.0208	J	-3.9
C1-SB-02-02	0.018	UJ	-4.0
C1-SB-03-01	R		
C1-SB-03-02	0.10	J	-2.3
C1-SB-04-01	0.54	J	-0.6
C1-SB-04-02	0.052		-3.0
C1-SB-04N-02	0.07	J	-2.7
C1-SB-05-01-AV	0.0195	U	-3.9
C1-SB-05-02	R		
C1-SB-06-01	0.0195	U	-3.9
C1-SB-06-02	0.0185	U	-4.0
C1-SB-07-01	0.0205	U	-3.9
C1-SB-07-02	0.0185	U	-4.0
C1-SB-30-01	0.08	J	-2.5
C1-SB-31-01	0.10	JN	-2.3

Frequency:	7/14		
Average:	0.08	Sample Std. Dev.	0.14
Average log:	-3.22	Sample Std. Dev. (log value)	1.03
UCL:	0.15		
Maximum:	0.54		

EFFLUENT CHARGE LINE

PCB:	AROCLOR 1260		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-01-01	R		
C1-SB-01-02	0.018	UJ	-4.0
C1-SB-02-01-AV	0.045	J	-3.1
C1-SB-02-02	0.018	UJ	-4.0
C1-SB-03-01	0.064	JN	
C1-SB-03-02	0.066	J	-2.7
C1-SB-04-01	0.22		-1.5
C1-SB-04-02	0.0195	U	-3.9
C1-SB-04N-02	0.02	U	-3.9
C1-SB-05-01-AV	0.26		-1.3
C1-SB-05-02	R		
C1-SB-06-01	0.0195	U	-3.9
C1-SB-06-02	0.0185	U	-4.0
C1-SB-07-01	0.0205	U	-3.9
C1-SB-07-02	0.0185	U	-4.0
C1-SB-30-01	0.064	JN	-2.7
C1-SB-31-01	0.019	UJ	-4.0

Frequency:	6/15		
Average:	0.06	Sample Std. Dev.	0.08
Average log:	-3.36	Sample Std. Dev. (log value)	0.94
UCL:	0.11		
Maximum:	0.26		

EFFLUENT DISCHARGE LINE

INORGANIC:	ARSENIC		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-01-01	0.345	U	-1.1
C1-SB-01-02	0.83	BJ	-0.2
C1-SB-02-01-AV	1.2	BJ	0.2
C1-SB-02-02	0.325	UJ	-1.1
C1-SB-03-01	2.1	BJ	0.7
C1-SB-03-02	0.86	BJ	-0.2
C1-SB-04-01	3.8		1.3
C1-SB-04-02	2.4		0.9
C1-SB-04N-02	0.365	U	-1.0
C1-SB-05-01-AV	2.5	B	0.9
C1-SB-05-02	0.90	B	-0.1
C1-SB-06-01	2.6		1.0
C1-SB-06-02	0.445	U	-0.8
C1-SB-07-01	6.1		1.8
C1-SB-07-02	1.3	B	0.3
C1-SB-30-01	1.6	BJ	0.5
C1-SB-31-01	1.9	BJ	0.6

Frequency:	13/17		
Average:	1.74	Sample Std. Dev.	1.49
Average log:	0.22	Sample Std. Dev.	0.87
UCL:	3.10	(log value)	
Maximum:	6.10		

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EFFLUENT DISCHARGE LINE

INORGANIC:	BARIUM		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-01-01	111		4.7
C1-SB-01-02	98		4.6
C1-SB-02-01-AV	86.8		4.5
C1-SB-02-02	75.3		4.3
C1-SB-03-01	168		5.1
C1-SB-03-02	133		4.9
C1-SB-04-01	157		5.1
C1-SB-04-02	334		5.8
C1-SB-04N-02	170		5.1
C1-SB-05-01-AV	167		5.1
C1-SB-05-02	494		6.2
C1-SB-06-01	137		4.9
C1-SB-06-02	136		4.9
C1-SB-07-01	215		5.4
C1-SB-07-02	184		5.2
C1-SB-30-01	145		5.0
C1-SB-31-01	106		4.7

Frequency:	17/17		
Average:	171.59	Sample Std. Dev.	102.20
Average log:	5.03	Sample Std. Dev. (log value)	0.47
UCL:	214.15		
Maximum:	494.00		

CHM 002 2175

EFFLUENT DISCHARGE LINE

INORGANIC:	BERYLLIUM						
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)	Frequency:	17/17		
				Average:	1.62	Sample Std. Dev.	0.39
				Average log:	0.45	Sample Std. Dev.	0.26
C1-SB-01-01	1.0	B	0.0	UCL:	1.83	(log value)	
C1-SB-01-02	1.6		0.5	Maximum:	2.40		
C1-SB-02-01-AV	1.55		0.4				
C1-SB-02-02	1.6		0.5				
C1-SB-03-01	1.7		0.5				
C1-SB-03-02	1.6		0.5				
C1-SB-04-01	1.1	B	0.1				
C1-SB-04-02	1.8		0.6				
C1-SB-04N-02	0.87	B	-0.1				
C1-SB-05-01-AV	1.7		0.5				
C1-SB-05-02	1.7		0.5				
C1-SB-06-01	1.6		0.5				
C1-SB-06-02	2.4		0.9				
C1-SB-07-01	1.9		0.6				
C1-SB-07-02	2.3		0.8				
C1-SB-30-01	1.6		0.5				
C1-SB-31-01	1.5		0.4				

EFFLUENT DISCHARGE LINE

INORGANIC:	MANGANESE		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-01-01	683		6.5
C1-SB-01-02	751		6.6
C1-SB-02-01-AV	721		6.6
C1-SB-02-02	762		6.6
C1-SB-03-01	477		6.2
C1-SB-03-02	587		6.4
C1-SB-04-01	774		6.7
C1-SB-04-02	1620		7.4
C1-SB-04N-02	1030		6.9
C1-SB-05-01-AV	890		6.8
C1-SB-05-02	2850		8.0
C1-SB-06-01	627		6.4
C1-SB-06-02	1140		7.0
C1-SB-07-01	872		6.8
C1-SB-07-02	1190		7.1
C1-SB-30-01	1370		7.2
C1-SB-31-01	695		6.5

Frequency:	17/17		
Average:	1002.29	Sample Std. Dev.	561.98
Average log:	6.81	Sample Std. Dev.	0.43
UCL:	1230.29	(log value)	
Maximum:	2850.00		

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EFFLUENT DISCHARGE LINE

INORGANIC:	MERCURY		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-01-01	0.055	U	-2.9
C1-SB-01-02	0.055	U	-2.9
C1-SB-02-01-AV	0.11		-2.2
C1-SB-02-02	0.055	U	-2.9
C1-SB-03-01	0.23		-1.5
C1-SB-03-02	0.14		-2.0
C1-SB-04-01	8.8		2.2
C1-SB-04-02	0.33		-1.1
C1-SB-04N-02	2.4		0.9
C1-SB-05-01-AV	0.38	J	-1.0
C1-SB-05-02	0.06	U	-2.8
C1-SB-06-01	0.06	U	-2.8
C1-SB-06-02	0.055	U	-2.9
C1-SB-07-01	0.06	U	-2.8
C1-SB-07-02	0.055	U	-2.9
C1-SB-30-01	0.20		-1.6
C1-SB-31-01	0.06	U	-2.8

Frequency:	8/17		
Average:	0.77	Sample Std. Dev.	2.14
Average log:	-1.88	Sample Std. Dev.	1.47
UCL:	1.59	(log value)	
Maximum:	8.80		

CHM 002 2178

EFFLUENT DISCHARGE LINE

INORGANIC:	THALLIUM		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-01-01	1.4	B	0.3
C1-SB-01-02	0.99	B	0.0
C1-SB-02-01-AV	1.35	B	0.3
C1-SB-02-02	1.6	B	0.5
C1-SB-03-01	1.9	B	0.6
C1-SB-03-02	1.1	B	0.1
C1-SB-04-01	0.67	BJ	-0.4
C1-SB-04-02	0.115	U	-2.2
C1-SB-04N-02	0.12	U	-2.1
C1-SB-05-01-AV	0.84	BJ	-0.2
C1-SB-05-02	0.47	U	-0.8
C1-SB-06-01	0.48	U	-0.7
C1-SB-06-02	0.445	U	-0.8
C1-SB-07-01	0.49	U	-0.7
C1-SB-07-02	0.445	U	-0.8
C1-SB-30-01	1.1	B	0.1
C1-SB-31-01	1.7	B	0.5

Frequency:	10/17		
Average:	0.90	Sample Std. Dev.	0.55
Average log:	-0.37	Sample Std. Dev.	0.83
UCL:	1.66	(log value)	
Maximum:	1.90		

CHM 002 2179

EFFLUENT DISCHARGE LINE

INORGANIC:	VANADIUM		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-01-01	23.5		3.2
C1-SB-01-02	21.3		3.1
C1-SB-02-01-AV	28.0		3.3
C1-SB-02-02	27.1		3.3
C1-SB-03-01	28.6		3.4
C1-SB-03-02	24.4		3.2
C1-SB-04-01	23.4		3.2
C1-SB-04-02	17.2		2.8
C1-SB-04N-02	27.9		3.3
C1-SB-05-01-AV	47.2	J	3.9
C1-SB-05-02	74.4	J	4.3
C1-SB-06-01	43.4	J	3.8
C1-SB-06-02	45.6	J	3.8
C1-SB-07-01	60.4	J	4.1
C1-SB-07-02	30.7		3.4
C1-SB-30-01	32.6		3.5
C1-SB-31-01	23.9		3.2

Frequency:	17/17		
Average:	34.09	Sample Std. Dev.	15.31
Average log:	3.45	Sample Std. Dev.	0.39
UCL:	41.14	(log value)	
Maximum:	74.40		

EFFLUENT DISCHARGE LINE

INORGANIC:	ZINC		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SB-01-01	106		4.7
C1-SB-01-02	82.7		4.4
C1-SB-02-01-AV	100.6		4.6
C1-SB-02-02	84		4.4
C1-SB-03-01	162		5.1
C1-SB-03-02	172		5.1
C1-SB-04-01	2170		7.7
C1-SB-04-02	171		5.1
C1-SB-04N-02	R		
C1-SB-05-01-AV	176	J	5.2
C1-SB-05-02	239	J	5.5
C1-SB-06-01	67.3		4.2
C1-SB-06-02	117		4.8
C1-SB-07-01	95.2		4.6
C1-SB-07-02	105		4.7
C1-SB-30-01	131		4.9
C1-SB-31-01	588		6.4

Frequency:	16/16		
Average:	285.43	Sample Std. Dev.	517.37
Average log:	5.08	Sample Std. Dev. (log value)	0.87
UCL:	409.64		
Maximum:	2170.00		

CHM 002 2161

ON-SITE - AIR

VOC: **ACETALDEHYDE (TIC)**

Sample Location	Concentration (mg/m3)	Concentration (ppb)	Q	Log of Concentration (mg/kg)
C1-AR-01	0.0165	9.2	J	-4.1
C1-AR-02-AV			R	
C1-AR-03	0.0081	4.5	JN	-4.8
C1-AR-04	0.0059	3.3	J	-5.1
C2-AR-B			NR	
C2-AR-C			NR	
C2-AR-D			NR	
C2-AR-E-AV			NR	

Frequency:	3/3		
Average:	0.010	Sample Std. Dev.	0.006
Average log:	-4.68	Sample Std. Dev.	0.53
UCL:	0.152 *	(log value)	
Maximum:	0.0165		

* - The 95% UCL concentration exceeds the maximum concentration detected in the samples.

NR - Not Reported

CHM 002 2182

ON-SITE - AIR

VOC:	BENZENE							
Sample Location	Concentration (mg/m3)	Concentration (ppb)	Q	Log of Concentration (mg/m3)	Frequency:	3/8		
					Average:	0.005	Sample Std. Dev.	0.003
					Average log:	-5.50	Sample Std. Dev.	0.73
C1-AR-01	0.0064	2.0	UJ	-5.1	UCL:	0.012 *	(log value)	
C1-AR-02-AV	0.0088	2.8	UJ	-4.7	Maximum:	0.0026		
C1-AR-03	0.0096	3.0	UJ	-4.6				
C1-AR-04	0.0064	2.0	UJ	-5.1				
C2-AR-B	0.0032	1.0	UJ	-5.7				
C2-AR-C	0.0026	0.80	J	-6.0				
C2-AR-D	0.0013	0.40	J	-6.7				
C2-AR-E-AV	0.0022	0.70	J	-6.1				

* - The 95% UCL concentration exceeds the maximum concentration detected in the samples.

CHM 002 2183

ON-SITE - AIR

VOC: **DICHLORODIFLUOROMETHANE**

Sample Location	Concentration (mg/m3)	Concentration (ppb)	Q	Log of Concentration (mg/m3)
C1-AR-01	0.0099	2.0	J	-4.6
C1-AR-02-AV	0.0109	2.2	J	-4.5
C1-AR-03	0.0148	3.0	UJ	-4.2
C1-AR-04	0.0109	2.2	J	-4.5
C2-AR-B	0.0049	1.0	UJ	-5.3
C2-AR-C	0.0049	1.0	UJ	-5.3
C2-AR-D	0.0049	1.0	UJ	-5.3
C2-AR-E-AV	0.0037	0.75	UJ	-5.6

Frequency:	3/8		
Average:	0.008	Sample Std. Dev.	0.004
Average log:	-4.93	Sample Std. Dev. (log value)	0.51
UCL:	0.013 *		
Maximum:	0.0109		

* - The 95% UCL concentration exceeds the maximum concentration detected in the samples.

CHM 002 2184

ON-SITE - AIR

VOC: **HEXANE**

Sample Location	Concentration (mg/m3)	Concentration (ppb)	Q	Log of Concentration (mg/m3)
C1-AR-01			R	
C1-AR-02-AV			R	
C1-AR-03			R	
C1-AR-04			R	
C2-AR-B	0.0035	1.0	W	-5.6
C2-AR-C	0.0035	1.0	W	-5.6
C2-AR-D	0.0106	3.0	J	-4.6
C2-AR-E-AV	0.0014	0.40	J	-6.6

Frequency:	2/4		
Average:	0.005	Sample Std. Dev.	0.004
Average log:	-5.60	Sample Std. Dev.	0.82
UCL:	0.163 *	(log value)	
Maximum:	0.0106		

* - The 95% UCL concentration exceeds the maximum concentration detected in the samples.

ON-SITE - AIR

VOC: **METHYLENE CHLORIDE**

Sample Location	Concentration (mg/m3)	Concentration (ppb)	Q	Log of Concentration (mg/m3)
C1-AR-01	0.0156	4.5	UJ	-4.2
C1-AR-02-AV	0.0225	6.5	UJ	-3.8
C1-AR-03	0.0260	7.5	UJ	-3.6
C1-AR-04	0.0156	4.5	UJ	-4.2
C2-AR-B	0.0010	0.3	UJB	-6.9
C2-AR-C	0.0035	1.0	UJ	-5.7
C2-AR-D	0.0208	6.0	BJ	-3.9
C2-AR-E-AV	0.0023	0.65	UJB	-6.1

Frequency:	1/8		
Average:	0.013	Sample Std. Dev.	0.010
Average log:	-4.78	Sample Std. Dev.	1.24
UCL:	0.119 *	(log value)	
Maximum:	0.0208		

* - The 95% UCL concentration exceeds the maximum concentration detected in the samples.

ON-SITE - AIR

VOC: **TETRACHLOROETHENE**

Sample Location	Concentration (mg/m3)	Concentration (ppb)	Q	Log of Concentration (mg/m3)
C1-AR-01	0.0305	4.5	UJ	-3.5
C1-AR-02-AV	0.0440	6.5	UJ	-3.1
C1-AR-03	0.0508	7.5	UJ	-3.0
C1-AR-04	0.0305	4.5	UJ	-3.5
C2-AR-B	0.0068	1.0	UJ	-5.0
C2-AR-C	0.0068	1.0	UJ	-5.0
C2-AR-D	0.0068	1.0	UJ	-5.0
C2-AR-E-AV	0.0041	0.60	J	-5.5

Frequency:	1/8		
Average:	0.023	Sample Std. Dev.	0.019
Average log:	-4.20	Sample Std. Dev. (log value)	1.02
UCL:	0.093 *		
Maximum:	0.0041		

* - The 95% UCL concentration exceeds the maximum concentration detected in the samples.

CHM 002 2187

ON-SITE - AIR

VOC:	TOLUENE			
Sample Location	Concentration (mg/m3)	Concentration (ppb)	Q	Log of Concentration (mg/m3)
C1-AR-01	0.0169	4.5	UJ	-4.1
C1-AR-02-AV	0.0203	5.4	J	-3.9
C1-AR-03	0.0282	7.5	UL	-3.6
C1-AR-04	0.0169	4.5	UJ	-4.1
C2-AR-B	0.0026	0.70	J	-5.9
C2-AR-C	0.0019	0.50	UJ	-6.3
C2-AR-D	0.0038	1.0	J	-5.6
C2-AR-E-AV	0.0032	0.85	J	-5.7

Frequency:	4/8		
Average:	0.012	Sample Std. Dev.	0.010
Average log:	-4.90	Sample Std. Dev.	1.09
UCL:	0.062 *	(log value)	
Maximum:	0.0203		

* - The 95% UCL concentration exceeds the maximum concentration detected in the samples.

CHN 002 2188

ON-SITE - AIR

VOC: **TRICHLOROETHENE**

Sample Location	Concentration (mg/m3)	Concentration (ppb)	Q	Log of Concentration (mg/kg)
C1-AR-01	0.0107	2.0	W	-4.5
C1-AR-02-AV	0.0148	2.75	W	-4.2
C1-AR-03	0.0161	3.0	W	-4.1
C1-AR-04	0.0107	2.0	W	-4.5
C2-AR-B	0.0011	0.20	J	-6.8
C2-AR-C	0.0054	1.0	W	-5.2
C2-AR-D	0.0054	1.0	W	-5.2
C2-AR-E-AV	0.0016	0.30	J	-6.4

Frequency:	2/8		
Average:	0.008	Sample Std. Dev.	0.006
Average log:	-5.14	Sample Std. Dev.	1.01
UCL:	0.040 *	(log value)	
Maximum:	0.0016		

* - The 95% UCL concentration exceeds the maximum concentration detected in the samples.

CHM 002 2189

DOWNWIND - AIR

VOC: ACETALDEHYDE (TIC)

Sample Location	Concentration (mg/m3)	Concentration (ppb)	Q	Log of Concentration (mg/m3)
C1-AR-05	0.0324	18.0	JN	-3.4
C1-AR-06	0.0142	7.9	JN	-4.3
C2-AR-A			NR	

Frequency:	2/2		
Average:	0.023	Sample Std. Dev.	0.013
Average log:	-3.84	Sample Std. Dev.	0.58
UCL:	2.394 *	(log value)	
Maximum:	0.032		

* - 95% UCL concentration exceeds the maximum concentration detected in the samples.

NR - Not Reported

CHM 002 2190

DOWNWIND - AIR

VOC:	ACROLEIN							
Sample Location	Concentration (mg/m3)	Concentration (ppb)	Q	Log of Concentration (mg/m3)				
					Frequency:	1/3		
					Average:	0.018	Sample Std. Dev.	0.010
					Average log:	-4.15	Sample Std. Dev.	0.73
C1-AR-05	0.0275	12.0	J	-3.6	UCL:	3.227 *	(log value)	
C1-AR-06	0.0206	9.0	UJ	-3.9	Maximum:	0.0275		
C2-AR-A	0.0069	3.0	UJ	-5.0				

* - 95% UCL concentration exceeds the maximum concentration detected in the samples.

CHM 002 2191

GROUND WATER

VOC: **ACETONE**

Sample Location	Concentration (mg/l)	Q	Log of Concentration (mg/l)
C-1	120 J		4.8
C-2	5		1.6
C-3	0.005 UJ		-5.3
C-4	0.05 UJ		-3.0
C-5-AV	R		
C-6	0.005 UJ		-5.3
C-7	0.005 UJ		-5.3
C-8-AV	0.00725 UJ		-4.9
C-9	0.014 U		-4.3
C-10	14 J		2.6
DMW-1	0.031 UJ		-3.5
DMW-2	0.005 UJ		-5.3
DMW-3	0.005 UJ		-5.3
DMW-4	0.005 U		-5.3
DMW-5	0.035 J		-3.4
DMW-6	0.005 UJ		-5.3
DMW-7	0.05 UJ		-3.0
DMW-8	0.025 UJ		-3.7
DMW-9	0.05 UJ		-3.0
DMW-10	0.005 UJ		-5.3
DMW-11	2.2 J		0.8
MW-101	0.005 UJ		-5.3
MW-102	0.005 UJ		-5.3
MW-103	0.005 UJ		-5.3
MW-104-AV	0.065 J		-2.7
OW-1	0.125 U		-2.1
OW-2	0.041 J		-3.2
OW-4	0.049 J		-3.0
OW-10	0.005 U		-5.3
OW-11	0.005 UJ		-5.3
OW-12	0.005 U		-5.3
OW-13	0.005 UJ		-5.3
OW-14	0.005 U		-5.3
TW-1	0.005 U		-5.3

Frequency:	11/48		
Average:	4.60	Sample Std. Dev.	18.81
Average log:	-3.50	Sample Std. Dev. (log value)	2.83
UCL:	10.85		
Maximum:	120.00		

CHM 002 2192

TW-2	0.0065 W	-5
TW-3	0.005 W	-5.3
TW-4	50 J	3.9
TW-5	22 J	3.1
TW-5A	6.5	1.9
TW-6	0.005 W	-5.3
TW-7	0.05 U	-3.0
TW-8	0.25 W	-1.4
TW-9	0.005 U	-5.3
TW-10	0.005 W	-5.3
TW-11	0.005 W	-5.3
TW-12	0.005 W	-5.3
TW-13	0.005 W	-5.3
TW-14	0.005 U	-5.3
TW-15	0.005 U	-5.3

CHM 002 2193

GROUND WA...

VOC:	BENZENE		
Sample Location	Concentration (mg/l)	Q	Log of Concentration (mg/l)
C-1	16		2.8
C-2	0.24		-1.4
C-3	0.001	J	-6.9
C-4	0.17		-1.8
C-5-AV	0.0285	J	-3.6
C-6	0.005	UJ	-5.3
C-7	0.007	J	-5.0
C-8-AV	0.005	UJ	-5.3
C-9	0.005	UJ	-5.3
C-10	0.31	J	-1.2
DMW-1	0.051	J	-3.0
DMW-2	0.005	UJ	-5.3
DMW-3	0.049		-3.0
DMW-4	0.005	U	-5.3
DMW-5	0.005	U	-5.3
DMW-6	0.005	UJ	-5.3
DMW-7	0.22	J	-1.5
DMW-8	0.18	J	-1.7
DMW-9	0.62	J	-0.5
DMW-10	0.005	UJ	-5.3
DMW-11	0.12		-2.1
MW-101	0.005	U	-5.3
MW-102	0.005	UJ	-5.3
MW-103	0.005	UJ	-5.3
MW-104-AV	0.01	U	-4.6
OW-1	0.23	J	-1.5
OW-2	0.072	J	-2.6
OW-4	0.041	J	-3.2
OW-10	0.005	U	-5.3
OW-11	0.005	UJ	-5.3
OW-12	0.005	U	-5.3
OW-13	0.005	UJ	-5.3
OW-14	0.005	U	-5.3
TW-1	0.009	J	-4.7

Frequency:	23/49		
Average:	0.81	Sample Std. Dev.	2.78
Average log:	-3.62	Sample Std. Dev. (log value)	2.40
UCL:	2.07		
Maximum:	16.00		

TW-2	0.005 W	-5.3
TW-3	0.005 W	-5.3
TW-4	1.8 J	0.6
TW-5	10	2.3
TW-5A	5.2	1.6
TW-6	0.026 J	-3.6
TW-7	0.17	-1.8
TW-8	4.2	1.4
TW-9	0.005 U	-5.3
TW-10	0.005 W	-5.3
TW-11	0.005 W	-5.3
TW-12	0.005 U	-5.3
TW-13	0.005 U	-5.3
TW-14	0.005 U	-5.3
TW-15	0.005 U	-5.3

CHM 002 2195

GROUNDWATER

VOC: **CARBON TETRACHLORIDE**

Sample Location	Concentration (mg/l)	Q	Log of Concentration (mg/l)
C-1	35		3.6
C-2	0.19		-1.7
C-3	0.042		-3.2
C-4	0.05	U	-3.0
C-5-AV	R		
C-6	0.002	J	-6.2
C-7	0.054	J	-2.9
C-8-AV	0.005	UJ	-5.3
C-9	0.003	J	-5.8
C-10	0.73	J	-0.3
DMW-1	0.24	J	-1.4
DMW-2	0.005	UJ	-5.3
DMW-3	0.034		-3.4
DMW-4	0.035		-3.4
DMW-5	0.005	U	-5.3
DMW-6	0.12	J	-2.1
DMW-7	0.23	J	-1.5
DMW-8	0.14	J	-2.0
DMW-9	0.016	J	-4.1
DMW-10	0.092	J	-2.4
DMW-11	0.12		-2.1
MW-101	0.005	U	-5.3
MW-102	0.052	J	-3.0
MW-103	0.005	UJ	-5.3
MW-104-AV	0.01	U	-4.6
OW-1	0.125	U	-2.1
OW-2	0.0125	UJ	-4.4
OW-4	0.05	UJ	-3.0
OW-10	0.005	U	-5.3
OW-11	0.005	UJ	-5.3
OW-12	0.2		-1.6
OW-13	0.005	UJ	-5.3
OW-14	0.005	U	-5.3
TW-1	0.005	U	-5.3

Frequency:	24/48		
Average:	1.44	Sample Std. Dev.	5.61
Average log:	-3.22	Sample Std. Dev. (log value)	2.43
UCL:	3.43		
Maximum:	35.00		

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TW-2	0.005 UJ	-5.3
TW-3	0.005 UJ	-5.3
TW-4	13 J	2.6
TW-5	1.25 U	0.2
TW-5A	0.09 J	-2.4
TW-6	0.87 J	-0.1
TW-7	13 J	2.6
TW-8	3.3 J	1.2
TW-9	0.057	-2.9
TW-10	0.005 UJ	-5.3
TW-11	0.005 UJ	-5.3
TW-12	0.005 U	-5.3
TW-13	0.005 U	-5.3
TW-14	0.005 U	-5.3
TW-15	0.005 U	-5.3

DHM 002 2197

VOC: **CHLOROFORM**

Sample Location	Concentration (mg/l)	Q	Log of Concentration (mg/l)
C-1	55		4.0
C-2	0.99		0.0
C-3	0.016	U	-4.1
C-4	0.05	UJ	-3.0
C-5-AV	0.035	J	-3.4
C-6	0.009	J	-4.7
C-7	0.15	J	-1.9
C-8-AV	0.005	UJ	-5.3
C-9	0.005	UJ	-5.3
C-10	1.4	J	0.3
DMW-1	0.81	J	-0.2
DMW-2	0.001	J	-6.9
DMW-3	0.26	J	-1.3
DMW-4	0.02	U	-3.9
DMW-5	0.065	U	-2.7
DMW-6	0.065	UJ	-2.7
DMW-7	0.72	J	-0.3
DMW-8	0.45	J	-0.8
DMW-9	0.45	J	-0.8
DMW-10	0.14	J	-2.0
DMW-11	0.43		-0.8
MW-101	0.019		-4.0
MW-102	0.0335	UJ	-3.4
MW-103	0.006	J	-5.1
MW-104-AV	0.01	U	-4.6
OW-1	1.4		0.3
OW-2	0.021	J	-3.9
OW-4	0.056	J	-2.9
OW-10	0.005	U	-5.3
OW-11	0.005	UJ	-5.3
OW-12	0.013	U	-4.3
OW-13	0.005	UJ	-5.3
OW-14	0.005	U	-5.3
TW-1	0.005	U	-5.3

Frequency:	23/49		
Average:	2.80	Sample Std. Dev.	10.83
Average log:	-2.93	Sample Std. Dev.	2.71
UCL:	12.82	(log value)	
Maximum:	55.00		

TW-2	0.005 W	-5.3
TW-3	0.005 W	-5.3
TW-4	8.5 J	2.1
TW-5	9.3	2.2
TW-5A	3.4	1.2
TW-6	0.0265 U	-3.6
TW-7	0.255 U	-1.4
TW-8	53 J	4.0
TW-9	0.005 U	-5.3
TW-10	0.005 W	-5.3
TW-11	0.005 W	-5.3
TW-12	0.005 U	-5.3
TW-13	0.005 U	-5.3
TW-14	0.005 U	-5.3
TW-15	0.005 U	-5.3

6212 002 MHD

GROUND WA

VOC:	1,2-DICHLOROETHANE		
Sample Location	Concentration (mg/l)	Q	Log of Concentration (mg/l)
C-1	23		3.1
C-2	0.28		-1.3
C-3	0.004	J	-5.5
C-4	1.3		0.3
C-5-AV	0.145	J	-1.9
C-6	0.011	J	-4.5
C-7	0.024	J	-3.7
C-8-AV	0.005	UJ	-5.3
C-9	0.005	UJ	-5.3
C-10	0.38	J	-1.0
DMW-1	0.12	J	-2.1
DMW-2	0.005	UJ	-5.3
DMW-3	0.12		-2.1
DMW-4	0.005	U	-5.3
DMW-5	0.031		-3.5
DMW-6	0.005	UJ	-5.3
DMW-7	0.45	J	-0.8
DMW-8	0.099	J	-2.3
DMW-9	0.72	J	-0.3
DMW-10	0.005	UJ	-5.3
DMW-11	0.15		-1.9
MW-101	0.005	U	-5.3
MW-102	0.005	UJ	-5.3
MW-103	0.005	UJ	-5.3
MW-104-AV	0.01	U	-4.6
OW-1	0.46		-0.8
OW-2	0.012	J	-4.4
OW-4	0.05	UJ	-3.0
OW-10	0.005	U	-5.3
OW-11	0.005	UJ	-5.3
OW-12	0.005	U	-5.3
OW-13	0.005	UJ	-5.3
OW-14	0.005	U	-5.3
TW-1	0.005	U	-5.3

Frequency:	22/49		
Average:	0.73	Sample Std. Dev.	3.33
Average log:	-3.53	Sample Std. Dev. (log value)	2.30
UCL:	1.49		
Maximum:	23.00		

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TW-2	0.005 UJ	-5.3
TW-3	0.005 UJ	-5.3
TW-4	1.3 J	0.3
TW-5	4.6	1.5
TW-5A	1.8	0.6
TW-6	0.067 J	-2.7
TW-7	0.05 U	-3.0
TW-8	0.25 U	-1.4
TW-9	0.003 J	-5.8
TW-10	0.005 UJ	-5.3
TW-11	0.005 UJ	-5.3
TW-12	0.005 U	-5.3
TW-13	0.005 U	-5.3
TW-14	0.005 U	-5.3
TW-15	0.005 U	-5.3

CHM 002 2201

GROUND W

VOC:	1,1-DICHLOROETHENE		
Sample Location	Concentration (mg/l)	Q	Log of Concentration (mg/l)
C-1	1.7		0.5
C-2	0.005	U	-5.3
C-3	0.005	U	-5.3
C-4	0.016	J	-4.1
C-5-AV	0.004	J	-5.5
C-6	0.001	J	-6.9
C-7	0.016	J	-4.1
C-8-AV	0.005	UJ	-5.3
C-9	0.005	UJ	-5.3
C-10	0.054	J	-2.9
DMW-1	0.031	UJ	-3.5
DMW-2	0.005	UJ	-5.3
DMW-3	0.011		-4.5
DMW-4	0.005	U	-5.3
DMW-5	0.005	U	-5.3
DMW-6	0.005	UJ	-5.3
DMW-7	0.036	J	-3.3
DMW-8	0.015	J	-4.2
DMW-9	0.05	UJ	-3.0
DMW-10	0.009	J	-4.7
DMW-11	0.005	U	-5.3
MW-101	0.005	U	-5.3
MW-102	0.005	UJ	-5.3
MW-103	0.005	UJ	-5.3
MW-104-AV	0.01	U	-4.6
OW-1	0.125	U	-2.1
OW-2	0.0125	UJ	-4.4
OW-4	0.05	UJ	-3.0
OW-10	0.005	U	-5.3
OW-11	0.005	UJ	-5.3
OW-12	0.005	U	-5.3
OW-13	0.005	UJ	-5.3
OW-14	0.005	U	-5.3
TW-1	0.005	U	-5.3

Frequency:	13/49		
Average:	0.10	Sample Std. Dev.	0.32
Average log:	-4.39	Sample Std. Dev. (log value)	1.65
UCL:	0.10		
Maximum:	1.70		

CHM 002 2202

TW-2	0.005 W	-5.3
TW-3	0.005 W	-5.3
TW-4	0.8 J	-0.2
TW-5	1.25 U	0.2
TW-5A	0.27 J	-1.3
TW-6	0.002 J	-6.2
TW-7	0.05 U	-3.0
TW-8	0.25 U	-1.4
TW-9	0.005 U	-5.3
TW-10	0.005 W	-5.3
TW-11	0.005 W	-5.3
TW-12	0.005 U	-5.3
TW-13	0.005 U	-5.3
TW-14	0.005 U	-5.3
TW-15	0.005 U	-5.3

CHM 002 2203

GROUND

VOC: 1,2-DICHLOROETHENE (TOTAL)

Sample Location	Concentration (mg/l)	Q	Log of Concentration (mg/l)
C-1	20		3.0
C-2	3.2		1.2
C-3	0.022		-3.8
C-4	1.4		0.3
C-5-AV	0.505	J	-0.7
C-6	0.078	J	-2.6
C-7	0.048	J	-3.0
C-8-AV	0.0005	J	-7.6
C-9	0.005	UJ	-5.3
C-10	0.52	J	-0.7
DMW-1	0.24	J	-1.4
DMW-2	0.005	J	-5.3
DMW-3	0.34	J	-1.1
DMW-4	0.005	J	-5.3
DMW-5	0.015		-4.2
DMW-6	0.02	J	-3.9
DMW-7	1.7	J	0.5
DMW-8	0.4	J	-0.9
DMW-9	1.6	J	0.5
DMW-10	0.031	J	-3.5
DMW-11	0.73		-0.3
MW-101	0.005	U	-5.3
MW-102	0.008	J	-4.8
MW-103	0.005	UJ	-5.3
MW-104-AV	0.004	J	-5.5
OW-1	3		1.1
OW-2	0.22	J	-1.5
OW-4	1.3	J	0.3
OW-10	0.005	U	-5.3
OW-11	0.005	UJ	-5.3
OW-12	0.008	J	-4.8
OW-13	0.005	UJ	-5.3
OW-14	0.005	U	-5.3
TW-1	0.005	U	-5.3

Frequency:	34/49		
Average:	1.87	Sample Std. Dev.	6.466
Average log:	-2.96	Sample Std. Dev. (log value)	2.86
UCL:	20.19		
Maximum:	39.00		

CHM 002 2204

TW-2	0.005 UJ	-5.3
TW-3	0.005 UJ	-5.3
TW-4	1.7 J	0.5
TW-5	39	3.7
TW-5A	15 J	2.7
TW-6	0.092 J	-2.4
TW-7	0.05 U	-3.0
TW-8	0.5	-0.7
TW-9	0.007 J	-5.0
TW-10	0.005 UJ	-5.3
TW-11	0.001 J	-6.9
TW-12	0.005 U	-5.3
TW-13	0.005 U	-5.3
TW-14	0.005 U	-5.3
TW-15	0.003 J	-5.8

CHM 002 2205

GROUND WATER

VOC:	TRICHLOROETHENE		
Sample Location	Concentration (mg/l)	Q	Log of Concentration (mg/l)
C-1	180		5.2
C-2	0.44		-0.8
C-3	0.022		-3.8
C-4	0.025	J	-3.7
C-5-AV	0.066	J	-2.7
C-6	0.092	J	-2.4
C-7	0.16	J	-1.8
C-8-AV	0.003	J	-5.8
C-9	0.008	J	-4.8
C-10	0.78	J	-0.2
DMW-1	0.84	J	-0.2
DMW-2	0.008	J	-4.8
DMW-3	0.35	J	-1.0
DMW-4	0.077		-2.6
DMW-5	0.001	J	-6.9
DMW-6	0.097	J	-2.3
DMW-7	0.76	J	-0.3
DMW-8	0.94	J	-0.1
DMW-9	0.2	J	-1.6
DMW-10	0.15	J	-1.9
DMW-11	0.48		-0.7
MW-101	0.002	J	-6.2
MW-102	0.13	J	-2.0
MW-103	0.0009	J	-7.0
MW-104-AV	0.01	U	-4.6
OW-1	2		0.7
OW-2	0.019	J	-4.0
OW-4	0.35	J	-1.0
OW-10	0.005	U	-5.3
OW-11	0.005	UJ	-5.3
OW-12	0.27		-1.3
OW-13	0.005	UJ	-5.3
OW-14	0.005	U	-5.3
TW-1	0.006	J	-5.1

Frequency:	39/49		
Average:	4.55	Sample Std. Dev.	25.80
Average log:	-2.90	Sample Std. Dev.	2.76
UCL:	15.31	(log value)	
Maximum:	180.00		

TW-2	0.007 J	-5.0
TW-3	0.003 J	-5.8
TW-4	11 J	2.4
TW-5	1.4 J	0.3
TW-5A	0.81	-0.2
TW-6	0.067 J	-2.7
TW-7	0.27	-1.3
TW-8	21 J	3.0
TW-9	0.004 J	-5.5
TW-10	0.005 UJ	-5.3
TW-11	0.005 UJ	-5.3
TW-12	0.005 U	-5.3
TW-13	0.005 U	-5.3
TW-14	0.005 U	-5.3
TW-15	0.003 J	-5.8

GROUN _R

VOC: VINYL CHLORIDE

Sample Location	Concentration (mg/l)	Q	Log of Concentration (mg/l)
C-1	0.56		-0.6
C-2	0.38		-1.0
C-3	0.005	U	-5.3
C-4	0.91		-0.1
C-5-AV	R		
C-6	0.003	J	-5.8
C-7	0.005	J	-5.3
C-8-AV	0.005	UJ	-5.3
C-9	0.005	UJ	-5.3
C-10	0.051	J	-3.0
DMW-1	0.031	UJ	-3.5
DMW-2	0.005	UJ	-5.3
DMW-3	0.005	U	-5.3
DMW-4	0.005	U	-5.3
DMW-5	0.005	U	-5.3
DMW-6	0.005	UJ	-5.3
DMW-7	0.05	UJ	-3.0
DMW-8	0.025	UJ	-3.7
DMW-9	1	J	0.0
DMW-10	0.005	UJ	-5.3
DMW-11	0.13		-2.0
MW-101	0.005	U	-5.3
MW-102	0.005	UJ	-5.3
MW-103	0.005	UJ	-5.3
MW-104-AV	0.01	U	-4.6
OW-1	0.125	U	-2.1
OW-2	0.02	J	-3.9
OW-4	0.05	UJ	-3.0
OW-10	0.005	U	-5.3
OW-11	0.005	UJ	-5.3
OW-12	0.005	U	-5.3
OW-13	0.005	UJ	-5.3
OW-14	0.005	U	-5.3
TW-1	0.005	U	-5.3

Frequency:	12/47		
Average:	0.20	Sample Std. Dev.	0.61
Average log:	-4.06	Sample Std. Dev. (log value)	1.94
UCL:	0.31		
Maximum:	3.30		

CHM 002 2208

TW-2	0.005 UJ	-5.3
TW-3	0.005 UJ	-5.3
TW-4	R	
TW-5	3.3	1.2
TW-5A	2.4	0.9
TW-6	0.02 J	-3.9
TW-7	0.05 U	-3.0
TW-8	0.25 U	-1.4
TW-9	0.005 U	-5.3
TW-10	0.005 UJ	-5.3
TW-11	0.005 UJ	-5.3
TW-12	0.005 U	-5.3
TW-13	0.005 U	-5.3
TW-14	0.005 U	-5.3
TW-15	0.005 U	-5.3

CHM 002 2209

GROUND WATER

SVOC: BIS(2-CHLOROETHYL)ETHER

Sample Location	Concentration (mg/l)	Q	Log of Concentration (mg/l)
C2-GW-C1-AV	0.2	D	-1.6
C-2	0.165	U	-1.8
C-3	0.005	U	-5.3
C2-GW-C4	0.017		-4.1
C2-GW-C5	0.11	D	-2.2
C2-GW-C6	0.005	U	-5.3
C2-GW-C7	0.005	UJ	-5.3
C2-GW-C8	0.0055	U	-5.2
C2-GW-C9	0.006	U	-5.1
C2-GW-C10	0.007	J	-5.0
C2-GW-DMW1	0.005	U	-5.3
C2-GW-DMW2	0.0055	U	-5.2
DMW-3	0.005	J	-5.3
DMW-4	0.005	U	-5.3
C2-GW-DMW5	0.005	UJ	-5.3
C2-GW-DMW6	0.0055	U	-5.2
C2-GW-DMW7	0.027		-3.6
C2-GW-DMW8	0.005	U	-5.3
C2-GW-DMW9	0.087		-2.4
C2-GW-DMW10	0.005	U	-5.3
C2-GW-DMW11	0.0055	U	-5.2
C2-GW-MW101	0.0055	U	-5.2
C2-GW-MW102	0.005	U	-5.3
C2-GW-MW103	0.006	U	-5.1
C2-GW-MW104-AV	0.00525	U	-5.2
OW-1	0.017	J	-4.1
C2-GW-OW2	0.0055	U	-5.2
C2-GW-OW4	0.005	U	-5.3
OW-10	0.005	U	-5.3
C2-GW-0W11	0.0055	U	-5.2
OW-12	0.005	U	-5.3
C2-GW-0W13	0.005	U	-5.3
OW-14	0.005	U	-5.3
TW-1	0.05	U	-3.0

Frequency:	9/49		
Average:	0.02	Sample Std. Dev.	0.040
Average log:	-4.87	Sample Std. Dev. (log value)	0.98
UCL:	0.02		
Maximum:	0.20		

C2-GW-TW2	0.005 U	-5.3
C2-GW-TW3	0.0055 U	-5.2
C2-GW-TW4	0.005 U	-5.3
C2-GW-TW5	0.005 U	-5.3
C2-GW-TW5A	0.005 U	-5.3
C2-GW-TW6	0.005 U	-5.3
C2-GW-TW7	0.005 U	-5.3
C2-GW-TW8-AV	0.0055 J	-5.2
TW-9	0.005 U	-5.3
C2-GW-TW10	0.005 U	-5.3
C2-GW-TW11	0.005 U	-5.3
TW-12	0.005 U	-5.3
TW-13	0.005 U	-5.3
C2-GW-TW14	0.005 U	-5.3
TW-15	0.005 U	-5.3

DHM 002 2211

GROUND WA...

INORGANIC:	MANGANESE		
Sample Location	Concentration (mg/l)	Q	Log of Concentration (mg/l)
C-1	4.68	J	1.5
C-2	1.3	J	0.3
C-3	0.0199		-3.9
C-4	0.672	J	-0.4
C-5-AV	0.8945		-0.1
C-6	0.0263		-3.6
C-7	0.0574	J	-2.9
C-8-AV	0.009	B	-4.7
C-9	0.0061	B	-5.1
C-10	0.0562	J	-2.9
DMW-1	0.0974		-2.3
DMW-2	0.466		-0.8
DMW-3	0.239	J	-1.4
DMW-4	2.02	J	0.7
DMW-5	0.14	J	-2.0
DMW-6	0.114	J	-2.2
DMW-7	0.417		-0.9
DMW-8	0.445		-0.8
DMW-9	0.564		-0.6
DMW-10	0.0131	B	-4.3
DMW-11	0.102	J	-2.3
MW-101	0.167	J	-1.8
MW-102	0.173	J	-1.8
MW-103	0.222	J	-1.5
MW-104-AV	2.22	J	0.8
OW-1	19.1		2.9
OW-2	6.12		1.8
OW-4	7.32		2.0
OW-10	5.23	J	1.7
OW-11	0.0717		-2.6
OW-12	2.24	J	0.8
OW-13	0.0657	J	-2.7
OW-14	13	J	2.6
TW-1	1.12	J	0.1

Frequency:	49/49		
Average:	1.80	Sample Std. Dev.	3.507
Average log:	-0.85	Sample Std. Dev.	1.89
UCL:	7.37	(log value)	
Maximum:	19.10		

OHM 002 2212

TW-2	0.149 J	-1.9
TW-3	0.174 J	-1.7
TW-4	1.18 J	0.2
TW-5	5.02	1.6
TW-5A	4.5	1.5
TW-6	0.513 J	-0.7
TW-7	1.49 J	0.4
TW-8	0.722	-0.3
TW-9	0.39 J	-0.9
TW-10	1.78 J	0.6
TW-11	0.3	-1.2
TW-12	0.181 J	-1.7
TW-13	0.374	-1.0
TW-14	0.785 J	-0.2
TW-15	1.16 J	0.1

OHM 002 2213

SURFACE WAT

VOC	1,2-DICHLOROETHANE						
Sample Location	Concentration (mg/l)	Q	Log of Concentration (mg/l)	Frequency:	1/14		
				Average:	0.01	Sample Std. Dev.	0.003
				Average log:	-5.21	Sample Std. Dev.	0.34
C1-SW-03-AV	0.005	U	-5.3	UCL:	0.007	(log value)	
C1-SW-04	0.005	U	-5.3	Maximum:	0.018		
C1-SW-05	0.005	U	-5.3				
C1-SW-06	0.005	U	-5.3				
C1-SW-07	0.005	U	-5.3				
C1-SW-08	0.005	U	-5.3				
C1-SW-09	0.005	U	-5.3				
C2-SW-03-AV	0.005	U	-5.3				
C2-SW-04	0.005	U	-5.3				
C2-SW-05	0.005	U	-5.3				
C2-SW-06	0.018		-4.0				
C2-SW-10	0.005	U	-5.3				
C2-SW-11	0.005	U	-5.3				
C2-SW-12	0.005	UJ	-5.3				

OHM 002 2214

SURFACE WATE

VOC: 1,2-DICHLOROETHENE (TOTAL)

Sample Location	Concentration (mg/l)	Q	Log of Concentration (mg/l)
C1-SW-03-AV	0.0005	J	-7.6
C1-SW-04	0.0006	J	-7.4
C1-SW-05	0.005	U	-5.3
C1-SW-06	0.005	U	-5.3
C1-SW-07	0.005	U	-5.3
C1-SW-08	0.005	U	-5.3
C1-SW-09	0.005	U	-5.3
C2-SW-03-AV	0.005	U	-5.3
C2-SW-04	0.028		-3.6
C2-SW-05	0.10		-2.3
C2-SW-06	0.12		-2.1
C2-SW-10	0.005	U	-5.3
C2-SW-11	0.005	U	-5.3
C2-SW-12	0.005	U	-5.3

Frequency:	5/14		
Average:	0.02	Sample Std. Dev.	0.04
Average log:	-5.05	Sample Std. Dev. (log value)	1.54
UCL:	0.099		
Maximum:	0.120		

SURFACE WATER

VOC	VINYL CHLORIDE		
Sample Location	Concentration (mg/l)	Q	Log of Concentration (mg/l)
C1-SW-03-AV	0.005	U	-5.3
C1-SW-04	0.005	U	-5.3
C1-SW-05	0.005	U	-5.3
C1-SW-06	0.005	U	-5.3
C1-SW-07	0.005	U	-5.3
C1-SW-08	0.005	U	-5.3
C1-SW-09	0.005	U	-5.3
C2-SW-03-AV	0.005	U	-5.3
C2-SW-04	0.005	U	-5.3
C2-SW-05	0.018		-4.0
C2-SW-06	0.011		-4.5
C2-SW-10	0.005	U	-5.3
C2-SW-11	0.005	U	-5.3
C2-SW-12	0.005	U	-5.3

Frequency:	2/14		
Average:	0.01	Sample Std. Dev.	0.004
Average log:	-5.15	Sample Std. Dev. (log value)	0.39
UCL:	0.008		
Maximum:	0.018		

SURFACE WATER

SVOC	BENZO(B)FLUORANTHENE						
Sample Location	Concentration (mg/l)	Q	Log of Concentration (mg/l)	Frequency:	1/14		
				Average:	0.005	Sample Std. Dev.	0.000
				Average log:	-5.28	Sample Std. Dev.	0.03
C1-SW-03-AV	0.0055	U	-5.2	UCL:	0.005	(log value)	
C1-SW-04	0.0055	U	-5.2	Maximum:	0.0055		
C1-SW-05	0.005	U	-5.3				
C1-SW-06	0.005	U	-5.3				
C1-SW-07	0.005	U	-5.3				
C1-SW-08	0.005	U	-5.3				
C1-SW-09	0.005	U	-5.3				
C2-SW-03-AV	0.005	U	-5.3				
C2-SW-04	0.005	U	-5.3				
C2-SW-05	0.005	U	-5.3				
C2-SW-06	0.005	U	-5.3				
C2-SW-10	0.005	U	-5.3				
C2-SW-11	0.005	U	-5.3				
C2-SW-12	0.005	U	-5.3				

* - The 95% UCL exceeds the maximum concentration detected in the samples.

