Table 1: Contaminants of Potential Concern for the Onondaga Lake HHRA

Contaminant	Fish Tissue (Fillets)	Northern Basin Sediments	Southern Basin Sediments	Onondaga Lake Surface Water
Metals/Inorganics				
Aluminum			·	NA-S
Antimony	·	·	·	NA-S
Arsenic (inorganic)	·	·	·	NA-S
Barium		·	·	NA-S
Cadmium		·	·	·
Chromium	·	·	·	·
Copper			·	
Cyanide	·		·	NA-S
Iron		·	·	
Lead			·	
Manganese	·	·	·	·
Methylmercury	·	·	·	·
Mercury (inorganic)	·	·	·	·
Nickel			·	
Selenium	·			NA-S
Thallium		·	·	NA-S
Vanadium	·		·	NA-S
Zinc	·			
Volatile Organic Compounds				
Benzene		·	·	·
Bromodichloromethane				·
Chlorobenzene			·	·
Chloroform				·
Methylene Chloride			·	
Total Xylenes (sum)			·	
Semivolatile Organic Compounds				
Bis(2-ethylhexyl)phthalate	·			NA-S
Dibenzofuran			·	NA-S
1,2-Dichlorobenzene				·
1,3-Dichlorobenzene			·	·
1,4-Dichlorobenzene			·	·
1,2,4-Trichlorobenzene				·
Hexachlorobenzene	·	·	·	

Table 1 (cont.)

Contaminant	Fish Tissue (Fillets)	Northern Basin Sediments	Southern Basin Sediments	Onondaga Lake Surface Water
Polycyclic Aromatic Hydrocarbons				
Acenaphthylene			·	NA-S
Benz(a)anthracene		·	·	NA-S
Benzo(a)pyrene		·	·	NA-S
Benzo(b)fluoranthene		·	·	NA-S
Benzo(g,h,i)perylene			·	NA-S
Benzo(k)fluoranthene			·	NA-S
Chrysene			·	NA-S
Dibenz(a,h)anthracene		·	·	NA-S
Fluoranthene			·	NA-S
Indeno(1,2,3-cd)pyrene			·	NA-S
2-Methylnaphthalene			·	NA-S
Naphthalene		·	·	NA-S
Phenanthrene			·	NA-S
Pesticides				
Aldrin	·			NA-S
delta-BHC	·			NA-S
Chlordanes (total)	·			NA-S
2,4'-DDE	·			NA-S
4,4-DDD	·			NA-S
4,4'-DDE	·			NA-S
4,4'-DDT	·			NA-S
Dieldrin	·		·	NA-S
Heptachlor Epoxide	·			NA-S
Polychlorinated Biphenyls				
Aroclor 1016	·			NA-S
Aroclor 1221			·	NA-S
Aroclor 1242	·		·	NA-S
Aroclor 1248	·		·	NA-S
Aroclor 1254		·	·	NA-S
Aroclor 1260	·		·	NA-S
Aroclor 1254/1260	·			NA-S
Aroclor 1268		·		NA-S
Total PCBs (sum)	·	·	·	NA-S
Dioxins/Furans				
Total PCDD/PCDF TEQ	·	·	·	NA

Notes: · - Specified contaminant identified as a contaminant of potential concern (COPC).
NA - This analyte or parameter group not analyzed in specified exposure area.
NA-S - This analyte not analyzed in shallow surface water (0-3 m). Data from deeper samples (6-12 m water depth) used to qualitatively evaluate this COPC.