OHM 002 2217

SURFACE WATE..

INORGANIC: **ARSENIC**

Sample Location	Concentration (mg/l)	Q	Log of Concentration (mg/l)
C1-SW-03-AV	0.00095	UJ	-7.0
C1-SW-04	0.00095	U	-7.0
C1-SW-05	0.00095	UJ	-7.0
C1-SW-06	0.00095	U	-7.0
C1-SW-07	0.0026	BJ	-6.0
C1-SW-08	0.0059	BJ	-5.1
C1-SW-09	0.00095	UJ	-7.0
C2-SW-03-AV	0.001	UJ	-6.9
C2-SW-04	0.001	U	-6.9
C2-SW-05	0.001	UJ	-6.9
C2-SW-06	0.001	U	-6.9
C2-SW-10	0.001	U	-6.9
C2-SW-11	0.001	U	-6.9
C2-SW-12	0.0028	BJ	-5.9

Frequency:	3/14		
Average:	0.002	Sample Std. Dev.	0.001
Average log:	-6.66	Sample Std. Dev. (log value)	0.57
UCL:	0.002		
Maximum:	0.0059		

SURFACE WATE.

INORGANIC:	BERYLLIUM		
Sample Location	Concentration (mg/l)	Q	Log of Concentration (mg/l)
C1-SW-03-AV	0.00015	UJ	-8.8
C1-SW-04	0.00015	U	-8.8
C1-SW-05	0.00015	UJ	-8.8
C1-SW-06	0.00015	U	-8.8
C1-SW-07	0.00015	UJ	-8.8
C1-SW-08	0.00015	U	-8.8
C1-SW-09	0.00015	U	-8.8
C2-SW-03-AV	0.00045	UJ	-7.7
C2-SW-04	0.00045	U	-7.7
C2-SW-05	0.00045	UJ	-7.7
C2-SW-06	0.00045	U	-7.7
C2-SW-10	0.00045	U	-7.7
C2-SW-11	0.00045	U	-7.7
C2-SW-12	0.00025	UJ	-8.3

Frequency:	0/14		
Average:	0.0003	Sample Std. Dev.	0.0001
Average log:	-8.30	Sample Std. Dev. (log value)	0.55
UCL:	0.0004		
Maximum:	0.00059		

CHM 002 2219

SURFACE WAT

INORGANIC: **CADMIUM**

Sample Location	Concentration (mg/l)	Q	Log of Concentration (mg/l)
C1-SW-03-AV	0.0012	BJ	-6.7
C1-SW-04	0.00075	U	-7.2
C1-SW-05	0.00075	UJ	-7.2
C1-SW-06	0.0019	B	-6.3
C1-SW-07	0.0067	J	-5.0
C1-SW-08	0.00075	U	-7.2
C1-SW-09	0.0017	B	-6.4
C2-SW-03-AV	0.0007	UJ	-7.3
C2-SW-04	0.0007	U	-7.3
C2-SW-05	0.0007	UJ	-7.3
C2-SW-06	0.0007	U	-7.3
C2-SW-10	0.0007	U	-7.3
C2-SW-11	0.0007	U	-7.3
C2-SW-12	0.0008	UJ	-7.1

Frequency:	4/14		
Average:	0.0013	Sample Std. Dev.	0.0016
Average log:	-6.91	Sample Std. Dev. (log value)	0.64
UCL:	0.0018		
Maximum:	0.0067		

DHM 002 2220

SURFACE WATER

INORGANIC: **MANGANESE**

Sample Location	Concentration (mg/l)	Q	Log of Concentration (mg/l)
C1-SW-03-AV	0.546	J	-0.6
C1-SW-04	0.0534		-2.9
C1-SW-05	0.211	J	-1.6
C1-SW-06	0.208		-1.6
C1-SW-07	3.1	J	1.1
C1-SW-08	1.77		0.6
C1-SW-09	0.0244		-3.7
C2-SW-03-AV	0.0179	J	-4.0
C2-SW-04	0.347		-1.1
C2-SW-05	1.83	J	0.6
C2-SW-06	1.48		0.4
C2-SW-10	0.414		-0.9
C2-SW-11	0.0489		-3.0
C2-SW-12	0.12	J	-2.1

Frequency:	14/14		
Average:	0.73	Sample Std. Dev.	0.94
Average log:	-1.34	Sample Std. Dev. (log value)	1.67
UCL:	6.98 *		
Maximum:	3.10		

* - The 95% UCL exceeds the maximum concentration detected in the samples.

CHM 002 2221

SEDIMENT - ON

SVOC	BENZO(A)ANTHRACENE						
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)	Frequency:	18/24		
				Average:	2.11	Sample Std. Dev.	4.72
				Average log:	-0.95	Sample Std. Dev.	1.60
C1-SD-03-01-AV	0.27	J	-1.3	UCL:	4.84	(log value)	
C1-SD-03-02	0.28	J	-1.3	Maximum:	11.0		
C1-SD-04-01	11.0	JD	2.4				
C1-SD-04-02	4.1	J	1.4				
C1-SD-05-01	0.48	J	-0.7				
C1-SD-05-02	0.28	J	-1.3				
C1-SD-06-01	0.13	J	-2.0				
C1-SD-06-02	0.096	J	-2.3				
C1-SD-07-01	0.041	J	-3.2				
C1-SD-08-01	0.38	UJ	-1.0				
C2-SD-03-01-AV	0.185	J	-1.7				
C2-SD-03-02	0.16	J	-1.8				
C2-SD-04-01	15.5	UJ	2.7				
C2-SD-04-02	15.5	UJ	2.7				
C2-SD-05-01	0.27	J	-1.3				
C2-SD-05-02	0.40	J	-0.9				
C2-SD-06-01	0.18	J	-1.7				
C2-SD-06-02	0.255	U	-1.4				
C2-SD-10-01	0.16	J	-1.8				
C2-SD-10-02	0.15	J	-1.9				
C2-SD-11-01	0.18	J	-1.7				
C2-SD-11-02	0.10	J	-2.3				
C2-SD-12-01	0.335	UJ	-1.1				
C2-SD-12-02	0.29	U	-1.2				

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SEDIMENT - E

SVOC	BENZO(B)FLUORANTHENE		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SD-03-01-AV	0.91	J	-0.1
C1-SD-03-02	1.1	J	0.1
C1-SD-04-01	32.0	JD	3.5
C1-SD-04-02	7.6	JD	2.0
C1-SD-05-01	1.1	J	0.1
C1-SD-05-02	0.64		-0.4
C1-SD-06-01	0.38	J	-1.0
C1-SD-06-02	0.23	J	-1.5
C1-SD-07-01	0.28	U	-1.3
C1-SD-08-01	0.38	UJ	-1.0
C2-SD-03-01-AV	0.38	J	-1.0
C2-SD-03-02	0.32	J	-1.1
C2-SD-04-01	15.5	UJ	2.7
C2-SD-04-02	15.5	UJ	2.7
C2-SD-05-01	0.52	J	-0.7
C2-SD-05-02	0.82	J	-0.2
C2-SD-06-01	0.27	J	-1.3
C2-SD-06-02	0.255	U	-1.4
C2-SD-10-01	0.54	J	-0.6
C2-SD-10-02	0.35	J	-1.0
C2-SD-11-01	0.41	J	-0.9
C2-SD-11-02	0.17	J	-1.8
C2-SD-12-01	0.335	UJ	-1.1
C2-SD-12-02	0.29	UJ	-1.2

Frequency:	17/24		
Average:	3.35	Sample Std. Dev.	7.52
Average log:	-0.26	Sample Std. Dev. (log value)	1.47
UCL:	6.25		
Maximum:	32.00		

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SEDIMENT - C

SVOC	BENZO(A)PYRENE		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SD-03-01-AV	0.875	UJ	-0.1
C1-SD-03-02	0.85	UJ	-0.2
C1-SD-04-01	13.0	JD	2.6
C1-SD-04-02	3.7	J	1.3
C1-SD-05-01	0.58	J	-0.5
C1-SD-05-02	0.42	J	-0.9
C1-SD-06-01	0.39	UJ	-0.9
C1-SD-06-02	0.265	U	-1.3
C1-SD-07-01	0.28	U	-1.3
C1-SD-08-01	0.38	UJ	-1.0
C2-SD-03-01-AV	0.385	J	-1.0
C2-SD-03-02	0.28	J	-1.3
C2-SD-04-01	15.5	UJ	2.7
C2-SD-04-02	15.5	UJ	2.7
C2-SD-05-01	0.35	J	-1.0
C2-SD-05-02	0.31	J	-1.2
C2-SD-06-01	0.24	J	-1.4
C2-SD-06-02	0.255	U	-1.4
C2-SD-10-01	0.25	J	-1.4
C2-SD-10-02	0.22	J	-1.5
C2-SD-11-01	0.28	J	-1.3
C2-SD-11-02	0.14	J	-2.0
C2-SD-12-01	0.335	UJ	-1.1
C2-SD-12-02	0.29	UJ	-1.2

Frequency:	13/24		
Average:	2.29	Sample Std. Dev.	4.85
Average log:	-0.52	Sample Std. Dev.	1.39
UCL:	4.05	(log value)	
Maximum:	13.00		

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SEDIMENT - C. .TE

SVOC	DIBENZO(A,H)ANTHRACENE		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SD-03-01-AV	0.875	UJ	-0.1
C1-SD-03-02	0.85	UJ	-0.2
C1-SD-04-01	1.6	J	0.5
C1-SD-04-02	0.39	J	-0.9
C1-SD-05-01	0.33	UJ	-1.1
C1-SD-05-02	0.285	U	-1.3
C1-SD-06-01	0.39	UJ	-0.9
C1-SD-06-02	0.265	U	-1.3
C1-SD-07-01	0.28	U	-1.3
C1-SD-08-01	0.38	UJ	-1.0
C2-SD-03-01-AV	0.85	UJ	-0.2
C2-SD-03-02	0.60	UJ	-0.5
C2-SD-04-01	15.5	UJ	2.7
C2-SD-04-02	15.5	UJ	2.7
C2-SD-05-01	0.315	UJ	-1.2
C2-SD-05-02	0.375	UJ	-1.0
C2-SD-06-01	0.39	UJ	-0.9
C2-SD-06-02	0.255	U	-1.4
C2-SD-10-01	0.375	U	-1.0
C2-SD-10-02	0.345	UJ	-1.1
C2-SD-11-01		R	
C2-SD-11-02	0.305	UJ	-1.2
C2-SD-12-01	0.335	UJ	-1.1
C2-SD-12-02	0.29	UJ	-1.2

Frequency:	2/23		
Average:	1.79	Sample Std. Dev.	4.34
Average log:	-0.56	Sample Std. Dev.	1.14
UCL:	2.23 *	(log value)	
Maximum:	1.60		

* - The 95% UCL exceeds the maximum concentration detected in the samples.

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SEDIMENT - ON

SVOC	INDENO(1,2,3-CD)PYRENE						
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)	Frequency:	4/23		
				Average:	2.08	Sample Std. Dev.	4.46
				Average log:	-0.43	Sample Std. Dev.	1.26
C1-SD-03-01-AV	0.875	UJ	-0.1	UCL:	3.14	(log value)	
C1-SD-03-02	0.85	UJ	-0.2	Maximum:	7.00		
C1-SD-04-01	7.0	J	1.9				
C1-SD-04-02	1.9	J	0.6				
C1-SD-05-01	0.33	UJ	-1.1				
C1-SD-05-02	0.285	U	-1.3				
C1-SD-06-01	0.39	UJ	-0.9				
C1-SD-06-02	0.265	U	-1.3				
C1-SD-07-01	0.28	U	-1.3				
C1-SD-08-01	0.38	UJ	-1.0				
C2-SD-03-01-AV	0.85	UJ	-0.2				
C2-SD-03-02	0.60	UJ	-0.5				
C2-SD-04-01	15.5	UJ	2.7				
C2-SD-04-02	15.5	UJ	2.7				
C2-SD-05-01	0.31	J	-1.2				
C2-SD-05-02	0.34	J	-1.1				
C2-SD-06-01	0.39	UJ	-0.9				
C2-SD-06-02	0.255	U	-1.4				
C2-SD-10-01	0.375	UJ	-1.0				
C2-SD-10-02	0.345	UJ	-1.1				
C2-SD-11-01		R					
C2-SD-11-02	0.305	UJ	-1.2				
C2-SD-12-01	0.335	UJ	-1.1				
C2-SD-12-02	0.29	UJ	-1.2				

SEDIMENT - ON

PCB:	AROCLOR 1248		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SD-03-01-AV	0.875	UJ	-0.1
C1-SD-03-02	0.85	UJ	-0.2
C1-SD-04-01	0.47	UJ	-0.8
C1-SD-04-02	0.39	UJ	-0.9
C1-SD-05-01	0.62	J	-0.5
C1-SD-05-02	1.1	J	0.1
C1-SD-06-01	1.4	J	0.3
C1-SD-06-02	0.39	J	-0.9
C1-SD-07-01	0.27	U	-1.3
C1-SD-08-01	0.0375	UJ	-3.3
C2-SD-03-01-AV	0.085	UJ	-2.5
C2-SD-03-02	0.06	UJ	-2.8
C2-SD-04-01	0.05	UJ	-3.0
C2-SD-04-02	6.3	JND	1.8
C2-SD-05-01	0.0315	UJ	-3.5
C2-SD-05-02	0.0375	UJ	-3.3
C2-SD-06-01	0.0395	UJ	-3.2
C2-SD-06-02	0.0255	UJ	-3.7
C2-SD-10-01	0.0375	UJ	-3.3
C2-SD-10-02	0.0345	UJ	-3.4
C2-SD-11-01	0.0315	U	-3.5
C2-SD-11-02	0.0305	U	-3.5
C2-SD-12-01	0.0335	UJ	-3.4
C2-SD-12-02	0.029	U	-3.5

Frequency:	5/24		
Average:	0.55	Sample Std. Dev.	1.29
Average log:	-2.01	Sample Std. Dev. (log value)	1.64
UCL:	1.84		
Maximum:	6.30		

SEDIMENT - ON

PCB:	AROCLOR 1254		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SD-03-01-AV	4.45	J	1.5
C1-SD-03-02	6.1	J	1.8
C1-SD-04-01	5.1	J	1.6
C1-SD-04-02	6.9	J	1.9
C1-SD-05-01	0.33	UJ	-1.1
C1-SD-05-02	0.285	U	-1.3
C1-SD-06-01	0.38	UJ	-1.0
C1-SD-06-02	0.265	U	-1.3
C1-SD-07-01	10.0	JN	2.3
C1-SD-08-01	0.038	J	-3.3
C2-SD-03-01-AV	1.75	DJN	0.6
C2-SD-03-02	2.7	DJ	1.0
C2-SD-04-01	6.2	DJ	1.8
C2-SD-04-02	0.05	UJ	-3.0
C2-SD-05-01	0.0315	UJ	-3.5
C2-SD-05-02	0.0375	UJ	-3.3
C2-SD-06-01	0.0395	UJ	-3.2
C2-SD-06-02	0.21	J	-1.6
C2-SD-10-01	1.1	JND	0.1
C2-SD-10-02	1.3	DJ	0.3
C2-SD-11-01	2.4	JND	0.9
C2-SD-11-02	6.2	D	1.8
C2-SD-12-01	0.0335	UJ	-3.4
C2-SD-12-02	0.029	U	-3.5

Frequency:	14/23		
Average:	2.33	Sample Std. Dev.	2.92
Average log:	-0.57	Sample Std. Dev. (log value)	2.12
UCL:	32.74 *		
Maximum:	10.00		

* - The 95% UCL exceeds the maximum concentration detected in the samples.

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SEDIMENT - OU

PCB:	AROCLOR 1260		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SD-03-01-AV	0.875	UJ	-0.1
C1-SD-03-02	0.85	UJ	-0.2
C1-SD-04-01	0.47	UJ	-0.8
C1-SD-04-02	0.39	UJ	-0.9
C1-SD-05-01	1.4	J	0.3
C1-SD-05-02	1.6	J	0.5
C1-SD-06-01	1.7	JN	0.5
C1-SD-06-02	0.82		-0.2
C1-SD-07-01	0.27	U	-1.3
C1-SD-08-01	0.0375	UJ	-3.3
C2-SD-03-01-AV	0.085	UJ	-2.5
C2-SD-03-02	0.06	UJ	-2.8
C2-SD-04-01	0.05	UJ	-3.0
C2-SD-04-02	3.8	D	1.3
C2-SD-05-01	3.0	DJ	1.1
C2-SD-05-02	1.1	J	0.1
C2-SD-06-01	1.2	J	0.2
C2-SD-06-02	0.0255	UJ	-3.7
C2-SD-10-01	0.0375	UJ	-3.3
C2-SD-10-02	0.0345	UJ	-3.4
C2-SD-11-01	0.0315	U	-3.5
C2-SD-11-02	0.0305	U	-3.5
C2-SD-12-01	0.13	J	-2.0
C2-SD-12-02	0.18	J	-1.7

Frequency:	10/24		
Average:	0.76	Sample Std. Dev.	0.99
Average log:	-1.33	Sample Std. Dev. (log value)	1.68
UCL:	3.92 *		
Maximum:	3.80		

* - The 95% UCL exceeds the maximum concentration detected in the samples.

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SEDIMENT - ON-...

INORGANIC:	ARSENIC		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SD-03-01-AV	5.2	BJ	1.6
C1-SD-03-02	7.1	BJ	2.0
C1-SD-04-01	6.4	J	1.9
C1-SD-04-02	4.9	J	1.6
C1-SD-05-01	5.9	J	1.8
C1-SD-05-02	6.1		1.8
C1-SD-06-01	4.6	J	1.5
C1-SD-06-02	4.1		1.4
C1-SD-07-01	1.8	BJ	0.6
C1-SD-08-01	3.7		1.3
C2-SD-03-01-AV	7.45	BJ	2.0
C2-SD-03-02	6.6	BJ	1.9
C2-SD-04-01	8.5	J	2.1
C2-SD-04-02	6.9	J	1.9
C2-SD-05-01	7.3	J	2.0
C2-SD-05-02	7.1	J	2.0
C2-SD-06-01	3.9	BJ	1.4
C2-SD-06-02	1.9	BJ	0.6
C2-SD-10-01	31.7	J	3.5
C2-SD-10-02	18.6	J	2.9
C2-SD-11-01	17.36	J	2.9
C2-SD-11-02	10.3	J	2.3
C2-SD-12-01	9.6	J	2.3
C2-SD-12-02	3.5	B	1.3

Frequency:	24/24		
Average:	7.94	Sample Std. Dev.	6.46
Average log:	1.85	Sample Std. Dev. (log value)	0.65
UCL:	10.58		
Maximum:	31.70		

SEDIMENT SITE

INORGANIC:

BERYLLIUM

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SD-03-01-AV	3.05	BJ	1.1
C1-SD-03-02	2.6	BJ	1.0
C1-SD-04-01	0.93	BJ	-0.1
C1-SD-04-02	1.1	BJ	0.1
C1-SD-05-01	1.2	BJ	0.2
C1-SD-05-02	2.1		0.7
C1-SD-06-01	1.2	BJ	0.2
C1-SD-06-02	0.97	B	0.0
C1-SD-07-01	0.35	B	-1.0
C1-SD-08-01	1.2	B	0.2
C2-SD-03-01-AV	3.1	BJ	1.1
C2-SD-03-02	1.8	BJ	0.6
C2-SD-04-01	1.2	BJ	0.2
C2-SD-04-02	1.6	BJ	0.5
C2-SD-05-01	1.4	BJ	0.3
C2-SD-05-02	2.0	BJ	0.7
C2-SD-06-01	0.74	BJ	-0.3
C2-SD-06-02	0.67	B	-0.4
C2-SD-10-01	2.7	J	1.0
C2-SD-10-02	2.6	J	1.0
C2-SD-11-01	2.3	J	0.8
C2-SD-11-02	1.9		0.6
C2-SD-12-01	1.6	BJ	0.5
C2-SD-12-02	0.52	B	-0.7

Frequency:	24/24		
Average:	1.62	Sample Std. Dev.	0.80
Average log:	0.34	Sample Std. Dev. (log value)	0.57
UCL:	2.12		
Maximum:	3.10		

SEDIMENT - ON-SITE

INORGANIC:	MANGANESE						
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)	Frequency:	24/24		
				Average:	1044.92	Sample Std. Dev.	1085.37
				Average log:	6.60	Sample Std. Dev. (log value)	0.80
C1-SD-03-01-AV	785	J	6.7	UCL:	1486.11		
C1-SD-03-02	711	J	6.6	Maximum:	4170.00		
C1-SD-04-01	688	J	6.5				
C1-SD-04-02	463	J	6.1				
C1-SD-05-01	446	J	6.1				
C1-SD-05-02	747	J	6.6				
C1-SD-06-01	967	J	6.9				
C1-SD-06-02	503	J	6.2				
C1-SD-07-01	1410	J	7.3				
C1-SD-08-01	390	J	6.0				
C2-SD-03-01-AV	395	J	6.0				
C2-SD-03-02	387	J	6.0				
C2-SD-04-01	608	J	6.4				
C2-SD-04-02	683	J	6.5				
C2-SD-05-01	695	J	6.5				
C2-SD-05-02	437	J	6.1				
C2-SD-06-01	597	J	6.4				
C2-SD-06-02	158		5.1				
C2-SD-10-01	4050	J	8.3				
C2-SD-10-02	4170	J	8.3				
C2-SD-11-01	1850	J	7.5				
C2-SD-11-02	1080		7.0				
C2-SD-12-01	2600	J	7.9				
C2-SD-12-02	258		5.6				

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SEDIMENT - ON-S.

INORGANIC: **MERCURY**

Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SD-03-01-AV	1.01	J	0.0
C1-SD-03-02	1.5	J	0.4
C1-SD-04-01	0.48	J	-0.7
C1-SD-04-02	0.55	J	-0.6
C1-SD-05-01	0.23	J	-1.5
C1-SD-05-02	0.38		-1.0
C1-SD-06-01	0.15	BJ	-1.9
C1-SD-06-02	0.15	B	-1.9
C1-SD-07-01	0.26		-1.3
C1-SD-08-01	0.11	B	-2.2
C2-SD-03-01-AV	1.45	J	0.4
C2-SD-03-02	1.9	J	0.6
C2-SD-04-01	0.93	J	-0.1
C2-SD-04-02	1.1	J	0.1
C2-SD-05-01	0.27	J	-1.3
C2-SD-05-02	0.24	J	-1.4
C2-SD-06-01	0.2	J	-1.6
C2-SD-06-02	0.04	UJ	-3.2
C2-SD-10-01	0.77	J	-0.3
C2-SD-10-02	0.5	U	-0.7
C2-SD-11-01	0.86	J	-0.2
C2-SD-11-02	7.1	J	2.0
C2-SD-12-01	0.14	BJ	-2.0
C2-SD-12-02	0.19	J	-1.7

Frequency:	22/24		
Average:	0.85	Sample Std. Dev.	1.42
Average log:	-0.83	Sample Std. Dev.	1.14
UCL:	1.66	(log value)	
Maximum:	7.10		

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SEDIMENT - d

INORGANIC:	VANADIUM		
Sample Location	Concentration (mg/kg)	Q	Log of Concentration (mg/kg)
C1-SD-03-01-AV	64.9	J	4.2
C1-SD-03-02	65.4	J	4.2
C1-SD-04-01	37.1	J	3.6
C1-SD-04-02	41.4	J	3.7
C1-SD-05-01	42.7	J	3.8
C1-SD-05-02	58.7	J	4.1
C1-SD-06-01	32.7	J	3.5
C1-SD-06-02	39.3	J	3.7
C1-SD-07-01	201	J	5.3
C1-SD-08-01	36.0	J	3.6
C2-SD-03-01-AV	63.7	J	4.2
C2-SD-03-02	67.2	J	4.2
C2-SD-04-01	52.6	J	4.0
C2-SD-04-02	69.9	J	4.2
C2-SD-05-01	54.7	J	4.0
C2-SD-05-02	48.4	J	3.9
C2-SD-06-01	30.5	J	3.4
C2-SD-06-02	19.5		3.0
C2-SD-10-01	89.9	J	4.5
C2-SD-10-02	99.8	J	4.6
C2-SD-11-01	77.5	J	4.4
C2-SD-11-02	58.4		4.1
C2-SD-12-01	63.1	J	4.1
C2-SD-12-02	32.8		3.5

Frequency:	24/24		
Average:	60.30	Sample Std. Dev.	35.68
Average log:	3.98	Sample Std. Dev. (log value)	0.47
UCL:	72.93		
Maximum:	201.00		

CHN 002 2234

Appendix N

CHM 200 2225

APPENDIX N

TOXICOLOGICAL PROFILES

ACETALDEHYDE

Acetaldehyde is used in the manufacture of a variety of products including paraldehyde, acetic acid, butanol, perfumes, flavors, aniline dyes, plastic, and synthetic rubber. It is irritating to the eyes and to mucous membranes and is toxic via the intratracheal and intravenous routes. It is a system irritant in humans via inhalation. Large doses may cause death by paralyzing the respiratory system. Acetaldehyde acts as a narcotic. Symptoms of chronic intoxication are similar to those of chronic alcoholism. (Budavari et al., 1989 and Lewis, 1992).

Acetaldehyde has been classified by EPA in Group B2 (Probable Human Carcinogen) based on sufficient evidence of carcinogenicity in animals and inadequate or no evidence in humans. IRIS (1995) derived an inhalation cancer slope factor of 7.7E-03 $(mg/kg\text{-}day)^{-1}$ for acetaldehyde based on a study by Woutersen and Appleman (1984) in which rats exposed by inhalation developed nasal tumors and adenocarcinomas. EPA has not developed an oral slope factor for this chemical (IRIS, 1995).

EPA has not developed an oral reference dose (RfD) for acetaldehyde (IRIS, 1995). EPA has derived an inhalation reference concentration (RfC) of 9E-03 mg/m^3, which corresponds to an inhalation RfD of 2.6E-03 mg/kg-day, based on short-term rat inhalation studies conducted by Appleman et al. (1982, 1986) where degeneration of the olfactory epithelium was observed. (IRIS, 1995). An uncertainty factor of 1000 was applied in the development of the inhalation RfD. (IRIS, 1995).

ACETONE

Acetone is a commonly used solvent in paints, varnishes and lacquers. It is also used to clean and dry parts of precision equipment, as a delusterant for cellulose acetate fibers, and for specification testing of vulcanized rubber products. (Sax and Lewis, 1987). Acetone is rapidly and passively absorbed from the lungs and gastrointestinal tract and can also be absorbed from the skin. After uptake by the lungs, acetone is readily absorbed into the bloodstream. Acetone is highly water soluble and is widely distributed to tissues and organs throughout the body. (ATSDR, 1992).

Acetone is generally regarded as having low toxicity and therefore has not been extensively studied (Clement Associates, Inc. 1985). The only acute effect observed in humans exposed to acetone vapors is irritation of the nose, throat, and lungs. Workers exposed to acetone at 900 ppm or higher complained of irritation, headache, light-headedness, dizziness, unsteadiness, and confusion. Eye irritation is also a common complaint of workers exposed to acetone vapors.

Neurobehavioral effects have been observed in humans exposed acutely by inhalation either in the workplace or in laboratory experiments. Hematological effects, which might indicate immunological effects, have been observed in humans exposed acutely in laboratory experiments. (ATSDR, 1992).

Acute exposure to animals to much higher concentrations (greater than 10,000 ppm) has

resulted in pulmonary edema, congestion, and hemorrhage of the lungs. Inhalation exposure to acetone for a few hours has resulted in death of rats of concentrations ranging from 16,000 to 50,600 ppm (ATSDR, 1992).

Prolonged inhalation of high concentrations of acetone may produce irritation of the respiratory tract, coughing, headache, drowsiness, incoordination, and in severe cases, coma (Clement Associates, Inc., 1985). No chronic health hazards in humans, however, have been associated with exposure to acetone (Clement Associates, Inc., 1985; ATSDR, 1992).

In animal studies, rats consuming doses of 18 mg/kg-day for 4 months showed reduced food consumption and growth. In behavioral studies, rats exposed to 6,000 ppm (14,200 mg/m3) acetone for 4 hours/day, 5 days/week for 2 weeks showed modified avoidance and escape behavior after one exposure, but no changes after subsequent exposures. At 16,000 ppm (37,800 mg/m3), altered responses were noted throughout the 2-week exposure period (Clement Associates, Inc., 1985).

Acetone has been classified by EPA (IRIS, 1994) in Group D - Not classifiable as to human carcinogenicity based on a lack of data in humans or animals. EPA (IRIS, 1994) has therefore not established oral or inhalation slope factors.

ACETONE (Cont'd)

EPA (IRIS, 1994) has derived an oral reference dose (RfD) of 1E-01 mg/kg-day for subchronic exposure to acetone based on an oral gavage study in rats in which increased liver and kidney weights and nephrotoxicity were observed (EPA, 1986). An uncertainty factor of 1000 was applied in the development of the oral RfD (IRIS, 1994). EPA has not derived an inhalation reference concentration (RfC) for acetone (IRIS, 1994).

ACROLEIN

Acrolein is an unsaturated aldehyde which has been used in the manufacture of colloidal metals, plastics, and perfumes, in military poison gas mixtures, and as an aquatic herbicide (Budavari et al., 1989).

Acrolein is absorbed in humans via the dermal contact and inhalation routes of exposure. It is a systemic irritant in humans. Inhalation exposure may cause eye irritation and lacrimation; delayed hypersensitivity, and respiratory system damage. Dermal exposure can cause severe skin irritation. (Lewis, 1992).

The EPA has classified acrolein in Group C (Possible Human Carcinogen) (IRIS, 1994). This classification is based on an increased incidence of adrenocortical adenomas in female rats and on the carcinogenic potential of an acrolein metabolite. Acrolein is mutagenic in bacteria and is structurally related to probable or known human carcinogens. (IRIS, 1994). No human carcinogencity data are available. Neither an oral nor an inhalation slope factor has been developed by the EPA for acrolein.

The EPA has developed a chronic oral reference dose (RfD) of 2E-02 mg/kg-day based on a study by Newell (1958) in which rats were exposed to acrolein in drinking water for 90 days. An NOAEL of 15.6 mg/kg-day was identified. An uncertainty factor of 1000 was applied in the development of the RfD. (EPA, 1994).

ACROLEIN (Cont'd)

The EPA has also developed a chronic inhalation reference concentration (RfC) of 2E-05 mg/m^3 which has been converted to an inhalation RfD of 5.7E-06 mg/kg-day (IRIS, 1994). This value was based on two subchronic rat inhalation studies by Kutzman (1981) and Feron et al. (1978). In the Kutzman (1981) inhalation study, rats were exposed to 0, 0.4, 1.4, and 4.0 ppm of acrolein 6 hours/day, 5 days/week for 62 days. In the Feron et al. (1978) inhalation study, hamsters, rats, and rabbits were exposed to 0, 0.4, 1.4, and 4.9 ppm of acrolein 6 hours/day, 5 days/week for 13 weeks. The effects observed in rats included squamous metaplasia and neutrophilic infiltration of the nasal epithelium. An uncertainty factor of 1000 was applied in development of the RfC. (IRIS, 1994).

ALDRIN/DIELDRIN

Aldrin degrades to dieldrin, which is very persistent in the environment. Both pesticides are carcinogenic in rats and mice and are teratogenic and reproductive toxicants. Poisoning by aldrin usually involves convulsions caused by effects on the central nervous system. Other reported symptoms include nausea, vomiting, dizziness, and mild clonic jerking (Clement Associates, Inc., 1985).

EPA has given dieldrin a Group B2 (Probable Human Carcinogen) weight-of-evidence classification. Dieldrin has been shown to be carcinogenic in various strains of mice. IRIS (1994) has developed an oral and inhalation slope factor of 1.6E+01 $(mg/kg\text{-}day)^{-1}$. The oral slope factor is the geometric mean of 13 slope factors calculated from liver carcinoma data in both sexes of several strains of mice (Davis, 1965; Walker et al., 1972, 1973; NCI, 1978; Tennekes, 1981 and Meierhenry, 1983). The inhalation slope factor was calculated from the oral data. The oral reference dose (RfD) was determined to be 5E-05 mg/kg-day based on a 2 year rat feeding study performed by Walker et al. (1969). Dieldrin was administered to Carworth Farm "E" rats for 2 years at dietary concentrations of 0, 0.1, 1, or 10 ppm. At the end of the 2 year study, female rats fed 1 and 10 ppm had increased liver weights and liver-to-body weight ratios. The critical effect was liver lesions characteristic of exposure to an organochlorine insecticide. The NOAEL was determined to be 0.005 mg/kg-day and an uncertainty factor of 100 was used to develop the oral RfD. An inhalation reference concentration (RfC) is not available at this time. (IRIS 1994).

ALDRIN/DIELDRIN (Cont'd)

EPA has given aldrin a Group B2 (Probable Human Carcinogen) weight-of-evidence classification. IRIS (1994) has developed an oral and inhalation slope factor of 1.7E+01 $(mg/kg\text{-}day)^{-1}$. These values were based on several studies in which mice fed aldrin in the diet developed liver cancer.

IRIS (1994) has derived an oral reference dose (RfD) of 3E-05 mg/kg-day based on a chronic feeding study by Fitzhugh et al. (1964) in which rats fed aldrin in the diet for 2 years developed liver lesions. A lowest-observed-adverse-effect-level (LOAEL) of 0.25 mg/kg-day was identified and an uncertainty factor of 1000 was used to develop the oral RfD. An inhalation reference concentration (RfC) has not been developed.

ANTIMONY

Antimony production has been associated with an increase in lung cancer in exposed workers. An inhalation study using rats yielded suggestive evidence that antimony trioxide causes lung and liver tumors, and several antimony compounds were mutagenic when tested using bacterial test systems. Female workers exposed to antimony compounds had an increased incidence of gynecological disorders and spontaneous abortions; similar effects were observed in an animal study. Antimony also causes cardiovascular changes in humans and may damage the myocardia (Clement Associates, Inc., 1985).

The EPA has not assigned antimony a weight-of-evidence classification. This chemical has not been reviewed by the EPA for evidence of carcinogenic potential (IRIS, 1994). An oral reference dose (RfD) of 4E-04 mg/kg-day was developed based on a rat chronic oral bioassay by Schroeder et al. (1970). In this study, rats were administered 5 ppm of antimony tartrate in drinking water. Survival rates decreased in male rats as did the blood glucose level. Cholesterol levels were altered in both sexes. A NOEL was not established as only one level of antimony was administered. The LOAEL was 0.35 mg/kg-day. An uncertainty factor of 1000 was applied in developing the oral RfD (IRIS, 1994). An inhalation reference concentration (RfC) has not been developed.

ARSENIC

Acute exposure of humans to the metal arsenic has been associated with gastrointestinal effects, hemolysis, and neuropathy. Chronic exposure of humans to this metal can produce toxic effects on both the peripheral and central nervous systems, keratosis, hyperpigmentation, precancerous dermal lesions, and cardiovascular damage (EPA, 1984). Arsenic is embryotoxic, fetotoxic, and teratogenic in several animals species (EPA, 1984). Arsenic is a known human carcinogen (Group A) (EPA, 1994). Epidemiological studies of workers in smelters and in plants manufacturing arsenical pesticides have shown that inhalation of arsenic is strongly associated with lung cancer and perhaps with hepatic angiosarcoma (EPA, 1984). Ingestion of arsenic has been linked to a form of skin cancer and more recently to bladder, liver, and lung cancer (Tseng et al., 1968).

EPA has developed inhalation and oral cancer slope factors for arsenic of 1.5E+01 $(mg/kg\text{-}day)^{-1}$ and 1.75E+00 $(mg/kg\text{-}day)^{-1}$ (IRIS, 1994), respectively. In developing the inhalation slope factor, a geometric mean was calculated from data sets obtained within distinct exposed populations. The final estimate is the geometric mean of those two values (IRIS, 1994). The oral slope factor was calculated using the unit risk of 5E-05 $(ug/l)^{-1}$ proposed by the Risk Assessment Forum. This was based on an epidemiological study in Taiwan by Tseng et al. (1977) which indicated an increased incidence of skin cancer in individuals exposed to arsenic in drinking water.

ARSENIC (Cont'd)

EPA (IRIS, 1994) developed an oral reference dose (RfD) of 3E-04 mg/kg-day based on the Tseng et al. (1968) study which showed increased incidences of hyperpigmentation and keratosis with age and on the Tseng (1977) study. An uncertainty factor of 3 was used to develop the oral RfD. An inhalation reference concentration (RfC) has not been developed.

BARIUM

Absorption of barium from the gastrointestinal tract following oral exposure has been estimated in one report to be approximately 5% for human adults (EPA, 1987). Specific studies on the extent of absorption of barium following inhalation exposure have not been conducted. However, systemic toxicity has been observed following inhalation exposure to this metal suggesting that absorption of barium from the respiratory tract occurs to some extent (EPA, 1984).

Barium carbonate and more soluble barium compounds are quite toxic to humans following oral exposure. Doses of barium carbonate and barium chloride of 57 mg/kg and 12 mg/kg, respectively, have been reported to be fatal when ingested by humans. Adverse effects observed in humans following ingestion of barium have included gastroenteritis, muscular paralysis, hypertension, cardiotoxicity including ventricular fibrillation, and damage to the central nervous system (EPA, 1984; Perry et al., 1983). Chronic oral exposure of rats to barium has been observed to cause significant increases in blood pressure (EPA, 1984).

Inhalation of barium sulfate or barium carbonate dust has been associated in occupationally exposed workers with baritosis, a benign pneumoconiosis (Goyer, 1986). Inhalation exposure of male rats to barium carbonate dust has produced such effects as decreased numbers of spermatozoids, decreased numbers of motile sperm forms, and increased fetal mortality following mating of treating males with untreated females. Exposure of female rats has been

associated with ovarian follicle atresia, increased mortality in subsequent litters, and a general underdevelopment of newborn pups (EPA, 1984).

EPA (IRIS, 1994) derived an oral reference dose (RfD) for barium based on epidemiological studies by Wones et al. (1990) and Brenniman and Levy (1984), as well as on rodent studies conducted by Perry et al. (1983), McCauley et al. (1985), Schroeder and Mitchner (1975a, b), and Tardiff et al. (1980). In the Wones et al. (1990) study, barium in the form of barium chloride was administered in drinking water to human volunteers over a 10 week period. Subjects were given 1.5 liters/day of water containing 0, 5 or 10 mg/l barium. As no increase in blood pressure was observed, the NOAEL of 10 mg/l barium was identified which corresponds to 0.21 mg/kg/day based on an actual consumption rate of 1.5 liters/day and a 70 kg body weight. In the Brenniman and Levy (1984) study, no significant differences in human mortality and morbidity rates, blood pressure, hypertension prevalence, stroke, or heart and renal disease were observed between populations ingesting 2 to 10 mg/l barium in drinking water and populations ingesting no or less than 0.2 mg/l barium in drinking water. EPA does not believe that any single study is adequate to calculate an oral RfD for barium. Therefore, based on these studies, an oral RfD of 7E-02 mg/kg-day was derived using an uncertainty factor of 3 (IRIS, 1994). An inhalation reference concentration (RfC) has not been developed by EPA (IRIS, 1994).

Barium has not been evaluated by EPA for evidence of human carcinogenic potential.

BENZENE

Benzene is readily absorbed into the body via ingestion and inhalation (EPA, 1985). The toxic effects of benzene vapors in humans and other animals include central nervous system effects, hematological effects, and immune system depression. In humans, acute exposure to high concentrations of benzene vapors can result in central nervous system effects such as dizziness, nausea, vomiting, headache, drowsiness, narcosis, coma, and death (NAS, 1976). Chronic exposure to benzene vapors can result in reduction in the number of leukocytes, platelets, or red blood cells (EPA, 1985). Benzene has produced solid tumors and leukemias in rats exposed by gavage (Maltoni et al., 1985). Many studies have also described a causal relationship between exposure to benzene (concentrations unspecified) by inhalation (either alone or in combination with other chemicals) and leukemia in humans (IARC, 1982).

Benzene is classified by EPA in Group A, Human Carcinogen, based on adequate evidence of carcinogenicity from epidemiological studies. IRIS (1994) derived an inhalation cancer slope factor of 2.9E-02 $(mg/kg\text{-}day)^{-1}$ for benzene based on epidemiological studies (Ott et al., 1978; Rinsky et al., 1981; Wong et al., 1983) in which significantly increased incidences of nonlymphotytic leukemia were observed in workers exposed to benzene principally by inhalation. The oral slope factor of 2.9E-02 $(mg/kg\text{-}day)^{-1}$ was derived based on the same studies used to develop the inhalation slope factor. The oral and inhalation reference dose (RfD) and reference concentration (RfC) are currently undergoing review by EPA; however, the slope factors presented here were used in quantifying risks in this report.

BERYLLIUM

Beryllium is a metal with a complicated chemistry, and it can form complexes, oxycarboxylates, and chelates with a variety of materials. Inhalation exposure to beryllium causes lung and bone cancer in animals, and epidemiological studies suggest that it may cause lung cancer in humans. Acute respiratory effects include rhinitis, pharyngitis, tracheobronchitis, and acute pneumonitis associated with inhalation of beryllium. Dermal exposure can cause contact dermatitis (Clement Associates, 1985). Beryllium has been reported to cause berylliosis (chronic granulomatous pulmonary disease), in which granulomatous lesions occur in the lungs. In the early stages, the lesions are filled with fluid. As the lesions progress, interstitial fibrosis increases with loss of functioning alveoli and effective air/capillary gas exchange resulting in increasing respiratory dysfunction (Casarett and Doull, 1986).

Beryllium has been classified for carcinogenicity by EPA in Group B2 (Probable Human Carcinogen). An inhalation slope factor of 8.4E+00 $(mg/kg\text{-}day)^{-1}$ was developed based on occupational exposure studies (IRIS, 1994). An oral slope factor of 4.3E+00 $(mg/kg\text{-}day)^{-1}$ was developed based on studies from rats exposed to beryllium (5 ppm) in drinking water (Schroeder and Mitchener, 1975). An oral reference dose (RfD) of 5E-03 mg/kg-day was developed based on the same study, with an uncertainty factor of 100 applied. An inhalation reference concentration (RfC) has not been developed (IRIS, 1994).

BIS(2-CHLOROETHYL)ETHER

Bis(2-chloroethyl)ether is a colorless, nonflammable liquid which has been used as a soil fumigant, an insecticide, and as an acaricide. It has also been used as a solvent for fats, waxes, greases, and cellulose ethers as a scouring agent for textiles, in paints, varnishes, and lacquers as a paint remover and in dry cleaning (IARC, 1975).

Lingg et al. (1978) administered 40 mg/kg of bis(2-chloroethyl)ether to male Sprague-Dawley rats by intubation and found that virtually all of the chemical was excreted as urinary metabolites. More than 60 percent of the compound was excreted within 24 hours.

Schrenk et al. (1933) found that exposure of guinea pigs to air containing toxic concentrations of bis(2-chloroethyl)ether resulted in irritation of the respiratory passages and lungs. The investigators also found that human exposures to concentrations of greater than 260 ppm were very irritating to the nasal passages and eyes. The highest exposure concentration resulting in no noticeable sign of irritation was 35 ppm.

Innes et al. (1969) administered 100 mg/kg-day bis(2-chloroethyl)ether to 7-day old males and females of two strains of C57B1 mice for 80 weeks, first by intubation for 3 weeks followed by ingestion of food containing 300 ppm bis(2-chloroethyl)ether (estimated to be equivalent to daily intake of 100 mg/kg). The incidence of hepatomas was significantly increased in male mice of both strains ($p=0.01$). Theiss et al. (1977) was unable to detect any enhancement of pulmonary tumor incidence in Strain A mice (a strain of mice that has a high spontaneous

pulmonary tumor incidence) administered repeated intraperitoneal injections of bis(2-chlorethyl)ether.

Bis(2-chloroethyl)ether has been found to be mutagenic using different tester strains of Escherichia coli, Salmonella typhimurium, and Bacillus subtilis. It was reported to be mutagenic in Saccharomyces cerevisiae D3 in suspension assay but not in mice in the heritable translocation test (EPA, 1980).

EPA classifies bis(2-chloroethyl)ether in Group B2-Probable Human Carcinogen. This category includes those agents for which there is inadequate evidence of carcinogenicity from human studies and sufficient evidence of carcinogenicity from animal studies. EPA (IRIS 1995) determined an oral carcinogenic slope factor for humans of 1.1E+00 $(mg/kg\text{-}day)^{-1}$ based on the Innes et al. (1969) study in which hepatomas were induced in male C57B1/6XC3H/AnF)F_1 mice orally gavaged with bis(2-chloroethyl)ether at 0 and 39 mg/kg-day followed by dietary exposure. An inhalation unit risk factor of 3.3E-04 $(\mu g/m^3)^{-1}$ was derived by EPA (IRIS 1995) based on oral exposure data from the same study. This inhalation unit risk factor corresponds to an inhalation slope factor of 1.1E+00 $(mg/kg\text{-}day)^{-1}$. EPA has not derived noncarcinogenic toxicity values for bis(2-chloroethyl)ether (IRIS, 1995).

CADMIUM

Gastrointestinal absorption of cadmium in humans ranges from 5% to 6% (EPA, 1985). Pulmonary absorption of cadmium in humans is reported to range from 10% to 50% (California Department of Health Services, 1986). Cadmium bioaccumulates in humans, particularly in the kidney and liver (EPA, 1985). Chronic oral or inhalation exposure of humans to cadmium has been associated with renal dysfunction, itai-itai disease (bone damage), hypertension, anemia, endocrine alterations, and immunosuppression. Renal toxicity occurs in humans at a renal cortex concentration of cadmium of 200 ug/g (EPA, 1985). Epidemiological studies have demonstrated a strong association between inhalation exposure to cadmium and cancers of the lungs, kidney, and prostate (EPA, 1985). In experimental animals, cadmium induces injection-site sarcomas and testicular tumors. When administered by inhalation, cadmium chloride is a potent pulmonary carcinogen in rats. Cadmium is a well-documented animal teratogen (EPA, 1985).

EPA (IRIS, 1994) has classified cadmium as a B1 chemical (Probable Human Carcinogen) by inhalation. This classification applies to chemicals for which there is limited evidence of carcinogenicity in humans from epidemiologic studies. EPA (IRIS, 1994) has derived an inhalation unit risk of 1.8E-02 $(ug/m^3)^{-1}$ corresponding to a slope factor of 6.3E+00 $(mg/kg\text{-}day)^{-1}$ for cadmium based in an epidemiologic study by Thun et al. (1985). Two oral reference doses (RfDs) have also been derived by EPA (IRIS, 1994). Both the oral RfD for food of 1E-03 mg/kg-day and the oral RfD for water of 5E-04 mg/kg-day were derived based on human studies involving chronic exposure (EPA, 1985a). An uncertainty factor of 10 was used in developing

both the oral RfD for food and water. A reference concentration (RfC) for inhalation has not been determined but the chemical is currently under review by EPA.

CARBON TETRACHLORIDE

Carbon tetrachloride is used as a solvent for oils, fats, lacquers, varnishes, rubber, waxes, and resins. It has been used in the past as a dry cleaning agent and fire extinguisher. (Budavari, et al., 1989).

Human exposure to carbon tetrachloride may occur via the ingestion, dermal contact, and inhalation routes. Acute symptoms of exposure include nausea, vomiting, diarrhea, headache, stupor, renal damage, and liver injury. Death may also occur. Chronic symptoms of exposure include liver damage, but kidney injury and visual disturbances may also occur. Dermal contact with carbon tetrachloride may lead to defatting of the skin and dermatitis. (Budavari, et al., 1989).

EPA has classified carbon tetrachloride in Group B2-Probable Human Carcinogen. Carbon tetrachloride has been shown to be carcinogenic in rats, mice, and hamsters. IRIS (1994) has developed an oral slope factor of 1.3E-01 $(mg/kg\text{-}day)^{-1}$ based on several animal gavage studies in which hepatocellular carcinomas were observed (Della Porta et al., 1961, Edwards et al., 1942, and NCI, 1976a, b, 1977). An inhalation unit risk of 1.5E-05 $(ug/m^3)^{-1}$ which converts to an inhalation slope factor of 5.3E-02 $(mg/kg\text{-}day)^{-1}$, has been developed by the EPA based on the oral exposure studies.

EPA has developed an oral reference dose (RfD) of 7E-04 mg/kg-day based on the Bruckner et al. (1986) subchronic study in which liver lesions were noted in rats exposed to 0.71

mg/kg-day of carbon tetrachloride by gavage. An uncertainly factor of 1000 was used to develop the oral RfD. An inhalation reference concentration (RfC) has not been developed. (IRIS, 1994).

CHLOROFORM

Chloroform, a trihalomethane, is rapidly absorbed through the respiratory and gastrointestinal tracts in humans and experimental animals; dermal absorption from contact of the skin with liquid chloroform can also occur (EPA, 1985). In humans, acute exposures to chloroform may result in depression of the central nervous system, hepatic and renal damage, and death caused by ventricular fibrillation following an acute ingested dose of 10 ml (EPA, 1984). Acute exposure to chloroform may also cause irritation to the skin, eyes, and gastrointestinal tract (EPA, 1984, 1985). In experimental animals, chronic exposure may lead to fatty cyst formation in the liver (Heywood et al., 1979), renal and cardiac effects, and central nervous system depression (EPA, 1985). Chloroform has been reported to induce renal epithelial tumors in rats (Jorgenson et al., 1985) and hepatocellular carcinomas in mice (NCI, 1976). Suggestive evidence from human epidemiological studies indicates that long-term exposure to chloroform and other trihalomethanes in contaminated water supplies may be associated with an increased incidence of bladder tumors (EPA, 1985). Chloroform is embryotoxic in pregnant rats and has retarded fetal development and increased the incidences of fetal resorption, absence of tail, imperforate anus, missing ribs and delayed ossification of sternebrae (Schwetz et al., 1974).

Chloroform has been classified by EPA (IRIS, 1994) in Group B2-Probable Human Carcinogen. EPA (IRIS, 1994) developed an oral cancer slope factor for chloroform of 6.1E-03 $(mg/kg\text{-}day)^{-1}$ based on a study in which kidney tumors were observed in rats exposed to chloroform in drinking water (Jorgenson et al. 1985). An inhalation cancer unit risk of 2.3E-05 $(ug/m^3)^{-1}$, which is equivalent to a slope factor of 8.1E-02 $mg/kg/day)^{-1}$, has been developed by EPA

(IRIS, 1994) based on an NCI (1976) bioassay in which liver tumors were observed in mice exposed to chloroform by gavage.

EPA (IRIS, 1993) also derived an oral reference dose (RfD) of 1E-02 mg/kg-day for chronic exposure to chloroform based on a chronic oral bioassay in dogs in which liver effects were observed at 12.9 mg/kg-day (Heywood et al., 1979); an uncertainty factor of 1000 was used to derive the RfD. EPA has not derived an inhalation reference concentration (RfC) for chloroform.

CHROMIUM

Gastrointestinal absorption of chromium (III) is low, whereas chromium (VI) is more readily absorbed following oral exposure (EPA, 1987). Chromium is an essential micronutrient and is not toxic in trace quantities (EPA, 1980). High levels of soluble chromium (VI) and chromium (III) can produce kidney and liver damage following acute oral exposures, but target organs following chronic oral exposures have not been identified (EPA, 1984). Chronic inhalation exposures may cause respiratory system damage (EPA, 1984). Epidemiological studies of worker populations have clearly established that inhaled chromium (VI) is a human carcinogen, with the respiratory passages and the lungs as the target organs (EPA, 1984). Inhalation of chromium (III) and the ingestion of chromium (VI) or (III) have not been associated with carcinogenicity in humans or experimental animals (EPA, 1984). Certain chromium salts have been shown to be teratogenic and embryotoxic in mice and hamsters following intravenous or intraperitoneal injection (EPA, 1984).

EPA has classified inhaled chromium (VI) for carcinogenicity in Group A (Human Carcinogen) (IRIS, 1994). Inhaled chromium (III) and ingested chromium (III) and (VI) have not been classified with respect to carcinogenicity. EPA (IRIS, 1994) has developed an inhalation unit risk of 1.2E-02 $(ug/m^3)^{-1}$ converted to an inhalation slope factor of 4.2E+01 $(mg/kg\text{-}day)^{-1}$ for chromium (VI) based upon an increased incidence of lung cancer in workers exposed to chromium over a 5 year period, and followed for approximately 40 years (Mancuso, 1975).

CHROMIUM (Cont'd)

EPA (IRIS, 1994) has derived an oral reference dose (RfD) for chromium (VI) based on a study by MacKenzie et al. (1958). In this study, no adverse effects were observed in rats exposed to chromium (VI) at concentrations of 2.4 mg/kg-day in drinking water for one year. Using a NOAEL of 2.4 mg/kg-day and applying an uncertainty factor of 500, an oral RfD of 5E-03 mg/kg-day was derived (IRIS, 1994). An inhalation reference concentration (RfC) has not been developed.

CIS/TRANS-1,2-DICHLOROETHENE

Cis-1,2-Dichloroethene (cis-1,2-DCE) is a colorless and flammable liquid that is often used as a chemical intermediate in the synthesis of chlorinated solvents. 1,2-DCE is often present as a mixture of both cis-1,2 and trans-1,2-DCE. This compound may be released to the environment from chemical factories, landfills, and industrial waste sites. It may also be present in the environment as a result of the degradation of other chlorinated solvents (ATSDR, 1990).

Cis-1,2-DCE is expected to be rapidly absorbed via inhalation. In one study, rats exposed to cis-1,2-DCE in air achieved equilibrium in the whole body within 1.5 to 2 hours (Filser et al., 1978). Several in vitro studies with isolated rat livers indicated that cis-DCE is metabolized to dichloroacetaldehyde, monochloroacetic acid, and 1,2-dichloroethanol by the rearrangement of epoxide intermediates. Based on the pharmacokinetics of similar chlorinated compounds, cis-1,2-DCE is expected to be rapidly absorbed and excreted when ingested and inhaled (Jaegar et al., 1977).

DCE has an oral LD_{50} in rats and mice ranging from 1275 mg/kg-day to 7902 mg/kg-day. Symptoms related to acute exposure to DCE in animals include pulmonary hyperemia, ataxia, depressed respiration, and CNS depression (Barnes et al., 1985; Freundt et al., 1977; Hayes et al., 1987). Human symptoms of acute exposure to trans-1,2-DCE in air include ocular irritation, dizziness, drowsiness, vertigo, and intracranial pressure (ATSDR, 1990).

Animal studies involving intermediate exposure (14-90 days) to 1,2-DCE indicate the heart, liver, and lungs are the likely targets of toxicity. Inhalation exposure of rats to trans-DCE has resulted in pulmonary edema, alveolar septal distention, fibrous swelling in the heart, and fatty degeneration and lipid accumulation in the liver. Similar effects have been observed in rats orally exposed to trans-1,2-DCE (ATSDR, 1990).

No data are available regarding the carcinogenicity of cis-1,2-DCE or trans-1,2-DCE from human or animal studies.

Cis-1,2-DCE was not mutagenic with or without metabolic activation in several studies with E. coli K12, Saccharomyces cerevisiae D7, Chinese hamster cells, and Salmonella typhimurium. However, cis-DCE was mutagenic in mouse-host mediated assays with Salmonella typhimurium and Saccharomyces cerevisiae D7 (ATSDR, 1990).

No teratogenicity studies in animals or humans have been conducted to date.

EPA (1994) has developed an oral reference dose of 9E-03 based on a 2-year study conducted by Quast et al. (1983) in which rats given 1,2-dichloroethene (cis/trans) in drinking water developed liver lesions. An uncertainty factor of 1000 was applied in deriving this value.

COPPER

Copper is an essential element. A daily copper intake of 2 mg is considered to be adequate for normal health and nutrition; the minimum daily requirement is 10 ug/kg (EPA, 1985). Adverse effects in humans resulting from acute overexposure to copper by ingestion includes salivation, gastrointestinal irritation, nausea, vomiting, hemorrhagic gastritis, and diarrhea (ACGIH, 1986). Dermal or ocular exposure of humans to copper salts can produce irritation (ACGIH, 1986). Acute inhalation of dusts or mists of copper salts by humans may produce irritation of the mucous membranes and pharynx, ulceration of the nasal septum, and metal fume fever. The latter condition is characterized by chills, fever, headache, and muscle pain. Limited data are available on the chronic toxicity of copper; however, chronic overexposure to copper by humans has been associated with anemia (ACGIH, 1986). Evidence to date indicates that copper is not teratogenic in experimental animals (EPA, 1980) and various copper compounds are negative for mutagenicity in microbial assay systems (EPA, 1985). Results of several animal bioassays suggest that copper compounds are not carcinogenic by oral administration; however, some copper compounds can induce injection-site tumors in mice (EPA, 1985).

EPA's Drinking Water Criteria document concluded that toxicity data were inadequate for calculation of an oral reference dose (RfD) for copper (EPA, 1994).

DICHLORODIFLUOROMETHANE

Dichlorodifluoromethane, also known as Freon-12, has been used as a refrigerant, blowing agent, food freezant, leak detection agent, for the chilling of cocktail glasses, and as a low temperature solvent. The use of this compound as aerosol propellants is minor due to government restrictions. (WHO, 1986).

Dichlorodifluoromethane is believed to be absorbed through the gastrointestinal tract and via inhalation. Systemic effects in humans resulting from inhalation exposure includes eye irritation, fibrosing alveolites, and liver changes. At high concentration, dichlorodifluoromethane is narcotic. (Lewis, 1992).

The EPA has not assigned dichlorodifluoromethane a weight-of-evidence classification (IRIS, 1994). A chronic oral reference dose (RfD) of 2E-01 mg/kg-day was developed based on a rat chronic oral bioassay by Sherman (1974). In this study, rats and dogs were fed 300 ppm or 3000 ppm of dichlorodifluoromethane in the diet for two years. A decreased weight gain in female rats receiving 3000 ppm (15 mg/kg-day) of dichlorodifluoromethane was observed. No other adverse effects were observed in the rats or dogs. An NOAEL of 300 ppm (15 mg/kg-day) was identified. An LOAEL of 3000 ppm (150 mg/kg-day) was also identified. An uncertainty factor of 100 was applied in developing the oral RfD. (IRIS, 1994).

A chronic inhalation reference concentration (RfC) of 2E-01 mg/m^3 converted to an RfD of 5E-02 mg/kg-day has also been derived by EPA (EPA, 1994). This value was based on an

inhalation study by Prendergast et al. (1967) in which guinea pigs intermittently exposed to dichlorodifluoromethane via inhalation over a six week period developed liver lesions. A LOAEL of 482 mg/kg-day was identified. An uncertainty factor of 10000 was applied to develop the chronic inhalation RfC. (IRIS, 1994).

1,2-DICHLOROETHANE

Data on the toxicokinetic properties of 1,2-dichloroethane (1,2-DCA) in humans are limited, but data from animal studies suggest that the chemical is rapidly absorbed following oral and inhalation exposure and after dermal contact with the liquid form of the compound (EPA, 1985). Effects of acute inhalation exposure in humans include irritation of mucous membranes in the respiratory tract and central nervous system depression (EPA, 1985). Death may occur as a result of respiratory and circulatory failure. Pathological examinations typically show congestion, degeneration, necrosis, and hemorrhagic lesions of the respiratory and gastrointestinal tracts, liver, kidney, spleen, and lungs (EPA, 1985). Adverse effects caused by less extreme exposures are generally associated with the gastrointestinal tracts, liver, kidney, spleen, and lungs (EPA, 1985). Occupational exposures to 1,2-DCA vapors result in anorexia, nausea, vomiting, fatigue, nervousness, epigastric pain, irritation of the eyes and respiratory tract, and gastrointestinal, liver, and gallbladder disease (EPA, 1984, 1985). Chronic inhalation studies in animals also have revealed toxic effects including degeneration of the liver (EPA, 1985). Available data suggest that 1,2-DCA does not adversely affect reproductive or developmental processes in experimental animals except at maternally toxic levels (EPA, 1985). In long-term oral bioassays sponsored by the National Cancer Institute (NCI, 1978), increased incidences of squamous-cell carcinomas of the forestomach, mammary gland adenocarcinomas, and hemangiosarcomas have been observed in rats exposed to 1,2-DCA: pulmonary adenomas, mammary adenocarcinomas, and uterine endometrial tumors have been observed in mice exposed to this chemical.

EPA (IRIS, 1994) has classified 1,2-DCA in Group B2 (Probable Human Carcinogen) based on inadequate evidence of carcinogenicity from human studies and sufficient evidence of carcinogenicity from animal studies. EPA (IRIS, 1994) derived an oral cancer slope factor of 9.1E-02 $(mg/kg\text{-}day)^{-1}$ for 1,2-DCA based on the incidences of hemangiosarcomas in Osborne-Mendel male rats observed in the NCI (1978) gavage study. An inhalation cancer unit risk of 2.6E-05 $(\mu g/m^3)^{-1}$ (equivalent to 9.1E-02 $(mg/kg\text{-}day)^{-1}$) has also been calculated by EPA (IRIS, 1994) using the same gavage study. EPA has not derived noncarcinogenic toxicity factors for 1,2-dichloroethane.

1,1-DICHLOROETHENE

1,1-Dichloroethene (1,1-DCE) is readily absorbed following oral and inhalation exposure (EPA, 1987). Kidney tumors and leukemia were observed in one study of mice exposed by inhalation to 1,1-DCE (EPA, 1987). 1,1-DCE is mutagenic and causes adverse reproductive effects when administered to rats and rabbits by inhalation (EPA, 1987). Chronic exposure causes liver damage, and acute exposure to high doses produces nervous system damage (EPA, 1987). 1,1-Dichloroethene is structurally related to the known carcinogen vinyl chloride (IRIS, 1994).

1,1-DCE has been classified by EPA in Group C-Possible Human Carcinogen (IRIS, 1994). EPA (IRIS, 1994) has derived cancer slope factors for both oral and inhalation exposures to 1,1-DCE based on studies by NTP (1982) and Maltoni et al. (1985), respectively. The oral slope factor is 6E-01 $(mg/kg\text{-}day)^{-1}$ and the inhalation unit risk is 5E-05 $(\mu g/m^3)^{-1}$ which corresponds to a cancer slope factor of 1.8E-01 $(mg/kg/day)^{-1}$.

An oral reference dose (RfD) of 9E-03 mg/kg-day has been determined by EPA (IRIS, 1994). The RfD is based on a study by Quast et al. (1983) in which rats exposed to 1,1-DCE in drinking water at a dose of 9 mg/kg-day developed hepatic lesions. An uncertainty factor of 1000 was applied to the LOAEL of 9 mg/kg-day to derive the oral RfD (IRIS, 1994).

HEXANE

Hexane, an alkane, has been used as an industrial solvent. It is produced during the distillation of crude oil and has numerous applications included laminating, vegetable oil extraction, as a solvent in glues, paints, varnishes, and inks, as a diluent in rubber and plastic manufacturing, and as a minor component of gasoline. (Andrews and Snyder, 1986).

Symptoms of acute exposure to alkanes generally include narcosis followed by convulsions and respiratory arrest. In humans, symptoms may include narcosis and irritation of the mucous membranes with intensity directly related to molecular weight. (ACGIH, 1986).

No studies regarding the carcinogenicity of hexane have been located in the literature.

EPA has developed a chronic oral reference dose (RfD) of 6E-02 mg/kg-day based on a study by Krasavage eta al. (1980) in which rats orally exposed to hexane showed neuropathy and testicular atrophy. An LOAEL of 570 mg/kg-day was determined. An uncertainty factor of 10,000 was applied in developing the oral RfD. (EPA, 1994). A chronic inhalation reference concentration (RfC) of 2E-01 mg/m^3 (IRIS, 1994) which has been converted to an inhalation RfD of 5.7E-02 mg/kg-day has been developed by EPA. This value is based on two inhalation studies performed by Sanagi et al. (1980) and Dunnick et al. (1989). Sanagi et al. (1980) conducted an epidemiological inhalation study in which workers exposed to hexane developed neurotoxicity and electrophysiological alterations. No NOAEL was determined. An LOAEL of 73 mg/m^3 was determined. Dunnick et al. (1989) conducted a 90-day mouse inhalation study

in which epithelial lesions in the nasal cavity were observed. An NOAEL of 38 mg/m^3 was determined. An LOAEL of 77 mg/m^3 was determined. An uncertainty factor of 300 was applied in developing the inhalation RfC.

LEAD

Absorption of lead from the gastrointestinal tract of humans is estimated at 10 to 15%. For adult humans, the deposition of particulate airborne lead is 30 to 50%, and essentially all of the lead deposited is absorbed. Lead is stored in the body in bone, kidney, and liver (EPA, 1984). The major adverse effects in humans caused by lead include alterations in the hematopoietic and nervous systems. The toxic effects are generally related to the concentration of the metal in blood. Blood concentration levels of over 80 ug/L in children and over 100 ug/L in sensitive adults can cause severe, irreversible brain damage, encephalopathy and possible death. Lower blood concentrations of lead (30-40 ug/L) have been associated in humans with altered nerve conduction, altered testicular function, renal dysfunction, and anemia. Lead exposure also has been associated in humans with spontaneous abortions, premature delivery, and early membrane rupture; however, reliable exposure estimates are lacking in these cases. Decreased fertility, phytotoxic effects and skeletal malformations have been observed in experimental animals exposed to lead (EPA, 1984).

EPA has classified lead as a Group B2 carcinogen (Probable Human Carcinogen) (IRIS, 1994). This category applies to those agents for which there is sufficient evidence of carcinogenicity in animals and inadequate evidence of carcinogenicity in humans. At present, the pharmacokinetics for lead do not allow an accurate estimate of the potential risks from exposure to lead, therefore, EPA recommends that a numerical estimate not be used. Oral ingestion of certain lead salts (lead acetate, lead phosphate, lead subacetate) has been associated in experimental animals with increased renal tumors, but no quantitative estimate of cancer potency

has been developed for these various lead compounds. Doses of lead that induced kidney tumors were high and were beyond the lethal dose in humans (EPA, 1985).

EPA has noted that the available data provide an insufficient basis on which to regulate lead acetate, phosphate and subacetate as human carcinogens. EPA (IRIS, 1994) determined that health effects are apparent from exposure to lead at levels so low as to be essentially without a threshold. EPA's Reference Dose (RfD) work groups discussed this issue and considered it inappropriate to develop an oral RfD for inorganic lead. No data are available to develop an inhalation reference concentration (RfC).

MANGANESE

Manganese is an essential element present in all living organisms. Daily manganese intake ranges from 2 to 9 mg although less than 5 percent is absorbed by the intestines. Acute inhalation exposure in the workplace (i.e., mining or manufacturing) to manganese may cause pneumonitis, a respiratory disease. Chronic inhalation of manganese dioxide in the workplace may result in the more serious central nervous system effects. Those who develop chronic manganese poisoning (manganism) exhibit a psychiatric disorder characterized by irritability, difficulty in walking, speech disturbances, and compulsive behavior. A Parkinson-like syndrome can develop if the condition persists. Recovery is slow, even when removed from excessive exposure (Goyer, 1986).

EPA has classified manganese as a Class D carcinogen (not classifiable) (IRIS, 1994). EPA (IRIS, 1994) had developed an oral RfD of 5E-03 mg/kg-day for manganese in water based on chronic human ingestion data (Kondakis et al. 1989) in which the critical effect occurred to the central nervous system. A no-observed-adverse-effect-level (NOAEL) of 0.005 mg/kg/day and a lowest-observed-adverse-effect-level (LOAEL) of 0.06 mg/kg/day were identified in the study. EPA (IRIS, 1994) has also developed an inhalation reference concentration (RfC) of 5E-05 mg/m^3 corresponding to an inhalation reference dose of 1.4E-05 mg/kg/day for manganese using an uncertainty factor of 1000. The RfC was derived based on an occupational study of workers exposed to manganese dioxide, tetroxide, and various salts. The study indicated an increased prevalence of respiratory symptoms and psychomotor disturbances in exposed workers (Roels et al., 1987).

MERCURY

In humans, elemental and inorganic mercury are absorbed following inhalation exposure but are poorly absorbed following oral exposure (EPA, 1984). Occupational exposure of workers to elemental mercury vapors (0.1 to 0.2 mg/m^3) has been associated with mental disturbances, tremors, and gingivitis (EPA, 1984). The central nervous system is a major target for organic mercury compounds. Adverse effects in humans from exposure to organic mercury compounds have included destruction of cortical cerebral neurons, damage to Purkinje cells, and lesions of the cerebellum. Clinical symptoms following exposure to organic mercury compounds have included paresthesia, loss of sensation in extremities, ataxia, and hearing and visual impairment (WHO, 1976). A primary target organ for inorganic compounds is the kidney. Human exposure to inorganic mercury compounds has been associated with anuria, polyuria, proteinuria, and renal lesions (Hammond and Beliles, 1980). Embryotoxic and teratogenic effects, including malformations of the skeletal and genitourinary systems, have been observed in animals exposed to organic mercury (EPA, 1984). Both organic and inorganic compounds are reported to be genotoxic in eukaryotic systems (Leonard et al., 1984).

EPA (1994) has categorized mercury as a Group D carcinogen (Not Classified). This classification applies to those agents for which there is inadequate evidence of carcinogenicity in animals. EPA (1994) has reported an oral reference dose (RfD) for inorganic mercury of 3E-04 mg/kg-day. The oral RfD was based on several oral studies in the Brown Norway rat which produced effects to the kidney. The inhalation reference concentration (RfC) of 3.0E-04 mg/m^3 converted to an inhalation RfD of 8.6E-05 mg/kg-day was based on occupational studies. An

uncertainty factor of 1000 for oral and 30 for inhalation was used. These toxicity values are currently under review.

METHYLENE CHLORIDE

Methylene chloride is absorbed following oral and inhalation exposure. Direct contact with methylene chloride by humans may result in irritation of the eyes, mucous membranes, skin, and respiratory tract. Exposure to high levels may result in central nervous system depression, elevated carboxyhemoglobin levels, and circulatory disorders that may be fatal. In experimental animals, methylene chloride can produce renal and hepatic toxicity. (Clement Associates, Inc., 1985). Methylene chloride is mutagenic for Salmonella typhimurium and produces mitotic recombination in yeast (IRIS, 1994). Several ingestion and inhalation studies conducted in animals provide clear evidence of methylene chloride's carcinogenicity.

EPA has classified methylene chloride in Group B2-Probable Human Carcinogen (IRIS, 1994). This classification is based on an increased incidence of hepatocellular neoplasms alveolar/bronchiolar neoplasms in mice an increased incidence of benign mammory and tumors, salivary gland sarcomas, and leukemias in rats. EPA has developed an oral slope factor for methylene chloride of 7.5E-03 $(mg/kg\text{-}day)^{-1}$ and an inhalation unit risk of 4.7E-07 $(ug/m^3)^{-1}$, which was converted to an inhalation slope factor of 1.6E-03 $(mg/kg\text{-}day)^{-1}$ (IRIS, 1994). The oral slope factor was determined based on the results of a National Toxicology Program (NTP) inhalation study in mice in which hepatocellular adenomas or carcinomas were observed (NTP, 1986) and on a National Coffee Association (NCA) ingestion study in mice in which hepatocellular cancer and neoplastic nodules were observed (NCA, 1983). The inhalation unit risk was determined by EPA based on the NTP (1986) inhalation study in which lung and liver adenomas and carcinomas were observed in mice.

METHYLENE CHLORIDE (Cont'd)

A chronic oral references dose (RfD) of 6E-02 mg/kg-day (IRIS, 1994) and a chronic inhalation reference concentration (RfD) of 3E+00 mg/m^3 (EPA, 1994) which was converted to an inhalation RfD of 8.6E-01 mg/kg-day have been developed by EPA based on an NCA (1982) bioassay in which rats exposed to methylene chloride in drinking water over a 2 year period developed liver toxicity. An uncertainty factor of 100 was used to develop the oral RfD and inhalation RfC.

POLYCHLORINATED BIPHENYLS (PCBs)

PCBs are very persistent in the natural environment and are readily bioaccumulated. Human exposure to PCBs has been associated with chloracne, impairment of liver function, a variety of neurobehavioral symptoms, menstrual disorders, minor birth abnormalities, and increased incidence of cancer (Clement Associates, Inc., 1985).

PCBs have been given an EPA classification for carcinogenicity of B2 (Probable Human Carcinogen) based on hepatocellular carcinomas in three strains of rats and two strains of mice and inadequate yet suggestive evidence of excess risk of liver cancer in humans by ingestion and inhalation or dermal contact (IRIS, 1994). The slope factor developed for PCBs of 7.7E+00 $(mg/kg\text{-}day)^{-1}$ is based on the studies performed by Norback and Weltman (1985). Sprague-Dawley rats were fed a diet containing Aroclor 1260 at 100 ppm for 16 months, followed by a 50 ppm diet for an additional 8 months, and then a basal diet for 5 months. Among animals that survived for at least 18 months, female rats exhibited a 91% incidence of hepatocellular carcinomas. In addition, the Norback and Weltman study is preferred over Kimbrough et al. (1974) because Sprague-Dawley rats are known to have low incidence of spontaneous hepatocellular neoplasms. This study spanned the natural life of the animal, and concurrent morphologic liver studies showed the sequential progression of liver lesions to hepatocellular carcinomas. Although it is known that PCB congeners vary greatly as to their potency in producing biological effects, for purposes of this assessment, Aroclor 1260 is intended to be representative of all PCB mixtures. An inhalation slope factor was not determined. No oral reference dose or inhalation reference concentration has been developed.

POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

Polycyclic aromatic hydrocarbons (PAHs) occur in the environment as complex mixtures of many components with varying noncarcinogenic and carcinogenic potencies. Only a few components of these mixtures have been adequately characterized, and only limited information is available on the relative potencies of different compounds. The PAHs are often separated into two categories for risk assessment purposes: carcinogenic and noncarcinogenic PAHs.

PAH absorption following oral exposure is inferred from the demonstrated toxicity of PAHs following ingestion (EPA, 1984a). PAH absorption following inhalation exposure is inferred from the demonstrated toxicity of PAHs following inhalation (EPA, 1984a). It has been suggested that simultaneous exposure to carcinogenic PAHs such as benzo(a)pyrene and particulate matter can increase the effective dose of the compound (ATSDR, 1987). PAHs are also absorbed following dermal exposure (Kao et al., 1985).

Acute effects from direct contact with PAHs and related materials are limited primarily to phytotoxicity; the primary effect is dermatitis (NIOSH, 1977). PAHs have also been shown to cause cytotoxicity in rapidly proliferating cells throughout the body; the hematopoietic system, lymphoid system, and testes are frequent targets (Santodonato et al., 1981). Some of the noncarcinogenic PAHs have been shown to cause systemic toxicity but these effects are generally seen only at rather high doses (Santodonato et al., 1981). Slight morphological changes in the

liver and kidneys of rats have been reported following oral exposure to acenaphthene. Oral administration of naphthalene to rabbits and rats has resulted in cataract formation (EPA, 1984b).

Non-neoplastic lesions are seen in animals exposed to the more potent carcinogenic PAHs only after exposure to levels well above those required to elicit a carcinogenic response. Carcinogenic PAHs are believed to induce tumors both at the site of application and systemically. Neal and Rigdon (1967) reported that oral administration of benzo(a)pyrene led to forestomach tumors in mice. Thyssen et al. (1981) observed respiratory tract tumors in hamsters exposed to benzo(a)pyrene.

Benzo(a)pyrene is representative of the carcinogenic PAHs and is classified by EPA as a B2 chemical (Probable Human Carcinogen) based on sufficient evidence of carcinogenicity from animal studies and inadequate evidence from epidemiological studies (IRIS, 1994). IRIS (1994) calculated a value of 7.3E+00 $(mg/kg\text{-}day)^{-1}$ for the slope factor for oral exposure to carcinogenic PAHs (specifically benzo(a)pyrene) based on the study by Neal and Rigdon (1967). In this study, mice given benzo(a)pyrene in the diet developed increased incidences of stomach tumors (IRIS, 1994). An inhalation slope factor has not been developed by EPA (IRIS, 1994).

Slope factors for the carcinogenic PAHs dibenzo(a,h)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)anthracene, chrysene, and indeno(1,2,3-cd)pyrene were calculated based on the benzo(a)pyrene slope factor and relative potency values.

Dibenzo(a,h)anthracene is classified by EPA as a B2 chemical (Probable Human Carcinogen) based on sufficient evidence of carcinogenicity from animal studies and inadequate or no evidence in human studies. Dibenzo(a,h)anthracene produced carcinomas in mice following oral or dermal exposure and injection site tumors in several species following subcutaneous or intramuscular injection. (IRIS, 1994). Although no human data specifically link this chemical with human cancers, it is a component of mixtures that have been associated with human cancer. These mixtures include coal tar, soots, coke oven emissions, and cigarette smoke (IRIS, 1994). An oral slope factor of 7.3E+00 $(mg/kg\text{-}day)^{-1}$ was calculated by using a relative potency value of 1 multiplied by the benzo(a)pyrene oral slope factor (EPA, 1993, IRIS, 1994).

Benzo(b)fluoranthene is classified by EPA as a B2 chemical. This chemical produced tumors in mice after lung implantation, intraperitoneal or subcutaneous injection, and skin painting. (IRIS, 1994). No human data specifically link exposure to benzo(b)fluoranthene to human cancers although it is a component of mixtures such as coal tar, soots, coke oven emissions, and cigarette smoke which have been associated with human cancer. (IRIS, 1994). An oral slope factor of 7.3E-01 $(mg/kg\text{-}day)^{-1}$ was calculated by using a relative potency value of 0.1 multiplied by the benzo(a)pyrene oral slope factor (EPA, 1993, IRIS, 1994).

Benzo(k)fluoranthene is classified by EPA as a B2 chemical. This chemical produced tumors after lung implantation in mice and when administered with a promoting agent in skin-painting studies. Equivocal results were found in a lung adenoma assay in mice. (IRIS, 1994). No human data specifically link exposure to benzo(k)fluoranthene to human cancers, although it is

a component of mixtures, (i.e., coal tar, soots, coke oven emissions, and cigarette smoke) which have been associated with human cancer (IRIS, 1994). An oral slope factor of 7.3E-02(mg/kg-day)$^{-1}$ was calculated by using a relative potency value of 0.01 multiplied by the benzo(a)pyrene oral slope factor (EPA, 1993, IRIS, 1994).

Benzo(a)anthracene is classified by EPA is a B2 chemical. This chemical produced tumors in mice exposed by gavage, intraperitoneal, subcutaneous or intramuscular injection, and topical application. (IRIS, 1994). No human data specifically link exposure to benzo(a)anthracene to human cancers although it is a component of mixtures which have been associated with human cancer (IRIS, 1994). An oral slope factor of 7.3E-01(mg/kg-day)$^{-1}$ was calculated by using a relative potency value of 0.1 multiplied by the benzo(a)pyrene oral slope factor (EPA, 1993, IRIS, 1994).

Chrysene is classified by EPA as a B2 chemical. This chemical produced carcinomas and malignant lymphoma in mice after intraperitoneal injection and skin carcinomas in mice following dermal exposure. (IRIS, 1994). Although no human data specifically link chrysene with human cancers, it is a component of mixtures which have been associated with human cancer (IRIS, 1994). An oral slope factor of 7.3E-03 (mg/kg-day)$^{-1}$ was calculated by using a relative potency value of 0.001 multiplied by the benzo(a)pyrene oral slope factor (EPA, 1993, IRIS, 1994).

Indeno (1,2,3-cd)pyrene is classified by EPA as a B2 chemical. This chemical produced tumors in mice following lung implants, subcutaneous injection and dermal exposure. (IRIS, 1994). Although no human data specifically link indeno (1,2,3-cd)pyrene with human cancers, it is a component of mixtures which have been associated with human cancer (IRIS, 1994). An oral slope factor of 7.3E-01 $(mg/kg\text{-}day)^{-1}$ was calculated by using a relative potency value of 0.1 multiplied by the benzo(a)pyrene oral slope factor (EPA, 1993, IRIS, 1994).

SILVER

Various forms of silver are used for industrial and medicinal purposes. Silver halide is used to manufacture photographic plates while silver salts may be used as an antiseptic or astringent. (Goyer, 1986).

Although silver is not generally found in body tissue, it can be absorbed from the gastrointestinal tract and the lungs. Large oral doses of silver nitrate cause severe gastrointestinal irritation due to its caustic action. Kidney and lung lesions as well as arteriosclerosis have resulted from industrial and medicinal exposures. Medicinal use of colloidal silver has resulted in chronic bronchitis (Browning, 1969 and Luckey et al., 1975) while in experimental animals large intravenous doses have resulted in death from pulmonary edema and congestion, hemolysis and resulting bone marrow hyperplasia. A chronic occupational disease, argyria, results from excessive absorption of silver. The local form of argyria involves the formation of blue-gray skin patches or it may manifest itself in the conjunctiva of the eye. The generalized form of argyria involves widespread pigmentation of the skin. The eyes and respiratory tract may also be affected. (Goyer, 1986). The deposition of silver, although permanent, is not associated with any health effects (IRIS, 1994).

Silver is classified by EPA in Group D, not classifiable as to human carcinogencity (IRIS, 1994). No evidence of cancer in humans has been reported despite frequent therapeutic use of silver over the years (IRIS, 1994). An chronic oral reference dose (RfD) of 5E-03 mg/kg-day has been developed based on a human study by Gaul and Staud (1935). In this study, humans

were intravenously injected with silver arsphenamine for therapeutic purposes over a 2 to 9.75 year period. The authors concluded that argyria may become clinically apparent in patients after receiving a total accumulated intravenous dose of 8 grams of silver arsphenamine. No NOEL was determined. The LOAEL was 0.014 mg/kg-day. An uncertainty factor of 3 was applied in developing the oral RfD. (IRIS, 1994). An inhalation reference concentration (RfC) has not been developed.

1,1,2,2-TETRACHLOROETHANE

1,1,2,2-Tetrachloroethane is a man-made dense liquid used to produce other chemicals, as an industrial solvent, to clean and degrease metals, and in paints and pesticides. At present, its use appears limited; however, information relating to production volume is protected by the manufacturer. (ATSDR, 1990).

While 1,1,2,2-tetrachloroethane is rapidly absorbed following inhalation exposure, no information regarding oral and dermal absorption is available in the literature. Human evidence suggests that oral or inhalation exposure to 1,1,2,2-tetrachloroethane may cause liver and gastrointestinal effects including jaundice, enlarged liver, stomach ache, nausea, and vomiting (Coyer, 1944, Koelsch, 1915, Hamilton, 1917, Horiuchi et al. 1962, Wilcox et al., 1915, and Lobo-Mendonca, 1963). Human deaths have occurred following excessive exposure in the workplace (Wilcox et al., 1915) and from dermal exposure following a large amount spilled onto the skin (Coyer, 1944). Deaths in humans have also occurred following single oral exposures of at least 3 ml (Hepple, 1927, Lilliman, 1949, and Mant, 1953).

The EPA has classified 1,1,2,2-tetrachloroethane in Group C (Possible Human Carcinogen) (IRIS, 1994). The basis for the classification is an increased incidence of hepatocellular carcinomas in mice. The EPA has developed an oral slope factor of 2E-01 $(mg/kg\text{-}day)^{-1}$ and an inhalation unit risk of 5.8E-05 $(ug/m^3)^{-1}$ which was converted to an inhalation slope factor of 2E-01 $(mg/kg\text{-}day)^{-1}$ (IRIS, 1994). The oral slope factor was determined based on the results of a National Cancer Institute (NCI) oral gavage study in mice in which hepatocellular

carcinomas were observed (NCI, 1978). The inhalation unit risk was determined by EPA based on the oral exposure data. (IRIS, 1994).

Neither an oral reference dose nor an inhalation reference concentration has been developed for 1,1,2,2-tetrachloroethane by the EPA.

TETRACHLOROETHENE (PCE)

Tetrachloroethene (PCE) is a volatile, colorless, nonflammable liquid. It has widespread use as a solvent in dry cleaning operations, metal degreasing, and as a paint remover.

In a National Cancer Institute bioassay (NCI, 1977), a high incidence of hepatocellular was observed in both sexes of $B6C3F_1$ mice administered tetrachloroethylene in corn oil by gavage five days per week for 78 weeks. Time-weighted average doses were 536 and 1072 mg/kg-day in males and 386 and 772 mg/kg-day in females. No conclusion concerning the effects on Osborne-Mendel rats administered 471 to 949 mg/kg-day by gavage could be made because of high mortality rates and other technical flaws (NCI, 1977).

NTP has reported the results of inhalation studies concerning carcinogenicity of tetrachloroethene. There was some evidence of carcinogenicity in F344/N rats (EPA, 1985a). Evidence of carcinogenicity was also observed in $B6C3F_1$ mice of both sexes (EPA, 1985a).

The offspring of female rats and mice exposed to tetrachloroethene at 2000 mg/m^3 for seven hours daily on days 6-15 of gestation showed toxic effects, including a decrease in fetal body weight in mice and a small but significant increase in fetal resorptions in rats (EPA, 1985a,b).

Mice also exhibited teratogenic effects, including subcutaneous edema and delayed ossification of skull bones and sternebrae (EPA, 1985a,b).

TETRACHLOROETHENE (PCE) (Cont'd)

The principal toxic effects of tetrachloroethene in humans and laboratory animals from both acute and longer-term exposures include central nervous system depression and fatty infiltration of the liver and kidney with concomitant changes in serum enzyme activity levels indicative of tissue damage (EPA, 1985a; EPA, 1985b).

Individuals exposed to concentrations of tetrachloroethene ranging from 6258 to 10600 mg/m^3experienced lassitude, mental fogginess, and exhilaration, progressing at the higher dose to signs of inebriation (EPA, 1980). Signs of central nervous system depression and cholinergic stimulation were also observed at concentrations of 1622 mg/kg tetrachloroethene in an animal study in rabbits, monkeys, rats, and guinea pigs (EPA, 1980).

Rats exposed to 1600 mg/kg tetrachloroethene seven hours per day, five days per week, 18 times over 25 days exhibited central nervous system depression and hepatic and renal hypertrophy. Rats exposed to 230 mg/kg and 470 mg/kg tetrachloroethene, eight hours a day, five days a week over a period of seven months, exhibited congestion and swelling of kidneys and liver, respectively (Carpenter, 1937). Female Sprague-Dawley rats exposed to tetrachloroethene in air five days a week for 12 months at concentrations of 300 to 600 mg/kg showed liver atrophy, and high-dose females developed an increased incidence of fluid-filled cysts in the liver (EPA, 1980).

Fatty infiltration in livers and other liver function alterations were noted in mice, guinea pigs, and rabbits (EPA, 1985a; EPA, 1985b; NCI, 1977).

Three of seven men occupationally exposed to tetrachloroethene at concentrations of 1890 to 2600 mg/m^3 showed evidence of impaired liver function (EPA, 1980).

Tetrachloroethene was formerly classified as a Group B2 carcinogen (EPA, 1985a). This classification is currently under reconsideration (IRIS, 1994). The decision whether tetrachloroethene will be classified as a Group B2 or Group C carcinogen is pending. Cancer slope factors for exposure to tetrachloroethene by ingestion and inhalation are currently under review but have been provided by the Superfund Health Risk Technical Support Center as 5.2E-02 $(mg/kg\text{-}day)^{-1}$ and 2.0E-03 mg/kg-day, respectively (EPA, 1994).

The oral RfD of 1E-02 mg/kg/day (IRIS, 1994) is based on a study conducted by Buben and O'Flaherty (1985), in which Swiss-Cox mice were exposed to tetrachloroethene in corn oil by gavage at doses of 0, 20, 100, 200, 500, 1,500, and 2,000 mg/kg for 5 days/week for 6 weeks. Several parameters were monitored to evaluate liver toxicity, including liver weight/body weight ratio, hepatic triglyceride concentration, DNA content, histopathological evaluation and serum enzyme levels. At doses of 100 mg/kg, liver triglyceride levels and liver weight/body weight ratios were significantly higher than in control animals. The no observed adverse effect level (NOAEL) of 20 mg/kg-day was adjusted for the treatment schedule of 5 days/week to arrive at a NOAEL of 14 mg/kg-day. An uncertainty factor of 1000 was applied to the NOAEL to account for intraspecies variability, interspecies variability, and extrapolation of a subchronic effect level to its chronic variability (IRIS, 1994).

THALLIUM

There is no evidence that thallium is carcinogenic in humans or experimental animals, and it does not appear to have significant mutagenic activity. Thallium, in the soluble form, is readily absorbed through the skin and gastrointestinal tract. Symptoms associated with acute poisoning in humans include gastrointestinal irritation; liver and kidney damage; pulmonary edema; degenerative changes in the adrenals, peripheral nervous system, and central nervous system; and ocular effects (Clement Associates, Inc., 1985).

Thallium chloride has been given a Group D (Not Classified) carcinogenicity weight-of-evidence classification by EPA (IRIS, 1994). Slope factors were not developed for thallium since there is no evidence that it is carcinogenic. A NOAEL of 0.25 mg/kg-day was based on an EPA subchronic study in Sprague-Dawley rats treated by gavage. No mortality was observed in the rats, but apparent dose-related increases in the incidence of alopecia, lacrimination and exophthalmos. Moderate dose-related changes were observed in some blood chemistry parameters: increased SGOT, LDH and sodium levels, and decreased blood sugar levels. An uncertainty factor of 3000 was applied to the NOAEL in developing an oral reference dose (RfD) of 8E-05 mg/kg-day. An inhalation reference concentration (RfC) was not developed (IRIS, 1994).

TOLUENE

In humans, toluene is absorbed quickly through the respiratory tract; dermal absorption of aqueous toluene is directly related to concentration (EPA, 1985). In humans, the primary acute effects of exposure to toluene vapor are central nervous system (CNS) depression and narcosis; in experimental animals, acute oral and inhalation exposures to toluene can result in central nervous system depression and histological changes in the lungs, liver, and kidneys (EPA, 1987). In humans, chronic exposure to toluene vapors at levels if approximately 200 and 800 ppm has been associated with CNS and possibly, peripheral nervous system effects, hepatomegaly, and hepatic and renal functions changes (EPA, 1987). Toxic effects following prolonged exposure of experimental animals to toluene are similar to those seen following acute exposure, predominantly to the CNS, liver, kidneys, and lungs (EPA, 1987). There is some evidence in experimental animals that oral and inhalation exposure to toluene during gestation results in embryotoxicity and skeletal malformations (Nawrot and Staples, 1979; Hudak and Ungvary, 1978).

EPA has classified toluene as a Class D carcinogen (Not Classifiable) (IRIS, 1994). EPA (IRIS, 1994) derived an oral reference dose (RfD) of 2E-01 mg/kg-day for toluene based on a 13-week rat gavage study (NTP, 1989); reporting changes in liver and kidney weight. A no-observed-adverse-effect-level (NOAEL) of 312 mg/kg (converted to 223 mg/kg-day) and an uncertainty factor of 1000 was the basis for the RfD.

TOLUENE (Cont'd)

EPA (IRIS, 1994) derived an inhalation reference concentration (RfC) of 4E-01 mg/m^3 corresponding to an inhalation RfD of 1.1E-01 mg/kg-day. The RfC was based on the lowest-observed-adverse effect level (LOAEL) from two studies (Foo et al., 1990; NTP, 1990) and an uncertainty factor of 300.

TOXAPHENE

Toxaphene is a chlorinated insecticide which is persistent in the environment (Clement Associates, Inc., 1985). The clinical signs common to both humans and animals following acute intoxication with toxaphene include salivation, hyperexcitability, behavioral changes, muscle spasms, convulsions, and death which point to the nervous system as the major target of toxicity. This system also appears to be affected, though to a lesser extent, following longer-term exposure in humans and animals. Other toxic manifestations of toxaphene exposure observed in humans and animals include adverse respiratory effects following inhalation exposure. Target organs of toxaphene toxicity identified in experimental animals but not humans include the liver, kidney, and to a lesser extent, the heart and immune system. (ATSDR, 1990).

EPA has classified toxaphene in Group B2, Probable Human Carcinogen (IRIS, 1994). EPA has developed an oral slope factor of 1.1E+00 $(mg/kg\text{-}day)^{-1}$ and an inhalation unit risk of 3.2E-04 $(ug/m^3)^{-1}$ converted to an inhalation slope factor of 1.1E+00 $(mg/kg\text{-}day)^{-1}$ based on a mouse study by Litton Bionetics (1978) in which mice fed toxaphene in the diet developed hepatocellular carcinomas and neoplastic nodules (IRIS, 1994). Neither an oral reference dose (RfD) nor an inhalation reference concentration (RfC) has been developed.

TRICHLOROETHENE (TCE)

Trichloroethene (TCE) is a colorless liquid mainly used as a metal degreaser. It is volatile with a sweet odor similar to chloroform. Trichloroethene was once used as a general anesthetic, but its use has been discontinued.

Trichloroethene is a central nervous system depressant following acute and chronic exposure. High level exposure can result in death due to the respiratory and cardiac failure.

Industrial use of trichloroethene is often associated with dermatological problems including reddening and burning skin on contact and dermatitis resulting from vapors. These effects are usually the result of contact with concentrated solvent, however, and no effects have been reported from exposure to trichloroethene in dilute, aqueous solutions (EPA, 1985a).

The heptoatoxic potential of trichloroethene has been evaluated to human and laboratory animal studies. Animal studies have revealed a transient increase in liver weights, but relative liver weights decreased postexposure (Kjhellstrand et al., 1983). Observations of liver or renal dysfunction in workers have been infrequent, and factors other than trichloroethene complicate interpretation of hepatorenal disturbances (EPA, 1985a).

Several epidemiological studies reported no significant excess cancer risk associated with occupational exposure to trichloroethene (Axelson et al., 1978, Tola et al., 1980, Malek et al., 1979). In a follow-up to one of these studies, Axelson (1986a, 1986b) observed a slight excess

of bladder cancer and lymphoma. In other epidemiological studies, no associations were found between trichloroethene exposure and liver cancer (Novotna et al. 1979, Paddle 1983) or malignant lymphoma (Hardell et al., 1981). Due to limitations with these studies, the available human studies do not allow a definite conclusion regarding the carcinogenicity of trichloroethene in humans.

Studies investigating the carcinogenic potential of trichloroethene have been conducted, and two of these studies revealed significant increases in the incidence of liver tumors among both sexes of $B6C3F_1$ mice exposed by gavage (NCI, 1976, NTP, 1982).

Trichloroethene was formerly classified as a Group B2 carcinogen (EPA 1985b). This classification is currently being reconsidered by EPA (IRIS, 1994). The carcinogenic slope factors for ingestion and inhalation of 1.1E-02 $(mg/kg\text{-}day)^{-1}$ and 6E-03 $(mg/kg\text{-}day)^{-1}$, respectively, have been cited (EPA, 1994), but are currently being reevaluated and are not available through IRIS, (1994).

An oral RfD for trichloroethene is currently not available on EPA's IRIS or HEAST. A provisional RfD of 6E-03 mg/kg-day has been generated by EPA (October, 1994). This RfD was based on a 6-month drinking water study of mice by Tucker et al. (1982). In this study, groups of 30 male and 30 female CD-1 mice received trichloroethene at average doses of 0, 18.4, 216.7, 393.0, and 660.2 mg/kg/day for males and 0, 17.9, 193.0, 437.1, and 793.3

mg/kg/day for females. Increased relative liver and kidney weights, decreases in terminal body weights, and elevated protein and ketone levels in urine were observed in high-dose female and male mice. The NOAEL identified from this study is 18.4 mg/kg/day. An uncertainty factor of 3000 was applied to the NOAEL to compensate for interspecies extrapolation, intraspecies variation, extrapolation to chronic duration, and for weakness of the data base.