Table 2: Contaminants and Stressors of Concern Selected for Onondaga Lake Media in the BERA

Contaminant	Water	Sediment	Soil	Plants	Fish
Metals					
Antimony		·	·		·
Arsenic		·	·	·	·
Barium	·		·		
Cadmium		·	·	·	
Chromium		·	·	·	·
Copper	·	·	·	·	
Iron			·		
Lead	·	·	·	·	
Manganese	·	·	·		
Mercury/Methylmercury	·	·	·	·	·
Nickel		·	·	·	
Selenium		·	·	·	·
Silver		·	·	·	
Thallium			·	·	
Vanadium		·	·	·	·
Zinc	·	·	·	·	·
Cyanide	·		·		
Volatile Organic Compounds					
Benzene		·	·		
Chlorobenzene	·	·	·		
Dichlorobenzenes (Sum)	·	·	·		
Ethylbenzene		·			
Toluene		·			
Trichlorobenzenes (Sum)	·	·	·		
Xylene isomers		·			
Semivolatile Organic Compounds					
Bis(2-ethylhexyl)phthalate	·				
Dibenzofuran		·			
Hexachlorobenzene		·	·		
Phenol		·	·		
Polycyclic aromatic hydrocarbon (total)		·	·		
Pesticides/Polychlorinated Biphenyls					
Aldrin			·		
Chlordane isomers		·	·		
DDT and metabolites		·	·		·
Dieldrin		·	·		
Endrin					·
Hexachlorocyclohexanes			·		
Heptachlor and heptachlor epoxide		·			
Total PCBs (sum)		·	·		·
Dioxins/Furans					
Total dioxins/furans		·			·
Stressors of Concern					
Calcium	·	·			
Oncolites		·			
Chloride	·				
Salinity	·				
Ammonia	·				
Nitrite	·				
Phosphorus	·				
Sulfide	·				
Dissolved oxygen	·				
Transparency	·				

Note: · – Contaminants and stressors of concern assessed in the BERA for the specific media listed.

Table 3: Concentrations of Select Contaminants in Onondaga Lake Sediments (1992)

		0-2 cm		0 to 30 cm		30 to 60 cm		60 to 90 cm		90 to 120 cm		120 to 150 cm		150 to 180 cm		180 to 210 cm	
Analyte	**Units**	**Maximum Detection**	**Mean**	**Maximum Detection**	**Mean**	**Maximum Detection**	**Mean**	**Maximum Detection**	**Mean**	**Maximum Detection**	**Mean**	**Maximum Detection**	**Mean**	**Maximum Detection**	**Mean**	**Maximum Detection**	**Mean**
Arsenic	mg/kg	11.2	3.0	8.00	4.04	9.90	3.96	11.0	3.91	9.80	5.03	6.70	6.10	NA	NA	NA	NA
Barium	mg/kg	890	179	708	177	707	169	352	135	208	154	148	128	NA	NA	NA	NA
Cadmium	mg/kg	14.2	2.5	22.8	10.8	53.6	21.5	55.9	11.3	85.8	10.2	22.1	4.35	4.00	3.90	4.80	2.95
Chromium	mg/kg	1,990	79.2	1,190	186	1,710	341	625	116	608	81.5	234	49.7	63.3	34.8	67.4	43.2
Mercury	mg/kg	68.9	3.9	74.0	11.1	76.0	20.0	71.0	9.47	60.9	12.0	72.7	20.1	62.6	16.3	60.7	32.2
Nickel	mg/kg	650	27.8	219	53.4	232	85.3	114	40.0	102	33.4	72.2	30.9	29.6	24.4	42.6	31.6
Zinc	mg/kg	276	114	453	268	705	335	651	218	783	192	476	147	263	119	264	206
Benzene	µg/kg	5,700	447	12,000	959	17,000	1,058	24,000	2,474	18,000	2,872	34,000	3,978	13,000	13,000	16,000	16,000
Toluene	µg/kg	4,200	149	14,000	1,440	32,000	2,156	22,000	2,500	28,000	3,621	15,000	3,713	ND	ND	17,000	9,050
Ethylbenzene	µg/kg	1,300	658	9,100	3,465	6,400	2,385	15,000	3,741	6,600	2,590	4,000	1,929	ND	ND	1,700	1,700
Xylene (Total)	µg/kg	13,000	3,619	110,000	7,964	120,000	9,569	110,000	22,081	140,000	26,251	85,000	22,026	36,000	36,000	43,000	43,000
Chlorobenzene	µg/kg	43,000	3,025	360,000	19,026	160,000	11,445	220,000	16,937	150,000	26,389	250,000	34,576	170,000	85,003	72,000	72,000
1,2-Dichlorobenzene	µg/kg	7,900	1,050	24,000	1,630	270,000	13,958	150,000	23,036	270,000	47,269	220,000	47,701	310,000	310,000	160,000	160,000
1,3-Dichlorobenzene	µg/kg	6,800	1,487	39,000	1,185	41,000	3,556	26,000	4,668	24,000	5,016	11,000	3,054	6.00	6.00	ND	ND
1,4-Dichlorobenzene	µg/kg	16,000	1,380	250,000	8,436	760,000	34,386	460,000	47,826	530,000	70,362	550,000	66,600	710,000	355,003	300,000	300,000
Hexachlorobenzene	µg/kg	1,200	63.0	20,000	1,059	7,700	441	17,000	847	3,400	479	1,100	283	1,300	1,300	1,900	955
Naphthalene	µg/kg	30,000	3,415	150,000	19,530	740,000	137,000	630,000	108,538	870,000	200,750	360,000	90,573	NA	NA	50,000	50,000
Aroclor-1016	µg/kg	180	135	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor-1221	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor-1232	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor-1242	µg/kg	ND	ND	830	757	890	645	1,800	1,450	430	430	ND	ND	ND	ND	ND	ND
Aroclor-1248	µg/kg	1,100	173	4,200	680	6,900	1,092	2,800	769	3,800	804	770	378	810	810	390	390
Aroclor-1254	µg/kg	100	80.7	510	350	540	335	240	195	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor-1260	µg/kg	1,000	218	1,800	373	2,900	647	1,900	589	4,100	693	2,000	556	320	320	190	190
Total PCBs (sum)	µg/kg	2,100	255.6	6,000	1,028	9,800	1,671	4,500	1,308	6,000	1,441	2,510	887	1,130	1,130	580	580