VANADIUM

Limited information is available regarding the toxicity of vanadium. Pentavalent vanadium compounds are generally considered to be more toxic than vanadium compounds having other valence states. In humans, short-term and long-term occupational exposure to vanadium by inhalation has been associated with irritation of the respiratory tract, coughing, labored breathing, bronchitis, and chest pains. Vanadium is also reported to cause ocular and dermal irritation in humans. Adverse effects observed in experimental animals following such chronic inhalation exposure to vanadium have included renal, hepatic, and pulmonary lesions (NIOSH, 1977; NAS, 1974).

EPA (1994) has established an oral reference dose (RfD) for vanadium of 7E-03 mg/kg-day. This value is based on a study by Schroeder et al. (1970) in which rats exposed to 5 ppm of vanadium in drinking water over a lifetime showed no adverse effects (EPA, 1994). An uncertainty factor of 100 was applied to develop the RfD. EPA has not developed inhalation criteria for vanadium.

VINYL CHLORIDE

Vinyl chloride is a human carcinogen that causes angiosarcomas of the liver and tumors of the brain, lung, and hemolymphopoietic system. There is suggestive evidence that vinyl chloride has teratogenic and reproductive effects in both humans and animals. Chronic human exposure to vinyl chloride is associated with multiple systemic disorders, including a sclerotic syndrome, acro-osteolysis, and liver damage. Acute human exposure to high concentrations can cause narcosis, respiratory tract irritation, bronchitis, and memory disturbances. Chronic exposure by animals can result in lesions of the liver, kidneys, spleen, and lungs (Clement Associates, Inc., 1985).

Vinyl chloride is classified as a Group A chemical (Human Carcinogen) (EPA, 1994). EPA (1994) has developed an oral slope factor of 1.9E+00 $(mg/kg\text{-}day)^{-1}$ based on a dietary study in which rats fed vinyl chloride for 1001 days developed lung and liver tumors. An inhalation slope factor of 3E-01 $(mg/kg\text{-}day)^{-1}$ has also been developed based on a rat study in which liver tumors resulted (EPA, 1994). Both slope factors are currently under review.

No oral references doses (RfDs) or inhalation reference concentrations (RfCs) have been developed for vinyl chloride.

ZINC

Zinc is absorbed in humans following oral exposure; however, insufficient data are available to evaluate absorption following inhalation exposure (EPA, 1984). Zinc is an essential trace element that is necessary for normal health and metabolism and therefore is nontoxic in trace quantities (Hammond and Beliles, 1980). However, overexposure to zinc has been associated with a variety of adverse effects. Chronic and subchronic inhalation exposure of humans to zinc has been associated with gastrointestinal disturbances, dermatitis, and metal fume fever, a condition characterized by fever, chills, coughing, dyspnea, and muscle pain (EPA, 1984). Chronic oral exposure of humans to zinc may cause anemia and altered hematological parameters. Reduced body weights have been observed in studies in which rats were administered zinc in the diet. There is no evidence that zinc is teratogenic or carcinogenic (EPA, 1984).

With respect to carcinogenicity, zinc (soluble salts) is categorized as a Group D carcinogen (Not Classified) (IRIS, 1994). This category applies to chemicals for which there is inadequate evidence of carcinogenicity in animals. EPA (IRIS, 1994) has derived an oral reference dose (RfD) of 3E-01 mg/kg-day. The oral RfD value is based on a human study by Yadrick et al. (1989) in which adult females given zinc diet supplements showed a decrease in erythrocyte superoxide dismutase (ESOD) which indicates altered copper levels at the LOAEL of 1.0 mg/kg-day. An uncertainty factor of 3 was applied to derive the RfD. An inhalation reference concentration (RfC) has not been developed.

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Appendix O

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APPENDIX O

SPREADSHEET CALCULATIONS

TABLE 1

SURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC. SITE - PRESENT-USE SCENARIO
RISKS TO AREA RESIDENTS/TRESPASSERS IN LOT 1A

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Children (12-17 years)

Chronic Daily Intake = (mg/kg day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/kg X 100 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 78 days/year X 6 years X 1 / 55 kg X 1 / 25550 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aroclor 1254	2.00E-02	100	1.0E-06	1	78	6	55	25550	6.7E-10	7.7E+00	5.1E-09
Arsenic	2.94E+00	100	1.0E-06	1	78	6	55	25550	9.8E-08	1.75E+00	1.7E-07
Beryllium	8.10E-01	100	1.0E-06	1	78	6	55	25550	2.7E-08	4.3E+00	1.2E-07

TOTAL RISK = 2.9E-07

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TABLE 1

SURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC. SITE - PRESENT-USE SCENARIO
RISKS TO AREA RESIDENTS/TRESPASSERS IN LOT 1A

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Children (12-17 years)

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/kg X 100 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 78 days/year X 6 years X 1 / 55 kg X 1 / 2190 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Arsenic	2.94E+00	100	1.0E-06	1	78	6	55	2190	1.1E-06	3.0E-04	3.8E-03
Beryllium	8.10E-01	100	1.0E-06	1	78	6	55	2190	3.1E-07	5.0E-03	6.3E-05
Manganese	4.81E+02	100	1.0E-06	1	78	6	55	2190	1.9E-04	5.0E-03	3.7E-02
Mercury	7.30E-01	100	1.0E-06	1	78	6	55	2190	2.8E-07	3.0E-04	9.5E-04
Silver	1.45E+01	100	1.0E-06	1	78	6	55	2190	5.6E-06	5.0E-03	1.1E-03
Vanadium	3.41E+01	100	1.0E-06	1	78	6	55	2190	1.3E-05	7.0E-03	1.9E-03

HAZARD INDEX = 4.5E-02

CHM 002 2326

TABLE 2

SURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC. SITE - PRESENT-USE SCENARIO
RISKS TO AREA RESIDENTS/TRESPASSERS IN LOT 1A

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Children (12-17 years)

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Conversion Factor X Skin Surface Area X Adherence Factor X Absorption Factor X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/kg X 1 kg ######### X 1945 cm2/day X 1 mg/cm2 X (unitless) X 78 events/year X 6 years X 1/55 kg X 1/25550 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aroclor 1254	2.00E-02	1.0E-06	1945	1	0.06	78	6	55	25550	7.8E-10	7.7E+00	6.0E-09

TOTAL RISK= 6.0E-09

CHM 002 2327

TABLE 2

SURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC. SITE - PRESENT-USE SCENARIO
RISKS TO AREA RESIDENTS/TRESPASSERS IN LOT 1A

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: (Children 12-17 years)

Chronic Daily Intake- (mg/kg-day)	Soil Concentration	X	Conversion Factor	X	Skin Surface Area	X	Adherence Factor	X	Absorption Factor	X	Exposure Frequency	X	Exposure Duration	X	1 / Body Weight	X	1 / Averaging Time
	mg/kg	X	1 kg / #########	X	1945 cm2/day	X	1 mg/cm2	X	(unitless)	X	78 events/year	X	6 years	X	1 / 55 kg	X	1 / 2190 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD

PCBs do not currently have established noncarcinogenic toxicity values. No other selected chemicals of potential concern have established dermal absorption factors.

CHM 002 2328

TABLE 3

SURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC. SITE - PRESENT-USE SCENARIO
RISKS TO AREA RESIDENTS/TRESPASSERS IN LOT 1B

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Children (12-17 years)

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/kg X 100 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 26 days/year X 6 years X 1/55 kg X 1/25550 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aldrin	4.50E+00	100	1.0E-06	1	26	6	55	25550	5.0E-08	1.7E+01	8.5E-07
Dieldrin	2.95E+00	100	1.0E-06	1	26	6	55	25550	3.3E-08	1.6E+01	5.2E-07
Aroclor 1248	7.30E+01	100	1.0E-06	1	26	6	55	25550	8.1E-07	7.7E+00	6.2E-06
Aroclor 1254	8.50E+00	100	1.0E-06	1	26	6	55	25550	9.4E-08	7.7E+00	7.3E-07
Aroclor 1260	8.49E+01	100	1.0E-06	1	26	6	55	25550	9.4E-07	7.7E+00	7.3E-06
Arsenic	3.84E+00	100	1.0E-06	1	26	6	55	25550	4.3E-08	1.75E+00	7.5E-08

TOTAL RISK = 1.6E-05

7/25/95
SS-IN TP1B XLS

TABLE 3

SURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC. SITE - PRESENT-USE SCENARIO
RISKS TO AREA RESIDENTS/TRESPASSERS IN LOT 1B

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Children (12-17 years)

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/kg X 100 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 26 days/year X 6 years X 1/55 kg X 1/2190 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Aldrin	4.50E+00	100	1.0E-06	1	26	6	55	2190	5.8E-07	3.0E-05	1.9E-02
Dieldrin	2.95E+00	100	1.0E-06	1	26	6	55	2190	3.8E-07	5.0E-05	7.6E-03
Antimony	8.87E+00	100	1.0E-06	1	26	6	55	2190	1.1E-06	4.0E-04	2.9E-03
Arsenic	3.84E+00	100	1.0E-06	1	26	6	55	2190	5.0E-07	3.0E-04	1.7E-03
Cadmium	4.80E+00	100	1.0E-06	1	26	6	55	2190	6.2E-07	1.0E-03	6.2E-04
Chromium VI	1.64E+01	100	1.0E-06	1	26	6	55	2190	2.1E-06	5.0E-03	4.2E-04
Manganese	1.03E+03	100	1.0E-06	1	26	6	55	2190	1.3E-04	5.0E-03	2.7E-02
Mercury	3.60E+00	100	1.0E-06	1	26	6	55	2190	4.7E-07	3.0E-04	1.6E-03
Thallium	4.60E-01	100	1.0E-06	1	26	6	55	2190	6.0E-08	8.0E-05	7.4E-04
Vanadium	8.12E+01	100	1.0E-06	1	26	6	55	2190	1.1E-05	7.0E-03	1.5E-03

HAZARD INDEX = 6.3E-02

TABLE 4

SURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC. SITE - PRESENT-USE SCENARIO
RISKS TO AREA RESIDENTS/TRESPASSERS IN LOT 1B

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Children (12-17 years)

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Conversion Factor X Skin Surface Area X Adherence Factor X Absorption Factor X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/kg X 1 kg ######### X 1945 cm2/day X 1 mg/cm2 X (unitless) X 78 events/year X 6 years X 1 / 55 kg X 1 / 25550 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aroclor 1248	7.30E+01	1.0E-06	1945	1	0.06	78	6	55	25550	2.8E-06	7.7E+00	2.2E-05
Aroclor 1254	8.50E+00	1.0E-06	1945	1	0.06	78	6	55	25550	3.3E-07	7.7E+00	2.5E-06
Aroclor 1260	8.49E+01	1.0E-06	1945	1	0.06	78	6	55	25550	3.3E-06	7.7E+00	2.5E-05

TOTAL RISK= 5.0E-05

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TABLE 4

SURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC SITE PRESENT USE SCENARIO
RISKS TO AREA RESIDENTS/TRESPASSERS IN LOT 1B

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: (Children 12-17 years)

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Conversion Factor X Skin Surface Area X Adherence Factor X Absorption Factor X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/kg X 1 kg / ########## X 1945 cm2/day X 1 mg/cm2 X (unitless) X 78 events/year X 6 years X 1 / 55 kg X 1 / 2190 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Cadmium	4.80E+00	1.0E-06	1945	1	0.01	78	6	55	2190	3.6E-07	1.0E-03	3.6E-10

TOTAL RISK = 3.6E-10

CHM 002 2332

7/25/96
SS-IN-A

TABLE

SURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC SITE - FUTURE-USE SCENARIO
RISKS TO RESIDENTS IN LOT 1A

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Adults

Chronic Daily Intake = (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/kg X 100 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 350 days/year X 24 years X 1 / 70 kg X 1 / 25550 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aroclor 1254	2.00E-02	100	1.0E-06	1	350	24	70	25550	9.4E-09	7.7E+00	7.2E-08
Arsenic	2.94E+00	100	1.0E-06	1	350	24	70	25550	1.4E-06	1.75E+00	2.4E-06
Beryllium	8.10E-01	100	1.0E-06	1	350	24	70	25550	3.8E-07	4.3E+00	1.6E-06

TOTAL RISK = 4.1E-06

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Children (0-6 years)

Chronic Daily Intake = (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/kg X 200 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 350 days/year X 6 years X 1 / 15 kg X 1 / 25550 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aroclor 1254	2.00E-02	200	1.0E-06	1	350	6	15	25550	2.2E-08	7.7E+00	1.7E-07
Arsenic	2.94E+00	200	1.0E-06	1	350	6	15	25550	3.2E-06	1.75E+00	5.6E-06
Beryllium	8.10E-01	200	1.0E-06	1	350	6	15	25550	8.9E-07	4.3E+00	3.8E-06

TOTAL RISK = 9.6E-06
30-YEAR COMBINED RISK (ADULT + CHILD) = 1.4E-05

CHM 002 2333

TABLE 5

SURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC SITE - FUTURE USE SCENARIO
RISKS TO RESIDENTS IN LOT 1A

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day)	Soil Concentration	X	Ingestion Rate	X	Conversion Factor	X	Fraction Ingested	X	Exposure Frequency	X	Exposure Duration	X	1 / Body Weight	X	1 / Averaging Time
	mg/kg	X	100 mg/day	X	1 kg / 1000000 mg	X	1 (unitless)	X	350 days/year	X	24 years	X	1 / 70 kg	X	1 / 8760 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Arsenic	2.94E+00	100	1.0E-06	1	350	24	70	8760	4.0E-06	3.0E-04	1.3E-02
Beryllium	8.10E-01	100	1.0E-06	1	350	24	70	8760	1.1E-06	5.0E-03	2.2E-04
Manganese	4.81E+02	100	1.0E-06	1	350	24	70	8760	6.6E-04	5.0E-03	1.3E-01
Mercury	7.30E-01	100	1.0E-06	1	350	24	70	8760	1.0E-06	3.0E-04	3.3E-03
Silver	1.45E+01	100	1.0E-06	1	350	24	70	8760	2.0E-05	5.0E-03	4.0E-03
Vanadium	3.41E+01	100	1.0E-06	1	350	24	70	8760	4.7E-05	7.0E-03	6.7E-03

HAZARD INDEX = 1.6E-01

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Children (0-6 years)

Chronic Daily Intake= (mg/kg-day)	Soil Concentration	X	Ingestion Rate	X	Conversion Factor	X	Fraction Ingested	X	Exposure Frequency	X	Exposure Duration	X	1 / Body Weight	X	1 / Averaging Time
	mg/kg	X	200 mg/day	X	1 kg / 1000000 mg	X	1 (unitless)	X	350 days/year	X	6 years	X	1 / 15 kg	X	1 / 2190 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Arsenic	2.94E+00	200	1.0E-06	1	350	6	15	2190	3.8E-05	3.0E-04	1.3E-01
Beryllium	8.10E-01	200	1.0E-06	1	350	6	15	2190	1.0E-05	5.0E-03	2.1E-03
Manganese	4.81E+02	200	1.0E-06	1	350	6	15	2190	6.1E-03	5.0E-03	1.2E+00
Mercury	7.30E-01	200	1.0E-06	1	350	6	15	2190	9.3E-06	3.0E-04	3.1E-02
Silver	1.45E+01	200	1.0E-06	1	350	6	15	2190	1.9E-04	5.0E-03	3.7E-02
Vanadium	3.41E+01	200	1.0E-06	1	350	6	15	2190	4.4E-04	7.0E-03	6.2E-02

HAZARD INDEX = 1.5E+00
30-YEAR COMBINED HAZARD INDEX (ADULT + CHILD) = 1.6E+00

CHM 002 2334

TABLE 6

SURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC SITE FUTURE USE SCENARIO
RISKS TO RESIDENTS IN LOT 1A

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Adults

Chronic Daily Intake = (mg/kg day)	Soil Concentration	X	Conversion Factor	X	Skin Surface Area	X	Adherence Factor	X	Absorption Factor	X	Exposure Frequency	X	Exposure Duration	X	1 / Body Weight	X	1 / Averaging Time
	mg/kg	X	1 kg / #########	X	793 cm2/day	X	1 mg/cm2	X	(unitless)	X	############	X	24 years	X	1 / 70 kg	X	1 / 25550 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aroclor 1254	2.00E-02	1.0E-06	793	1	0.06	350	24	70	25550	4.5E-09	7.7E+00	3.4E-08
											TOTAL RISK =	3.4E-08

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Children (0-6 years)

Chronic Daily Intake = (mg/kg day)	Soil Concentration	X	Conversion Factor	X	Skin Surface Area	X	Adherence Factor	X	Absorption Factor	X	Exposure Frequency	X	Exposure Duration	X	1 / Body Weight	X	1 / Averaging Time
	mg/kg	X	1 kg / #########	X	1750 cm2/day	X	1 mg/cm2	X	(unitless)	X	############	X	6 years	X	1 / 15 kg	X	1 / 25550 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aroclor 1254	2.00E-02	1.0E-06	1750	1	0.06	350	6	15	25550	1.2E-08	7.7E+00	8.9E-08
											TOTAL RISK =	8.9E-08

30-YEAR COMBINED RISK (ADULT + CHILD) = 1.2E-07

CHM 002 2335

TABLE 6

SURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC SITE FUTURE USE SCENARIO
RISKS TO RESIDENTS IN LOT 1A

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day)	Soil Concentration	X	Conversion Factor	X	Skin Surface Area	X	Adherence Factor	X	Absorption Factor	X	Exposure Frequency	X	Exposure Duration	X	1 Body Weight	X	1 Averaging Time
	mg/kg	X	1 kg / #########	X	793 cm2/day	X	1 mg/cm2	X	(unitless)	X	############	X	24 years	X	1 / 70 kg	X	1 / 8760 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD

PCBs do not currently have established noncarcinogenic toxicity values No other selected chemicals of potential concern have established dermal absorption factors.

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Children (0-6 years)

Chronic Daily Intake= (mg/kg-day)	Soil Concentration	X	Conversion Factor	X	Skin Surface Area	X	Adherence Factor	X	Absorption Factor	X	Exposure Frequency	X	Exposure Duration	X	1 Body Weight	X	1 Averaging Time
	mg/kg	X	1 kg / #########	X	1750 cm2/day	X	1 mg/cm2	X	(unitless)	X	############	X	6 years	X	1 / 15 kg	X	1 / 2190 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD

PCBs do not currently have established noncarcinogenic toxicity values No other selected chemicals of potential concern have established dermal absorption factors.

CHM 002 2336

7/25/96
SS-IH-RES1A.XLS

TABLE 7

SURFACE SOIL INHALATION PATHWAY
CHEMSOL, INC SITE - FUTURE USE SCENARIO
PISKS TO RESIDENTS (INSIDE AND OUTSIDE RESIDENCE) IN LOT 1A

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE: Adults

Chronic Daily Intake- (mg/kg-day) = Soil Concen X Susp Soil Concen X Resp Fraction X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X Conv. Factor X 1 / Body Wt X 1 / Avging Time

mg/kg X ######### X (unitless) X 0.83 m3/hr X 24 hrs/day X 350 days/yr X 24 years X 1 kg / 1000000 mg X 1 / 70 kg X 1 / ########

Chemicals	Soil Concen	Susp Soil Concen	Resp Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv. Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Arsenic	#######	1.3E-02	1	0.83	24	350	24	1.0E-06	70	25550	3.6E-09	1.5E+01	5.4E-08
Beryllium	8.10E-01	1.3E-02	1	0.83	24	350	24	1.0E-06	70	25550	9.9E-10	8.4E+00	8.3E-09

TOTAL RISK = 6.2E-08

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE: Children (0-6 years)

Chronic Daily Intake- (mg/kg-day) = Soil Concen X Susp Soil Concen X Resp Fraction X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X Conv. Factor X 1 / Body Wt X 1 / Avging Time

mg/kg X ######### X (unitless) X 0.83 m3/hr X 24 hrs/day X 350 days/yr X 6 years X 1 kg / 1000000 mg X 1 / 15 kg X 1 / ########

Chemicals	Soil Concen	Susp Soil Concen	Resp Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv. Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Arsenic	#######	1.3E-02	1	0.83	24	350	6	1.0E-06	15	25550	4.2E-09	1.5E+01	6.3E-08
Beryllium	8.10E-01	1.3E-02	1	0.83	24	350	6	1.0E-06	15	25550	1.1E-09	8.4E+00	9.7E-09

TOTAL RISK = 7.2E-08

30-YEAR COMBINED RISK (ADULT + CHILD) = 1.3E-07

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7/25/98
SS-IH-RES1A.XLS

TABLE 7

SURFACE SOIL INHALATION PATHWAY
CHEMSOL, INC SITE - FUTURE USE SCENARIO
RISKS TO RESIDENTS (INSIDE AND OUTSIDE RESIDENCE) IN LOT 1A

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Soil Concen X Susp Soil Concen X Resp Fraction X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X Conv. Factor X 1 / Body Wt X 1 / Avging Time

mg/kg X ######### X (unitless) X 0.83 m3/hr X 24 hrs/day X 350 days/yr X 24 years X 1 kg / 1000000 mg X 1 / 70 kg X 1 / 8760 days

Chemicals	Soil Concen	Susp Soil Concen.	Resp Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv. Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Manganese	#######	1.3E-02	1	0.83	24	350	24	1.0E-06	70	8760	1.7E-06	1.4E-05	1.2E-01
Mercury	7.30E-01	1.3E-02	1	0.83	24	350	24	1.0E-06	70	8760	2.6E-09	8.6E-05	3.0E-05

HAZARD INDEX = 1.2E-01

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE: Children (0-6 years)

Chronic Daily Intake= (mg/kg-day) = Soil Concen X Susp Soil Concen X Resp Fraction X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X Conv Factor X 1 / Body Wt X 1 / Avging Time

mg/kg X ######### X (unitless) X 0.83 m3/hr X 24 hrs/day X 350 days/yr X 6 years X 1 kg / 1000000 mg X 1 / 15 kg X 1 / 2190 days

Chemicals	Soil Concen.	Susp Soil Concen.	Resp. Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv. Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Manganese	#######	1.3E-02	1	0.83	24	350	6	1.0E-06	15	2190	8.0E-06	1.4E-05	5.7E-01
Mercury	7.30E-01	1.3E-02	1	0.83	24	350	6	1.0E-06	15	2190	1.2E-08	8.6E-05	1.4E-04

HAZARD INDEX = 5.7E-01

30-YEAR COMBINED HAZARD INDEX (ADULT + CHILD) = 6.9E-01

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TABLE 8

SURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC SITE - FUTURE USE SCENARIO
RISKS TO RESIDENTS IN LOT 1B

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Adults

Chronic Daily Intake = (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/kg X 100 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 350 days/year X 24 years X 1 / 70 kg X 1 / 25550 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aldrin	4.50E+00	100	1.0E-06	1	350	24	70	25550	2.1E-06	1.7E+01	3.6E-05
Dieldrin	2.95E+00	100	1.0E-06	1	350	24	70	25550	1.4E-06	1.6E+01	2.2E-05
Aroclor 1248	7.30E+01	100	1.0E-06	1	350	24	70	25550	3.4E-05	7.7E+00	2.6E-04
Aroclor 1254	8.50E+00	100	1.0E-06	1	350	24	70	25550	4.0E-06	7.7E+00	3.1E-05
Aroclor 1260	8.49E+01	100	1.0E-06	1	350	24	70	25550	4.0E-05	7.7E+00	3.1E-04
Arsenic	3.84E+00	100	1.0E-06	1	350	24	70	25550	1.8E-06	1.75E+00	3.2E-06

TOTAL RISK = 6.6E-04

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Children (0 - 6 years)

Chronic Daily Intake = (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/kg X 200 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 350 days/year X 6 years X 1 / 15 kg X 1 / 25550 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aldrin	4.50E+00	200	1.0E-06	1	350	6	15	25550	4.9E-06	1.7E+01	8.4E-05
Dieldrin	2.95E+00	200	1.0E-06	1	350	6	15	25550	3.2E-06	1.6E+01	5.2E-05
Aroclor 1248	7.30E+01	200	1.0E-06	1	350	6	15	25550	8.0E-05	7.7E+00	6.2E-04
Aroclor 1254	8.50E+00	200	1.0E-06	1	350	6	15	25550	9.3E-06	7.7E+00	7.2E-05
Aroclor 1260	8.49E+01	200	1.0E-06	1	350	6	15	25550	9.3E-05	7.7E+00	7.2E-04
Arsenic	3.84E+00	200	1.0E-06	1	350	6	15	25550	4.2E-06	1.75E+00	7.4E-06

TOTAL RISK = 1.5E-03
30-YEAR COMBINED RISK (ADULT + CHILD) = 2.2E-03

CHM 002 2339

TABLE 6

SURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC SITE - FUTURE USE SCENARIO
RISKS TO RESIDENTS IN LOT 18

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/kg X 100 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 350 days/year X 24 years X 1/70 kg X 1/8760 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Aldrin	4.50E+00	100	1.0E-06	1	350	24	70	8760	6.2E-06	3.0E-05	2.1E-01
Dieldrin	2.95E+00	100	1.0E-06	1	350	24	70	8760	4.0E-06	5.0E-05	8.1E-02
Antimony	8.87E+00	100	1.0E-06	1	350	24	70	8760	1.2E-05	4.0E-04	3.0E-02
Arsenic	3.84E+00	100	1.0E-06	1	350	24	70	8760	5.3E-06	3.0E-04	1.8E-02
Cadmium	4.80E+00	100	1.0E-06	1	350	24	70	8760	6.6E-06	1.0E-03	6.6E-03
Chromium VI	1.64E+01	100	1.0E-06	1	350	24	70	8760	2.2E-05	5.0E-03	4.5E-03
Manganese	1.03E+03	100	1.0E-06	1	350	24	70	8760	1.4E-03	5.0E-03	2.8E-01
Mercury	3.60E+00	100	1.0E-06	1	350	24	70	8760	4.9E-06	3.0E-04	1.6E-02
Thallium	4.60E-01	100	1.0E-06	1	350	24	70	8760	6.3E-07	8.0E-05	7.9E-03
Vanadium	8.12E+01	100	1.0E-06	1	350	24	70	8760	1.1E-04	7.0E-03	1.6E-02

HAZARD INDEX = 6.7E-01

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Children (0-6 years)

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/kg X 200 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 350 days/year X 6 years X 1/15 kg X 1/2190 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Aldrin	4.50E+00	200	1.0E-06	1	350	6	15	2190	5.8E-05	3.0E-05	1.9E+00
Dieldrin	2.95E+00	200	1.0E-06	1	350	6	15	2190	3.8E-05	5.0E-05	7.5E-01
Antimony	8.87E+00	200	1.0E-06	1	350	6	15	2190	1.1E-04	4.0E-04	2.8E-01
Arsenic	3.84E+00	200	1.0E-06	1	350	6	15	2190	4.9E-05	3.0E-04	1.6E-01
Cadmium	4.80E+00	200	1.0E-06	1	350	6	15	2190	6.1E-05	1.0E-03	6.1E-02
Chromium VI	1.64E+01	200	1.0E-06	1	350	6	15	2190	2.1E-04	5.0E-03	4.2E-02
Manganese	1.03E+03	200	1.0E-06	1	350	6	15	2190	1.3E-02	5.0E-03	2.6E+00
Mercury	3.60E+00	200	1.0E-06	1	350	6	15	2190	4.6E-05	3.0E-04	1.5E-01
Thallium	4.60E-01	200	1.0E-06	1	350	6	15	2190	5.9E-06	8.0E-05	7.4E-02
Vanadium	8.12E+01	200	1.0E-06	1	350	6	15	2190	1.0E-03	7.0E-03	1.5E-01

HAZARD INDEX = 6.2E+00

30-YEAR COMBINED HAZARD INDEX (ADULT + CHILD) = 6.9E+00

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TABLE 9

SURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC SITE - FUTURE USE SCENARIO
RISKS TO RESIDENTS IN LOT 1B

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day)	Soil Concentration	X	Conversion Factor	X	Skin Surface Area	X	Adherence Factor	X	Absorption Factor	X	Exposure Frequency	X	Exposure Duration	X	1 / Body Weight	X	1 / Averaging Time
	mg/kg	X	1 kg / #########	X	793 cm2/day	X	1 mg/cm2	X	(unitless)	X	############	X	24 years	X	1 / 70 kg	X	1 / 25550 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aroclor 1248	7.30E+01	1.0E-06	793	1	0.06	350	24	70	25550	1.6E-05	7.7E+00	1.3E-04
Aroclor 1254	8.50E+00	1.0E-06	793	1	0.06	350	24	70	25550	1.9E-06	7.7E+00	1.5E-05
Aroclor 1260	8.49E+01	1.0E-06	793	1	0.06	350	24	70	25550	1.9E-05	7.7E+00	1.5E-04

TOTAL RISK = 2.9E-04

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Children (0-6 years)

Chronic Daily Intake= (mg/kg-day)	Soil Concentration	X	Conversion Factor	X	Skin Surface Area	X	Adherence Factor	X	Absorption Factor	X	Exposure Frequency	X	Exposure Duration	X	1 / Body Weight	X	1 / Averaging Time
	mg/kg	X	1 kg / #########	X	1750 cm2/day	X	1 mg/cm2	X	(unitless)	X	############	X	6 years	X	1 / 15 kg	X	1 / 25550 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aroclor 1248	7.30E+01	1.0E-06	1750	1	0.06	350	6	15	25550	4.2E-05	7.7E+00	3.2E-04
Aroclor 1254	8.50E+00	1.0E-06	1750	1	0.06	350	6	15	25550	4.9E-06	7.7E+00	3.8E-05
Aroclor 1260	8.49E+01	1.0E-06	1750	1	0.06	350	6	15	25550	4.9E-05	7.7E+00	3.8E-04

TOTAL RISK = 7.4E-04

30-YEAR COMBINED RISK (ADULT + CHILD) = 1.0E-03

CHM 002 2341

TABLE 9

SURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC SITE FUTURE USE SCENARIO
RISKS TO RESIDENTS IN LOT 1B

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Adults

Chronic Daily Intake- (mg/kg day)	Soil Concentration	X	Conversion Factor	X	Skin Surface Area	X	Adherence Factor	X	Absorption Factor	X	Exposure Frequency	X	Exposure Duration	X	1 / Body Weight	X	1 / Averaging Time
	mg/kg	X	1 kg / #########	X	793 cm2/day	X	1 mg/cm2	X	(unitless)	X	############	X	24 years	X	1 / 70 kg	X	1 / 8760 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Cadmium	4 80E+00	1 0E-06	793 cm2/day	1	0 01	350	24	70	8760	5.2E-07	1.0E-03	5 2E-10

HAZARD INDEX = 5 2E-10

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Children (0-6 years)

Chronic Daily Intake- (mg/kg day)	Soil Concentration	X	Conversion Factor	X	Skin Surface Area	X	Adherence Factor	X	Absorption Factor	X	Exposure Frequency	X	Exposure Duration	X	1 / Body Weight	X	1 / Averaging Time
	mg/kg	X	1 kg / #########	X	1750 cm2/day	X	1 mg/cm2	X	(unitless)	X	############	X	6 years	X	1 / 15 kg	X	1 / 2190 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Cadmium	4 80E+00	1 0E-06	1750 cm2/day	1	0 01	350	6	15	2190	5.4E-06	1 0E-03	5.4E-09

HAZARD INDEX = 5 4E-09

30-YEAR COMBINED HAZARD INDEX (ADULT + CHILD) = 5.9E-09

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TABLE

SURFACE SOIL INHALATION PATHWAY
CHEMSOL, INC SITE - FUTURE USE SCENARIO
RISKS TO RESIDENTS (INSIDE AND OUTSIDE RESIDENCE) IN LOT 1B

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day)	Soil Concen	X	Susp Soil Concen	X	Resp Fraction	X	Inhalation Rate	X	Exposure Time	X	Exposure Frequency	X	Exposure Duration	X	Conv Factor	X	1 / Body Wt	X	1 / Avging Time
	mg/kg	X	#########	X	(unitless)	X	0.83 m3/hr	X	24 hrs/day	X	350 days/yr	X	24 years	X	1 kg / 1000000 mg	X	1 / 70 kg	X	1 / ########

Chemicals	Soil Concen	Susp Soil Concen	Resp Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv. Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aldrin	#######	1.3E-02	1	0.83	24	350	24	1.0E-06	70	25550	5.5E-09	1.7E+01	9.3E-08
Dieldrin	#######	1.3E-02	1	0.83	24	350	24	1.0E-06	70	25550	3.6E-09	1.6E+01	5.7E-08
Arsenic	#######	1.3E-02	1	0.83	24	350	24	1.0E-06	70	25550	4.7E-09	1.5E+01	7.0E-08
Cadmium	#######	1.3E-02	1	0.83	24	350	24	1.0E-06	70	25550	5.8E-09	6.3E+00	3.7E-08
Chromium VI	#######	1.3E-02	1	0.83	24	350	24	1.0E-06	70	25550	2.0E-08	4.2E+01	8.4E-07

TOTAL RISK = 1.1E-06

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE: Children (0-6 years)

Chronic Daily Intake= (mg/kg-day)	Soil Concen	X	Susp Soil Concen	X	Resp Fraction	X	Inhalation Rate	X	Exposure Time	X	Exposure Frequency	X	Exposure Duration	X	Conv Factor	X	1 / Body Wt	X	1 / Avging Time
	mg/kg	X	#########	X	(unitless)	X	0.83 m3/hr	X	24 hrs/day	X	350 days/yr	X	6 years	X	1 kg / 1000000 mg	X	1 / 15 kg	X	1 / ########

Chemicals	Soil Concen	Susp Soil Concen	Resp. Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv. Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aldrin	#######	1.3E-02	1	0.83	24	350	6	1.0E-06	15	25550	6.4E-09	1.7E+01	1.1E-07
Dieldrin	#######	1.3E-02	1	0.83	24	350	6	1.0E-06	15	25550	4.2E-09	1.6E+01	6.7E-08
Arsenic	#######	1.3E-02	1	0.83	24	350	6	1.0E-06	15	25550	5.4E-09	1.5E+01	8.2E-08
Cadmium	#######	1.3E-02	1	0.83	24	350	6	1.0E-06	15	25550	6.8E-09	6.3E+00	4.3E-08
Chromium VI	#######	1.3E-02	1	0.83	24	350	6	1.0E-06	15	25550	2.3E-08	4.2E+01	9.8E-07

TOTAL RISK = 1.3E-06

30-YEAR COMBINED RISK (ADULT + CHILD) = 5.4E-06

CHM 002 2343

TABLE 10

SURFACE SOIL INHALATION PATHWAY
CHEMSOL, INC SITE FUTURE USE SCENARIO
RISKS TO RESIDENTS (INSIDE AND OUTSIDE RESIDENCE) IN LOT 1B

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE - Adults

Chronic Daily Intake= (mg/kg-day) = Soil Concen X Susp Soil Concen X Resp Fraction X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X Conv Factor X 1 / Body Wt X 1 / Avging Time

mg/kg X ######### X (unitless) X 0.83 m3/hr X 24 hrs/day X 350 days/yr X 24 years X 1 kg / 1000000 mg X 1 / 70 kg X 1 / 8760 days

Chemicals	Soil Concen	Susp. Soil Concen.	Resp Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Manganese	#######	1.3E-02	1	0.83	24	350	24	1.0E-06	70	8760	3.7E-06	1.4E-05	2.6E-01
Mercury	#######	1.3E-02	1	0.83	24	350	24	1.0E-06	70	8760	1.3E-08	8.6E-05	1.5E-04

HAZARD INDEX = 2.6E-01

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE - Children (0-6 years)

Chronic Daily Intake= (mg/kg-day) = Soil Concen X Susp Soil Concen X Resp Fraction X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X Conv Factor X 1 / Body Wt X 1 / Avging Time

mg/kg X ######### X (unitless) X 0.83 m3/hr X 24 hrs/day X 350 days/yr X 6 years X 1 kg / 1000000 mg X 1 / 15 kg X 1 / 2190 days

Chemicals	Soil Concen.	Susp. Soil Concen.	Resp Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv. Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Manganese	#######	1.3E-02	0.75	0.83	24	350	6	1.0E-06	15	2190	1.3E-05	1.4E-05	9.1E-01
Mercury	#######	1.3E-02	0.75	0.83	24	350	6	1.0E-06	15	2190	4.5E-08	8.6E-05	5.2E-04

HAZARD INDEX = 9.1E-01

30-YEAR COMBINED HAZARD INDEX (ADULT+ CHILD) = 1.2E+00

CHM 002 2344

TABLE 1

SURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC SITE - FUTURE-USE SCENARIO
RISKS TO SITE WORKERS/EMPLOYEES IN LOT 1A AND LOT 1B (SITE-WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Adults

Chronic Daily Intake = (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/kg X 50 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 250 days/year X 25 years X 1/70 kg X 1/25550 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aldrin	3.80E-01	50	1.0E-06	1	250	25	70	25550	6.6E-08	1.7E+01	1.1E-06
Dieldrin	1.60E-01	50	1.0E-06	1	250	25	70	25550	2.8E-08	1.6E+01	4.5E-07
Aroclor 1248	9.92E+00	50	1.0E-06	1	250	25	70	25550	1.7E-06	7.7E+00	1.3E-05
Aroclor 1254	5.79E+00	50	1.0E-06	1	250	25	70	25550	1.0E-06	7.7E+00	7.8E-06
Aroclor 1260	1.33E+01	50	1.0E-06	1	250	25	70	25550	2.3E-06	7.7E+00	1.8E-05
Arsenic	3.37E+00	50	1.0E-06	1	250	25	70	25550	5.9E-07	1.75E+00	1.0E-06

TOTAL RISK = 4.2E-05

CHM 002 2345

TABLE 11

SURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC SITE - FUTURE USE SCENARIO
RISKS TO SITE WORKERS/EMPLOYEES IN LOT 1A AND LOT 1B (SITE-WIDE)

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Adults

Chronic Daily Intake = (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/kg X 50 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 250 days/year X 25 years X 1/70 kg X 1/9125 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Aldrin	3.80E-01	50	1.0E-06	1	250	25	70	9125	1.9E-07	3.0E-05	6.2E-03
Dieldrin	1.60E-01	50	1.0E-06	1	250	25	70	9125	7.8E-08	5.0E-05	1.6E-03
Antimony	7.52E+00	50	1.0E-06	1	250	25	70	9125	3.7E-06	4.0E-04	9.2E-03
Arsenic	3.37E+00	50	1.0E-06	1	250	25	70	9125	1.6E-06	3.0E-04	5.5E-03
Cadmium	2.32E+00	50	1.0E-06	1	250	25	70	9125	1.1E-06	1.0E-03	1.1E-03
Chromium VI	1.01E+01	50	1.0E-06	1	250	25	70	9125	4.9E-06	5.0E-03	9.9E-04
Manganese	9.97E+02	50	1.0E-06	1	250	25	70	9125	4.9E-04	5.0E-03	9.8E-02
Mercury	1.60E+00	50	1.0E-06	1	250	25	70	9125	7.8E-07	3.0E-04	2.6E-03
Thallium	3.90E-01	50	1.0E-06	1	250	25	70	9125	1.9E-07	8.0E-05	2.4E-03
Vanadium	5.96E+01	50	1.0E-06	1	250	25	70	9125	2.9E-05	7.0E-03	4.2E-03

HAZARD INDEX = 1.3E-01

CHN 002 2346

TABLE 12

SURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC SITE FUTURE USE SCENARIO
RISKS TO SITE WORKERS/EMPLOYEES IN LOT 1A AND LOT 1B (SITE WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day)	Soil Concentration	X	Conversion Factor	X	Skin Surface Area	X	Adherence Factor	X	Absorption Factor	X	Exposure Frequency	X	Exposure Duration	X	1 / Body Weight	X	1 / Averaging Time
	mg/kg	X	1 kg / ##########	X	1930 cm2/day	X	1 mg/cm2	X	(unitless)	X	############	X	25 years	X	1 / 70 kg	X	1 / 25550 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aroclor 1248	9.92E+00	1.0E-06	1930	1	0.06	250	25	70	25550	4.0E-06	7.7E+00	3.1E-05
Aroclor 1254	5.79E+00	1.0E-06	1930	1	0.06	250	25	70	25550	2.3E-06	7.7E+00	1.8E-05
Aroclor 1260	1.33E+01	1.0E-06	1930	1	0.06	250	25	70	25550	5.4E-06	7.7E+00	4.1E-05

TOTAL RISK = 9.0E-05

CHM 002 2347

1/96
SS DC SW XLS

TABLE 12

SURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC SITE FUTURE USE SCENARIO
RISKS TO SITE WORKERS/EMPLOYEES IN LOT 1A AND LOT 1B (SITE WIDE)

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day)	Soil Concentration	X	Conversion Factor	X	Skin Surface Area	X	Adherence Factor	X	Absorption Factor	X	Exposure Frequency	X	Exposure Duration	X	1 / Body Weight	X	1 / Averaging Time
	mg/kg	X	1 kg / #########	X	1940 cm2/day	X	1 mg/cm2	X	(unitless)	X	############	X	25 years	X	1 / 70 kg	X	1 / 9125 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Cadmium	2.32E+00	1.0E-06	1940	1	0.01	250	25	70	9125	4.4E-07	1.0E-03	4.4E-10

HAZARD INDEX = 4.4E-10

CHM 002 2348

TABLE 13

SURFACE SOIL INHALATION PATHWAY
CHEMSOL, INC SITE - FUTURE USE SCENARIO
RISKS TO SITE WORKERS/EMPLOYEES IN LOT 1A AND LOT 1B (SITE WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE: Adults

Chronic Daily Intake = (mg/kg day) Soil Concen X Susp Soil Concen X Resp Fraction X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X Conv Factor X 1 / Body Wt X 1 / Avging Time

mg/kg X ########## X (unitless) X 0.83 m3/hr X 8 hrs/day X 250 days/yr X 25 years X 1 kg / 1000000 mg X 1 / 70 kg X 1 / 25550 days

Chemicals	Soil Concen	Susp Soil Concen	Resp Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv. Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aldrin	3.80E-01	1.3E-02	1	0.83	8	250	25	1.0E-06	70	25550	1.1E-10	1.7E+01	1.9E-09
Dieldrin	1.60E-01	1.3E-02	1	0.83	8	250	25	1.0E-06	70	25550	4.8E-11	1.6E+01	7.7E-10
Arsenic	#######	1.3E-02	1	0.83	8	250	25	1.0E-06	70	25550	1.0E-09	1.5E+01	1.5E-08
Cadmium	#######	1.3E-02	1	0.83	8	250	25	1.0E-06	70	25550	7.0E-10	6.3E+00	4.4E-09
Chromium VI	#######	1.3E-02	1	0.83	8	250	25	1.0E-06	70	25550	3.0E-09	4.2E+01	1.3E-07

TOTAL RISK = 1.5E-07

CHM 002 2349

1/98
SS H-SW.XLS

TABLE 13

SURFACE SOIL INHALATION PATHWAY
CHEMSOL, INC SITE - FUTURE USE SCENARIO
RISKS TO SITE WORKERS/EMPLOYEES IN LOT 1A AND LOT 1B (SITE-WIDE)

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE: Adults

Chronic Daily Intake- (mg/kg-day)	Soil Concen	X	Susp Soil Concen	X	Resp Fraction	X	Inhalation Rate	X	Exposure Time	X	Exposure Frequency	X	Exposure Duration	X	Conv Factor	X	1 / Body Wt	X	1 / Avging Time
	mg/kg	X	#########	X	(unitless)	X	0.83 m3/hr	X	8 hrs/day	X	250 days/yr	X	25 years	X	1 kg / 1000000 mg	X	1 / 70 kg	X	1 / 9125 days

Chemicals	Soil Concen	Susp. Soil Concen	Resp Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv. Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Manganese	#######	1.3E-02	1	0.83	8	250	25	1.0E-06	70	9125	8.4E-07	1.4E-05	6.0E-02
Mercury	#######	1.3E-02	1	0.83	8	250	25	1.0E-06	70	9125	1.4E-09	8.6E-05	1.6E-05

HAZARD INDEX = 6.0E-02

CHM 002 2350

1/10/95
SS IN CW XLS

TABLE 14

SURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC SITE - FUTURE-USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN LOT 1A AND LOT 1B (SITE WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/kg X 480 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 65 days/year X 1 year X 1 / 70 kg X 1 / 25550 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aldrin	3.80E-01	480	1.0E-06	1	65	1	70	25550	6.6E-09	1.7E+01	1.1E-07
Dieldrin	1.60E-01	480	1.0E-06	1	65	1	70	25550	2.8E-09	1.6E+01	4.5E-08
Aroclor 1248	9.92E+00	480	1.0E-06	1	65	1	70	25550	1.7E-07	7.7E+00	1.3E-06
Aroclor 1254	5.79E+00	480	1.0E-06	1	65	1	70	25550	1.0E-07	7.7E+00	7.8E-07
Aroclor 1260	1.33E+01	480	1.0E-06	1	65	1	70	25550	2.3E-07	7.7E+00	1.8E-06
Arsenic	3.37E+00	480	1.0E-06	1	65	1	70	25550	5.9E-08	1.75E+00	1.0E-07

TOTAL RISK = 4.2E-06

CHM 002 2351

TABLE 14

SURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC SITE - FUTURE-USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN LOT 1A AND LOT 1B (SITE-WIDE)

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Adults

Subchronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/kg X 480 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 65 days/year X 1 year X 1/70 kg X 1/365 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Subchronic Daily Intake (SDI)	Reference Dose (RfD)	HQ= SDI/RfD
Aldrin	3.80E-01	480	1.0E-06	1	65	1	70	365	4.6E-07	3.0E-05	1.5E-02
Dieldrin	1.60E-01	480	1.0E-06	1	65	1	70	365	2.0E-07	5.0E-05	3.9E-03
Antimony	7.52E+00	480	1.0E-06	1	65	1	70	365	9.2E-06	4.0E-04	2.3E-02
Arsenic	3.37E+00	480	1.0E-06	1	65	1	70	365	4.1E-06	3.0E-04	1.4E-02
Chromium VI	1.01E+01	480	1.0E-06	1	65	1	70	365	1.2E-05	2.0E-02	6.2E-04
Manganese	9.97E+02	480	1.0E-06	1	65	1	70	365	1.2E-03	5.0E-03	2.4E-01
Mercury	1.60E+00	480	1.0E-06	1	65	1	70	365	2.0E-06	3.0E-04	6.5E-03
Thallium	3.90E-01	480	1.0E-06	1	65	1	70	365	4.8E-07	8.0E-04	6.0E-04
Vanadium	5.96E+01	480	1.0E-06	1	65	1	70	365	7.3E-05	7.0E-03	1.0E-02

HAZARD INDEX = 3.2E-01

CHM 002 2352

1/1086
SS-DC-CW.XLS

TABLE 15

SURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC SITE FUTURE USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN LOT 1A AND LOT 1B (SITE WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Conversion Factor X Skin Surface Area X Adherence Factor X Absorption Factor X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/kg X 1 kg / 1000000000 X 1930 cm2/day X 1 mg/cm2 X (unitless) X 65 events/yr X 1 year X 1 / 70 kg X 1 / 25550 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aroclor 1248	9.92E+00	1.0E-06	1930	1	0.06	65	1	70	25550	4.2E-08	7.7E+00	3.2E-07
Aroclor 1254	5.79E+00	1.0E-06	1930	1	0.06	65	1	70	25550	2.4E-08	7.7E+00	1.9E-07
Aroclor 1260	1.33E+01	1.0E-06	1930	1	0.06	65	1	70	25550	5.6E-08	7.7E+00	4.3E-07

TOTAL RISK = 9.4E-07

CHM 002 2353

TABLE 15

SURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC SITE FUTURE USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN LOT 1A AND LOT 1B (SITE WIDE)

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Adults

Subchronic Daily Intake- (mg/kg-day)	Soil Concentration	X	Conversion Factor	X	Skin Surface Area	X	Adherence Factor	X	Absorption Factor	X	Exposure Frequency	X	Exposure Duration	X	1 Body Weight	X	1 Averaging Time
	mg/kg	X	1 kg ##########	X	1930 cm2/day	X	1 mg/cm2	X	(unitless)	X	65 events/yr	X	1 year	X	1 70 kg	X	1 365 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Subchronic Daily Intake (SDI)	Reference Dose (RfD)	HQ= SDI/RfD

Neither PCBs nor cadmium currently have established subchronic toxicity values. No other selected chemicals of potential concern have established dermal absorption factors.