Source: These values were taken from Appendix G1 of the Onondaga Lake RI report.
NA=not analyzed
ND=not detected

Table 4: Concentrations of Select Contaminants in Lake Stratigraphy Sediment Samples Collected from Onondaga Lake (1992)

Analyte	Concentration Units	Measurement Basis	Maximum Detection	Mean
0-5 cm				
Cadmium	mg/kg	dw	12.8	5.2
Chromium	mg/kg	dw	194	54
Mercury	mg/kg	dw	4.4	2.8
Nickel	mg/kg	dw	51	22
Zinc	mg/kg	dw	510	186
5-15 cm				
Cadmium	mg/kg	dw	11	4.6
Chromium	mg/kg	dw	292	74
Mercury	mg/kg	dw	3.1	1.4
Nickel	mg/kg	dw	80	28
Zinc	mg/kg	dw	597	231
15-30 cm				
Cadmium	mg/kg	dw	37	20
Chromium	mg/kg	dw	749	264
Mercury	mg/kg	dw	70	31
Nickel	mg/kg	dw	221	80
Zinc	mg/kg	dw	576	324
30-100 cm				
Cadmium	mg/kg	dw	50	17
Chromium	mg/kg	dw	646	151
Mercury	mg/kg	dw	42	6.9
Nickel	mg/kg	dw	149	52
Zinc	mg/kg	dw	609	263
100-200 cm				
Cadmium	mg/kg	dw	65	14
Chromium	mg/kg	dw	535	56
Mercury	mg/kg	dw	29	17
Nickel	mg/kg	dw	108	24
Zinc	mg/kg	dw	727	156
200-300 cm				
Cadmium	mg/kg	dw	1.4	0.77
Chromium	mg/kg	dw	29	11
Mercury	mg/kg	dw	51	30
Nickel	mg/kg	dw	68	17
Zinc	mg/kg	dw	421	70

Source: These values were taken from Appendix G1 of the Onondaga Lake RI report.
Note: Intervals reported include data from anywhere within that interval. For example, data reported for 0 to 5 cm include data collected from 0 to 2, 0 to 4, and 2 to 5 cm.