CHM 002 2354

V1096
SS IH-CW XLS

TABLE 16

SURFACE SOIL INHALATION PATHWAY
CHEMSOL, INC SITE - FUTURE USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN LOT 1A AND LOT 1B (SITE-WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE: Adults

Chronic Daily Intake = (mg/kg-day) = Soil Concen X Susp Soil Concen X Resp Fraction X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X Conv Factor X 1 / Body Wt X 1 / Avging Time

mg/kg X 0.026 mg/m3 X (unitless) X 0.83 m3/hr X 8 hrs/day X 65 days/yr X 1 year X 1 kg / 1000000 mg X 1 / 70 kg X 1 / 25550 days

Chemicals	Soil Concen	Susp Soil Concen	Resp Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aldrin	3.80E-01	2.6E-02	1	0.83	8	65	1	1.0E-06	70	25550	2.4E-12	1.7E+01	4.1E-11
Dieldrin	1.60E-01	2.6E-02	1	0.83	8	65	1	1.0E-06	70	25550	1.0E-12	1.6E+01	1.6E-11
Arsenic	#######	2.6E-02	1	0.83	8	65	1	1.0E-06	70	25550	2.1E-11	1.5E+01	3.2E-10
Cadmium	#######	2.6E-02	1	0.83	8	65	1	1.0E-06	70	25550	1.5E-11	6.3E+00	9.2E-11
Chromium VI	#######	2.6E-02	1	0.83	8	65	1	1.0E-06	70	25550	6.3E-11	4.2E+01	2.7E-09

TOTAL RISK 3.1E-09

CHM 002 2355

V1066
SS 1+CW 10.S

TABLE 18

SURFACE SOIL INHALATION PATHWAY
CHEMSOL, INC SITE FUTURE USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN LOT 1A AND LOT 1I (SITE WIDE)

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE: Adults

Subchronic Daily Intake= (mg/kg day)	Soil Concen	X	Susp Soil Concen	X	Resp Fraction	X	Inhalation Rate	X	Exposure Time	X	Exposure Frequency	X	Exposure Duration	X	Conv Factor	X	1 / Body Wt	X	1 / Avging Time
	mg/kg	X	0.026 mg/m3	X	(unitless)	X	0.83 m3/hr	X	8 hrs/day	X	65 days/yr	X	1 year	X	1 kg / 1000000 mg	X	1 / 70 kg	X	1 / 365 days

Chemicals	Soil Concen	Susp Soil Concen	Resp Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv Factor	Body Weight	Averaging Time	Subchronic Daily Intake (SDI)	Reference Dose (RfD)	HQ= SDI/RfD
Chromium VI	#######	2.6E-02	1	0.83	8	65	1	1.0E-06	70	365	4.4E-09	1.1E-06	4.0E-03
Mercury	#######	2.6E-02	1	0.83	8	65	1	1.0E-06	70	365	7.0E-10	8.6E-05	8.2E-06

HAZARD INDEX 4.0E-03

CHM 002 2356

TABLE 17

SUBSURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC SITE - FUTURE-USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN LOT 1A AND LOT 1B (SITE-WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE SUBSURFACE SOIL INGESTION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/kg X 480 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 65 days/year X 1 year X 1 / 70 kg X 1 / 25550 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
1,1,2,2-Tetrachloroethane	3.00E-02	480	1.0E-06	1	65	1	70	25550	5.2E-10	2.0E-01	1.0E-10
Aldrin	3.00E-03	480	1.0E-06	1	65	1	70	25550	5.2E-11	1.7E+01	8.9E-10
Dieldrin	6.00E-03	480	1.0E-06	1	65	1	70	25550	1.0E-10	1.6E+01	1.7E-09
Toxaphene	2.30E-01	480	1.0E-06	1	65	1	70	25550	4.0E-09	1.1E+00	4.4E-09
Aroclor 1248	1.40E-01	480	1.0E-06	1	65	1	70	25550	2.4E-09	7.7E+00	1.9E-08
Aroclor 1254	1.20E-01	480	1.0E-06	1	65	1	70	25550	2.1E-09	7.7E+00	1.6E-08
Aroclor 1260	8.00E-02	480	1.0E-06	1	65	1	70	25550	1.4E-09	7.7E+00	1.1E-08
Arsenic	1.39E+00	480	1.0E-06	1	65	1	70	25550	2.4E-08	1.75E+00	4.2E-08
Beryllium	1.45E+00	480	1.0E-06	1	65	1	70	25550	2.5E-08	4.3E+00	1.1E-07

TOTAL RISK = 2.0E-07

CHM 002 2367

SUBSURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC SITE - FUTURE-USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN LOT 1A AND LOT 1B (SITE-WIDE)

NONCARCINOGENS - REASONABLE MAXIMUM CASE SUBSURFACE SOIL INGESTION EXPOSURE: Adults

Subchronic Daily Intake= (mg/kg-day)

Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/kg X 480 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 65 days/year X 1 year X 1 / 70 kg X 1 / 365 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Subchronic Daily Intake (SDI)	Reference Dose (RfD)	HQ= SDI/RfD
Aldrin	3.00E-03	480	1.0E-06	1	65	1	70	365	3.7E-09	3.0E-05	1.2E-04
Dieldrin	6.00E-03	480	1.0E-06	1	65	1	70	365	7.3E-09	5.0E-05	1.6E-04
Antimony	3.90E+00	480	1.0E-06	1	65	1	70	365	4.8E-06	4.0E-04	1.2E-02
Arsenic	1.39E+00	480	1.0E-06	1	65	1	70	365	1.7E-06	3.0E-04	5.7E-03
Barium	1.77E+02	480	1.0E-06	1	65	1	70	365	2.2E-04	7.0E-02	3.1E-03
Beryllium	1.45E+00	480	1.0E-06	1	65	1	70	365	1.8E-06	5.0E-03	3.6E-04
Chromium VI	5.51E+00	480	1.0E-06	1	65	1	70	365	6.7E-06	2.0E-02	3.4E-04
Manganese	8.62E+02	480	1.0E-06	1	65	1	70	365	1.1E-03	5.0E-03	2.1E-01
Mercury	4.10E-01	480	1.0E-06	1	65	1	70	365	5.0E-07	3.0E-04	1.7E-03
Thallium	2.20E-01	480	1.0E-06	1	65	1	70	365	2.7E-07	8.0E-04	3.4E-04
Vanadium	3.21E+01	480	1.0E-06	1	65	1	70	365	3.9E-05	7.0E-03	5.6E-03

HAZARD INDEX = 2.4E-01

CHM 002 2358

TABLE 18

SUBSURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC SITE FUTURE USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN LOT 1A AND LOT 1B SITE WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE SUBSURFACE SOIL DERMAL CONTACT EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Conversion Factor X Skin Surface Area X Adherence Factor X Absorption Factor X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/kg X 1 kg / ########## X 1930 cm2/day X 1 mg/cm2 X (unitless) X 65 events/yr X 1 year X 1 / 70 kg X 1 / 25550 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aroclor 1248	1.40E 01	1.0E-06	1930	1	0.06	65	1	70	25550	5.9E-10	7.7E+00	4.5E 09
Aroclor 1254	1.20E 01	1.0E-06	1930	1	0.06	65	1	70	25550	5.1E-10	7.7E+00	3.9E-09
Aroclor 1260	8.00E 02	1.0E-06	1930	1	0.06	65	1	70	25550	3.4E-10	7.7E+00	2.6E-09

TOTAL RISK = 1.1E-08

CHM 002 2359

TABLE 18

SUBSURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC SITE - FUTURE USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN LOT 1A AND LOT 1B SITE WIDE)

NONCARCINOGENS - REASONABLE MAXIMUM CASE SUBSURFACE SOIL DERMAL CONTACT EXPOSURE: Adults

Subchronic Daily Intake= (mg/kg-day)	Soil Concentration	X Conversion Factor	X Skin Surface Area	X Adherence Factor	X Absorption Factor	X Exposure Frequency	X Exposure Duration	X 1 / Body Weight	X 1 / Averaging Time
	mg/kg	X 1 kg / 999999999	X 1930 cm2/day	X 1 mg/cm2	X (unitless)	X 65 events/yr	X 1 year	X 1 / 70 kg	X 1 / 365 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Subchronic Daily Intake (SDI)	Reference Dose (RfD)	HQ= SDI/RfD

PCBs do not currently have established noncarcinogenic toxicity values No other selected chemicals of potential concern have established dermal absorption factors.

CHM 002 2360

TABLE ..

SUBSURFACE SOIL INHALATION PATHWAY
CHEMSOL, INC SITE - FUTURE USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN LOT 1A AND LOT 1B (SITE WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE SUBSURFACE SOIL INHALATION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day)	Soil Concen	X	Susp Soil Concen	X	Resp Fraction	X	Inhalation Rate	X	Exposure Time	X	Exposure Frequency	X	Exposure Duration	X	Conv Factor	X	1 / Body Wt	X	1 / Avging Time
	mg/kg	X	##########	X	(unitless)	X	0.83 m3/hr	X	8 hrs/day	X	65 days/yr	X	1 year	X	1 kg / 1000000 mg	X	1 / 70 kg	X	1 / 25550 days

Chemicals	Soil Concen	Susp Soil Concen	Resp Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aldrin	3.00E-03	2.6E-02	1	0.83	8	65	1	1.0E-06	70	25550	1.9E-14	1.7E+01	3.2E-13
Dieldrin	8.00E-03	2.6E-02	1	0.83	8	65	1	1.0E-06	70	25550	3.8E-14	1.6E+01	6.0E-13
Toxaphene	2.30E-01	2.6E-02	1	0.83	8	65	1	1.0E-06	70	25550	1.4E-12	1.1E+00	1.6E-12
Arsenic	1.39E+00	2.6E-02	1	0.83	8	65	1	1.0E-06	70	25550	8.7E-12	1.5E+01	1.3E-10
Beryllium	1.45E+00	2.6E-02	1	0.83	8	65	1	1.0E-06	70	25550	9.1E-12	8.4E+00	7.6E-11
Chromium VI	5.51E+00	2.6E-02	1	0.83	8	65	1	1.0E-06	70	25550	3.5E-11	4.2E+01	1.5E-09

TOTAL RISK = 1.7E-09

DHM 002 2341

TABLE 19

SUBSURFACE SOIL INHALATION PATHWAY
CHEMSOL, INC SITE - FUTURE USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN LOT 1A AND LOT 1B (SITE WIDE)

NONCARCINOGENS - REASONABLE MAXIMUM CASE SUBSURFACE SOIL INHALATION EXPOSURE: Adults

Subchronic Daily Intake= (mg/kg-day) = Soil Concen X Susp Soil Concen X Resp Fraction X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X Conv Factor X 1 / Body Wt X 1 / Avging Time

mg/kg X ######### X (unitless) X 0.83 m3/hr X 8 hrs/day X 65 days/yr X 1 year X 1 kg / 1000000 mg X 1 / 70 kg X 1 / 365 days

Chemicals	Soil Concen.	Susp. Soil Concen.	Resp Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv. Factor	Body Weight	Averaging Time	Subchronic Daily Intake (SDI)	Reference Dose (RfD)	HQ= SDI/RfD
Barium	1.77E+02	2.6E-02	1	0.83	8	65	1	1.0E-06	70	365	7.8E-08	1.4E-03	5.6E-05
Chromium VI	5.51E+00	2.6E-02	1	0.83	8	65	1	1.0E-06	70	365	2.4E-09	1.1E-06	2.2E-03
Mercury	4.10E-01	2.6E-02	1	0.83	8	65	1	1.0E-06	70	365	1.8E-10	8.6E-05	2.1E-06

HAZARD INDEX = 2.3E-03

CHH 002 2362

TABLE 20

SUBSURFACE SOIL INHALATION OF VOCS PATHWAY
CHEMSOL, INC SITE - FUTURE-USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN LOT 1A AND LOT 1B (SITE-WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE SUBSURFACE SOIL INHALATION OF VOCS EXPOSURE: Adults

Chronic Daily Intake = (mg/kg-day) = Soil Concen. X Soil-to-Air Volatilization Factor X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X 1/Body Wt X 1/Avging Time

mg/kg X 1/2454 kg X 0.83 m3/hr X 8 hrs/day X 65 days/yr X 1 year X 1/70 kg X 1/25550 days

Chemicals	Soil Concen	Volatilization Factor	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
1,1,2,2-Tetrachloroethane	3.00E-02	4.1E-04	0.83	8	65	1	70	25550	3.0E-09	2.0E-01	5.9E-10

TOTAL RISK = 5.9E-10

CHM 002 2363

TABLE 20

SUBSURFACE SOIL INHALATION OF VOCS PATHWAY
CHEMSOL, INC SITE - FUTURE-USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN LOT 1A AND LOT 1B (SITE-WIDE)

NONCARCINOGENS - REASONABLE MAXIMUM CASE SUBSURFACE SOIL INHALATION OF VOCS EXPOSURE: Adults

Subchronic Daily Intake= (mg/kg-day)	Soil Concen.	X	Soil-to-Air Volatilization Factor	X	Inhalation Rate	X	Exposure Time	X	Exposure Frequency	X	Exposure Duration	X	1 / Body Wt	X	1 / Averging Time
	mg/kg	X	1 / 2454 kg	X	0.83 m3/hr	X	8 hrs/day	X	65 days/yr	X	1 year	X	1 / 70 kg	X	1 / 365 days

Chemicals	Soil Concen	Volatilization Factor	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Subchronic Daily Intake (SDI)	Reference Dose (RfD)	HQ= SDI/RfD

1,1,2,2-Tetrachloroethane does not currently have an established subchronic inhalation reference dose.

CHM 002 2364

TABLE

SURFACE/SUBSURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC SITE - PRESENT-USE SCENARIO
RISKS TO AREA RESIDENTS/TRESPASSERS - EFFLUENT DISCHARGE LINE

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Children (12-17 years)

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/kg X 100 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 18 days/year X 6 years X 1/55 kg X 1/25550 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Benzo(a)pyrene	2.50E-01	100	1.0E-06	1	18	6	55	25550	1.9E-09	7.3E+00	1.4E-08
Aroclor 1248	8.00E-02	100	1.0E-06	1	18	6	55	25550	4.6E-10	7.7E+00	3.6E-09
Aroclor 1254	1.50E-01	100	1.0E-06	1	18	6	55	25550	1.2E-09	7.7E+00	8.9E-09
Aroclor 1260	1.10E-01	100	1.0E-06	1	18	6	55	25550	8.5E-10	7.7E+00	6.5E-09
Arsenic	3.10E+00	100	1.0E-06	1	18	6	55	25550	2.4E-08	1.75E+00	4.2E-08
Beryllium	1.83E+00	100	1.0E-06	1	18	6	55	25550	1.4E-08	4.3E+00	6.0E-08

TOTAL RISK = 1.4E-07

CHM 002 2365

TABLE 4.

SURFACE/SUBSURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC SITE - PRESENT-USE SCENARIO
RISKS TO AREA RESIDENTS/TRESPASSERS - EFFLUENT DISCHARGE LINE

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Children (12-17 years)

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/kg X 100 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 18 days/year X 6 years X 1 / 55 kg X 1 / 2190 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Arsenic	3.10E+00	100	1.0E-06	1	18	6	55	2190	2.8E-07	3.0E-04	9.3E-04
Barium	2.14E+02	100	1.0E-06	1	18	6	55	2190	1.9E-05	7.0E-02	2.7E-04
Beryllium	1.83E+00	100	1.0E-06	1	18	6	55	2190	1.6E-07	5.0E-03	3.3E-05
Manganese	1.23E+03	100	1.0E-06	1	18	6	55	2190	1.1E-04	5.0E-03	2.2E-02
Mercury	1.59E+00	100	1.0E-06	1	18	6	55	2190	1.4E-07	3.0E-04	4.8E-04
Thallium	1.86E+00	100	1.0E-06	1	18	6	55	2190	1.5E-07	8.0E-05	1.9E-03
Vanadium	4.11E+01	100	1.0E-06	1	18	6	55	2190	3.7E-06	7.0E-03	5.3E-04
Zinc	4.10E+02	100	1.0E-06	1	18	6	55	2190	3.7E-05	3.0E-01	1.2E-04

HAZARD INDEX = 2.6E-02

CHM 002 2366

TABLE 2a

SURFACE/SUBSURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC SITE - PRESENT USE SCENARIO
RISKS TO AREA RESIDENTS/TRESPASSERS - EFFLUENT DISCHARGE LINE

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Children (12-17 years)

Chronic Daily Intake= (mg/kg day)	Soil Concentration	X Conversion Factor	X Skin Surface Area	X Adherence Factor	X Absorption Factor	X Exposure Frequency	X Exposure Duration	X 1 / Body Weight	X 1 / Averaging Time
	mg/kg	X 1 kg ##########	X 1945 cm2/day	X 1 mg/cm2	X (unitless)	X 18 events/year	X 6 years	X 1 / 55 kg	X 1 / 25550 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aroclor 1248	6 00E-02	1 0E-06	1945	1	0 06	18	6	55	25550	5 4E-10	7 7E+00	4 1E-09
Aroclor 1254	1 50E-01	1 0E-06	1945	1	0 06	18	6	55	25550	1 3E-09	7 7E+00	1 0E-08
Aroclor 1260	1 10E-01	1 0E-06	1945	1	0 06	18	6	55	25550	9.9E-10	7 7E+00	7 6E-09

TOTAL RISK= 2 2E-08

CHM 002 2367

TABLE 2c

SURFACE/SUBSURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC SITE PRESENT USE SCENARIO
RISKS TO AREA RESIDENTS/TRESPASSERS EFFLUENT DISCHARGE LINE

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: (Children 12-17 years)

Chronic Daily Intake= (mg/kg day)	Soil Concentration	X Conversion Factor	X Skin Surface Area	X Adherence Factor	X Absorption Factor	X Exposure Frequency	X Exposure Duration	X 1 / Body Weight	X 1 / Averaging Time
	mg/kg	X 1 kg / 1000000	X 1945 cm2/day	X 1 mg/cm2	X (unitless)	X 18 events/year	X 6 years	X 1 / 55 kg	X 1 / 2190 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD

PCBs do not currently have established noncarcinogenic toxicity values No other selected chemicals of potential concern have established dermal absorption factors.

CHM 002 2368

TABLE 23

SURFACE/SUBSURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC SITE - FUTURE-USE SCENARIO
RISKS TO RESIDENTS - EFFLUENT DISCHARGE LINE

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/kg X 100 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 350 days/year X 24 years X 1/70 kg X 1/25550 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Benzo(a)pyrene	2.50E-01	100	1.0E-06	1	350	24	70	25550	1.2E-07	7.3E+00	8.6E-07
Aroclor 1248	6.00E-02	100	1.0E-06	1	350	24	70	25550	2.8E-08	7.7E+00	2.2E-07
Aroclor 1254	1.50E-01	100	1.0E-06	1	350	24	70	25550	7.0E-08	7.7E+00	5.4E-07
Aroclor 1260	1.10E-01	100	1.0E-06	1	350	24	70	25550	5.2E-08	7.7E+00	4.0E-07
Arsenic	3.10E+00	100	1.0E-06	1	350	24	70	25550	1.5E-06	1.75E+00	2.5E-06
Beryllium	1.83E+00	100	1.0E-06	1	350	24	70	25550	8.6E-07	4.3E+00	3.7E-06

TOTAL RISK = 8.3E-06

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Children (0-6 years)

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/kg X 200 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 350 days/year X 6 years X 1/15 kg X 1/25550 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Benzo(a)pyrene	2.50E-01	200	1.0E-06	1	350	6	15	25550	2.7E-07	7.3E+00	2.0E-06
Aroclor 1248	6.00E-02	200	1.0E-06	1	350	6	15	25550	6.6E-08	7.7E+00	5.1E-07
Aroclor 1254	1.50E-01	200	1.0E-06	1	350	6	15	25550	1.6E-07	7.7E+00	1.3E-06
Aroclor 1260	1.10E-01	200	1.0E-06	1	350	6	15	25550	1.2E-07	7.7E+00	9.3E-07
Arsenic	3.10E+00	200	1.0E-06	1	350	6	15	25550	3.4E-06	1.75E+00	5.9E-06
Beryllium	1.83E+00	200	1.0E-06	1	350	6	15	25550	2.0E-06	4.3E+00	8.6E-06

TOTAL RISK = 1.9E-05

30-YEAR COMBINED RISK (ADULT + CHILD) = 2.8E-05

CHH 002 2269

TABLE 23

SURFACE/SUBSURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO RESIDENTS - EFFLUENT DISCHARGE LINE

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/kg X 100 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 350 days/year X 24 years X 1 / 70 kg X 1 / 8760 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Arsenic	3.10E+00	100	1.0E-06	1	350	24	70	8760	4.2E-06	3.0E-04	1.4E-02
Barium	2.14E+02	100	1.0E-06	1	350	24	70	8760	2.9E-04	7.0E-02	4.2E-03
Beryllium	1.83E+00	100	1.0E-06	1	350	24	70	8760	2.5E-06	5.0E-03	5.0E-04
Manganese	1.23E+03	100	1.0E-06	1	350	24	70	8760	1.7E-03	5.0E-03	3.4E-01
Mercury	1.59E+00	100	1.0E-06	1	350	24	70	8760	2.2E-06	3.0E-04	7.3E-03
Thallium	1.66E+00	100	1.0E-06	1	350	24	70	8760	2.3E-06	8.0E-05	2.8E-02
Vanadium	4.11E+01	100	1.0E-06	1	350	24	70	8760	5.6E-05	7.0E-03	8.0E-03
Zinc	4.10E+02	100	1.0E-06	1	350	24	70	8760	5.6E-04	3.0E-01	1.9E-03

HAZARD INDEX = 4.0E-01

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Children (0-6 years)

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/kg X 200 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 350 days/year X 6 years X 1 / 15 kg X 1 / 2190 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Arsenic	3.10E+00	200	1.0E-06	1	350	6	15	2190	4.0E-05	3.0E-04	1.3E-01
Barium	2.14E+02	200	1.0E-06	1	350	6	15	2190	2.7E-03	7.0E-02	3.9E-02
Beryllium	1.83E+00	200	1.0E-06	1	350	6	15	2190	2.3E-05	5.0E-03	4.7E-03
Manganese	1.23E+03	200	1.0E-06	1	350	6	15	2190	1.6E-02	5.0E-03	3.1E+00
Mercury	1.59E+00	200	1.0E-06	1	350	6	15	2190	2.0E-05	3.0E-04	6.8E-02
Thallium	1.66E+00	200	1.0E-06	1	350	6	15	2190	2.1E-05	8.0E-05	2.7E-01
Vanadium	4.11E+01	200	1.0E-06	1	350	6	15	2190	5.3E-04	7.0E-03	7.5E-02
Zinc	4.10E+02	200	1.0E-06	1	350	6	15	2190	5.2E-03	3.0E-01	1.7E-02

HAZARD INDEX = 3.7E+00

30-YEAR COMBINED HAZARD INDEX (ADULT + CHILD) = 4.1E+00

CHM 002 2370

TABLE 24

SURFACE/SUBSURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC. SITE - FUTURE -USE SCENARIO
RISKS TO RESIDENTS - EFFLUENT DISCHARGE LINE

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Adults

Chronic Daily Intake- (mg/kg-day)	Soil Concentration	X Conversion Factor	X Skin Surface Area	X Adherence Factor	X Absorption Factor	X Exposure Frequency	X Exposure Duration	X 1 / Body Weight	X 1 / Averaging Time
	mg/kg	X 1 kg / #########	X 793 cm2/day	X 1 mg/cm2	X (unitless)	X ############	X 24 years	X 1 / 70 kg	X 1 / 25550 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aroclor 1248	6.00E-02	1.0E-06	793	1	0.06	350	24	70	25550	1.3E-08	7.7E+00	1.0E-07
Aroclor 1254	1.50E-01	1.0E-06	793	1	0.06	350	24	70	25550	3.4E-08	7.7E+00	2.6E-07
Aroclor 1260	1.10E-01	1.0E-06	793	1	0.06	350	24	70	25550	2.5E-08	7.7E+00	1.9E-07

TOTAL RISK = 5.5E-07

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Children (0-6 years)

Chronic Daily Intake- (mg/kg-day)	Soil Concentration	X Conversion Factor	X Skin Surface Area	X Adherence Factor	X Absorption Factor	X Exposure Frequency	X Exposure Duration	X 1 / Body Weight	X 1 / Averaging Time
	mg/kg	X 1 kg / #########	X 1750 cm2/day	X 1 mg/cm2	X (unitless)	X ############	X 6 years	X 1 / 15 kg	X 1 / 25550 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aroclor 1248	6.00E-02	1.0E-06	1750	1	0.06	350	6	15	25550	3.5E-08	7.7E+00	2.7E-07
Aroclor 1254	1.50E-01	1.0E-06	1750	1	0.06	350	6	15	25550	8.6E-08	7.7E+00	6.6E-07
Aroclor 1260	1.10E-01	1.0E-06	1750	1	0.06	350	6	15	25550	6.3E-08	7.7E+00	4.9E-07

TOTAL RISK = 1.4E-06

30 YEAR COMBINED RISK (ADULT + CHILD) = 2.0E-06

1232 200 MHD

TABLE 24

SURFACE/SUBSURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC. SITE - FUTURE -USE SCENARIO
RISKS TO RESIDENTS - EFFLUENT DISCHARGE LINE

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day)	Soil Concentration	X Conversion Factor	X Skin Surface Area	X Adherence Factor	X Absorption Factor	X Exposure Frequency	X Exposure Duration	X 1 / Body Weight	X 1 / Averaging Time
	mg/kg	X 1 kg / ##########	X 5065 cm2/day	X 1 mg/cm2	X (unitless)	X ############	X 24 years	X 1 / 70 kg	X 1 / 8760 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD

PCBs do not currently have established noncarcinogenic toxicity values. No other selected chemicals of potential concern have established dermal absorption factors.

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Children (0-6 years)

Chronic Daily Intake= (mg/kg-day)	Soil Concentration	X Conversion Factor	X Skin Surface Area	X Adherence Factor	X Absorption Factor	X Exposure Frequency	X Exposure Duration	X 1 / Body Weight	X 1 / Averaging Time
	mg/kg	X 1 kg / ##########	X 1270 cm2/day	X 1 mg/cm2	X (unitless)	X ############	X 6 years	X 1 / 15 kg	X 1 / 2190 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD

PCBs do not currently have established noncarcinogenic toxicity values. No other selected chemicals of potential concern have established dermal absorption factors.

27272 200 MHD

TABLE 25

SURFACE/SUBSURFACE SOIL INHALATION PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO RESIDENTS (INSIDE AND OUTSIDE RESIDENCE) - EFFLUENT DISCHARGE LINE

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE: Adults

Chronic Daily Intake = (mg/kg-day) = Soil Concen. X Susp. Soil Concen. X Resp. Fraction X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X Conv Factor X 1 / Body Wt X 1 / Avging Time

mg/kg X ######### X (unitless) X 0.83 m3/hr X 24 hrs/day X 350 days/yr X 24 years X 1 kg / 1000000 mg X 1 / 70 kg X 1 / ########

Chemicals	Soil Concen.	Susp. Soil Concen.	Resp. Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Arsenic	#######	1.3E-02	1	0.83	24	350	24	1.0E-06	70	25550	3.8E-09	1.5E+01	5.7E-08
Beryllium	#######	1.3E-02	1	0.83	24	350	24	1.0E-06	70	25550	2.2E-09	8.4E+00	1.9E-08

TOTAL RISK = 7.5E-08

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE: Children (0-6 years)

Chronic Daily Intake = (mg/kg-day) = Soil Concen. X Susp. Soil Concen. X Resp. Fraction X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X Conv Factor X 1 / Body Wt X 1 / Avging Time

mg/kg X ######### X (unitless) X 0.83 m3/hr X 24 hrs/day X 350 days/yr X 6 years X 1 kg / 1000000 mg X 1 / 15 kg X 1 / ########

Chemicals	Soil Concen.	Susp. Soil Concen.	Resp. Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Arsenic	#######	1.3E-02	1	0.83	24	350	6	1.0E-06	15	25550	4.4E-09	1.5E+01	6.6E-08
Beryllium	#######	1.3E-02	1	0.83	24	350	6	1.0E-06	15	25550	2.6E-09	8.4E+00	2.2E-08

TOTAL RISK = 8.8E-08

30-YEAR COMBINED RISK (ADULT + CHILD) = 1.6E-07

CHM 002 2373

TABLE 25

SURFACE/SUBSURFACE SOIL INHALATION PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO RESIDENTS (INSIDE AND OUTSIDE RESIDENCE) - EFFLUENT DISCHARGE LINE

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE - Adults

Chronic Daily Intake= (mg/kg-day) = Soil Concen. X Soil Concen. X Resp. Fraction X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X Conv. Factor X 1 / Body Wt X 1 / Avging Time

mg/kg X ######### X (unitless) X 0.83 m3/hr X 24 hrs/day X 350 days/yr X 24 years X 1 kg / 1000000 mg X 1 / 70 kg X 1 / 8760 days

Chemicals	Soil Concen.	Susp. Soil Concen.	Resp. Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv. Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Manganese	#######	1.3E-02	1	0.83	24	350	24	1.0E-06	70	8760	4.4E-06	1.4E-05	3.1E-01
Mercury	#######	1.3E-02	1	0.83	24	350	24	1.0E-06	70	8760	6.0E-09	8.6E-05	6.9E-05

HAZARD INDEX = 3.1E-01

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE - Children (0-6 years)

Chronic Daily Intake= (mg/kg-day) = Soil Concen. X Soil Concen. X Resp. Fraction X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X Conv. Factor X 1 / Body Wt X 1 / Avging Time

mg/kg X ######### X (unitless) X 0.83 m3/hr X 24 hrs/day X 350 days/yr X 6 years X 1 kg / 1000000 mg X 1 / 15 kg X 1 / 2190 days

Chemicals	Soil Concen.	Susp. Soil Concen.	Resp Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Manganese	#######	1.3E-02	1	0.83	24	350	6	1.0E-06	15	2190	2.0E-05	1.4E-05	1.5E+00
Mercury	#######	1.3E-02	1	0.83	24	350	6	1.0E-06	15	2190	2.8E-08	8.6E-05	3.2E-04

HAZARD INDEX = 1.5E+00

30-YEAR COMBINED HAZARD INDEX (ADULT + CHILD) = 1.8E+00

CHMD 002 23274

TABLE 26

SURFACE/SUBSURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO SITE WORKERS/EMPLOYEES - EFFLUENT DISCHARGE LINE

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/kg X 50 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 250 days/year X 25 years X 1/70 kg X 1/25550 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Benzo(a)pyrene	2.50E-01	50	1.0E-06	1	250	25	70	25550	4.4E-08	7.3E+00	3.2E-07
Aroclor 1248	6.00E-02	50	1.0E-06	1	250	25	70	25550	1.0E-08	7.7E+00	8.1E-08
Aroclor 1254	1.50E-01	50	1.0E-06	1	250	25	70	25550	2.6E-08	7.7E+00	2.0E-07
Aroclor 1260	1.10E-01	50	1.0E-06	1	250	25	70	25550	1.9E-08	7.7E+00	1.5E-07
Arsenic	3.10E+00	50	1.0E-06	1	250	25	70	25550	5.4E-07	1.75E+00	9.5E-07
Beryllium	1.83E+00	50	1.0E-06	1	250	25	70	25550	3.2E-07	4.3E+00	1.4E-06

TOTAL RISK = 3.1E-06

CHM 002 2375

TABLE 26

SURFACE/SUBSURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO SITE WORKERS/EMPLOYEES - EFFLUENT DISCHARGE LINE

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/kg X 50 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 250 days/year X 25 years X 1 / 70 kg X 1 / 9125 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Arsenic	3.10E+00	50	1.0E-06	1	250	25	70	9125	1.5E-06	3.0E-04	5.1E-03
Barium	2.14E+02	50	1.0E-06	1	250	25	70	9125	1.0E-04	7.0E-02	1.5E-03
Beryllium	1.83E+00	50	1.0E-06	1	250	25	70	9125	9.0E-07	5.0E-03	1.8E-04
Manganese	1.23E+03	50	1.0E-06	1	250	25	70	9125	6.0E-04	5.0E-03	1.2E-01
Mercury	1.59E+00	50	1.0E-06	1	250	25	70	9125	7.8E-07	3.0E-04	2.6E-03
Thallium	1.66E+00	50	1.0E-06	1	250	25	70	9125	8.1E-07	8.0E-05	1.0E-02
Vanadium	4.11E+01	50	1.0E-06	1	250	25	70	9125	2.0E-05	7.0E-03	2.9E-03
Zinc	4.10E+02	50	1.0E-06	1	250	25	70	9125	2.0E-04	3.0E-01	6.7E-04

HAZARD INDEX = 1.4E-01

CHM 002 2376

TABLE 27

SURFACE/SUBSURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO SITE WORKERS/EMPLOYEES - EFFLUENT DISCHARGE LINE

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Adults

Chronic Daily Intake = (mg/kg-day)	Soil Concentration	X Conversion Factor	X Skin Surface Area	X Adherence Factor	X Absorption Factor	X Exposure Frequency	X Exposure Duration	X 1 / Body Weight	X 1 / Averaging Time
	mg/kg	X 1 kg / #########	X 1930 cm2/day	X 1 mg/cm2	X (unitless)	X ############	X 25 years	X 1 / 70 kg	X 1 / 25550 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aroclor 1248	6.00E-02	1.0E-06	1930 cm2/day	1	0.06	250	25	70	25550	2.4E-08	7.7E+00	1.9E-07
Aroclor 1254	1.50E-01	1.0E-06	1930 cm2/day	1	0.06	250	25	70	25550	6.1E-08	7.7E+00	4.7E-07
Aroclor 1260	1.10E-01	1.0E-06	1930 cm2/day	1	0.06	250	25	70	25550	4.5E-08	7.7E+00	3.4E-07

TOTAL RISK = 1.0E-06

CHM 002 2377

TABLE 27

SURFACE/SUBSURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO SITE WORKERS/EMPLOYEES - EFFLUENT DISCHARGE LINE

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL DERMAL CONTACT EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day)	Soil Concentration	X Conversion Factor	X Skin Surface Area	X Adherence Factor	X Absorption Factor	X Exposure Frequency	X Exposure Duration	X 1 / Body Weight	X 1 / Averaging Time
	mg/kg	X 1 kg / #########	X 1930 cm2/day	X 1 mg/cm2	X (unitless)	X ############	X 25 years	X 1 / 70 kg	X 1 / 9125 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD

PCBs do not currently have established noncarcinogenic toxicity values. No other selected chemicals of potential concern have established dermal absorption factors.

CHM 002 2378

TABLE 28

SURFACE/SUBSURFACE SOIL INHALATION PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO SITE WORKERS/EMPLOYEES - EFFLUENT DISCHARGE LINE

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day)	Soil Concen.	X	Susp. Soil Concen.	X	Resp. Fraction	X	Inhalation Rate	X	Exposure Time	X	Exposure Frequency	X	Exposure Duration	X	Conv. Factor	X	1 / Body Wt	X	1 / Avging Time
	mg/kg	X	#########	X	(unitless)	X	0.83 m3/hr	X	8 hrs/day	X	250 days/yr	X	25 years	X	1 kg / 1000000 mg	X	1 / 70 kg	X	1 / 25550 days

Chemicals	Soil Concen.	Susp. Soil Concen.	Resp. Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv. Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Arsenic	#######	1.3E-02	1	0.83	8	250	25	1.0E-06	70	25550	9.4E-10	1.5E+01	1.4E-08
Beryllium	#######	1.3E-02	1	0.83	8	250	25	1.0E-06	70	25550	5.5E-10	8.4E+00	4.6E-09

TOTAL RISK = 1.9E-08

CHM 002 2379

TABLE 28

SURFACE/SUBSURFACE SOIL INHALATION PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO SITE WORKERS/EMPLOYEES - EFFLUENT DISCHARGE LINE

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day)	Soil Concen.	X	Susp. Soil Concen.	X	Resp. Fraction	X	Inhalation Rate	X	Exposure Time	X	Exposure Frequency	X	Exposure Duration	X	Conv. Factor	X	1 / Body Wt	X	1 / Avging Time
	mg/kg	X	#########	X	(unitless)	X	0.83 m3/hr	X	8 hrs/day	X	250 days/yr	X	25 years	X	1 kg / 1000000 mg	X	1 / 70 kg	X	1 / 9125 days

Chemicals	Soil Concen.	Susp. Soil Concen.	Resp. Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv. Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Manganese	#######	1.3E-02	1	0.83	8	250	25	1.0E-06	70	9125	1.0E-06	1.4E-05	7.5E-02
Mercury	#######	1.3E-02	1	0.83	8	250	25	1.0E-06	70	9125	1.4E-09	8.6E-05	1.6E-05

HAZARD INDEX = 7.5E-02

CHM 002 2360

TABLE 29

SURFACE/SUBSURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN EFFLUENT DISCHARGE LINE

CARCINOGENS - REASONABLE MAXIMUM CASE SUBSURFACE SOIL INGESTION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/kg X 480 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 65 days/year X 1 year X 1/70 kg X 1/25550 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Benzo(a)pyrene	2.50E-01	480	1.0E-06	1	65	1	70	25550	4.4E-09	7.3E+00	3.2E-08
Aroclor 1248	6.00E-02	480	1.0E-06	1	65	1	70	25550	1.0E-09	7.7E+00	8.1E-09
Aroclor 1254	1.50E-01	480	1.0E-06	1	65	1	70	25550	2.6E-09	7.7E+00	2.0E-08
Aroclor 1260	1.10E-01	480	1.0E-06	1	65	1	70	25550	1.9E-09	7.7E+00	1.5E-08
Arsenic	3.10E+00	480	1.0E-06	1	65	1	70	25550	5.4E-08	1.75E+00	9.5E-08
Beryllium	1.83E+00	480	1.0E-06	1	65	1	70	25550	3.2E-08	4.3E+00	1.4E-07

TOTAL RISK = 3.1E-07

CHM 002 2381

TABLE 29

SURFACE/SUBSURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN EFFLUENT DISCHARGE LINE

NONCARCINOGENS - REASONABLE MAXIMUM CASE SUBSURFACE SOIL INGESTION EXPOSURE: Adults

Subchronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/kg X 480 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 65 days/year X 1 year X 1/70 kg X 1/365 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Subchronic Daily Intake (SDI)	Reference Dose (RfD)	HQ= SDI/RfD
Arsenic	3.10E+00	480	1.0E-06	1	65	1	70	365	3.8E-06	3.0E-04	1.3E-02
Barium	2.14E+02	480	1.0E-06	1	65	1	70	365	2.6E-04	7.0E-02	3.7E-03
Beryllium	1.83E+00	480	1.0E-06	1	65	1	70	365	2.2E-06	5.0E-03	4.5E-04
Manganese	1.23E+03	480	1.0E-06	1	65	1	70	365	1.5E-03	5.0E-03	3.0E-01
Mercury	1.59E+00	480	1.0E-06	1	65	1	70	365	1.9E-06	3.0E-04	6.5E-03
Thallium	1.66E+00	480	1.0E-06	1	65	1	70	365	2.0E-06	8.0E-04	2.5E-03
Vanadium	4.11E+01	480	1.0E-06	1	65	1	70	365	5.0E-05	7.0E-03	7.2E-03
Zinc	4.10E+02	480	1.0E-06	1	65	1	70	365	5.0E-04	3.0E-01	1.7E-03

HAZARD INDEX = 3.4E-01

CHM 002 2382

TABLE 30

SURFACE/SUBSURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN EFFLUENT DISCHARGE LINE

CARCINOGENS - REASONABLE MAXIMUM CASE SUBSURFACE SOIL DERMAL CONTACT EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Conversion Factor X Skin Surface Area X Adherence Factor X Absorption Factor X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/kg X 1 kg / ########## X 1930 cm2/day X 1 mg/cm2 X (unitless) X 65 events/yr X 1 year X 1/70 kg X 1/25550 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aroclor 1248	6.00E-02	1.0E-06	1930	1	0.06	65	1	70	25550	2.5E-10	7.7E+00	1.9E-09
Aroclor 1254	1.50E-01	1.0E-06	1930	1	0.06	65	1	70	25550	6.3E-10	7.7E+00	4.9E-09
Aroclor 1260	1.10E-01	1.0E-06	1930	1	0.06	65	1	70	25550	4.6E-10	7.7E+00	3.6E-09

TOTAL RISK = 1.0E-08

CHM 002 2383

TABLE 30

SURFACE/SUBSURFACE SOIL DERMAL CONTACT PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN EFFLUENT DISCHARGE LINE

NONCARCINOGENS - REASONABLE MAXIMUM CASE SUBSURFACE SOIL DERMAL CONTACT EXPOSURE: Adults

Subchronic Daily Intake= (mg/kg-day)	Soil Concentration	X	Conversion Factor	X	Skin Surface Area	X	Adherence Factor	X	Absorption Factor	X	Exposure Frequency	X	Exposure Duration	X	1 / Body Weight	X	1 / Averaging Time
	mg/kg	X	1 kg ##########	X	1930 cm2/day	X	1 mg/cm2	X	(unitless)	X	65 events/yr	X	1 year	X	1 / 70 kg	X	1 / 365 days

Chemicals	Soil Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Subchronic Daily Intake (SDI)	Reference Dose (RfD)	HQ= SDI/RfD

PCBs do not currently have established noncarcinogenic toxicity values. No other selected chemicals of potential concern have established dermal absorption factors.

CHM 002 2384

TABLE 31

SURFACE/SUBSURFACE SOIL INHALATION PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN EFFLUENT DISCHARGE LINE

CARCINOGENS - REASONABLE MAXIMUM CASE SUBSURFACE SOIL INHALATION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Soil Concen. X Susp. Soil Concen. X Resp. Fraction X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X Conv. Factor X 1 / Body Wt X 1 / Avging Time

mg/kg X ######### X (unitless) X 0.83 m3/hr X 8 hrs/day X 65 days/yr X 1 year X 1 kg / 1000000 mg X 1 / 70 kg X 1 / 25550 days

Chemicals	Soil Concen.	Susp. Soil Concen.	Resp. Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv. Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Arsenic	3.10E+00	2.6E-02	1	0.83	8	65	1	1.0E-06	70	25550	1.9E-11	1.5E+01	2.9E-10
Beryllium	1.83E+00	2.6E-02	1	0.83	8	65	1	1.0E-06	70	25550	1.1E-11	8.4E+00	9.6E-11

TOTAL RISK = 3.9E-10

CHM 002 2385

TABLE 31

SURFACE/SUBSURFACE SOIL INHALATION PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO CONSTRUCTION WORKERS IN EFFLUENT DISCHARGE LINE

NONCARCINOGENS - REASONABLE MAXIMUM CASE SUBSURFACE SOIL INHALATION EXPOSURE: Adults

Subchronic Daily Intake= (mg/kg-day) = Soil Concen. X Susp. Soil Concen. X Resp. Fraction X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X Conv. Factor X 1/Body Wt X 1/Avging Time

mg/kg X ######### X (unitless) X 0.83 m3/hr X 8 hrs/day X 65 days/yr X 1 year X 1 kg / 1000000 mg X 1/70 kg X 1/365 days

Chemicals	Soil Concen.	Susp. Soil Concen.	Resp. Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv. Factor	Body Weight	Averaging Time	Subchronic Daily Intake (SDI)	Reference Dose (RfD)	HQ= SDI/RfD
Barium	2.14E+02	2.6E-02	1	0.83	8	65	1	1.0E-06	70	365	9.4E-08	1.4E-03	6.7E-05
Mercury	1.59E+00	2.6E-02	1	0.83	8	65	1	1.0E-06	70	365	7.0E-10	8.6E-05	8.1E-06

HAZARD INDEX = 7.5E-05

CHM 002 2386

TABLE 32

INHALATION OF VOCS IN AMBIENT AIR PATHWAY
CHEMSOL, INC. SITE - PRESENT-USE SCENARIO
RISKS TO DOWNWIND (OFF-SITE) RESIDENTS

CARCINOGENS - REASONABLE MAXIMUM CASE INHALATION OF VOCS IN AMBIENT AIR EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day)	Air Concen.	X	Inhalation Rate	X	Exposure Time	X	Exposure Frequency	X	Exposure Duration	X	1 / Body Wt	X	1 / Avging Time
	mg/m3	X	0.83 m3/hr	X	24 hr/day	X	12 days/yr	X	24 years	X	1 / 70 kg	X	1 / 25550 days

Chemicals	Air Concen.	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
No site-related carcinogenic compounds were detected in down-wind air samples										

TOTAL RISK = 0.0E+00

CARCINOGENS - REASONABLE MAXIMUM CASE INHALATION OF VOCS IN AMBIENT AIR EXPOSURE: Children (0-6 years)

Chronic Daily Intake= (mg/kg-day)	Air Concen.	X	Inhalation Rate	X	Exposure Time	X	Exposure Frequency	X	Exposure Duration	X	1 / Body Wt	X	1 / Avging Time
	mg/m3	X	0.83 m3/hr	X	24 hr/day	X	12 days/yr	X	6 years	X	1 / 15 kg	X	1 / 25550 days

Chemicals	Air Concen.	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
No site-related carcinogenic compounds were detected in down-wind air samples										

TOTAL RISK = 0.0E+00

30-YEAR COMBINED RISK (ADULT + CHILD) = 0.0E+00

TABLE 32

INHALATION OF VOCS IN AMBIENT AIR PATHWAY
CHEMSOL, INC. SITE - PRESENT-USE SCENARIO
RISKS TO DOWNWIND (OFF-SITE) RESIDENTS

NONCARCINOGENS - REASONABLE MAXIMUM CASE INHALATION OF VOCS IN AMBIENT AIR EXPOSURE: Adults

Chronic Daily Intake- (mg/kg-day) = Air Concen X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X 1/Body Wt X 1/Avging Time

mg/m3 X 0.83 m3/hr X 24 hr/day X 12 days/yr X 24 years X 1/70 kg X 1/8760 days

Chemicals	Air Concen.	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
2-Butanone	2.86E-02	0.83	24	12	24	70	8760	2.7E-04	2.9E-01	9.2E-04
Dichlorodifluoromethane	4.94E-03	0.83	24	12	24	70	8760	4.6E-05	8.6E+00	5.4E-06

HAZARD INDEX = 9.3E-04

NONCARCINOGENS - REASONABLE MAXIMUM CASE INHALATION OF VOCS IN AMBIENT AIR EXPOSURE: Children (0-6 years)

Chronic Daily Intake- (mg/kg-day) = Air Concen X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X 1/Body Wt X 1/Avging Time

mg/m3 X 0.83 m3/hr X 24 hr/day X 12 days/yr X 6 years X 1/15 kg X 1/2190 days

Chemicals	Soil Concen	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
2-Butanone	2.86E-02	0.83	24	12	6	15	2190	1.2E-03	2.9E-01	4.3E-03
Dichlorodifluoromethane	4.94E-03	0.83	24	12	6	15	2190	2.2E-04	8.6E+00	2.5E-05

HAZARD INDEX = 4.3E-03

30-YEAR COMBINED HAZARD INDEX (ADULT + CHILD) = 5.3E-03

8832 200 HHD

TABLE 33

INHALATION OF VOCS IN AMBIENT AIR PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO RESIDENTS (SITE-WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE INHALATION OF VOCS IN AMBIENT AIR EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Air Concen. X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X 1 / Body Wt X 1 / Avging Time

mg/m3 X 0.83 m3/hr X 24 hrs/day X 350 days/yr X 24 years X 1 / 70 kg X 1 / 25550 days

Chemicals	Air Concen.	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Benzene	2.60E-03	0.83	24	350	24	70	25550	2.4E-04	2.9E-02	7.1E-06
Methylene Chloride	2.08E-02	0.83	24	350	24	70	25550	1.9E-03	1.6E-03	3.1E-06
Tetrachloroethene	4.10E-03	0.83	24	350	24	70	25550	3.8E-04	2.0E-03	7.7E-07
Trichloroethene	1.60E-03	0.83	24	350	24	70	25550	1.5E-04	6.0E-03	9.0E-07

TOTAL RISK = 1.2E-05

CARCINOGENS - REASONABLE MAXIMUM CASE INHALATION OF VOCS IN AMBIENT AIR EXPOSURE: Children (0-6 years)

Chronic Daily Intake= (mg/kg-day) = Air Concen. X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X 1 / Body Wt X 1 / Avging Time

mg/m3 X 0.83 m3/hr X 24 hrs/day X 350 days/yr X 6 years X 1 / 15 kg X 1 / 25550 days

Chemicals	Air Concen.	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Benzene	2.60E-03	0.83	24	350	6	15	25550	2.8E-04	2.9E-02	8.2E-06
Methylene Chloride	2.08E-02	0.83	24	350	6	15	25550	2.3E-03	1.6E-03	3.6E-06
Tetrachloroethene	4.10E-03	0.83	24	350	6	15	25550	4.5E-04	2.0E-03	9.0E-07
Trichloroethene	1.60E-03	0.83	24	350	6	15	25550	1.7E-04	6.0E-03	1.0E-06

TOTAL RISK = 1.4E-05

30-YEAR COMBINED RISK (ADULT + CHILD) = 2.6E-05

CHM 002 2389

TABLE 33

INHALATION OF VOCS IN AMBIENT AIR PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO RESIDENTS (SITE-WIDE)

NONCARCINOGENS - REASONABLE MAXIMUM CASE INHALATION OF VOCS IN AMBIENT AIR EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Air Concen. X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X 1 / Body Wt X 1 / Avging Time

mg/m3 X 0.83 m3/hr X 24 hrs/day X 350 days/yr X 24 years X 1 / 70 kg X 1 / 8760 days

Chemicals	Air Concen.	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
2-Butanone	1.85E-02	0.83	24	350 days/yr	24	70	8760	5.0E-03	2.9E-01	1.7E-02
Dichlorodifluoromethane	1.09E-02	0.83	24	350 days/yr	24	70	8760	3.0E-03	5.0E-02	5.9E-02
Hexane	1.06E-02	0.83	24	350 days/yr	24	70	8760	2.9E-03	5.7E-02	5.1E-02
Methylene Chloride	2.08E-02	0.83	24	350 days/yr	24	70	8760	5.7E-03	8.6E-01	6.6E-03
Toluene	2.03E-02	0.83	24	350 days/yr	24	70	8760	5.5E-03	1.1E-01	5.0E-02
1,1,2-Trichloro-1,1,2-trifluoroethane	7.70E-02	0.83	24	350 days/yr	24	70	8760	2.1E-02	8.6E+00	2.4E-03

HAZARD INDEX = 1.9E-01

NONCARCINOGENS - REASONABLE MAXIMUM CASE INHALATION OF VOCS IN AMBIENT AIR EXPOSURE: Children (0-6 years)

Chronic Daily Intake= (mg/kg day) = Air Concen X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X 1 / Body Wt X 1 / Avging Time

mg/m3 X 0.83 m3/hr X 24 hrs/day X 350 days/yr X 6 years X 1 / 15 kg X 1 / 2190 days

Chemicals	air Concen.	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
2-Butanone	1.85E-02	0.83	24	350 days/yr	6	15	2190	2.4E-02	2.9E-01	8.1E-02
Dichlorodifluoromethane	1.09E-02	0.83	24	350 days/yr	6	15	2190	1.4E-02	5.0E-02	2.8E-01
Hexane	1.06E-02	0.83	24	350 days/yr	6	15	2190	1.3E-02	5.7E-02	2.4E-01
Methylene Chloride	2.08E-02	0.83	24	350 days/yr	6	15	2190	2.6E-02	8.6E-01	3.1E-02
Toluene	2.03E-02	0.83	24	350 days/yr	6	15	2190	2.6E-02	1.1E-01	2.4E-01
1,1,2-Trichloro-1,1,2-trifluoroethane	7.70E-02	0.83	24	350 days/yr	6	15	2190	9.8E-02	8.6E+00	1.1E-02

HAZARD INDEX = 8.7E-01

30-YEAR COMBINED HAZARD INDEX (ADULT + CHILD) = 1.1E+00

0632 200 IHC

TABLE 34

INHALATION OF VOCS IN AMBIENT AIR PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO SITE WORKERS/EMPLOYEES (SITE-WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE INHALATION OF VOCS IN AMBIENT AIR EXPOSURE: Adults

Chronic Daily Intake = (mg/kg-day) = Air Concen. X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X 1 / Body Wt X 1 / Avging Time

mg/m3 X 0.83 m3/hr X 8 hrs/day X 250 days/yr X 25 years X 1 / 70 kg X 1 / 25550 days

Chemicals	Air Concen.	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Benzene	2.60E-03	0.83	8	250	25	70	25550	6.0E-05	2.9E-02	1.7E-06
Methylene Chloride	2.08E-02	0.83	8	250	25	70	25550	4.8E-04	1.6E-03	7.7E-07
Tetrachloroethene	4.10E-03	0.83	8	250	25	70	25550	9.5E-05	2.0E-03	1.9E-07
Trichloroethene	1.60E-03	0.83	8	250	25	70	25550	3.7E-05	6.0E-03	2.2E-07

TOTAL RISK = 2.9E-06

CHM 002 2391

TABLE 34

INHALATION OF VOCS IN AMBIENT AIR PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO SITE WORKERS/EMPLOYEES (SITE-WIDE)

NONCARCINOGENS - REASONABLE MAXIMUM CASE INHALATION OF VOCS IN AMBIENT AIR EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day)	Air Concen.	X	Inhalation Rate	X	Exposure Time	X	Exposure Frequency	X	Exposure Duration	X	1 / Body Wt	X	1 / Avging Time
	mg/m3	X	0.83 m3/hr	X	8 hrs/day	X	250 days/yr	X	25 years	X	1 / 70 kg	X	1 / 9125 days

Chemicals	Air Concen.	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
2-Butanone	1.85E-02	0.83	8	250	25	70	9125	1.2E-03	2.9E-01	4.1E-03
Dichlorodifluoromethane	1.09E-02	0.83	8	250	25	70	9125	7.1E-04	5.0E-02	1.4E-02
Hexane	1.06E-02	0.83	8	250	25	70	9125	6.9E-04	5.7E-02	1.2E-02
Methylene Chloride	2.08E-02	0.83	8	250	25	70	9125	1.4E-03	8.6E-01	1.6E-03
Toluene	2.03E-02	0.83	8	250	25	70	9125	1.3E-03	1.1E-01	1.2E-02
1,1,2-Trichloro-1,1,2-trifluoroethane	7.70E-02	0.83	8	250	25	70	9125	5.0E-03	8.6E+00	5.8E-04

HAZARD INDEX = 4.5E-02

2432 200 OHM

TABLE 35

INHALATION OF VOCS IN AMBIENT AIR PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO CONSTRUCTION WORKERS (SITE-WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE INHALATION OF VOCS IN AMBIENT AIR EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Air Concen. X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X 1 / Body Wt X 1 / Avging Time

mg/m3 X 0.83 m3/hr X 8 hrs/day X 65 days/yr X 1 year X 1 / 70 kg X 1 / 25550 days

Chemicals	Air Concen.	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Benzene	2.60E-03	0.83	8	65	1	70	25550	6.3E-07	2.9E-02	1.8E-08
Methylene Chloride	2.08E-02	0.83	8	65	1	70	25550	5.0E-06	1.6E-03	8.0E-09
Tetrachloroethene	4.10E-03	0.83	8	65	1	70	25550	9.9E-07	2.0E-03	2.0E-09
Trichloroethene	1.60E-03	0.83	8	65	1	70	25550	3.9E-07	6.0E-03	2.3E-09

TOTAL RISK = 3.1E-08

CHD 002 2293

TABLE 35

INHALATION OF VOCS IN AMBIENT AIR PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO CONSTRUCTION WORKERS (SITE-WIDE)

NONCARCINOGENS - REASONABLE MAXIMUM CASE INHALATION OF VOCS IN AMBIENT AIR EXPOSURE: Adults

Subchronic Daily Intake= (mg/kg-day) = Air Concen. X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X 1 / Body Wt X 1 / Avging Time

mg/m3 X 0.83 m3/hr X 8 hrs/day X 65 days/yr X 1 year X 1 / 70 kg X 1 / 365 days

Chemicals	Air Concen.	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Subchronic Daily Intake (SDI)	Reference Dose (RID)	HQ= SDI/RID
2-Butanone	1.85E-02	0.83	8	65	1	70	365	3.1E-04	2.9E-01	1.1E-03
Dichlorodifluoromethane	1.09E-02	0.83	8	65	1	70	365	1.8E-04	5.0E-01	3.7E-04
Hexane	1.06E-02	0.83	8	65	1	70	365	1.8E-04	5.7E-02	3.1E-03
Methylene Chloride	2.08E-02	0.83	8	65	1	70	365	3.5E-04	8.6E-01	4.1E-04
Toluene	2.03E-02	0.83	8	65	1	70	365	3.4E-04	2.9E-01	1.2E-03
1,1,2-Trichloro-1,1,2-trifluoroethane	7.70E-02	0.83	8	65	1	70	365	1.3E-03	8.6E+00	1.5E-04

HAZARD INDEX = 6.3E-03

4694 2332 CHC

TABLE 36

GROUND WATER INGESTION PATHWAY
CHEMSOL, INC. SITE - FUTURE- USE SCENARIO
RISKS TO RESIDENTS (SITE-WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE GROUND WATER INGESTION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Water Concentration X Ingestion Rate X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/l X 2 l/day X 350 days/year X 24 years X 1 / 70 kg X 1 / 25550 days

Chemicals	Water Concentration	Ingestion Rate	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Benzene	2.07E+00	2	350	24	70	25550	1.9E-02	2.9E-02	5.6E-04
Carbon Tetrachloride	3.43E+00	2	350	24	70	25550	3.2E-02	1.3E-01	4.2E-03
Chloroform	1.28E+01	2	350	24	70	25550	1.2E-01	6.1E-03	7.3E-04
1,2-Dichloroethane	1.49E+00	2	350	24	70	25550	1.4E-02	9.1E-02	1.3E-03
1,1-Dichloroethene	1.00E-01	2	350	24	70	25550	9.4E-04	6.0E-01	5.6E-04
Trichloroethene	1.53E+01	2	350	24	70	25550	1.4E-01	1.1E-02	1.6E-03
Vinyl Chloride	3.10E-01	2	350	24	70	25550	2.9E-03	1.9E+00	5.5E-03
Bis(2-chloroethyl)ether	2.00E-02	2	350	24	70	25550	1.9E-04	1.1E+00	2.1E-04

TOTAL RISK = 1.5E-02

CARCINOGENS - REASONABLE MAXIMUM CASE GROUND WATER INGESTION EXPOSURE: Children (0-6 years)

Chronic Daily Intake= (mg/kg-day) = Water Concentration X Ingestion Rate X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/l X 1 l/day X 350 days/year X 6 years X 1 / 15 kg X 1 / 25550 days

Chemicals	Water Concentration	Ingestion Rate	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Benzene	2.07E+00	1	350	6	15	25550	1.1E-02	2.9E-02	3.3E-04
Carbon Tetrachloride	3.43E+00	1	350	6	15	25550	1.9E-02	1.3E-01	2.4E-03
Chloroform	1.28E+01	1	350	6	15	25550	7.0E-02	6.1E-03	4.3E-04
1,2-Dichloroethane	1.49E+00	1	350	6	15	25550	8.2E-03	9.1E-02	7.4E-04
1,1-Dichloroethene	1.00E-01	1	350	6	15	25550	5.5E-04	6.0E-01	3.3E-04
Trichloroethene	1.53E+01	1	350	6	15	25550	8.4E-02	1.1E-02	9.2E-04
Vinyl Chloride	3.10E-01	1	350	6	15	25550	1.7E-03	1.9E+00	3.2E-03
Bis(2-chloroethyl)ether	2.00E-02	1	350	6	15	25550	1.1E-04	1.1E+00	1.2E-04

TOTAL RISK = 8.5E-03

CHM 002 2299

TABLE 36

GROUND WATER INGESTION PATHWAY
CHEMSOL, INC. SITE - FUTURE- USE SCENARIO
RISKS TO RESIDENTS (SITE-WIDE)

NONCARCINOGENS - REASONABLE MAXIMUM CASE GROUND WATER INGESTION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Water Concentration X Ingestion Rate X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/l X 2 l/day X 350 days/year X 24 years X 1/70 kg X 1/8760 days

Chemicals	Water Concentration	Ingestion Rate	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Acetone	1.09E+01	2	350	24	70	8760	3.0E-01	1.0E-01	3.0E+00
Carbon Tetrachloride	3.43E+00	2	350	24	70	8760	9.4E-02	7.0E-04	1.3E+02
Chloroform	1.28E+01	2	350	24	70	8760	3.5E-01	1.0E-02	3.5E+01
1,1-Dichloroethene	1.00E-01	2	350	24	70	8760	2.7E-03	9.0E-03	3.0E-01
1,2-Dichloroethene (Total)	2.02E+01	2	350	24	70	8760	5.5E-01	9.0E-03	6.1E+01
Trichloroethene	1.53E+01	2	350	24	70	8760	4.2E-01	6.0E-03	7.0E+01
Manganese	7.37E+00	2	350	24	70	8760	2.0E-01	5.0E-03	4.0E+01

HAZARD INDEX = 3.4E+02

NONCARCINOGENS - REASONABLE MAXIMUM CASE GROUND WATER INGESTION EXPOSURE. Children (0-6 years)

Chronic Daily Intake= (mg/kg-day) = Water Concentration X Ingestion Rate X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/l X 1 l/day X 350 days/year X 6 years X 1/15 kg X 1/2190 days

Chemicals	Water Concentration	Ingestion Rate	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Acetone	1.09E+01	1	350	6	15	2190	6.9E-01	1.0E-01	6.9E+00
Carbon Tetrachloride	3.43E+00	1	350	6	15	2190	2.2E-01	7.0E-04	3.1E+02
Chloroform	1.28E+01	1	350	6	15	2190	8.2E-01	1.0E-02	8.2E+01
1,1-Dichloroethene	1.00E-01	1	350	6	15	2190	6.4E-03	9.0E-03	7.1E-01
1,2-Dichloroethene (Total)	2.02E+01	1	350	6	15	2190	1.3E+00	9.0E-03	1.4E+02
Trichloroethene	1.53E+01	1	350	6	15	2190	9.8E-01	6.0E-03	1.6E+02
Manganese	7.37E+00	1	350	6	15	2190	4.7E-01	5.0E-03	9.4E+01

HAZARD INDEX = 8.0E+02

9632 200 MHD

TABLE 37

GROUND WATER INHALATION PATHWAY (SHOWER MODEL)
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO RESIDENTS (SITE-WIDE)

C(a) = Concentration of contaminant in air (mg/m3)
C(aMAX) = Maximum concentration of contaminant in air (mg/m3)
t1 = Time of shower (hr)
t2 = Time after shower (hr)

Equation:

	C(a) = (mg/m3)	[C(aMAX)/2 (mg/m3)	x	t1] (hr)	+ [C(aMAX) (mg/m3)	x	t2] (hr)	/	(t1 + t2) (hr)
Chemicals:									
Benzene	1.6E+01	9.7E+00		0.2	1.9E+01		0.3		0.5
Carbon Tetrachloride	2.6E+01	1.6E+01		0.2	3.2E+01		0.3		0.5
Chloroform	9.6E+01	6.0E+01		0.2	1.2E+02		0.3		0.5
1,2-Dichloroethane	1.1E+01	7.0E+00		0.2	1.4E+01		0.3		0.5
1,1-Dichloroethene	7.5E-01	4.7E-01		0.2	9.4E-01		0.3		0.5
Trichloroethene	1.1E+02	7.2E+01		0.2	1.4E+02		0.3		0.5
Vinyl Chloride	2.3E+00	1.5E+00		0.2	2.9E+00		0.3		0.5

C(aMAX) = Maximum air concentration in bathroom (mg/m3)
C(w) = Water concentration (mg/l)
f = Fraction volatilized (unitless)
F(w) = Water flow rate (l/hr)
V(a) = Bathroom volume (m3)

Equation:

	C(aMAX) = (mg/m3)	[C(w) (mg/l)	x	f (unitless)	x	F(w) (l/hr)	x	t1] (hr)	/	V(a) (m3)
Chemicals:										
Benzene	1.9E+01	2.07E+00		0.75		750		0.2		12
Carbon Tetrachloride	3.2E+01	3.43E+00		0.75		750		0.2		12
Chloroform	1.2E+02	1.28E+01		0.75		750		0.2		12
1,2-Dichloroethane	1.4E+01	1.49E+00		0.75		750		0.2		12
1,1-Dichloroethene	9.4E-01	1.00E-01		0.75		750		0.2		12
Trichloroethene	1.4E+02	1.53E+01		0.75		750		0.2		12
Vinyl Chloride	2.9E+00	3.10E-01		0.75		750		0.2		12

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TABLE 37

GROUND WATER INHALATION PATHWAY (SHOWER MODEL)
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO RESIDENTS (SITE-WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE GROUND WATER INHALATION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Air Concentration X Inhalation Rate X Exposure Time X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/m3 X 0.6 m3/hr X 0.2 hrs/day X 350 days/year X 30 years X 1/70 kg X 1/25550 days

Chemicals	Air Concentration	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Benzene	1.6E+01	0.6	0.2	350	30	70	25550	1.1E-02	2.9E-02	3.3E-04
Carbon Tetrachloride	2.6E+01	0.6	0.2	350	30	70	25550	1.8E-02	5.3E-02	9.7E-04
Chloroform	9.6E+01	0.6	0.2	350	30	70	25550	6.8E-02	8.1E-02	5.5E-03
1,2-Dichloroethane	1.1E+01	0.6	0.2	350	30	70	25550	7.7E-03	9.1E-02	7.1E-04
1,1-Dichloroethene	7.5E-01	0.6	0.2	350	30	70	25550	5.3E-04	1.8E-01	9.5E-05
Trichloroethene	1.1E+02	0.6	0.2	350	30	70	25550	7.7E-02	6.0E-03	4.6E-04
Vinyl Chloride	2.3E+00	0.6	0.2	350	30	70	25550	1.6E-03	3.0E-01	4.9E-04

TOTAL RISK = 8.5E-03

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TABLE 37

GROUND WATER INHALATION PATHWAY (SHOWER MODEL)
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO RESIDENTS (SITE-WIDE)

NONCARCINOGENS - REASONABLE MAXIMUM CASE GROUND WATER INHALATION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day)	Air Concentration	X	Inhalation Rate	X	Exposure Time	X	Exposure Frequency	X	Exposure Duration	X	1 / Body Weight	X	1 / Averaging Time
	mg/m3	X	0.6 m3/hr	X	0.2 hrs/day	X	350 days/year	X	30 years	X	1 / 70 kg	X	1 / 10950 days

Chemicals	Air Concentration	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD

No selected chemicals of potential concern have established chronic inhalation reference doses.

CHHD 002 2299

TABLE 38

GROUND WATER INGESTION PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO SITE WORKERS/EMPLOYEES (SITE-WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE GROUND WATER INGESTION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Water Concentration X Ingestion Rate X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/l X 1 l/day X 250 days/year X 25 years X 1/70 kg X 1/25550 days

Chemicals	Water Concentration	Ingestion Rate	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Benzene	2.07E+00	1	250	25	70	25550	7.2E-03	2.9E-02	2.1E-04
Carbon Tetrachloride	3.43E+00	1	250	25	70	25550	1.2E-02	1.3E-01	1.6E-03
Chloroform	1.28E+01	1	250	25	70	25550	4.5E-02	6.1E-03	2.7E-04
1,2-Dichloroethane	1.49E+00	1	250	25	70	25550	5.2E-03	9.1E-02	4.7E-04
1,1-Dichloroethene	1.00E-01	1	250	25	70	25550	3.5E-04	6.0E-01	2.1E-04
Trichloroethene	1.53E+01	1	250	25	70	25550	5.4E-02	1.1E-02	5.9E-04
Vinyl Chloride	3.10E-01	1	250	25	70	25550	1.1E-03	1.9E+00	2.1E-03
Bis(2-chloroethyl)ether	2.00E-02	1	250	25	70	25550	7.0E-05	1.1E+00	7.7E-05

TOTAL RISK = 5.4E-03

CHM 002 2400

TABLE 38

GROUND WATER INGESTION PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO SITE WORKERS/EMPLOYEES (SITE-WIDE)

CHM 002 2401

NONCARCINOGENS - REASONABLE MAXIMUM CASE GROUND WATER INGESTION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Water Concentration X Ingestion Rate X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/l X 1 l/day X 250 days/year X 25 years X 1/70 kg X 1/9125 days

Chemicals	Water Concentration	Ingestion Rate	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Acetone	1.09E+01	1	250	25	70	9125	1.1E-01	1.0E-01	1.1E+00
Carbon Tetrachloride	3.43E+00	1	250	25	70	9125	3.4E-02	7.0E-04	4.8E+01
Chloroform	1.28E+01	1	250	25	70	9125	1.3E-01	1.0E-02	1.3E+01
1,1-Dichloroethene	1.00E-01	1	250	25	70	9125	9.8E-04	9.0E-03	1.1E-01
1,2-Dichloroethene (Total)	2.02E+01	1	250	25	70	9125	2.0E-01	9.0E-03	2.2E+01
Trichloroethene	1.53E+01	1	250	25	70	9125	1.5E-01	6.0E-03	2.5E+01
Manganese	7.37E+00	1	250	25	70	9125	7.2E-02	5.0E-03	1.4E+01

HAZARD INDEX = 1.2E+02

TABLE 39

GROUND WATER INGESTION PATHWAY
CHEMSOL, INC. SITE - FUTURE - USE SCENARIO
RISKS TO CONSTRUCTION WORKERS (SITE-WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE GROUND WATER INGESTION EXPOSURE

Chronic Daily Intake = (mg/kg-day) = Water Concentration X Ingestion Rate X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/l X 1 l/day X 65 days/year X 1 year X 1 / 70 kg X 1 / 25550 days

Chemicals	Water Concentration	Ingestion Rate	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Benzene	2.07E+00	1	65	1	70	25550	7.5E-05	2.9E-02	2.2E-06
Carbon Tetrachloride	3.43E+00	1	65	1	70	25550	1.2E-04	1.3E-01	1.6E-05
Chloroform	1.28E+01	1	65	1	70	25550	4.7E-04	6.1E-03	2.8E-06
1,2-Dichloroethane	1.49E+00	1	65	1	70	25550	5.4E-05	9.1E-02	4.9E-06
1,1-Dichloroethene	1.00E-01	1	65	1	70	25550	3.6E-06	6.0E-01	2.2E-06
Trichloroethene	1.53E+01	1	65	1	70	25550	5.6E-04	1.10E-02	6.1E-06
Vinyl Chloride	3.10E-01	1	65	1	70	25550	1.1E-05	1.9E+00	2.1E-05
Bis(2-chloroethyl)ether	2.00E-02	1	65	1	70	25550	7.3E-07	1.1E+00	8.0E-07
								TOTAL RISK =	5.7E-05

CHM 002 2402

TABLE 39

GROUND WATER INGESTION PATHWAY
CHEMSOL, INC. SITE - FUTURE - USE SCENARIO
RISKS TO CONSTRUCTION WORKERS (SITE-WIDE)

NONCARCINOGENS - REASONABLE MAXIMUM CASE GROUND WATER INGESTION EXPOSURE

Subchronic Daily Intake= (mg/kg-day) = Water Concentration X Ingestion Rate X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/l X 1 l/day X 65 days/year X 1 year X 1/70 kg X 1/365 days

Chemicals	Water Concentration	Ingestion Rate	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Subchronic Daily Intake (SDI)	Reference Dose (RfD)	HQ= SDI/RfD
Acetone	1.09E+01	1	65	1	70	365	2.8E-02	1.0E+00	2.8E-02
Carbon Tetrachloride	3.43E+00	1	65	1	70	365	8.7E-03	2.0E-03	4.4E+00
Chloroform	1.28E+01	1	65	1	70	365	3.3E-02	1.0E-02	3.3E+00
1,1-Dichloroethene	1.00E-01	1	65	1	70	365	2.5E-04	9.0E-03	2.8E-02
1,2-Dichloroethene (Total)	2.02E+01	1	65	1	70	365	5.1E-02	9.0E-03	5.7E+00
Manganese	7.37E+00	1	65	1	70	365	1.9E-02	5.0E-03	3.7E+00

HAZARD INDEX = 1.7E+01

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TABLE 40

SURFACE WATER DERMAL CONTACT PATHWAY
CHEMSOL, INC. SITE - PRESENT-USE SCENARIO
RISKS TO AREA RESIDENTS/TRESPASSERS - STREAM 1B AND DRAINAGE DITCH

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE WATER DERMAL CONTACT EXPOSURE: Children (12-17 years)

Chronic Daily Intake= (mg/kg-day)	Water Concentration	X Skin Surface Area	X Permeability Constant	X Exposure Time	X Exposure Frequency	X Exposure Duration	X Conversion Factor	X 1 / Body Weight	X 1 / Averaging Time
	mg/l	X 1985 cm2	X cm/hr	X 0.5 hr/day	X ##########	X 6 years	X 1 L / 1000 cm3	X 1 / 55 kg	X 1 / 25550 days

Chemicals	Water Concentration	Skin Surface Area	Permeability Constant	Exposure Time	Exposure Frequency	Exposure Duration	Conversion Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
1,2-Dichloroethane	7.00E-03	1985	5.30E-03	0.5	26	6	1.0E-03	55	2190	4.8E-08	9.1E-02	4.3E-09
Vinyl Chloride	8.00E-03	1985	7.30E-03	0.5	26	6	1.0E-03	55	2190	7.5E-08	1.9E+00	1.4E-07
Benzo(b)fluoranthene	5.00E-03	1985	1.20E+00	0.5	26	6	1.0E-03	55	2190	7.7E-06	7.3E-01	5.6E-06

TOTAL RISK = 5.8E-06

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TABLE 40

SURFACE WATER DERMAL CONTACT PATHWAY
CHEMSOL, INC. SITE - PRESENT-USE SCENARIO
RISKS TO AREA RESIDENTS/TRESPASSERS - STREAM 1B AND DRAINAGE DITCH

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE WATER DERMAL CONTACT EXPOSURE: Children (12-17 years)

Chronic Daily Intake= (mg/kg-day)	Water Concentration	X Skin Surface Area	X Permeability Constant	X Exposure Time	X Exposure Frequency	X Exposure Duration	X Conversion Factor	X 1 / Body Weight	X 1 / Averaging Time
	mg/l	X 1985 cm2	X cm/hr	X 0.5 hr/day	X ##########	X 6 years	X 1 L / 1000 cm3	X 1 / 55 kg	X 1 / 2190 days

Chemicals	Water Concentration	Skin Surface Area	Permeability Constant	Exposure Time	Exposure Frequency	Exposure Duration	Conversion Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
1,2-Dichloroethene (Total)	8.00E-02	1985	1.00E-02	0.5	26	6	1.0E-03	55	2190	1.0E-06	9.0E-03	1.1E-04
Cadmium	1.80E-03	1985	1.00E-03	0.5	26	6	1.0E-03	55	2190	2.3E-09	5.0E-04	4.6E-06
Manganese	3.10E+00	1985	1.00E-03	0.5	26	6	1.0E-03	55	2190	4.0E-08	5.0E-03	8.0E-04

HAZARD INDEX = 9.2E-04

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TABLE 41

SURFACE WATER DERMAL CONTACT PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO RESIDENTS - STREAM 1B AND DRAINAGE DITCH

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE WATER DERMAL CONTACT EXPOSURE: Children (12-17 Years)

Chronic Daily Intake= (mg/kg-day)	Water Concentration	X Skin Surface Area	X Permeability Constant	X Exposure Time	X Exposure Frequency	X Exposure Duration	X Conversion Factor	X 1 / Body Weight	X 1 / Averaging Time
	mg/l	X 1985 cm2	X cm/hr	X ########	X ##########	X 6 years	X 1 L / 1000 cm3	X 1 / 55 kg	X 1 / 25550 days

Chemicals	Water Concentration	Skin Surface Area	Permeability Constant	Exposure Time	Exposure Frequency	Exposure Duration	Conversion Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
1,2-Dichloroethane	7.00E-03	1985	5.30E-03	0.5	26	6	1.0E-03	55	25550	4.1E-09	9.1E-02	3.7E-10
Vinyl Chloride	8.00E-03	1985	7.30E-03	0.5	26	6	1.0E-03	55	25550	6.4E-09	1.9E+00	1.2E-08
Benzo(b)fluoranthene	5.00E-03	1985	1.20E+00	0.5	26	6	1.0E-03	55	25550	6.6E-07	7.3E-01	4.8E-07

TOTAL RISK = 5.0E-07

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE WATER DERMAL CONTACT EXPOSURE: Children (12-17 Years)

Chronic Daily Intake= (mg/kg-day)	Water Concentration	X Skin Surface Area	X Permeability Constant	X Exposure Time	X Exposure Frequency	X Exposure Duration	X Conversion Factor	X 1 / Body Weight	X 1 / Averaging Time
	mg/l	X 1985 cm2	X cm/hr	X 0.5 hr/day	X #########	X 6 years	X 1 L / 1000 cm3	X 1 / 55 kg	X 1 / 2190 days

Chemicals	Water Concentration	Skin Surface Area	Permeability Constant	Exposure Time	Exposure Frequency	Exposure Duration	Conversion Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
1,2-Dichloroethene (Total)	8.00E-02	1985	1.00E-02	0.5	26	6	1.0E-03	55	2190	1.0E-06	9.0E-03	1.1E-04
Cadmium	1.80E-03	1985	1.00E-03	0.5	26	6	1.0E-03	55	2190	2.3E-09	5.0E-04	4.6E-06
Manganese	3.10E+00	1985	1.00E-03	0.5	26	6	1.0E-03	55	2190	4.0E-06	5.0E-03	8.0E-04

HAZARD INDEX = 9.2E-04

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TABLE 42

SEDIMENT DERMAL CONTACT PATHWAY
CHEMSOL, INC. SITE - PRESENT-USE SCENARIO
RISKS TO AREA RESIDENTS/TRESPASSERS - STREAM 1B AND DRAINAGE DITCH

CARCINOGENS - REASONABLE MAXIMUM CASE SEDIMENT DERMAL CONTACT EXPOSURE: Children (12-17 years)

Chronic Daily Intake= (mg/kg-day)	Sediment Concentration	X Conversion Factor	X Skin Surface Area	X Adherence Factor	X Absorption Factor	X Exposure Frequency	X Exposure Duration	X 1 / Body Weight	X 1 / Averaging Time
	mg/kg	X 1 kg ##########	X 1985 cm2/day	X 1 mg/cm2	X (unitless)	X 26 events/yr	X 6 years	X 1 / 55 kg	X 1 / 25550 days

Chemicals	Sediment Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aroclor 1248	1.84E+00	1.0E-06	1985	1	0.06	26	6	55	25550	2.4E-08	7.7E+00	1.9E-07
Aroclor 1254	1.00E+01	1.0E-06	1985	1	0.06	26	6	55	25550	1.3E-07	7.7E+00	1.0E-06
Aroclor 1260	3.80E+00	1.0E-06	1985	1	0.06	26	6	55	25550	5.0E-08	7.7E+00	3.9E-07

TOTAL RISK = 1.6E-06

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TABLE 42

SEDIMENT DERMAL CONTACT PATHWAY
CHEMSOL, INC. SITE - PRESENT-USE SCENARIO
RISKS TO AREA RESIDENTS/TRESPASSERS - STREAM 1B AND DRAINAGE DITCH

NONCARCINOGENS - REASONABLE MAXIMUM CASE SEDIMENT DERMAL CONTACT EXPOSURE: Children (12-17 years)

Chronic Daily Intake= (mg/kg-day)	Sediment Concentration	X Conversion Factor	X Skin Surface Area	X Adherence Factor	X Absorption Factor	X Exposure Frequency	X Exposure Duration	X 1 / Body Weight	X 1 / Averaging Time
	mg/kg	X 1 kg / #########	X 1985 cm2/day	X 1 mg/cm2	X (unitless)	X 26 events/yr	X 6 years	X 1 / 55 kg	X 1 / 2190 days

Chemicals	Sediment Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD

PCBs do not currently have established noncarcinogenic toxicity values. No other selected chemicals of potential concern have established dermal absorption factors.

TABLE 43

SEDIMENT DERMAL CONTACT PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO RESIDENTS - STREAM 1B AND DRAINAGE DITCH

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CARCINOGENS - REASONABLE MAXIMUM CASE SEDIMENT DERMAL CONTACT EXPOSURE: Children (12-17 years)

Chronic Daily Intake= (mg/kg-day)	Sediment Concentration	X Conversion Factor	X Skin Surface Area	X Adherence Factor	X Absorption Factor	X Exposure Frequency	X Exposure Duration	X 1 Body Weight	X 1 Averaging Time
	mg/kg	X 1 kg ##########	X 1985 cm2/day	X 1 mg/cm2	X (unitless)	X 26 events/yr	X 6 years	X 1 55 kg	X 1 25550 days

Chemicals	Sediment Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aroclor 1248	1.84E+00	1.0E-06	1985	1	0.06	26	6	55	25550	2.4E-08	7.7E+00	1.9E-07
Aroclor 1254	1.00E+01	1.0E-06	1985	1	0.06	26	6	55	25550	1.3E-07	7.7E+00	1.0E-06
Aroclor 1260	3.80E+00	1.0E-06	1985	1	0.06	26	6	55	25550	5.0E-08	7.7E+00	3.9E-07

TOTAL RISK = 1.6E-06

NONCARCINOGENS - REASONABLE MAXIMUM CASE SEDIMENT DERMAL CONTACT EXPOSURE: Children (12-17 years)

Chronic Daily Intake= (mg/kg-day)	Sediment Concentration	X Conversion Factor	X Skin Surface Area	X Adherence Factor	X Absorption Factor	X Exposure Frequency	X Exposure Duration	X 1 Body Weight	X 1 Averaging Time
	mg/kg	1 kg ##########	X 1985 cm2/day	X 1 mg/cm2	X (unitless)	X 26 events/yr	X 6 years	X 1 55 kg	X 1 2190 days

Chemicals	Sediment Concentration	Conversion Factor	Skin Surface Area	Adherence Factor	Absorption Factor	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD

PCBs do not currently have established noncarcinogenic toxicity values No other selected chemicals of potential concern have established dermal absorption factors

Appendix P

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APPENDIX P

CENTRAL TENDENCY CALCULATIONS

CENTRAL T: NDEN... ALCULATION
SURFACE SOIL IN... I PATHWAY
CHEMSOL, INC SITE - ... -USE SCENARIO
RISKS TO RESIDENTS IN LOT 1A

NONC... ...IOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Children (0-6 years)

Chronic Daily Intake= (mg/kg-day)

Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/kg X 100 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 350 days/year X 6 years X 1 / 15 kg X 1 / 2190 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Arsenic	2 94E+00	100	1 0E-06	1	350 days/year	6	15	2190	1.9E-05	3.0E-04	6.3E-02
Beryllium	8 10E-01	100	1 0E-06	1	350 days/year	6	15	2190	5.2E-06	5.0E-03	1.0E-03
Manganese	4 81E+02	100	1 0E-06	1	350 days/year	6	15	2190	3.1E-03	5.0E-03	6 1E-01
Mercury	7 30E-01	100	1 0E-06	1	350 days/year	6	15	2190	4 7E-06	3.0E-04	1.6E-02
Silver	1 45E+01	100	1 0E-06	1	350 days/year	6	15	2190	9.3E-05	5.0E-03	1 9E-02
Vanadium	3 41E+01	100	1 0E-06	1	350 days/year	6	15	2190	2.2E-04	7.0E-03	3.1E-02

HAZARD INDEX = 7.4E-01

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TABLE 2

CENTRAL TENDENCY CALCULATION
SURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC SITE - FUTURE-USE SCENARIO
RISKS TO RESIDENTS IN LOT 1B

CARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Children (0 - 6 years)

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/kg X 100 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 350 days/year X 6 years X 1 / 15 kg X 1 / 25550 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Aldrin	1.78E+00	100	1.0E-06	1	350 days/year	6	15	25550	9.8E-07	1.7E+01	1.7E-05
Dieldrin	4.10E-01	100	1.0E-06	1	350 days/year	6	15	25550	2.2E-07	1.6E+01	3.6E-06
Aroclor 1248	3.17E+01	100	1.0E-06	1	350 days/year	6	15	25550	1.7E-05	7.7E+00	1.3E-04
Aroclor 1254	1.57E+01	100	1.0E-06	1	350 days/year	6	15	25550	8.6E-06	7.7E+00	6.6E-05
Aroclor 1260	3.98E+01	100	1.0E-06	1	350 days/year	6	15	25550	2.2E-05	7.7E+00	1.7E-04
Arsenic	3.69E+00	100	1.0E-06	1	350 days/year	6	15	25550	2.0E-06	1.75E+00	3.5E-06

TOTAL RISK = 3.9E-04

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CENTRAL TENDENCY CALCULATION
SURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC SITE - FUTURE-USE SCENARIO
RISKS TO RESIDENTS IN LOT 1B

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Children (0-6 years)

Chronic Daily Intake= (mg/kg-day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/kg X 100 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 350 days/year X 6 years X 1/15 kg X 1/2190 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Aldrin	1.78E+00	100	1.0E-06	1	350 days/year	6	15	2190	1.1E-05	3.0E-05	3.8E-01
Dieldrin	4.10E-01	100	1.0E-06	1	350 days/year	6	15	2190	2.6E-06	5.0E-05	5.2E-02
Antimony	8.26E+00	100	1.0E-06	1	350 days/year	6	15	2190	5.3E-05	4.0E-04	1.3E-01
Arsenic	3.69E+00	100	1.0E-06	1	350 days/year	6	15	2190	2.4E-05	3.0E-04	7.9E-02
Cadmium	3.43E+00	100	1.0E-06	1	350 days/year	6	15	2190	2.2E-05	1.0E-03	2.2E-02
Chromium VI	1.32E+01	100	1.0E-06	1	350 days/year	6	15	2190	8.4E-05	5.0E-03	1.7E-02
Manganese	1.20E+03	100	1.0E-06	1	350 days/year	6	15	2190	7.7E-03	5.0E-03	1.5E+00
Mercury	2.15E+00	100	1.0E-06	1	350 days/year	6	15	2190	1.4E-05	3.0E-04	4.6E-02
Thallium	4.80E-01	100	1.0E-06	1	350 days/year	6	15	2190	3.1E-06	8.0E-05	3.8E-02
Vanadium	7.06E+01	100	1.0E-06	1	350 days/year	6	15	2190	4.5E-04	7.0E-03	6.4E-02

HAZARD INDEX = 2.4E+00

CHM 002 2414

CENTRAL TENDENCY CALCULATION
SURFACE SOIL INHALATION PATHWAY
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO RESIDENTS (INSIDE AND OUTSIDE RESIDENCE) IN LOT 1B

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE - Children (0-6 years)

Chronic Daily Intake= (mg/kg-day)	Soil Concen.	X	Soil Concen.	X	Resp. Fraction	X	Inhalation Rate	X	Exposure Time	X	Exposure Frequency	X	Exposure Duration	X	Conv. Factor	X	1 / Body Wt	X	1 / Avging Time
	mg/kg	X	##########	X	(unitless)	X	0.83 m3/hr	X	12 hrs/day	X	350 days/yr	X	6 years	X	1 kg / 1000000 mg	X	1 / 15 kg	X	1 / 2190 days

Chemicals	Soil Concen.	Susp. Soil Concen.	Resp. Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv. Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Manganese	########	##########	1	0.83	12	350 days/yr	6	1.0E-06	15	2190	4.3E-06	1.4E-05	3.0E-01
Mercury	########	##########	1	0.83	12	350 days/yr	6	1.0E-06	15	2190	1.5E-08	8.6E-05	1.7E-04

HAZARD INDEX = 3.0E-01

CHM 002 2415

TABLE

CENTRAL TENDENCY CALCULATION
SURFACE/SUBSURFACE SOIL INGESTION PATHWAY
CHEMSOL, INC SITE - FUTURE-USE SCENARIO
RISKS TO RESIDENTS - EFFLUENT DISCHARGE LINE

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INGESTION EXPOSURE: Children (0-6 years)

Chronic Daily Intake= (mg/kg day) = Soil Concentration X Ingestion Rate X Conversion Factor X Fraction Ingested X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/kg X 100 mg/day X 1 kg / 1000000 mg X 1 (unitless) X 350 days/year X 6 years X 1/15 kg X 1/2190 days

Chemicals	Soil Concentration	Ingestion Rate	Conversion Factor	Fraction Ingested	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Arsenic	3.10E+00	100	1.0E-06	1	350 days/year	6	15	2190	2.0E-05	3.0E-04	6.6E-02
Barium	2.14E+02	100	1.0E-06	1	350 days/year	6	15	2190	1.4E-03	7.0E-02	2.0E-02
Beryllium	1.83E+00	100	1.0E-06	1	350 days/year	6	15	2190	1.2E-05	5.0E-03	2.3E-03
Manganese	1.23E+03	100	1.0E-06	1	350 days/year	6	15	2190	7.9E-03	5.0E-03	1.6E+00
Mercury	1.59E+00	100	1.0E-06	1	350 days/year	6	15	2190	1.0E-05	3.0E-04	3.4E-02
Thallium	1.66E+00	100	1.0E-06	1	350 days/year	6	15	2190	1.1E-05	8.0E-05	1.3E-01
Vanadium	4.11E+01	100	1.0E-06	1	350 days/year	6	15	2190	2.6E-04	7.0E-03	3.8E-02
Zinc	4.10E+02	100	1.0E-06	1	350 days/year	6	15	2190	2.6E-03	3.0E-01	8.7E-03

HAZARD INDEX = 1.9E+00

CHM 002 2416

TABLE 3

CENTRAL TENDENCY CALCULATION
SURFACE/SUBSURFACE SOIL INHALATION PATHWAY
CHEMSOL, INC. SITE - FUTURE USE SCENARIO
RISKS TO RESIDENTS (INSIDE AND OUTSIDE RESIDENCE) - EFFLUENT DISCHARGE LINE

NONCARCINOGENS - REASONABLE MAXIMUM CASE SURFACE SOIL INHALATION EXPOSURE - Children (0-6 years)

Chronic Daily Intake= (mg/kg-day)	Soil Concen	X	Soil Concen.	X	Resp Fraction	X	Inhalation Rate	X	Exposure Time	X	Exposure Frequency	X	Exposure Duration	X	Conv. Factor	X	1 / Body Wt	X	1 / Avging Time
	mg/kg	X	#########	X	(unitless)	X	0.83 m3/hr	X	12 hrs/day	X	350 days/yr	X	6 years	X	1 kg / 1000000 mg	X	1 / 15 kg	X	1 / 2190 days

Chemicals	Soil Concen.	Susp Soil Concen.	Resp Fraction	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Conv. Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Manganese	#######	6.5E-03	1	0.83	12	350 days/yr	6	1.0E-06	15	2190	5.1E-06	1.4E-05	3.7E-01
Mercury	#######	6.5E-03	1	0.83	12	350 days/yr	6	1.0E-06	15	2190	7.0E-09	8.6E-05	8.1E-05

HAZARD INDEX = 3.7E-01

CHM 002 2417

TAB

CENTRAL TENDENCY CALCULATIONS
GROUND WATER INGESTION PATHWAY
CHEMSOL, INC SITE - FUTURE- USE SCENARIO
RISKS TO RESIDENTS (SITE-WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE GROUND WATER INGESTION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Water Concentration X Ingestion Rate X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/l X 1.4 l/day X 350 days/year X 9 years X 1 / 70 kg X 1 / 25550 days

Chemicals	Water Concentration	Ingestion Rate	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Benzene	2.07E+00	1.4	350 days/year	9	70	25550	5.1E-03	2.9E-02	1.5E-04
Carbon Tetrachloride	3.43E+00	1.4	350 days/year	9	70	25550	8.5E-03	1.3E-01	1.1E-03
Chloroform	1.28E+01	1.4	350 days/year	9	70	25550	3.2E-02	6.1E-03	1.9E-04
1,2-Dichloroethane	1.49E+00	1.4	350 days/year	9	70	25550	3.7E-03	9.1E-02	3.3E-04
1,1-Dichloroethene	1.00E-01	1.4	350 days/year	9	70	25550	2.5E-04	6.0E-01	1.5E-04
Trichloroethene	1.53E+01	1.4	350 days/year	9	70	25550	3.8E-02	1.1E-02	4.2E-04
Vinyl Chloride	3.10E-01	1.4	350 days/year	9	70	25550	7.6E-04	1.9E+00	1.5E-03
Bis(2-chloroethyl)ether	2.00E-02	1.4	350 days/year	9	70	25550	4.9E-05	1.1E+00	5.4E-05

TOTAL RISK = 3.8E-03

CARCINOGENS - REASONABLE MAXIMUM CASE GROUND WATER INGESTION EXPOSURE: Children (0-6 years)

Chronic Daily Intake= (mg/kg-day) = Water Concentration X Ingestion Rate X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/l X 0.7 l/day X 350 days/year X 6 years X 1 / 15 kg X 1 / 25550 days

Chemicals	Water Concentration	Ingestion Rate	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Benzene	2.07E+00	0.7	350	6	15	25550	7.9E-03	2.9E-02	2.3E-04
Carbon Tetrachloride	3.43E+00	0.7	350	6	15	25550	1.3E-02	1.3E-01	1.7E-03
Chloroform	1.28E+01	0.7	350	6	15	25550	4.9E-02	6.1E-03	3.0E-04
1,2-Dichloroethane	1.49E+00	0.7	350	6	15	25550	5.7E-03	9.1E-02	5.2E-04
1,1-Dichloroethene	1.00E-01	0.7	350	6	15	25550	3.8E-04	6.0E-01	2.3E-04
Trichloroethene	1.53E+01	0.7	350	6	15	25550	5.9E-02	1.1E-02	6.5E-04
Vinyl Chloride	3.10E-01	0.7	350	6	15	25550	1.2E-03	1.9E+00	2.3E-03
Bis(2-chloroethyl)ether	2.00E-02	0.7	350	6	15	25550	7.7E-05	1.1E+00	8.4E-05

TOTAL RISK = 6.0E-03

CHM 002 2418

TAB

CENTRAL TENDENCY CALCULATIONS
GROUND WATER INGESTION PATHWAY
CHEMSOL, INC SITE - FUTURE- USE SCENARIO
RISKS TO RESIDENTS (SITE-WIDE)

NONCARCINOGENS - REASONABLE MAXIMUM CASE GROUND WATER INGESTION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Water Concentration X Ingestion Rate X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/l X 1.4 l/day X 350 days/year X 9 years X 1 / 70 kg X 1 / 3285 days

Chemicals	Water Concentration	Ingestion Rate	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Acetone	1.09E+01	1.4	350	9	70	3285	2.1E-01	1.0E-01	2.1E+00
Carbon Tetrachloride	3.43E+00	1.4	350	9	70	3285	6.6E-02	7.0E-04	9.4E+01
Chloroform	1.28E+01	1.4	350	9	70	3285	2.5E-01	1.0E-02	2.5E+01
1,1-Dichloroethene	1.00E-01	1.4	350	9	70	3285	1.9E-03	9.0E-03	2.1E-01
1,2-Dichloroethene (Total)	2.02E+01	1.4	350	9	70	3285	3.9E-01	9.0E-03	4.3E+01
Trichloroethene	1.53E+01	1.4	350	9	70	3285	2.9E-01	6.0E-03	4.9E+01
Manganese	7.37E+00	1.4	350	9	70	3285	1.4E-01	5.0E-03	2.8E+01

HAZARD INDEX = 2.4E+02

NONCARCINOGENS - REASONABLE MAXIMUM CASE GROUND WATER INGESTION EXPOSURE: Children (0-6 years)

Chronic Daily Intake= (mg/kg-day) = Water Concentration X Ingestion Rate X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/l X 0.7 l/day X 350 days/year X 6 years X 1 / 15 kg X 1 / 2190 days