Table 5: Concentrations of Select Contaminants in Onondaga Lake Sediments (2000)

		0 to 5 cm [1]		0 to 15 cm [2]		15 to 30 cm		30 to 100 cm		100 to 200 cm	
	Concentration	Maximum		Maximum		Maximum		Maximum		Maximum	
Analyte	Units	Detection	Mean	Detection	Mean	Detection	Mean	Detection	Mean	Detection	Mean
Arsenic	mg/kg	19	5.55	47.3	6.13	39.7	6.78	33.6	8.47	38.9	9.23
Barium	mg/kg	1,640	277	2,070	357	22,600	696	4,760	637	4,120	587
Cadmium	mg/kg	2.6	0.97	14.9	2.11	42	3.80	88.5	9.22	47.6	5.47
Chromium	mg/kg	229	64.5	4,180	237	4,950	283	6,310	486	11,300	487
Methylmercury	µg/kg	61.1	16.0	121	12	NA	NA	NA	NA	NA	NA
Total Mercury	mg/kg	12	3.39	77.7	5.62	55	6.23	48.6	10.3	87.1	9.59
Nickel	mg/kg	107	25	1,670	88.6	1,610	96.3	2,020	129	4,640	174
Zinc	mg/kg	160	77.1	421	127	2,260	154	1,530	221	819	158
Benzene	µg/kg	30,000	6,104	42,000	2,050	180,000	5,550	270,000	7,640	140,000	9,780
Toluene	µg/kg	6,900	2,430	8,300	2,040	37,000	4,080	47,000	7,220	230,000	13,600
Ethylbenzene	µg/kg	71,000	14,400	7,000	1,210	13,000	1,820	13,000	1,890	18,000	2,280
Xylene (Total)	µg/kg	330,000	86,262	150,000	15,212	270,000	23,352	240,000	31,884	430,000	43,358
Chlorobenzene	µg/kg	2,900	1,450	1,000,000	36,900	310,000	38,200	640,000	48,200	210,000	16,700
1,2-Dichlorobenzene	µg/kg	1,800	1,100	48,000	6,360	200,000	14,400	55,000	7,550	24,000	4,800
1,3-Dichlorobenzene	µg/kg	ND	ND	37,000	5,240	7,000	1,820	35,000	2,970	2,100	435
1,4-Dichlorobenzene	µg/kg	4,200	2,300	170,000	13,115	460,000	24,700	120,000	11,400	24,000	4,360
Hexachlorobenzene	µg/kg	ND	ND	140	140	300	280	ND	ND	110	100.5
Hexachlorobenzene (GC/ECD)	µg/kg	247	60.1	6,750	205	2,630	148	981	114	356	66.7
Naphthalene	µg/kg	26,000,000	5,210,000	170,000	26,300	560,000	50,500	770,000	51,300	1,300,000	111,000
Aroclor 1016	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	µg/kg	ND	ND	1,550	1,020	2,390	1,200	1,680	1,300	4,460	2,750
Aroclor 1232	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	µg/kg	161	49.6	10,500	734	4,160	643	17,900	1,160	1,810	315
Aroclor 1248	µg/kg	60.5	60.5	122	61.1	170	132	5,150	1,220	1,540	815
Aroclor 1254	µg/kg	142	56.8	1,010	157	2,480	351	9,430	583	1,440	266
Aroclor 1260	µg/kg	57.6	28.8	1,020	117	878	146.7	1,880	228	1,600	256
Aroclor 1268	µg/kg	75.6	75.6	313	119	58	33.4	376	130	237	105
Total PCBs (sum)	µg/kg	5,780	761	20,955	1,155	4,663	1,045	29,210	1,730	4,486	728
PCDD/PCDF TEQs (mammalian)	ng/kg	8.37	8.37	165	46.6	715	102	426	140	284	73.1

Table 5 (cont.)