Chemicals	Water Concentration	Ingestion Rate	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Acetone	1.09E+01	0.7	350	6	15	2190	4.9E-01	1.0E-01	4.9E+00
Carbon Tetrachloride	3.43E+00	0.7	350	6	15	2190	1.5E-01	7.0E-04	2.2E+02
Chloroform	1.28E+01	0.7	350	6	15	2190	5.7E-01	1.0E-02	5.7E+01
1,1-Dichloroethene	1.00E-01	0.7	350	6	15	2190	4.5E-03	9.0E-03	5.0E-01
1,2-Dichloroethene (Total)	2.02E+01	0.7	350	6	15	2190	9.0E-01	9.0E-03	1.0E+02
Trichloroethene	1.53E+01	0.7	350	6	15	2190	6.9E-01	6.0E-03	1.1E+02
Manganese	7.37E+00	0.7	350	6	15	2190	3.3E-01	5.0E-03	6.6E+01

HAZARD INDEX = 5.6E+02

CHM 002 2419

CENTRAL TENDENCY CALCULATIONS
GROUND WATER INHALATION PATHWAY (SHOWER MODEL)
CHEMSOL, INC SITE - FUTURE-USE SCENARIO
RISKS TO RESIDENTS (SITE-WIDE)

C(a) = Concentration of contaminant in air (mg/m3)
C(aMAX) = Maximum concentration of contaminant in air (mg/m3)
t1 = Time of shower (hr)
t2 = Time after shower (hr)

Equation:

	C(a) = (mg/m3)	[C(aMAX)/2 (mg/m3)	x	t1] (hr)	+ [C(aMAX) (mg/m3)	x	t2] (hr)	/	(t1 + t2) (hr)
Chemicals:									
Benzene	1.6E+01	9.7E+00		0.2	1.9E+01		0.3		0.5
Carbon Tetrachloride	2.6E+01	1.6E+01		0.2	3.2E+01		0.3		0.5
Chloroform	9.6E+01	6.0E+01		0.2	1.2E+02		0.3		0.5
1,2-Dichloroethane	1.1E+01	7.0E+00		0.2	1.4E+01		0.3		0.5
1,1-Dichloroethene	7.5E-01	4.7E-01		0.2	9.4E-01		0.3		0.5
Trichloroethene	1.1E+02	7.2E+01		0.2	1.4E+02		0.3		0.5
Vinyl Chloride	2.3E+00	1.5E+00		0.2	2.9E+00		0.3		0.5

C(aMAX) = Maximum air concentration in bathroom (mg/m3)
C(w) = Water concentration (mg/l)
f = Fraction volatilized (unitless)
F(w) = Water flow rate (l/hr)
V(a) = Bathroom volume (m3)

Equation:

	C(aMAX) = (mg/m3)	[C(w) (mg/l)	x	f (unitless)	x	F(w) (l/hr)	x	t1] (hr)	/	V(a) (m3)
Chemicals:										
Benzene	1.9E+01	2.07E+00		0.75		750		0.2		12
Carbon Tetrachloride	3.2E+01	3.43E+00		0.75		750		0.2		12
Chloroform	1.2E+02	1.28E+01		0.75		750		0.2		12
1,2-Dichloroethane	1.4E+01	1.49E+00		0.75		750		0.2		12
1,1-Dichloroethene	9.4E-01	1.00E-01		0.75		750		0.2		12
Trichloroethene	1.4E+02	1.53E+01		0.75		750		0.2		12
Vinyl Chloride	2.9E+00	3.10E-01		0.75		750		0.2		12

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CENTRAL TENDENCY CALCULATIONS
GROUND WATER INHALATION PATHWAY (SHOWER MODEL)
CHEMSOL, INC. SITE - FUTURE-USE SCENARIO
RISKS TO RESIDENTS (SITE-WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE GROUND WATER INHALATION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day)	Air Concentration	X Inhalation Rate	X Exposure Time	X Exposure Frequency	X Exposure Duration	X 1 / Body Weight	X 1 / Averaging Time
	mg/m3	X 0.6 m3/hr	X 0.12 hrs/day	X 175 days/year	X 9 years	X 1 / 70 kg	X 1 / 25550 days

Chemicals	Air Concentration	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Benzene	1.6E+01	0.6	0.12	175 days/year	9	70	25550	1.0E-03	2.9E-02	2.9E-05
Carbon Tetrachloride	2.6E+01	0.6	0.12	175 days/year	9	70	25550	1.6E-03	5.3E-02	8.7E-05
Chloroform	9.6E+01	0.6	0.12	175 days/year	9	70	25550	6.1E-03	8.1E-02	4.9E-04
1,2-Dichloroethane	1.1E+01	0.6	0.12	175 days/year	9	70	25550	7.0E-04	9.1E-02	6.3E-05
1,1-Dichloroethene	7.5E-01	0.6	0.12	175 days/year	9	70	25550	4.8E-05	1.8E-01	8.6E-06
Trichloroethene	1.1E+02	0.6	0.12	175 days/year	9	70	25550	7.0E-03	6.0E-03	4.2E-05
Vinyl Chloride	2.3E+00	0.6	0.12	175 days/year	9	70	25550	1.5E-04	3.0E-01	4.4E-05

TOTAL RISK = 7.7E-04

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CENTRAL TENDENCY CALCULATION
GROUND WATER INGESTION PATHWAY
CHEMSOL, INC. SITE-USE SCENARIO
RISKS TO SITE WORKERS/EMPLOYEES (SITE-WIDE)

CARCINOGENS - REASONABLE MAXIMUM CASE GROUND WATER INGESTION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day)

Water Concentration	X	Ingestion Rate	X	Exposure Frequency	X	Exposure Duration	X	1 / Body Weight	X	1 / Averaging Time
mg/l	X	0.5 l/day	X	250 days/year	X	25 years	X	1 / 70 kg	X	1 / 25550 days

Chemicals	Water Concentration	Ingestion Rate	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Slope Factor (SF)	RISK = (CDI*SF)
Benzene	2.07E+00	0.5 l/day	250	25	70	25550	3.6E-03	2.9E-02	1.0E-04
Carbon Tetrachloride	3.43E+00	0.5 l/day	250	25	70	25550	6.0E-03	1.3E-01	7.8E-04
Chloroform	1.28E+01	0.5 l/day	250	25	70	25550	2.2E-02	6.1E-03	1.4E-04
1,2-Dichloroethane	1.49E+00	0.5 l/day	250	25	70	25550	2.6E-03	9.1E-02	2.4E-04
1,1-Dichloroethene	1.00E-01	0.5 l/day	250	25	70	25550	1.7E-04	6.0E-01	1.0E-04
Trichloroethene	1.53E+01	0.5 l/day	250	25	70	25550	2.7E-02	1.1E-02	2.9E-04
Vinyl Chloride	3.10E-01	0.5 l/day	250	25	70	25550	5.4E-04	1.9E+00	1.0E-03
Bis(2-chloroethyl)ether	2.00E-02	0.5 l/day	250	25	70	25550	3.5E-05	1.1E+00	3.8E-05

TOTAL RISK = 2.7E-03

CHM 002 2422

TABLE

CENTRAL TENDENCY CALCULATION
GROUND WATER INGESTION PATHWAY
CHEMSOL, INC SITE - FUTURE USE SCENARIO
RISKS TO SITE WORKERS/EMPLOYEES (SITE-WIDE)

NONCARCINOGENS - REASONABLE MAXIMUM CASE GROUND WATER INGESTION EXPOSURE: Adults

Chronic Daily Intake= (mg/kg-day) = Water Concentration X Ingestion Rate X Exposure Frequency X Exposure Duration X 1 / Body Weight X 1 / Averaging Time

mg/l X 0 5 l/day X 250 days/year X 25 years X 1 / 70 kg X 1 / 9125 days

Chemicals	Water Concentration	Ingestion Rate	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Acetone	1 09E+01	0 5 l/day	250	25	70	9125	5 3E-02	1.0E-01	5.3E-01
Carbon Tetrachloride	3 43E+00	0 5 l/day	250	25	70	9125	1 7E-02	7.0E-04	2.4E+01
Chloroform	1 28E+01	0 5 l/day	250	25	70	9125	6 3E-02	1.0E-02	6.3E+00
1,1-Dichloroethene	1 00E-01	0 5 l/day	250	25	70	9125	4 9E-04	9.0E-03	5.4E-02
1,2-Dichloroethene (Total)	2 02E+01	0 5 l/day	250	25	70	9125	9 9E-02	9.0E-03	1.1E+01
Trichloroethene	1 53E+01	0 5 l/day	250	25	70	9125	7 5E-02	6.0E-03	1.2E+01
Manganese	7 37E+00	0 5 l/day	250	25	70	9125	3.6E-02	5.0E-03	7.2E+00

HAZARD INDEX = 6.2E+01

CHM 002 2423

Appendix Q

CHM 002 2424

APPENDIX Q

THREATENED AND ENDANGERED SPECIES/SIGNIFICANT HABITATS

CHM 002 2425

Revised 8/93

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN NEW JERSEY

An **ENDANGERED SPECIES** is any species that is in danger of extinction throughout all or a significant portion of its range.

A **THREATENED SPECIES** is any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

FISHES

Sturgeon, shortnose*	Acipenser brevirostrum	E

REPTILES

Turtle, Atl. Ridley*	Lepidochelys kempii	E
Turtle, green*	Chelonia mydas	T
Turtle, hawksbill*	Eretmochelys imbricata	E
Turtle, leatherback*	Dermochelys coriacea	E
Turtle, loggerhead*	Caretta caretta	T

BIRDS

Eagle, bald	Haliaeetus leucocephalus	E
Falcon, Am. peregrine	Falco peregrinus anatum	E
Falcon, Arctic peregrine	Falco peregrinus tundrius	T
Plover, piping	Charadrius melodus	T
Tern, roseate	Sterna dougallii dougallii	E

MAMMALS

Bat, Indiana	Myotis sodalis	E
Cougar, eastern	Felis concolor couguar	E+
Whale, blue*	Balaenoptera musculus	E
Whale, finback*	Balaenoptera physalus	E
Whale, humpback*	Megaptera novaeangliae	E
Whale, right*	Balaena glacialis	E
Whale, sei*	Balaenoptera borealis	E
Whale, sperm*	Physeter catodon	E

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INVERTEBRATES

Dwarf wedge mussel	Alasmidonta heterodon	E+
Beetle, northeastern beach tiger	Cicindela dorsalis dorsalis	T+
Butterfly, Mitchell satyr	Neonympha m. mitchellii	E+
American burying beetle	Nicrophorus americanus	E+

PLANTS

Pogonia, small whorled	Isotria medeoloides	E
Swamp pink	Helonias bullata	T
Orchid, eastern prairie fringed	Platanthera leucophaea	T+
Knieskern's beaked-rush	Rhynchospora knieskernii	T
American chaffseed	Schwalbea americana	E
Joint-vetch, sensitive	Aeschynomene virginica	T
Pigweed, sea-beach	Amaranthus pumilus	T+

STATUS:

E: endangered species
T: threatened species
+: presumed extirpated
PE: proposed endangered
PT: proposed threatened

* Except for sea turtle nesting habitat, principal responsibility for these species is vested with the National Marine Fisheries Service.

Note: for a complete listing of Endangered and Threatened Wildlife and Plants refer to 50 CFR 17.11 and 17.12, July 15, 1991)

CANDIDATE SPECIES IN NEW JERSEY

CANDIDATE SPECIES in categories 1 and 2 are species that appear to warrant consideration for addition to the List of Endangered and Threatened Wildlife and Plants. Although these species receive no substantive or procedural protection under the Endangered Species Act, the Service encourages federal agencies and other planners to give consideration to these species in the environmental planning process.

Species		Category
VERTEBRATES		
Turtle, bog	Clemmys muhlenbergii	2
Terrapin, northern diamondback	Malaclemys terrapin terrapin	2
Snake, northern pine	Pituophis melanoleucus melanoleucus	2
Duck, harlequin	Histrionicus histrionicus	2
Rail, Black	Laterallus jamaicensis	2
Shrike, migrant loggerhead	Lanius ludovicianus migrans	2
Sparrow, Henslow's	Ammodramus henslowii	2
Warbler, cerulean	Dendroica cerulea	2
Bat, eastern small-footed	Myotis subulatus leibii	2
Rabbit, New England cottontail	Sylvilagus transitionalis	2
Shrew, long-tailed	Sorex dispar	3C
Shrew, Tuckahoe masked	Sorex cinereus nigriculus	2
Woodrat, eastern	Neotoma floridana magister	2
INVERTEBRATES		
Beetle, cobblestone tiger	Cicindela marginipennis	2
Butterfly, regal fritillary	Speyeria idalia	2*
Butterfly, tawny crescent	Phyciodes batesi	2*
Dragonfly, banded bog skimmer	Williamsonia lintneri	2
Dragonfly, extra-striped snaketail	Ophiogomphus anomalus	2*
Moth, Albarufan dagger	Acronicta albarufa	2
Moth, Buchholz's dart	Agrotis buchholzi	2
Moth, Daecke's pyralid	Crambus daeckeellus	2
Moth, Hebard's noctuid	Erythroecia hebardi	2
Moth, Lemmer's pinnion	Lithophane lemmeri	3C
Moth, precious underwing	Catocala pretiosa	2
Moth, Carter's noctuid	Spartiniphaga carterae	2
Moth, annointed sallow noctuid	Pyreferra ceromatica	2*
Moth, buck	Hemileuca sp.	2
Skipper, Eastern beardgrass	Atrytone arogos arogos	2
Skipper, grizzled	Pyrgus wyandot	2*
Skipper, rare	Problema bulenta	2
Mussel, brook floater	Alasmidonta varicosa	2
Mussel, green floater	Lasmigona subviridis	2
Mussel, yellow lamp	Lampsilis cariosa	2

PLANTS

Lakecress	Armoracia lacustris	3C
Bur-marigold	Bidens bidentoides var. bidentoides	2
Sedge, variable	Carex polymorpha	2
Sedge, Schweinitz's	Carex schweinitzii	2
Spring beauty	Claytonia virginica var. hammondiae	2
Tick-trefoil, ground-spreading	Desmodium humifusum	2
Boneset, pine barrens	Eupatorium resinosum	2
Spurge, Darlington's	Euphorbia purpurea	2
Everlasting, clammy	Gnaphalium macounii	3B
St. Johnswort, Barton's	Hypericum adpressum	2
Butternut	Juglans cinerea	2
Rush, New Jersey	Juncus caesariensis	2
Blazingstar	Liatris borealis	2
Spicebush	Lindera subcoriacea	2
Lobelia, Boykin's	Lobelia boykinii	2
Micranthemum, Nuttall's	Micranthemum micranthemoides	2*
Bog asphodel	Narthecium americanum	1
Panic grass, Hirst's	Panicum hirstii	2
Pondweed, algae-like	Potamogeton confervoides	2
Plum, Alleghany	Prunus alleghaniensis	2
Meadowbeauty, awned	Rhexia aristosa	2
Bulrush, Long's	Scirpus longii	2
Morning-glory, Pickering's	Stylisma pickeringii	2
Sea blite	Suaeda rolandii	2
Verbena	Verbena riparia	2*?

STATUS:

1 Taxa for which the Service currently has substantial information to support the appropriateness of proposing to list the species as threatened or endangered. Development and publication of proposed rules on these species is anticipated.

2 Taxa for which information now in possession of the Service indicates that proposing to list the species as threatened or endangered is possibly appropriate, but for which conclusive data are not available to support proposed rules at this time.

3B Names that, on the basis of current taxonomic understanding, do not represent distinct taxa meeting the Act's definition of "species." Such supposed taxa could be reevaluated in the future on the basis of new information.

3C Taxa that have proven to be more abundant than previously believed and/or those that are not subject to any identifiable threat. If further research or changes in habitat indicate a significant decline in any of these taxa, they may be reevaluated for possible inclusion in categories 1 or 2.

PE Proposed Endangered species

PT: Proposed Threatened species

* indicates those species whose continued existence is in doubt.

? indicates those species for which occurrence in New Jersey is questionable.

Note: for complete listings of taxa under review, refer to Federal Register Vol. 56, No. 225, Nov. 21, 1991 (Animal) and Vol. 58, No. 188, September 30, 1993 (Plants).

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
927 North Main Street (Bldg. D1)
Pleasantville, New Jersey 08232

Tel: 609-646-9310
FAX: 609-646-0352

IN REPLY REFER TO:

ES-94/95

May 27, 1994

Ms. Nancy Zygmont
CDM Federal Programs Corporation
107-F Corporate Boulevard
South Plainfield, New Jersey 07080

Dear Ms. Zygmont:

This letter responds to your May 13, 1994 request to the U.S. Fish and Wildlife Service (Service) for information on the presence of federally-listed endangered and threatened species within the vicinity of the Chemsol site, a National Priorities List site located in Piscataway Township, Middlesex County, New Jersey.

Authority

This response is provided pursuant to the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) to ensure the protection of endangered and threatened species and is intended to assist your assessments, investigations, and planning being conducted pursuant to Section 104(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (P.L. 96-510 94 Stat. 2767) as amended by the Superfund Amendments and Reauthorization Act (42 U.S.C. 9601 et seq.). These comments do not represent any position the U.S. Department of the Interior may adopt concerning possible injury to natural resources under the Department's trusteeship nor do they relieve responsible parties from liabilities outlined under Section 107(a)(4)(C) of CERCLA.

Listed Species

Enclosed are current summaries of the federally-listed and candidate species in New Jersey for your information. There are two known occurrences of the federally-listed threatened plant, swamp pink (*Helonias bullata*), within eight miles of the project site, including one within six and one-half miles. Swamp pink typically occurs in forested wetlands, although occurrence in scrub / shrub wetlands is known. Threats to swamp pink include direct loss of its wetland habitat due to filling or draining, and indirect degradation of its habitat due to sedimentation, erosion, disruption of groundwater hydrology, and adverse impacts to water quality.

In accordance with Section 7(a)(2) of the Endangered Species Act, an assessment of potential direct, indirect, and cumulative impacts is required for all federal actions that may affect listed species. The Service's National Wetlands Inventory (NWI) map (Plainfield, New Jersey quadrangle) indicates that palustrine forested wetlands occur within the Chemsol site. Therefore, swamp pink could occur on forested wetlands within the project site. If any such wetlands would be directly or indirectly affected by project activities, the Service requests a vegetative survey of these affected areas to determine the absence or presence of swamp pink. The results of the survey, including the survey method used and the qualifications of the surveyor, must be forwarded to this office for review to determine if further consultation pursuant to Section 7 (a)(2) of the Endangered Species Act is necessary.

Other than swamp pink and an occasional transient bald eagle (*Haliaeetus leucocephalus*) or peregrine falcon (*Falco peregrinus*), no other federally-listed or proposed threatened or endangered flora or fauna are known to occur in the vicinity of the project site.

Candidate Species

Candidate species are species under consideration by the Service for possible inclusion on the List of Endangered and Threatened Wildlife and Plants. Although these species receive no substantive or procedural protection under the Endangered Species Act, the Service encourages federal agencies and other planners to consider candidate species in the project planning process.

The State's Natural Heritage Program (NHP) provides the most up-to-date information for candidate species in New Jersey, as well as maintaining information on State-listed species. The NHP may be contacted at the following address:

Mr. Thomas Breden
Natural Heritage Program
Division of Parks and Forestry
CN 404
Trenton, New Jersey 08625
(609/984-0097)

Should the NHP data search reveal the presence of any candidate species on the site, the Service must be contacted to ensure that these species are not adversely affected by project activities.

Further information on New Jersey's State-listed wildlife species may be obtained from the following office:

CHM 002 2431

Mr. Larry Niles
Endangered and Nongame Species Program
Division of Fish, Game and Wildlife
CN 400
Trenton, New Jersey 08625
(609/292-9400)

Wetlands

As previously stated, the Service's NWI map (Plainfield, New Jersey quadrangle) indicates that palustrine forested wetlands occur within the proposed Chemsol site. Wetlands provide habitats for a variety of migratory and resident species of fish and wildlife. Direct threats to wetlands include draining and filling for development. The integrity of wetlands are also vulnerable to indirect threats, such as increased sedimentation, decreased water quality, and loss of adjacent upland buffer habitats to development. The Service discourages activities in and affecting the Nation's wetlands that would unnecessarily damage, degrade, or destroy the values associated with them. The Service recommends that special consideration be given during project planning to avoid any direct or indirect impacts on wetlands within the Chemsol site.

Project activities in freshwater wetlands may require a State permit from the New Jersey Department of Environmental Protection and Energy pursuant to the Clean Water Act and the Freshwater Wetlands Protection Act (N.J.S.A. 13:9B-1 *et seq.*). Thus, if work is proposed in wetlands, the following office must be contacted to determine State permit requirements:

Land Use Regulation Program
Department of Environmental Protection and Energy
CN 401
Trenton, New Jersey 08625-0401
(609/292-1235)

Information contained in this letter and additional information obtained from the aforementioned sources represents the public interest for fish and wildlife resources and should warrant full consideration in the project planning process. The Service requests that no part of this letter be taken out of context and if reproduced, the letter should appear in its entirety.

Please contact Eric Schrading of my staff if you have any questions or require further assistance regarding federally-listed threatened or endangered species.

Sincerely,

John C. Staples
Assistant Supervisor

Enclosures

CHM 002 2432

Revised 8/93

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN NEW JERSEY

An **ENDANGERED SPECIES** is any species that is in danger of extinction throughout all or a significant portion of its range.

A **THREATENED SPECIES** is any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

FISHES

Sturgeon, shortnose*	Acipenser brevirostrum	E

REPTILES

Turtle, Atl. Ridley*	Lepidochelys kempii	E
Turtle, green*	Chelonia mydas	T
Turtle, hawksbill*	Eretmochelys imbricata	E
Turtle, leatherback*	Dermochelys coriacea	E
Turtle, loggerhead*	Caretta caretta	T

BIRDS

Eagle, bald	Haliaeetus leucocephalus	E
Falcon, Am. peregrine	Falco peregrinus anatum	E
Falcon, Arctic peregrine	Falco peregrinus tundrius	T
Plover, piping	Charadrius melodus	T
Tern, roseate	Sterna dougallii dougallii	E

MAMMALS

Bat, Indiana	Myotis sodalis	E
Cougar, eastern	Felis concolor couguar	E+
Whale, blue*	Balaenoptera musculus	E
Whale, finback*	Balaenoptera physalus	E
Whale, humpback*	Megaptera novaeangliae	E
Whale, right*	Balaena glacialis	E
Whale, sei*	Balaenoptera borealis	E
Whale, sperm*	Physeter catodon	E

Revised 12/93

CANDIDATE SPECIES IN NEW JERSEY

CANDIDATE SPECIES in categories 1 and 2 are species that appear to warrant consideration for addition to the List of Endangered and Threatened Wildlife and Plants. Although these species receive no substantive or procedural protection under the Endangered Species Act, the Service encourages federal agencies and other planners to give consideration to these species in the environmental planning process.

VERTEBRATES

Species		Category
Turtle, bog	Clemmys muhlenbergii	2
Terrapin, northern diamondback	Malaclemys terrapin terrapin	2
Snake, northern pine	Pituophis melanoleucus melanoleucus	2
Duck, harlequin	Histrionicus histrionicus	2
Rail, Black	Laterallus jamaicensis	2
Shrike, migrant loggerhead	Lanius ludovicianus migrans	2
Sparrow, Henslow's	Ammodramus henslowii	2
Warbler, cerulean	Dendroica cerulea	2
Bat, eastern small-footed	Myotis subulatus leibii	2
Rabbit, New England cottontail	Sylvilagus transitionalis	2
Shrew, long-tailed	Sorex dispar	3C
Shrew, Tuckahoe masked	Sorex cinereus nigriculus	2
Woodrat, eastern	Neotoma floridana magister	2

INVERTEBRATES

Beetle, cobblestone tiger	Cicindela marginipennis	2
Butterfly, regal fritillary	Speyeria idalia	2*
Butterfly, tawny crescent	Phyciodes batesi	2*
Dragonfly, banded bog skimmer	Williamsonia lintneri	2
Dragonfly, extra-striped snaketail	Ophiogomphus anomalus	2*
Moth, Albarufan dagger	Acronicta albarufa	2
Moth, Buchholz's dart	Agrotis buchholzi	2
Moth, Daecke's pyralid	Crambus daeckeellus	2
Moth, Hebard's noctuid	Erythroecia hebardi	2
Moth, Lemmer's pinnion	Lithophane lemmeri	3C
Moth, precious underwing	Catocala pretiosa	2
Moth, Carter's noctuid	Spartiniphaga carterae	2
Moth, annointed sallow noctuid	Pyreferra ceromatica	2*
Moth, buck	Hemileuca sp.	2
Skipper, Eastern beardgrass	Atrytone arogos arogos	2
Skipper, grizzled	Pyrgus wyandot	2*
Skipper, rare	Problema bulenta	2
Mussel, brook floater	Alasmidonta varicosa	2
Mussel, green floater	Lasmigona subviridis	2
Mussel, yellow lamp	Lampsilis cariosa	2

CHM 002 2434

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL
PROTECTION AND ENERGY

CHRISTINE TODD WHITMAN
Governor

Division of Parks and Forestry
Office of Natural Lands Management
CN 404
Trenton, NJ 08625-0404
Tel. #609-984-1339
Fax. #609-984-1427

ROBERT C. SHINN, JR.
Commissioner

June 13, 1994

Nancy Zygmont
CDM Federal Programs Corporation
107-F Corporate Boulevard
South Plainfield, NJ 07080

Re: Chemsol Site

Dear Ms. Zygmont:

Thank you for your data request regarding rare species information for the above referenced project site in Piscataway Township, Middlesex County.

The Natural Heritage Data Base does not have any records for rare plants, animals, or natural communities on the site. The attached list of rare species is from records in the general vicinity of the project site (within approximately 2 miles). Additionally, enclosed is a list of rare species and natural communities which have been documented from Middlesex County. If suitable habitat is present at the project site, these species have potential to be present. If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend you contact the Division of Fish, Game and Wildlife, Endangered and Nongame Species Program.

In order to red flag the general locations of documented occurrences of rare and endangered species and natural communities, we have prepared computer generated Natural Heritage Index Maps. Enclosed please find these maps for the Plainfield USGS quadrangle.

PLEASE SEE THE ATTACHED 'CAUTIONS AND RESTRICTIONS ON NHP DATA'.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact

us again regarding any future data requests.

Sincerely,

Thomas F. Breden
Coordinator/Ecologist
Natural Heritage Program

cc: Lawrence Niles
Thomas Hampton
NHP File No. 94-4007454

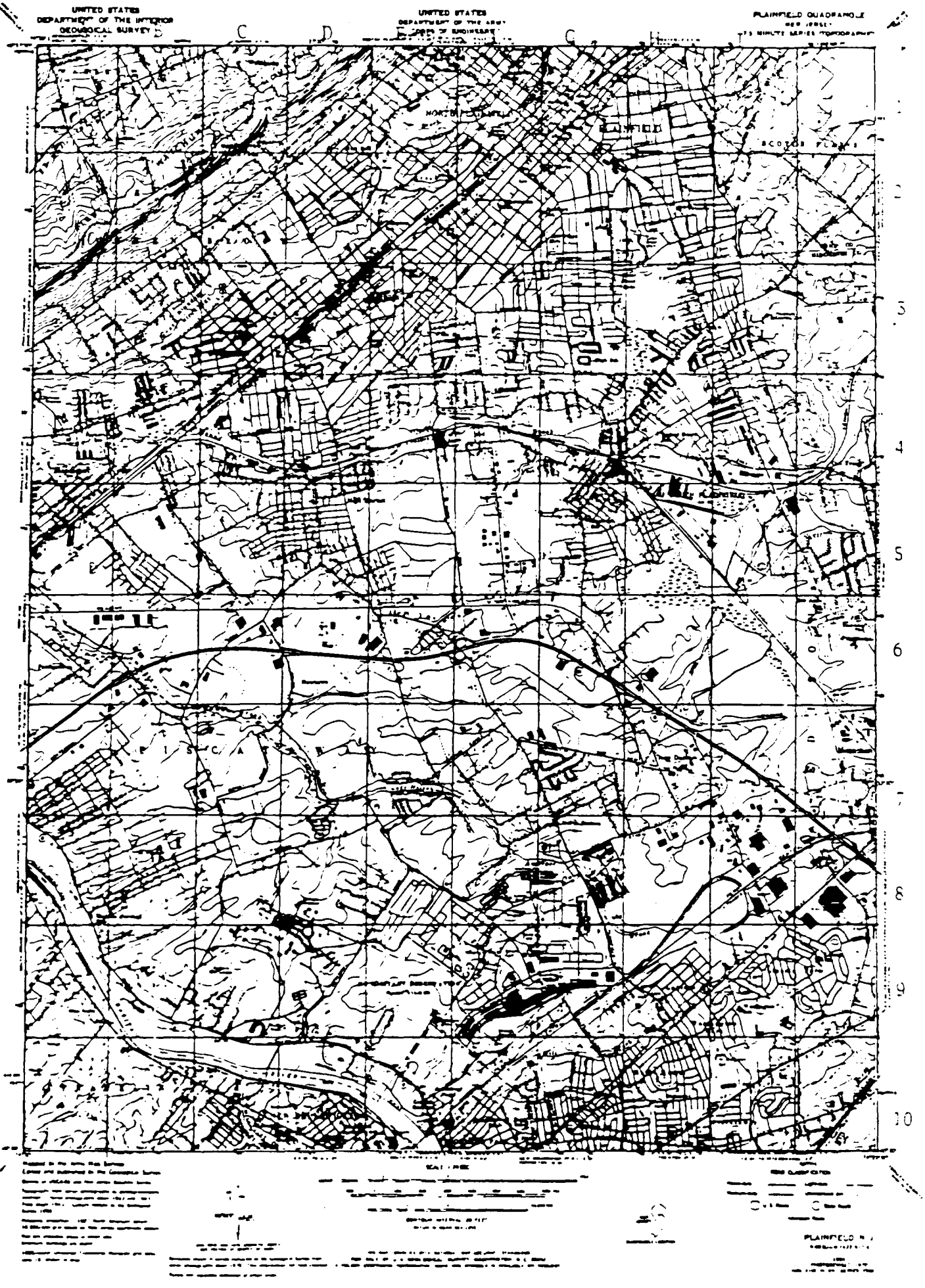
13 JUN 1994

GENERAL VICINITY OF PROJECT SITE
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK	DATE OBSERVED	IDENT.
*** Vertebrates								
AMMODRAMUS HENSLOWII	HENSLOW'S SPARROW	C2	E		G4	S1	1963-??-??	Y
BARTRAMIA LONGICAUDA	UPLAND SANDPIPER		E		G5	S1	1955-??-??	Y
LANIUS LUDOVICIANUS MIGRANS	LOGGERHEAD SHRIKE	C2	E		G4G5T3T4	S1	1991-08-21	Y
*** Vascular plants								
RANUNCULUS PUSILLUS	LOW SPEARWORT				G5	S2	1982-06-04	Y

4 Records Processed

CHM 002 2437


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
PLAINFIELD QUADRANGLE
NEW JERSEY
7.5 MINUTE SERIES (TOPOGRAPHIC)
B
C
D
E
G
H
3
4
5
6
7
8
9
10

CHM 002 2438

Generalized Natural Heritage Index Map

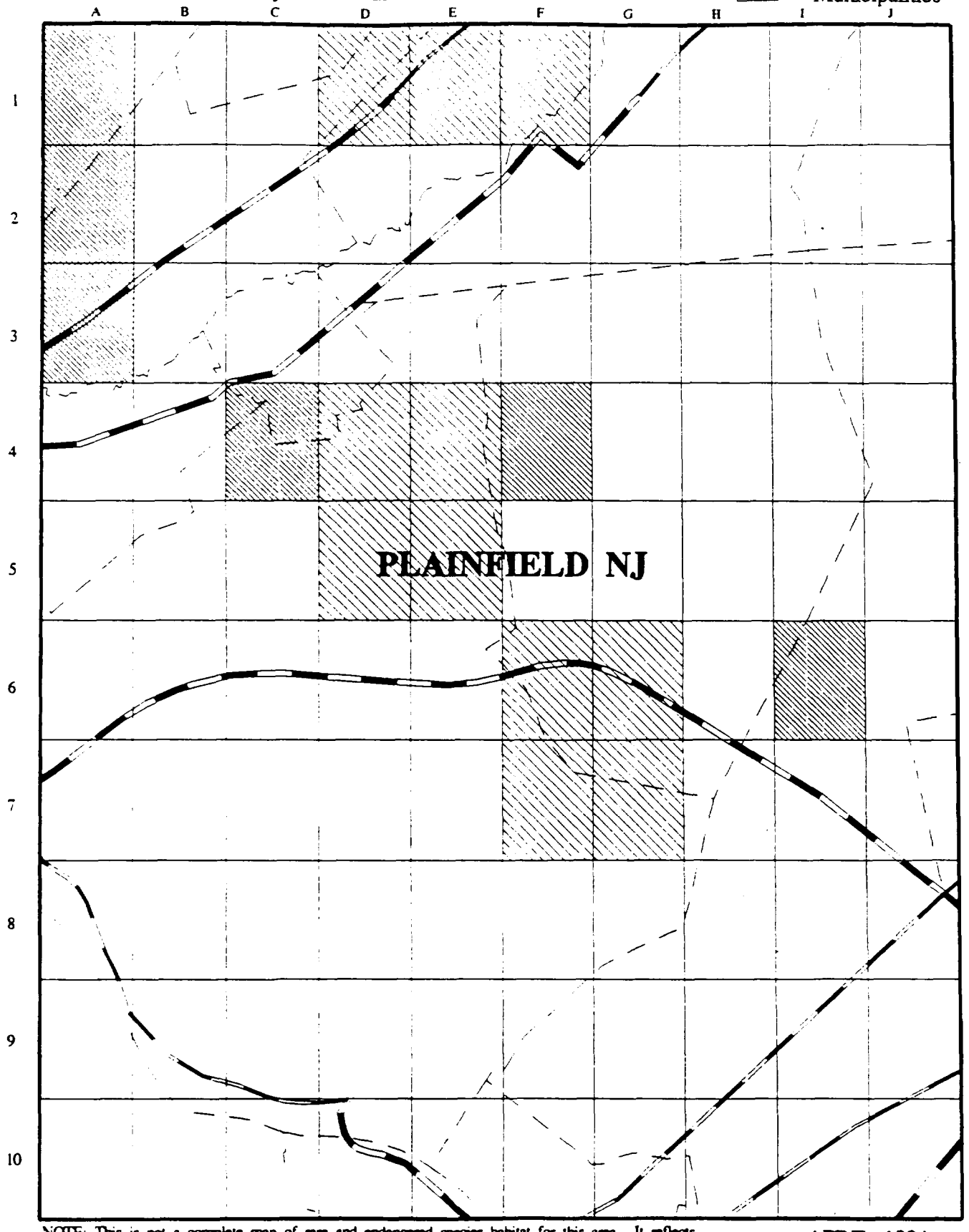
Generalized Locations for Rare and Endangered Elements of Natural Diversity

Documented Location Known Precisely

Documented Location Known Within 1.5 Miles

Major Roads

Municipalities



NOTE: This is not a complete map of rare and endangered species habitat for this area. It reflects data on known occurrences compiled as of the above date. It includes both historically and recently documented habitat. Additional occurrences may be found on unsurveyed habitat. For more information, contact the Office of Natural Lands Management, CN404, Trenton, NJ 08625.

APRIL 1994
Updated semiannually

CHM 002 2439

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Fish and Wildlife Enhancement
927 North Main Street (Bldg. D1)
Pleasantville, New Jersey 08232

Tel: 609-646-9310
FAX: 609-646-0352

REPLY REFER TO:

ES-91/98

June 21, 1991

Mr. Robert W. Hargrove, Chief
Environmental Impacts Branch
U.S. Environmental Protection Agency
26 Federal Plaza
New York, New York 10278

Dear Mr. Hargrove:

This letter responds to your May 30, 1991, request to the Fish and Wildlife Service (Service) for information on the presence of federally listed and proposed endangered and threatened species within the project area of the Chemsol, Inc. National Priorities List Site, located in Piscataway Township, Middlesex County, New Jersey.

This response is provided pursuant to the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) to ensure the protection of endangered and threatened species and is intended to assist your assessments, investigations and planning being conducted pursuant to Section 104 (a) of the Comprehensive Environmental Response, Compensation and Liability Act as amended by the Superfund Amendments and Reauthorization Act. These comments do not represent any position the U.S. Department of the Interior may adopt concerning possible injury to natural resources under the Department's trusteeship.

The federally threatened plant species Helonias bullata (swamp pink) is documented to exist in forested wetlands approximately 6 miles from the project site. A review of the Service's National Wetland Inventory map of the Plainfield, New Jersey Quadrangle indicates palustrine forested wetlands on the project site. Since swamp pink favors forested wetland habitats, it may be present on the project site. If wetlands will be impacted by the proposed project, we recommend that a survey be conducted to determine the absence or presence of swamp pink. The results of the survey should be forwarded to this office for review.

Except for the possible occurrence of swamp pink and an occasional transient Bald Eagle (Haliaeetus leucocephalus) or Peregrine Falcon (Falco peregrinus), no other federally listed or proposed threatened or endangered flora or fauna are known to occur at the project site. Enclosed is a summary of federally listed and candidate species in New Jersey for your information. Candidate species are those species under consideration by the Service for possible inclusion on the List of Endangered and Threatened Wildlife and Plants. Although these species receive no substantive or procedural protection under

the Endangered Species Act, the Service encourages federal agencies and other planners to consider candidate species in the project planning process. The New Jersey Natural Heritage Program provides the most up-to-date data source for candidate species in the State, as well as maintaining information on State listed species, and may be contacted at the following address:

Mr. Thomas Breden
Natural Heritage Program
Division of Parks and Forestry
CN 404
Trenton, New Jersey 08625
(609/984-0097

Should the Natural Heritage Program data search reveal the presence of any candidate species on the site, the Service should be contacted to ensure that these species are not adversely affected by project activities.

Further information on State listed species may be obtained from the following office:

Ms. JoAnn Frier-Murza
Endangered and Nongame Species Program
Division of Fish, Game and Wildlife
CN 400
Trenton, New Jersey 08625
(609/292-9101)

In regard to potential wetland impacts, the specific extent of wetlands on the project site can only be determined by on-site inspection. Wetlands provide habitat for a variety of migratory and resident species of fish and wildlife. Thus, the Service discourages activities in and affecting the Nation's wetlands that would unnecessarily damage, degrade or destroy these habitat values. Without detailed project information, we are unable to provide a more extensive review of the project proposal at this time. Project activities in wetlands may require federal and State permits from the U.S. Army Corps of Engineers pursuant to the Clean Water Act (33 U.S.C. 1344 et seq.) and the New Jersey Department of Environmental Protection pursuant to the Freshwater Wetlands Protection Act (N.J.S.A. 13:9B-1 et seq.). The Department of Environmental Protection, through the Freshwater Wetlands Protection Act, can provide a letter of interpretation stating if wetlands are present on the site and verifying the delineation of any wetland boundary line. Thus, if work is proposed in wetlands, the following offices should be contacted to determine permit compliance:

Regulatory Branch
U.S. Army Corps of Engineers
New York District
26 Federal Plaza
New York, New York 10278-0090
(212/264-90530

CHM 002 2441

Division of Coastal Resources
Department of Environmental Protection
CN 401
Trenton, New Jersey 08625-0401
(609/984-0853)

Information contained in this letter and additional information obtained from the aforementioned sources represents the public interest for fish and wildlife resources and should warrant full consideration in the project planning process. The Service requests that no part of this letter be taken out of context and if reproduced, the letter should appear in its entirety.

Please contact Dana Peters of my staff if you have any questions or require further assistance regarding threatened or endangered species.

Sincerely,

Clifford G. Day
Supervisor

Enclosures

CHM 002 2442

revised 5/90

FEDERALLY ENDANGERED AND THREATENED SPECIES IN NEW JERSEY

An ENDANGERED SPECIES is any species which is in danger of extinction throughout all or a significant portion of its range.

A THREATENED SPECIES is any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

FISHES

Sturgeon, shortnose*	Acipenser brevirostrum	E

REPTILES

Turtle, Atl. Ridley*	Lepidochelys kempii	E
Turtle, green*	Chelonia mydas	T
Turtle, hawksbill*	Eretmochelys imbricata	E
Turtle, leatherback*	Dermochelys coriacea	E
Turtle, loggerhead*	Caretta caretta	T

BIRDS

Eagle, bald	Haliaeetus leucocephalus	E
Falcon, Am. peregrine	Falco peregrinus anatum	E
Falcon, Artic peregrine	Falco peregrinus tundrius	T
Plover, piping	Charadrius melodus	T
Tern, roseate	Sterna dougallii dougallii	E

MAMMALS

Whale, blue*	Balaenoptera musculus	E
Whale, finback*	Balaenoptera physalus	E
Whale, humpback*	Megaptera novaeangliae	E
Whale, right*	Balaena glacialis	E
Whale, sei*	Balaenoptera borealis	E
Whale, sperm*	Physeter catodon	E

E. Chemsol, Inc.

1. Swamp Pink

a. Habitat Comparison

Forested wetlands have been mapped within this site. These wetlands are most likely not appropriate habitat for swamp pink due to the fact that this community is mapped on a mineral hydric soil, the Parsippany series. Swamp pink prefers highly organic muck soils.

b. Existing Records

The NJDEPE Natural Heritage Program database does not have any records of the species on the site or within the Bound Brook watershed. The USFWS in their consultation letter dated June 21, 1991 (Appendix A) indicates a swamp pink record within 6 miles of the site. However, the Chemsol Inc. site appears to be beyond the established range of swamp pink (Figure 1). The USFWS record must be south of Piscataway within the known range of the species. In addition, the NJDEPE and the Army Corps of Engineers have not identified Piscataway Township as a municipality with a documented record of swamp pink.

c. Recommendation

Forested wetlands are mapped on-site, however, based on characteristics of the mapped hydric soil, this wetland is not typical of swamp pink habitat. In addition, there are not existing records for swamp pink from this municipality. Although Swamp pink may occur within six miles of the site, it is not known to occur in Piscataway Township. Based on these considerations, a field survey of the Chemsol Inc. site is not recommended.

CHM 002 2444

Table 3. Summary of Findings

<u>Chemsol Inc.</u> Piscataway Twp. Middlesex Cty Raritan River Watershed	PFO1	Parsippany silt loam	PEM1B PFO1C	No	NE	Yes	No	No	No	x

CHM 002 2445

IV. FIELD SURVEY RATIONALE

In this section the information on the habitat requirements for swamp pink and Knieskern's beaked-rush are compared to existing habitats mapped for the NPL sites. Based upon the presence of suitable habitat and documented locations for these species, a recommendation is made concerning the necessity of conducting a field survey of the site. Table 3 summarizes the results of the site review process.

CHM 002 2446

4. On-site Habitat Studies

The ROD (1991) and FFS (1991) prepared by Malcolm Pirnie, Inc., both identify a marshy are an on-site that may be classified as wetlands. No other environmental studies appear to have been conducted on this site; therefore, no site-specific vegetation or threatened and endangered species data is available.

CHM 002 2447

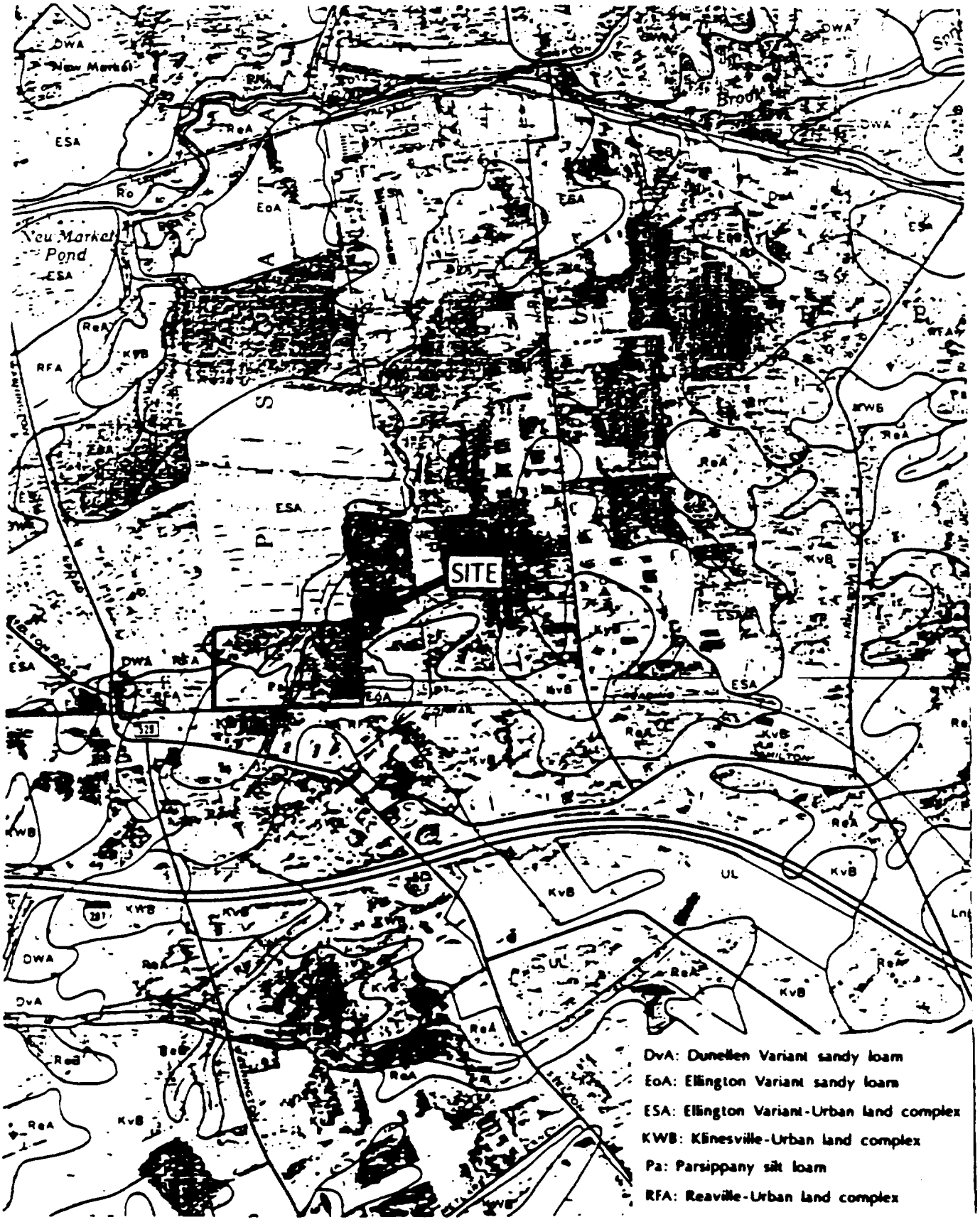


FIGURE 7C: SCS SOILS MAPPING

CHEMSOL, INC. SITE

SCALE: 1" = 1660'

EcolSciences, Inc.