Analyte	Concentration Units	200 to 300 cm Maximum Detection	200 to 300 cm Mean	300 to 400 cm Maximum Detection	300 to 400 cm Mean	400 to 500 cm Maximum Detection	400 to 500 cm Mean	500 to 600 cm Maximum Detection	500 to 600 cm Mean	600 to 700 cm Maximum Detection	600 to 700 cm Mean	700 to 800 cm Maximum Detection	700 to 800 cm Mean
Arsenic	mg/kg	11.8	6.70	26.9	8.01	29.2	6.75	67.2	7.90	44.5	6.37	26.4	4.63
Barium	mg/kg	1,810	357	1,540	278	1,050	205	954	147	1,170	189	134	91.1
Cadmium	mg/kg	16.6	2.72	22.2	3.17	4.8	1.08	3.5	0.98	3.2	0.82	1.2	0.33
Chromium	mg/kg	260	39.6	158	36.5	72.5	23.6	68.7	20.1	89.8	20.4	22.8	14.8
Methylmercury	µg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Mercury	mg/kg	125	26.0	110	16.9	28.9	3.56	6.2	1.21	2.7	0.84	0.85	0.35
Nickel	mg/kg	106	25.7	71.6	25.9	85.1	22.5	62.9	18.4	53	17.7	22.1	14.7
Zinc	mg/kg	539	159	613	158	574	104	252	84.9	189	74.4	99.9	64.0
Benzene	µg/kg	3,600	807.9	9,300	1,200	6,300	959.7	4,400	917.6	3,600	740	34	21.6
Toluene	µg/kg	18,000	3,047	16,000	4,610	8,900	2,260	20,000	4,140	19,000	4,440	230	133
Ethylbenzene	µg/kg	7,100	1,500	40,000	7,670	15,000	2,450	4,900	1,240	11,000	2,293	90	58.5
Xylene (Total)	µg/kg	93,000	14,245	276,000	39,458	123,000	19,337	70,000	7,276	166,000	21,836	640	165
Chlorobenzene	µg/kg	6,700	1,990	24,000	8,170	9,400	2,740	16,000	8,700	5,600	3,370	ND	ND
1,2-Dichlorobenzene	µg/kg	29,000	13,300	5,500	3,500	5,000	3,000	1,600	1,500	2,100	1,490	ND	ND
1,3-Dichlorobenzene	µg/kg	650	270	180	150	700	700	ND	ND	2,400	2,400	ND	ND
1,4-Dichlorobenzene	µg/kg	49,000	11,700	6,900	3,097	4,400	3,770	3,100	2,750	13,000	5,970	ND	ND
Hexachlorobenzene	µg/kg	1,600	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene (GC/ECD)	µg/kg	1,880	294	398	69.3	159	38.8	35	9.01	50	14.8	ND	ND
Naphthalene	µg/kg	210,000	70,700	250,000	57,360	85,000	20,800	67,000	14,800	190,000	53,300	3,800	1,130
Aroclor 1016	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	µg/kg	492	194	229	152	269	196	104	62.5	516	215	162	92.8
Aroclor 1248	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	17.7	17.7	ND	ND
Aroclor 1254	µg/kg	180	124.5	135	87.7	78.1	63.8	36.9	24.8	32.9	22.2	15.5	15.5
Aroclor 1260	µg/kg	1,050	297	487	121	66.7	39.5	35	24.3	53.7	29.5	ND	ND
Aroclor 1268	µg/kg	141	73	1260	397	355	355.0	ND	ND	ND	ND	ND	ND
Total PCBs (sum)	µg/kg	1,550	407	1,520	419	545	236	204	81	666	166	178	113
PCDD/PCDF TEQs (mammalian)	ng/kg	149	36	129	28	37.2	10.7	3.68	2.38	1.22	0.53	0.18	0.18

Source: These values were taken from Appendix G1 of the Onondaga Lake RI report except for the methylmercury, total PCBs, and PCDD/PCDF TEQs values, which were obtained from the Onondaga Lake database.