SOURCE: SCS, MIDDLESEX COUNTY SURVEY, 1987, SHEETS 2 & 6

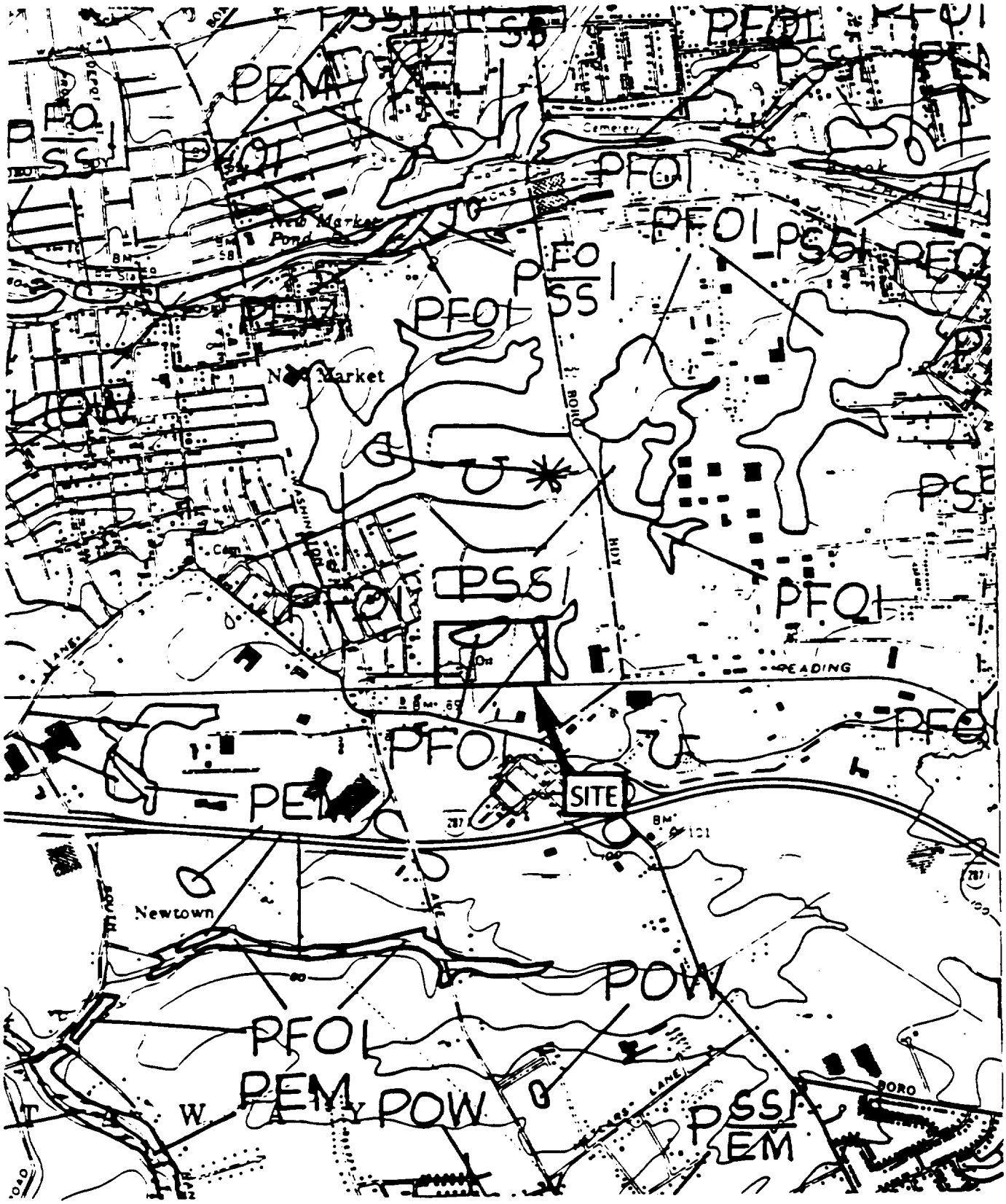


FIGURE 7B: USFWS NWI MAPPING

CHEMSOL, INC. SITE

SCALE: 1" = 2000'

EcolSciences, Inc.

SOURCE: USFWS; PLAINFIELD, NEW JERSEY QUAD; 1976

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The major components of the remedial action include the following:

- o Installation of a groundwater collection and extraction system for removal of contaminated groundwater from the perched zone and upper bedrock aquifer;
- o Installation of an on-site treatment plant to treat the groundwater; and
- o Disposal of the treated groundwater in an on-site surface water body.

3. Existing Mapping of Environmental Conditions

a. USFWS NWI Mapping

The USFWS NWI mapping (USFWS, Plainfield Quadrangle, 1976) shows palustrine forested wetlands characterized by broad-leaved deciduous species (PFO1) in the north-central and northeastern parts of the site (Figure 7B).

b. SCS Soils Mapping

According to the Middlesex County Soil Survey (1987) prepared by the SCS, three soil series and two soil complexes are mapped on-site (Figure 7C). The soil series include the Dunellen variant, the Ellington variant and Parsippany soils. The soil complexes are Klinesville-Urban Land and Reaville-Urban Land. The Parsippany series is mapped in association with the drainage features in the undeveloped portions of the site. This series is poorly drained, with a seasonal high water table from 0-1 foot. Outside of the drainages in the southern half of the site, the soil complexes are mapped. These other mapping units are not classified as hydric soils. The Parsippany series is classified as a hydric soil by the National Technical Committee for Hydric Soils (1987).

c. NJDEPE Wetlands Mapping

According to the wetlands mapping prepared by the NJDEPE (Map Nos. 0611 and 0613), all of the undeveloped portions of the site consist of wetlands. The forested areas are mapped as palustrine forested wetlands characterized by broad-leaved deciduous species (PFO1C). The "C" is a hydrology modifier and refers to a seasonally wet wetland. The undeveloped portions of the property that are not forested are mapped as palustrine emergent wetlands characterized by persistent species (PEM1B). The "B" refers to a hydrological regime characterized by soil saturation, but surface water is seldom present.

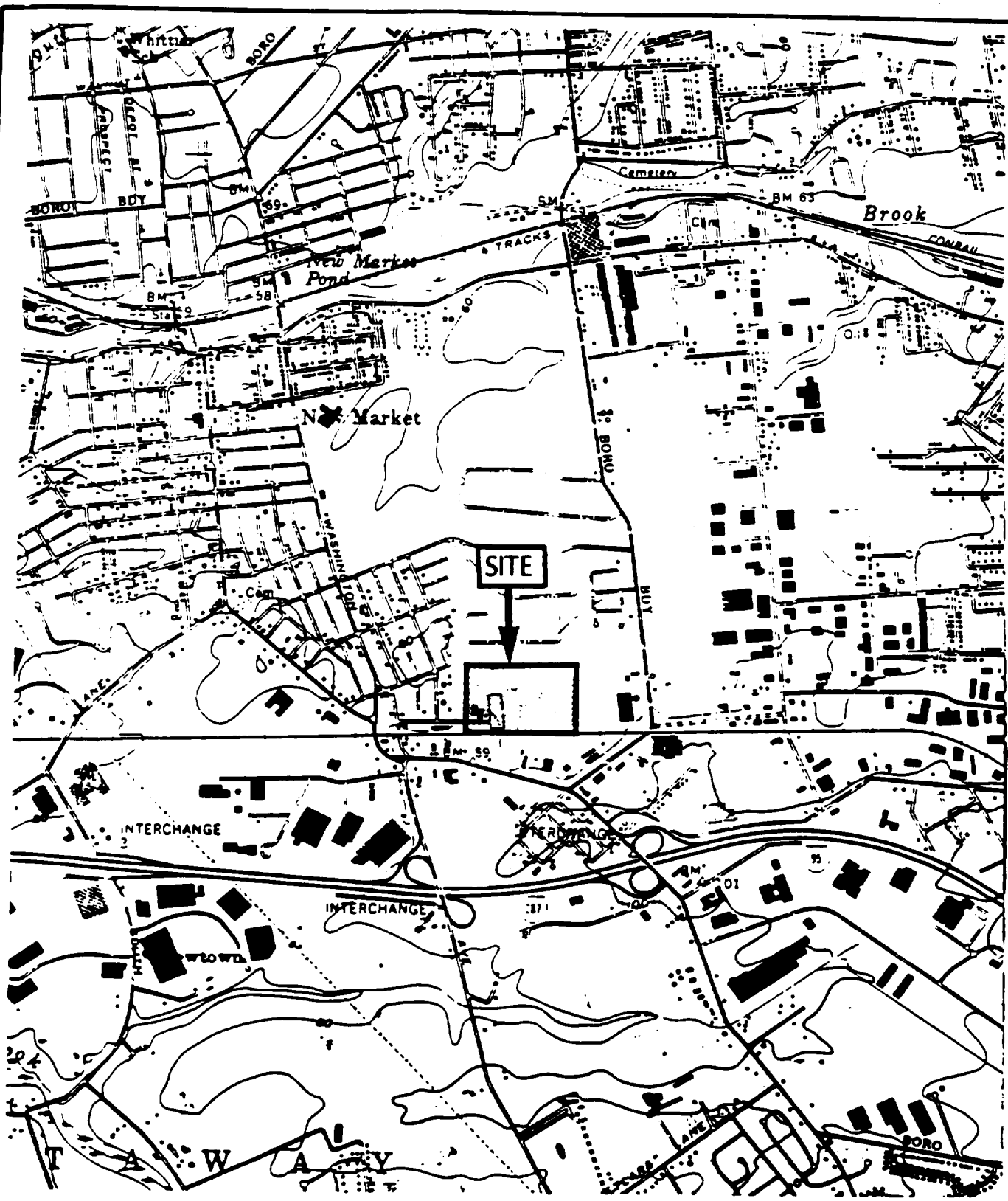

FIGURE 7A: SITE LOCATION

CHEMSOL, INC.

BOTH SITE AND STUDY AREA INDICATED BY SHADING

SOURCE: USGS; PLAINFIELD, NEW JERSEY QUAD; 1981

SCALE: 1" = 2000'

EcolSciences, Inc.

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Jersey (Figure 7A). The site is located within a developed landscape and surrounded by a mix of commercial, industrial and residential areas. A Reading railroad right-of-way is adjacent to the site's southern boundary. The western half of the site contains three razed concrete foundations representing the remnants of the Chemsol solvent recovery and waste reprocessing facility. The eastern half of the site is undeveloped. According to the FFS (1991), three tributaries to Bound Brook are located within the site.

In the 1950's and 1960's, the Chemsol site was occupied by a chemical reprocessing firm known at various times as Chemsol Corporation and Chemsol, Inc. Operations at the site included solvent recovery and waste reprocessing. The owner was ordered by the Township to cease operations in 1964. The plant was dismantled the following year (1965) and operation ceased. In September 1983, the site was placed on the NPL.

Numerous site investigations have been conducted on behalf of the site owners, under ACOs by the NJDEPE. Organic and inorganic compounds have been detected in the site soil and groundwater. Furthermore, sampling of private (residential) wells, located downgradient of the site indicates the presence of organic contaminants in these wells.

Based on the hydrogeologic tests conducted pursuant to the FFS (1991), two water-bearing zones have been identified: a perched water zone in the overburden and a water table in the bedrock zone. Volatile organic compounds, semivolatile organic compounds, inorganic compounds, and pesticides were detected in both the perched zone and the water table (bedrock) zone.

2. **Proposed Remedial Action**

A remedial plan has been proposed for the purpose of preventing further migration of site-related contaminated groundwater in the perched and shallow bedrock water bearing zones.

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revised 9/90

CANDIDATE SPECIES IN NEW JERSEY

CANDIDATE SPECIES are species which appear to warrant consideration for addition to the List of Endangered and Threatened Wildlife. Although these species receive no substantive or procedural protection under the Endangered Species Act, the Service encourages federal agencies and other planners to give consideration to these species in the environmental planning process.

VERTEBRATES

Turtle, bog	Clemmys muhlenbergi	2
Terrapin, northern diamondback	Malaclemys terrapin terrapin	2
Snake, northern pine	Pituophis melanoleucas melanoleucas	2
Shrike, migrant loggerhead	Lanius ludovicianus migrans	2
Bat, eastern small-footed	Myotis subulatus leibii	2
Rabbit, New England cottontail	Sylvilagus transitionalis	2
Shrew, long-tailed	Sorex dispar	2
Shrew, Tuckahoe masked	Sorex cinereus nigriculus	2
Woodrat, eastern	Neotoma floridana magister	2

INVERTEBRATES

Beetle, northeastern beach tiger	Cicindela dorsalis dorsalis	PE
Beetle, cobblestone tiger	Cicindela marginipennis	2
Butterfly, Mitchell satyr	Neonympha mitchelli	2
Butterfly, regal fritillary	Speveria idalia	2
Butterfly, tawny crescent	Phyciodes batesi	2
Dragonfly, banded bog skimmer	Williamsonia lintneri	2
Moth, Albarufan dagger	Acronicta albarufa	2
Moth, bucholz' dart	Agrotis bucholzi	2
Moth, Daecke's pyralid	Crambus daeckeellus	2*
Moth, Hebard's noctuid	Erythroecia hebardi	2
Moth, Lemmer's noctuid	Lithophane lemmeri	2
Moth, precious underwing	Catocala pretiosa	2

PLANTS

Beaked-rush, Knieskern's	Rhynchospora knieskernii	PT
Blazingstar	Liatris borealis	2
Bog asphodel	Narthecium americanum	1
Boneset, Pine Barrens	Eupatorium resinosum	2
ulrush, Long's	Scirpus longii	2
utternut	Juglans cinerea	2

The following sections describe the sites and study areas in the context of their potential to support swamp pink or Knieskern's beaked-rush. A general site description and brief history is provided, including the current remediation proposals, followed by a description of the existing mapping for the site and a description of any other relevant on-site habitat studies.

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III. SITE DESCRIPTIONS

This chapter provides descriptions of each of the nine NPL sites identified by the USFWS as of concern for swamp pink and Knieskern's beaked-rush. These sites and their corresponding section are:

A. [redacted]
B. [redacted]
C. [redacted]
D. Chemsol Inc., Piscataway Township, Middlesex County
E. [redacted]
F. [redacted]
G. [redacted]
H. [redacted]
I. [redacted]

The site descriptions represent a synthesis of information pertaining to existing conditions on each of the sites. Sources of information include but are not limited to:

- o Interviews with the EPA Remedial Project Managers (RPMs) for each of the sites.
- o RI/FS Reports and Records of Decision (RODs) for the sites;
- o Existing mapping for each of the sites including:
  - United States Geological Survey (USGS) 7.5 minute series topographic quadrangles;
  - USFWS National Wetlands Inventory (NWI) mapping;
  - U.S. Department of Agriculture, Soil Conservation Servite (SCS) County Soil Surveys;
  - New Jersey Freshwater Wetlands Mapping, prepared pursuant to the New Jersey Freshwater Wetlands Protection Act, where available;
  - Pine Barrens Vegetation Geography mapping prepared for the New Jersey State Museum (McCormick and Jones, 1973), where appropriate; and
- o Miscellaneous site specific reports, where available.

For purposes of this discussion, the site refers to the area of the dumping, stockpiling of waste, etc. In some cases this area is referred to by municipal block and lot. The study area, on the other hand, refers to the area of contamination, i.e., the area subject to direct impacts due to the proposed remediation plan. Typically, the study area is larger than, and inclusive of, the site.

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includes sweet pepperbush, swamp azalea (Rhododendron viscosum), winterberry, highbush blueberry, swamp sweetbells (Leucothoe racemosa), smooth alder, sweetbay, greenbrier and bayberry (Myrica sp.). Hebaceous associates include pitcher plant (Sarracenia purpurea), blue flag iris (Iris versicolor), golden club, cinnamon fern, swamp dewberry (Rubus hispidus), swamp candles (Lysimachia terrestris), Virginia chain fern (Woodwardia virginiana), skunk cabbage and netted chain fern (Woodwardia areolata).

B. Knieskern's Beaked-rush

1. Background

Knieskern's beaked-rush (Rhynchospora knieskernii) is an annual plant endemic to the Pine Barrens region of New Jersey. The plant was first discovered by Peter D. Knieskern, M.D. in Ocean County, New Jersey in 1843 (Store, 1973) who originally labelled the specimens as Rhynchospora gravana. The species description was not published until John Carey did so in 1847 (Carey 1847), naming it after Dr. Knieskern. Currently, 27 occurrences exist in four counties of New Jersey: Atlantic, Burlington, Monmouth, and Ocean.

An early-successional obligate hydrophyte and poor competitor, Knieskern's beaked-rush inhabits sparsely vegetated, muddy substrates of bog-iron, clay, peat, sand, and gravel. Suitable habitat is maintained in early successional stages by natural or human-induced forces. The number of extant occurrences has declined to 27 from the total record of 41 sites. The decline of this species is attributed to the loss of the required specific open habitat due to vegetative succession, development, and commercial and agricultural activities. Knieskern's beaked-rush was listed as a federally threatened species on July 18, 1991 (USFWS, 1991). The species has also been listed as endangered by the State of New Jersey (NJDEPE, 1990) and as threatened or endangered by the Pinelands Commission (Pinelands Commission, 1987). Figure 1 shows the occurrence of Knieskern's beaked-rush by township in relation to the NPL sites.

2. Description

Knieskern's beaked-rush is a grass-like annual member of the sedge family (Cyperaceae), although in some relatively stable habitats it may be a short-lived perennial. The plant is in fruit from late July to September. It

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Table 1 (continued)

Herbs(continued)	
Equisteum sylvaticum	Equisetum
Lycopus virginicus	Virginia bugleweed
Orontium aquaticum	Golden club
Osmunda cinnamomea	Cinnamon fern
Sphagnum spp.	Sphagnum moss
Symplocarpus foetidus	Skunk cabbage

[1]Source: USFWS Swamp Pink Recovery Plan (1992)

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TABLE 1

Vegetation Associates of *Helonias bullata* [1]

Trees	
Acer rubrum	Red maple
Chamaecyparis thyoides	Atlantic white cedar
Larix lariciana	Amercian larch
Magnolia virginiana	Sweetbay magnolia
Nyssa sylvatica	Black gum
Picea mariana	Black spruce
Picea rubens	Red spruce
Pinus rigida	Pitch pine
Pinus strobus	Eastern white pine
Tsuga canadensis	Eastern hemlock
Shrubs	
Alnus serrulata	Red alder
Ilex ambigua	Caroline holly
Ilex verticillata	Winterberry
Kalmia latifolia	Mountain laurel
Lindera benzoin	Spicebush
Rhododendron arborescens	Smooth azalea
Rosa palustris	Swamp rose
Sambucus canadensis	Elderberry
Vaccinium constablei	Mountain blueberry
Vaccinium corymbosum	Highbush blueberry
Viburnum cassinoides	Witherod
Herbs	
Aster puniceus	Purple-stemmed aster
Aster radula	Rough-leaved aster
Carex collinsii	Collins' sedge
Carex folliculata	Long sedge
Carex muricata	Lesser prickly sedge
Clintonia borealis	Yellow clintonia
Coptis trifolia	Gold thread

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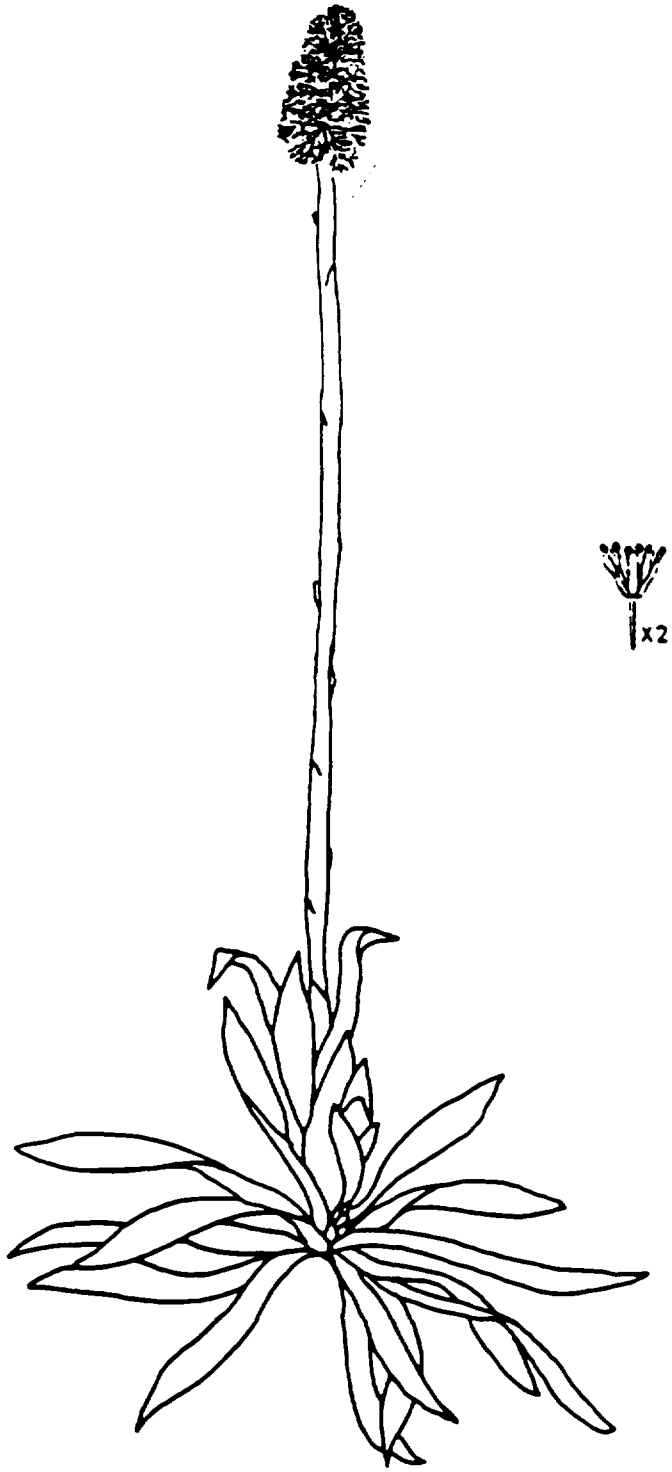

FIGURE 2 : LINE DRAWING OF SWAMP PINK (Helonias bullata)

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seed maturation (USFWS, 1991). Plants bloom as early as March and often last until May, with seed production occurring in June (USFWS, 1991).

The fruit capsule is 3-lobed, papery, 3-5 mm long and 8-10 mm wide, with an inverted heart shape and consisting of many ovules. The ovule opens into six lobes releasing linear-shaped seeds that are 5 mm long with appendages at both ends (USFWS, 1991). A line drawing of the plant is presented in Figure 2.

3. Habitat Requirements

Swamp pink is an obligate hydrophyte (USFWS, 1992). The technical manuals typically describe swamp pink habitat as swamps and bogs (Stone, 1911; Gray, 1950; Britton & Brown, 1952; Gleason, 1963; Hough, 1983). In Brown's 1910 description of the species, he notes its occurrence in New Jersey as in shady swamps on headwater streams and cold swamps in the pines. According to Brown (1910) "...Helonias thrives best in a shaded swamps, often in a tangle of cat-briar and alder, where its roots may go deep into the soft muck." More specific habitats are recorded in the USFWS, National Wetlands Inventory (NWI) database (1992). In addition to swamps and bogs, the following habitats are noted: low woods; open deciduous swamps; cedar swamps; spruce bogs; acid bogs; acid woods; and sphagnous woodlands. The USFWS Recovery Plan for swamp pink (1992) notes its habitat as: swampy forested wetlands bordering meandering streams; headwaters wetlands; sphagnous, hummocky, dense Atlantic white cedar swamp; Blue Ridge swamps; meadows; bogs; and spring seepage areas.

The habitats listed above have a common hydrology characterized by frequently or permanently saturated soils. In addition, as noted by Brown (1910), associated soils area usually organic mucks. The mucks may overlie a sandy or gravelly subsoil (Sutter, 1982; USFWS, 1992). Such soils are poorly or very poorly drained with a seasonal high water table at the surface for long or very long periods.

Table 1 presents vegetative associates of swamp pink identified in the USFWS Recovery Plan (1992). Based on the Contractor's experience in New Jersey, swamp pink occurs in red maple-or Atlantic white cedar-dominated wooded swamps. Subordinate canopy species include black gum and sweetbay. These swamps are also characterized by a very dense woody understory that

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New Jersey supports over half of the total world population of the species. In New Jersey, only 71 extant populations remain of 139 historic records (USFWS, 1991). Because of this, the species has been listed as endangered by the State of New Jersey (NJDEPE, 1990) and as threatened or endangered by the Pinelands Commission (Pinelands Commission, 1987). Figure 1 shows the range of swamp pink in New Jersey relative to the NPL sites. Since 1980, populations have been confirmed in eleven counties: Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Middlesex, Monmouth, Morris, Ocean and Salem (USFWS, 1991). A historical record is known from Mercer County, (Rutgers University, Chrysler Herbarium, 1992).

2. Description

Swamp pink is a perennial herb of the lily family (Liliaceae) (USFWS, 1992) with an evergreen basal rosette of six to twelve, flat, parallel-veined, lanceolate to elongate, spatulate leaves, 0.9-2.5 decimeters (dm) long to 2-4 centimeters (cm) wide, narrowed to a broad petiole (Figure 2). Leaves at time of flowering are not more than one fifth the size they afterwards attain (NJNHP, 1990) typically increasing in length to 4 dm or more as the season progresses. During the winter months, the leaves lie flat or slightly raised from the ground, and are often hidden by fallen leaf litter (USFWS, 1992). In the center of the rosette, the flowerhead and leaves of the next season are tightly rolled together appearing like a large button (Brown, 1910). The winter leaves, although evergreen, often turn reddish brown in color (USFWS, 1992) or are edged or tipped with brown (Brown, 1910). Newly emerging spring leaves are bright green in color (Peterson, 1990).

The inflorescence is a terminal raceme consisting of 30-50 (37.5 mean) fragrant flowers each about 1 cm wide produced in early spring atop a hollow scape (Sutter, 1982). The entire infloresence is 3-10 cm long and about 3 cm thick (NTNHP, 1990). Individual flowers have pedicels which are very short at first, elongating to 4-8 millimeters (mm). The perianth is composed of six spatulate-oblong, pink to lavender segments that are 5-9 mm long and 1-2 mm wide. As the inflorescence elongates, the perianth persists and retains a pink color suffused with green (USFWS, 1991). The sparsely bracteate, blue-green (Brown, 1910) scape arises from the basal rosette and may grow from a height of 2-9 dm at the time of flowering to 1.5 meters (m) at the time of

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II. NATURAL HISTORY

This chapter provides technical background information pertaining to swamp pink and Knieskern's beaked-rush, including detailed descriptions of the plants and their habitat requirements. It represents a review of existing information on these plants. Sources of information included, but were not limited to:

- Technical Manuals such as Gray's Manual of Botany (1950), New Britton & Brown Illustrated Flora (1952), Manual of Vascular Plants (1963) and New Jersey Wild Plants (1983);
- Scientific Journals such as Castanea, Bartonia and Rhodora;
- USFWS Government Publications such as the Swamp Pink and Knieskern's Beaked-rush Recovery Plans, Endangered Species Technical Bulletin and Endangered and Threatened Wildlife and Plants (50 CFR);
- Rutgers University Chrysler Herbarium specimens;
- U.S. Army Corps of Engineers Public Notice on swamp pink;
- Unpublished documents such as the Draft Stewardship Abstract for Swamp Pink (New Jersey Natural Heritage Program) and records from the Plant Species Database (USFWS, National Wetlands Inventory).

The following sections provide background information for each of the species and a description of the species and their preferred habitats.

A. Swamp Pink

1. Background

Swamp pink (*Helonias bullata*) was first collected in the mid 1700's in New Jersey and subsequently in eight other eastern states, i.e., New York, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina and Georgia. Historically, more than 200 records exist, with 122 extant (presently occurring) populations known from six states (USFWS, 1991). Widespread drainage and development of eastern wetlands has resulted in significant population decline and serious habitat threats to this plant. In response to this threat, the USFWS proposed to list swamp pink as a threatened species on February 25, 1988 (USFWS, 1988b). Formal adoption of the listing as threatened was published in the Federal Register on September 9, 1988 (USFWS, 1988a).

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This Draft Habitat Survey Work Plan presents the findings of the literature review phase of the study and describes the methodology that is proposed for use during the field survey. The report begins with a desciption of the natural history and habitat requirements of swamp pink and Knieskern's beaked-rush. Each of the NPL sites are then described with particular reference to existing habitats on-site. Based upon a comparison of the natural habitats of the species of concern with those habitats mapped on-site and existing sightings for the species, a recommendation is made to conduct or not to conduct a field survey. Finally, a proposed methodology to be employed for the field survey work is descibed.

CHM 002 2463

4. Chemsol Inc., Middlesex County
5. [redacted]
6. [redacted]
7. [redacted]
8. [redacted]
9. [redacted]

Additionally, the potential for the occurrence of the habitat of another threatened plant, Knieskern's beaked-rush (Rhynchospora knieskernii), has also been identified near several sites, including:

1. [redacted]
2. [redacted]
3. [redacted]
4. [redacted]

The objective of this special study is to determine through a literature search and possible field survey, whether the federally threatened plant species swamp pink and Knieskern's beaked-rush or their habitats are present on the above-listed NPL sites. Furthermore, because the impact of remedial activities on the above-listed NPL sites may extend beyond the boundaries of the sites, study areas were defined based upon the location of potential habitat for the threatened plant species that may be affected by site remediation.

The Scope of Work for this special study is comprised of task series covering the following items:

1. A review of existing information concerning the habitat requirements of the species;
2. A review of known sightings or locations of suitable species habitat in the vicinity of each of the NPL sites;
3. Development of a habitat survey work plan;
4. Implementation of the habitat survey work plan; and
5. Documentation of the presence of the species in a technical report.

CHM 002 2464

I. INTRODUCTION

The Comprehensive Environmental Response, Compensation and Liability Act, (CERCLA), commonly referred to as "Superfund", was enacted in December 1980. Under CERCLA, the federal government is authorized to compel responsible parties to conduct cleanup of hazardous waste sites or initiate cleanup actions and then determine who is liable for the cost of clean-up. The Superfund Amendments and Reauthorization Act of 1986 (SARA) provided additional funds for Superfund cleanups but did not significantly change the basic principles of Superfund.

Section 121 of CERCLA establishes general rules for selecting and implementing remedial actions at Superfund sites. This section specifies that remedial actions must comply with all applicable, relevant and appropriate requirements (ARARs). Standards, requirements, criteria or limitations under any Federal environmental law are to be met if legally applicable or relevant and appropriate.

Section 7(a) of the Endangered Species Act (1973) requires federal agencies to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the coninued existence of federally endangered and/or threatened species, or adversely modify or destroy the critical habitats of such species. In compliance with this Act, the U.S. Environmental Protection Agency (EPA) conducts informal consultations with the U.S. Fish and Wildlife Service (USFWS) to determine whether there are any federal endangered and/or threatened species or critical habitats present on or in the vicinity of CERCLA National Priorities List (NPL) sites.

As a result of several recent informal consultations (Appendix A), the potential for the presence of the threatened plant species, swamp pink (Helonias bullata), has been identified within the vicinity of various NPL sites in New Jersey, including:

1. [redacted]
2. [redacted]
3. [redacted]

CHM 002 2465

D. Chemsol Inc.

1. Site Description and History

The Chemsol site is a 40-acre parcel of land known as Block 229A, Lots 1-A and 1-B, located in the Township of Piscataway, Middlesex County, New

CHM 002 2466

DRAFT HABITAT SURVEY WORK PLAN
FOR THE
THREATENED SWAMP PINK (HELONIAS BULLATA)
AND THE
THREATENED KNIESKERN'S BEAKED-RUSH
(RHYNCHOSPORA KNIESKERNII)
AT VARIOUS NEW JERSEY NPL SITES

Submitted to:

U.S. Environmental Protection Agency, Region II
26 Federal Plaza
New York, New York 10278

Submitted by:

Gannett Fleming, Inc.
P.O. Box 1963
Harrisburg, Pennsylvania 17105

and

EcolSciences, Inc.
75 Fleetwood Drive
Suite 250
Rockaway, New Jersey 07866

CHM 002 2467

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II

DATE: JUL 09 1992

SUBJECT: Draft Habitat Survey Work Plan for Swamp Pink and Knieskern's Beaked-Rush

FROM: Joanne R. Arenwald, Environmental Scientist
Environmental Impacts Branch

TO: See Below

I am pleased to provide you with a copy of the Draft Habitat Survey Work Plan for the Threatened Swamp Pink (Helonias bullata) and the Threatened Knieskern's Beaked-Rush (Rhynchospora kneiskernii) at Various New Jersey NPL Sites.

Thank you all for your help in the preparation of this document, I hope you will find it informative. As always, I will continue to keep you updated with respect to the progress of this study. In the interim, should you have any questions, please feel free to contact me at x6718.

Attachment

Addressees:
[redacted], 2ERRD-NJS2
[redacted], 2ERRD-NJS2
[redacted], 2ERRD-NJS2
[redacted], 2ERRD-NJS2
[redacted], 2ERRD-NJS1
[redacted], 2ERRD-NJS1
James Haklar, 2ERRD-NJS2

cc: S. Osofsky
L. LaMonica
R. Witte

CHM 002 2468

REGION II FORM 1320-1 (9/85)

Appendix R

CHM 002 2469

APPENDIX R

ECOLOGICAL EXPOSURE AND TOXICITY

TABLE R-1
BIOACCUMULATION FACTORS
CHEMSOL, INC. SITE

CHEMICAL	BIOACCUMULATION FACTOR		
	INVERTEBRATE	SMALL MAMMAL (13)	PLANTS
VOLATILE ORGANICS			
Carbon tetrachloride	1	1	1
Chlorobenzene	1	1	1
Ethylbenzene	1	1	1
1,1,2,2-Tetrachloroethane	1	1	1
Tetrachloroethene	1	1	1
Toluene	1	1	1
1,1,1-Trichloroethane	1	1	1
Trichloroethene	1	1	1
Xylenes (Total)	1	1	1
SEMIVOLATILE ORGANICS			
Bis (2-ethylhexyl)phthalate	1	1	1
1,2-Dichlorobenzene	1	1	1
Di-n-butylphthalate	1	1	1
Di-n-octylphthalate	1	1	1
2-Methylnaphthalene	1	1	1
Naphthalene	1	1	1
1,2,4-Trichlorobenzene	1	1	1
PESTICIDES/PCBs			
Aldrin	30[9]	8.0E-03	1
Alpha-chlordane	30[9]	0.087	1
delta-BHC	30[9]	1	1
Dieldrin	30[9]	1.07	1

TABLE R-1
BIOACCUMULATION FACTORS
CHEMSOL, INC. SITE

CHEMICAL	BIOACCUMULATION FACTOR		
	INVERTEBRATE	SMALL MAMMAL (13)	PLANTS
VOLATILE ORGANICS			
Carbon tetrachloride	1	1	1
Chlorobenzene	1	1	1
Ethylbenzene	1	1	1
1,1,2,2-Tetrachloroethane	1	1	1
Tetrachloroethene	1	1	1
Toluene	1	1	1
1,1,1-Trichloroethane	1	1	1
Trichloroethene	1	1	1
Xylenes (Total)	1	1	1
SEMIVOLATILE ORGANICS			
Bis (2-ethylhexyl)phthalate	1	1	1
1,2-Dichlorobenzene	1	1	1
Di-n-butylphthalate	1	1	1
Di-n-octylphthalate	1	1	1
2-Methylnaphthalene	1	1	1
Naphthalene	1	1	1
1,2,4-Trichlorobenzene	1	1	1
PESTICIDES/PCBs			
Aldrin	30[9]	8.0E-03	1
Alpha-chlordane	30[9]	0.087	1
delta-BHC	30[9]	1	1
Dieldrin	30[9]	1.07	1

(CONTINUED)
TABLE R-1
BIOACCUMULATION FACTORS
CHEMSOL, INC. SITE

CHEMICAL	BIOACCUMULATION FACTOR		
	Invertebrate	Small Mammal	Plants
PESTICIDES/PCBs, continued			
Endosulfan I	30[9]	2.74E-02	1
Endosulfan II	30[9]	0.014	1
Endosulfan sulfate	30[9]	0.0165	1
Endrin aldehyde	30[9]	0.009	1
Endrin ketone	30[9]	9.32E-03	1
Endrin (Total)	30[9]	1.44E-01	1
4,4'-DDD	30[9]	1.12	1
4,4'-DDE	30[9]	2.68	1
4,4'-DDT	30[9]	0.61	1
gamma-Chlordane	30[9]	8.67E-02	1
Heptachlor	30[9]	0.33	1
Lindane (total)	30[9]	0.34	1
Toxaphene	30[9]	0.0011	1
Aroclor 1248	30[9]	7.91	1
Aroclor 1252	30[9]	7.91	1
Aroclor 1254	30[9]	7.91	1
Aroclor 1260	30[9]	7.91	1
INORGANIC COMPOUNDS			
Antimony	1	1	0.20[12]
Cadmium	4[4]	2[8]	0.55[12]
Chromium	1.26[3]	1	0.008[12]
Copper	6.83[5]	1	0.40[12]
Lead	7[10]	1	0.045[12]
Mercury	1	1	0.90[12]

(CONTINUED)
TABLE R-1
BIOACCUMULATION FACTORS
CHEMSOL, INC. SITE

CHEMICAL	BIOACCUMULATION FACTOR		
	Invertebrate	Small Mammal	Plants
INORGANIC COMPOUNDS, continued			
Arsenic	9.5[10]	1	0.04[12]
Manganese	0.4[11]	1	0.025[12]
Beryllium	1	1	0.01[12]
Vanadium	1	1	0.006[12]
Nickel	1.82[6]	1	0.06[12]
Silver	1	1	0.40[12]
Thallium	1	1	0.004[12]
Zinc	8.32[7]	0.77[8]	1.5[12]

NR Not reported

1 Bioaccumulation factors were conservatively estimated as 1 when empirical data were unavailable.

2 Earthworm bioaccumulation factor values (Diercxsens et al., 1985).*

3 Earthworm bioaccumulation factor values (Beyer and Chromartie, 1987).*

4 Estimation of bioaccumulation factor value for carnivorous invertebrates as reported in invertebrates (Roberts and Johnson [1978] as reported in Hughes et al., 1980).*

5 Estimation of isopod bioaccumulation factor value (Wieser et al. [1976] as reported in Hughes et al., 1980)

6 Earthworm bioaccumulation factor value (Kabata-Pendias and Pendias, 1984).

7 Estimation of earthworm bioaccumulation factor value (Hughes et al., 1980).

8 Estimation of bioaccumulation factor values for invertebrate-eating small mammal (Roberts and Johnson [1978] as reported in Hughes et al., 1980).

9. Estimation of earthworm bioaccumulation factor (Menzie et al. 1992).

10. Earthworm bioaccumulation factor (Arden et al. 1973).

11. Earthworm bioaccumulation factors (Beyer, W.N. and C. Stafford, 1993).

12. Plant bioaccumulation factors (Baes et al. 1984).

13. BAF mammal taken directly from Garten and Trabalka (1983) and multiplied by 0.25, assuming 25% fat in mammalian fresh.

7 .E R-2
SUMMARY OF AN..AL TOXICITY DATA
CHEMSOL SITE
MAMMALS

CHEMICAL	SPECIES	TEST ENDPOINT	DURATION	MEASURED EFFECT	REPORTED VALUE	REFERENCE
VOLATILE ORGANICS						
Ethylbenzene	Rat	subchronic NOAEL	NR	liver and kidney	136 mg/kg/day	IRIS, 1993
Tetrachloroethylene	Mouse	subchronic NOAEL	6 weeks	liver toxicity	14 mg/kg/day	IRIS, 1994
Trichloroethylene	Rat	acute LD_{50}	single dose	mortality	7617 mg/kg	RTECS, 1993
Toluene	Rat	chronic NOAEL	NR	liver and kidney	223 mg/kg/day	IRIS, 1993
Xylenes	Rat	acute LD_{50}	single dose	liver/kidney/ureter/bladder, mortality	4300 mg/kg	RTECS, 1993
Carbon tetrachloride	Female rat	subchronic NOAEL	5-6 weeks	reproduction	15	Alumot et al., 1976
1,1,2,2-Tetrachlorethane	Rat	subchronic LOAEL	27 weeks	irreversible testicular damage	3.2	ATSDR, 1989
1,2,4-Trichlorobenzene	Rat	LOAEL	9-13 days of gestation	embryonic development	360 mg/kg/day	HSDB, 1994
Chlorobenzene	Rat	subchronic LOAEL	91 days	liver necrosis kidney	250 mg/kg/day	HSDB, 1994
1,2-Dichlorobenzene	Rat	LOAEL	3 days	liver effects	250 mg/kg/day	HSDB, 1994
1,1,1-Trichloroethane	Rat	chronic LOAEL	78 wk	mortality	750 mg/kg/day	HSDB, 1994

TABLE R-2
SUMMARY OF ANIMAL TOXICITY DATA
CHEMSOL SITE

CHEMICAL	SPECIES	TEST ENDPOINT	DURATION	MEASURED EFFECT	REPORTED VALUE	REFERENCE
VOLATILE ORGANICS						
Trichloroethylene	Mouse	LD_{10}	1 dose	mortality	1161 mg/kgbw	HSDB, 1994
SEMIVOLATILE ORGANICS						
Bis(2-ethylhexyl)phthalate	Rat	chronic NOAEL	1 year	NR	1300 mg/kg/day	Krauskopf, 1973
Di-n-butylphthalate	Rat	chronic NOAEL	NR	mortality	125 mg/kg/day	IRIS, 1993
di(n-octyl)phthalate	Rat	subchronic LOAEL	21 days	liver necrosis	1,600 mg/kg/day	HSDB, 1994
Naphthalene	Rat	chronic NOAEL	700 days	mortality	41 mg/kg/day	ATSDR, 1994
2-Methylnaphthalene	Rat	LD_{50}	1 dose	mortality	1630	NIOSH, 1985

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TABLE R-2
SUMMARY OF ANIMAL TOXICITY DATA
CHEMSOL SITE
MAMMALS

CHEMICAL	SPECIES	TEST ENDPOINT	DURATION	MEASURED EFFECT	REPORTED VALUE	REFERENCE
PESTICIDES/PCBs						
Delta BHC	Mouse	subchronic NOAEL	30 days	normal uteri and cycling	3.9 mg/kg/day	Cornacoff et. al. 1988
Lindane	Mouse	LOAEL	gestation	increased fetal resorption	5 mg/kg/day	Sircar and Lahiri, 1989
Heptachlor/ heptachlor epoxide	Mink	subacute LOAEL	28 days	feed consumption	12.5 mg/kg/day	Aulerich et al., 1990
Aldrin	Rat	Chronic LOAEL	3 generations	reproduction of offspring mortality	1.3 mg/kg/day	HSDB, 1994
Endosulfan I, II Endosulfan sulfate	Rat	LOAEL	days 6-14 gestation	skeletal anomalies in pups	13 mg/kg/day	Raltech, 1980
Dieldrin	Shrew	subchronic LOAEL	14 days	mortality	651 mg/kg/day	Blus, 1978
4,4'DDE,4,4'DDD 4,4'DDT	Shrew	subchronic LOAEL	14 days	mortality	651 mg/kg/day	Blus, 1978
Endrin/Endrin ketone and aldehyde	Shrew	subchronic LOAEL	14 days	mortality	50	Blus, 1978
Chlordane	Mouse	LOAEL	1-19 days at gestation	increased mortality of pups	0.8 mg/kg/day	Cranmer et al., 1984
Toxaphene	Rat	LOAEL	during organogenesis	fetal toxicity	15 mg/kg/day	Pollock and Kilgore, 1978

T(R-2
SUMMARY OF AN..AL TOXICITY DATA
CHEMSOL SITE
MAMMALS

CHEMICAL	SPECIES	TEST ENDPOINT	DURATION	MEASURED EFFECT	REPORTED VALUE	REFERENCE
PCBs Aroclor-1248, -1254, -1260	Rat	subchronic NOAEL	42 days	neonatal death	13 mg/kg/day	Overman, et al., 1987
Aroclor-1242	Mink	acute LD_{50}	single dose	mortality	3000 mg/kg	Eisler, 1986b
INORGANIC COMPOUNDS						
Arsenic	mouse	chronic LOAEL	2yrs	histopathology	1.5	Byron et al., 1967
Barium	rat	chronic NOAEL	NA	systemic	0.70	ATSDR, 1992
Beryllium	mouse	LD50	single dose	mortality	0.5	Gough et.al., 1979
Copper	Mouse	chronic NOAEL	gestation 0-19 days	malformation of offspring	78	Lecyk, 1980
Antimony	Mouse	chronic NOAEL	504-909 days	NR	0.35	ATSDR, 1992
Chromium (CR+3)	Rat	chronic LOAEL	840 days	various effects	1468	IRIS, 1993
Cadmium	Rat	LOAEL	12 wks	hepatic and renal necrosis	14	ATSDR, 1992

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TABLE R-2
SUMMARY OF ANIMAL TOXICITY DATA
CHEMSOL SITE
MAMMALS

CHEMICAL	SPECIES	TEST ENDPOINT	DURATION	MEASURED EFFECT	REPORTED VALUE	REFERENCE
INORGANIC COMPOUNDS (Cont'd)						
Lead	Rat	chronic LOAEL	30 days before mating	estrus cycles, prostate weights	5 mg/kg/day	Hilderbrand, 1973
Manganese	Rat	chronic NOAEL	NA	hematopoietic	180	ATSDR, 1990
Vanadium	mouse	chronic NOAEL	25 yr	systematic	0.54	Schroeder and Mitchner, 1975 cited in ATSDR, 1990
Zinc	Rat	subchronic NOAEL	21 day, 1-15 days gestation	fetal resorptions, malformations	100 mg/kg/day	Schlicker, S.A. Cox, D.H. 1968
Thallium chloride	Rat	subchronic NOAEL	90 day	neurotoxic ophthalmic	0.25	IRIS, 1987
Silver	Mouse	LOAEL	125 days	deposits in nervous system	18.1 mg/kg/day	Rungby and Danscher, 1984

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TABLE R-2
SUMMARY OF ANIMAL TOXICITY DATA
CHEMSOL SITE
BIRDS

CHEMICAL	SPECIES	TEST ENDPOINT	DURATION	MEASURED EFFECT	REPORTED VALUE (mg/kg/day)	REFERENCE
PESTICIDES						
delta-BHC	Coturnix	LD_{50}	5 day	mortality	45	Hill and Comardese, 1986
Dieldrin	Rock dove	LD_{50}	NR	mortality	23.7	Schafer et al. 1983
Aldrin	House sparrow	LD_{50}	NR	mortality	13.3	Schafer et al. 1983
Lindane	Japanese quail	chronic NOAEL	90 day	reproduction	5	Verschueren, 1983
Endrin	Mallard	chronic NOAEL	NR	egg hatchability	0.038	Roylance et al., 1985
Heptachlor	Woodcock	chronic NOAEL	60 days	mortality	0.65	Stickel, 1965
Endosulfan	Coturnix	LD_{50}	5 days	mortality	233	Hill and Comardese, 1984
4,4'-DDT, DDE, DDD	Kestrel	chronic LOAEL	7 months	reproduction	0.17	Wiemeyer et al. 1986
Chlordane	Japanese quail	LD_{50}	5 days	mortality	35	Hill et al., 1975
Toxaphene	Bobwhite quail	chronic LOAEL		behavioral	0.8	Kreitzer, J.F. 1980
PCB Aroclor-1254	Kestrel	subchronic LOAEL	69 days	reduced sperm production	9	Eisler, 1986b
Endosulfan I	Duck	acute LD_{50}	single dose	NR	33 mg/kg	RTECS, 1994

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CHEMICAL	SPECIES	TEST ENDPOINT	DURATION	MEASURED EFFECT	REPORTED VALUE	REFERENCE
INORGANICS						
Arsenic	California Qual	Acute LD50	single dose	mortality	47.6	Eisler, 1988
Chromium CR+6	Black duck	chronic NOAEL	5 months	growth patterns altered	8	Eisler, 1986
Lead	Mallard	subchronic LD50	5 day	mortality	107	Hudson et al., 1984
Methyl mercury	Mallard	chronic LOAEL	lifetime	fertility, food conversion	0.007	Heinz, 1972
Zinc	Mallard	chronic NOAEL	30 day	paralysis food consumption	12	Gasaway and Buss, 1972
Nickel	Coturnix	LD_{50}	5 day	mortality	400	Hill and Comardese, 1984
Copper	Mallard	chronic LOAEL	NS		29	NRC, 1977
Chromium	Black duck	chronic LOAEL	5 months	growth patterns	3.5	Eisler, 1986a
Cadmium	Japanese quail	subchronic LOAEL	6 wks	bone marrow hypoplasia	7.6	Eisler, 1985

RTV = Reference Toxicity Value
NR = Details not reported
NA = Data not available

APPENDIX R-3
AQUATIC TOXICITY DATA

Cobalt:

Species	Endpoint	Concentration (ug/L) (#listings)
C. dubia	Acute LC50 mortality chronic NOEC mortality	>5275 <50 (4) 600 (1)
D. magna	EC50 reproduction 21day EC50 immobilization	12 (1) 21 (1)
Microhyla carolinensis(narrow-mouthed frog)	7d LC50	50 (1)
C. pipiens (mosquito)	ET50 5d	45 (effects on pupae observed in 5 days at this concentration)
Orconectes limosus (crayfish)	30 day LC50 mortality	790 (1) 880 (1)

Manganese:

Species	Endpoint	Concentration (ug/L) (#listings)
Daphnia magna	21 day EC50 reproduction	5200(1)
Orconectes limosus (crayfish)	30 day LC50 mortality	3400-3600(1)
Microhyla carolinensis	7-day LC50 mortality	1420(1)

Vanadium:

Species	Endpoint	Concentration (ug/L) (#listings)
Daphnia magna	EC50	1800(1)
Microhyla carolinensis	7-day LC50 mortality	250(1)