ND=not detected
NA=not analyzed

1. The statistics for the 0 to 5 cm depth interval include data collected from 0 to 2 cm.
2. The statistics for the 0 to 15 cm depth interval include data collected from 2 to 15 cm.
3. PCDD/PCDF TEQs were calculated using World Health Organization TEFs for mammals.

Table 6: Concentrations of Select Contaminants in Surface Water of Onondaga Lake

Contaminant	Units	NYSDEC Standard/Guidance for Human Consumption of Fish	NYSDEC Standard/Guidance for Wildlife Protection	NYSDEC Standard/Guidance for Fish Propagation, Aquatic (Chronic)	NYSDEC Standard/Guidance for Fish Survival, Aquatic (Acute)	Surface Water Concentrations [1,2]											
						1992 data, 0 to 9 meters			1992 data, below 9 meters			1999 data, 0 to 9 meters			1999 data, below 9 meters		
						Number of Detects/Number of Samples	Average Detection	Max Detection	Number of Detects/Number of Samples	Average Detection	Maximum Detections	Number of Detects/Number of Samples	Average Detection	Maximum Detections	Number of Detects/Number of Samples	Average Detection	Maximum Detections
Benzene	µg/L	10	--	210	760	0/56	ND	ND	0/36	ND	ND	2/12	3.21	6.3	NA	NA	NA
Benzo(a)pyrene	µg/L	0.0012	--	--	--	0/2	ND	ND	0/2	ND	ND	NA	NA	NA	NA	NA	NA
Chlorobenzene	µg/L	400	--	5	--	0/56	ND	ND	0/36	ND	ND	2/12	6.26	12	NA	NA	NA
Dichlorobenzenes (sum)	µg/L	--	--	5	--	0/56	ND	ND	0/36	ND	ND	10/12	0.89	6.6	NA	NA	NA
Ethylbenzene	µg/L	--	--	17	150	0/56	ND	ND	0/36	ND	ND	0/12	ND	ND	NA	NA	NA
Fluorene	µg/L	--	--	0.54	4.8	0/2	ND	ND	0/2	ND	ND	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	µg/L	3.E-05	--	--	--	0/2	ND	ND	0/2	ND	ND	NA	NA	NA	NA	NA	NA
Naphthalene	µg/L	--	--	13	110	0/2	ND	ND	0/2	ND	ND	NA	NA	NA	NA	NA	NA
Phenanthrene	µg/L	--	--	5	45	0/2	ND	ND	0/2	ND	ND	NA	NA	NA	NA	NA	NA
Phenol [3]	µg/L	--	--	--	--	0/2	ND	ND	0/2	ND	ND	NA	NA	NA	NA	NA	NA
Total PCBs	µg/L	1.E-06	1.2E-04	--	--	0/2	ND	ND	0/2	ND	ND	NA	NA	NA	NA	NA	NA
Pyrene	µg/L	--	--	4.6	42	0/2	ND	ND	0/2	ND	ND	NA	NA	NA	NA	NA	NA
Toluene	µg/L	6,000	--	100	480	0/56	ND	ND	0/36	ND	ND	1/12	0.16	0.16	NA	NA	NA
Mercury-Dissolved	ng/L	0.70	2.6	770	1,400	66/66	2.58	5.40	40/40	4.86	10.7	47/47	2.21	11.4	26/26	8.05	24.0
Mercury-Total	ng/L	--	--	--	--	66/66	5.73	14.8	40/40	12.4	28.5	47/47	9.83	103	26/26	13.2	26.8
Methylmercury-Dissolved	ng/L	--	--	--	--	66/66	0.23	0.86	40/40	2.59	9.17	47/47	0.91	12.6	26/26	3.22	15.3
Methylmercury-Total	ng/L	--	--	--	--	66/66	0.56	1.62	39/40	5.06	12.4	47/47	1.88	12.1	26/26	4.19	14.3
Trichlorobenzenes	µg/L	--	--	5	--	0/56	ND	ND	0/36	ND	ND	NA	NA	NA	NA	NA	NA
Total Xylenes	µg/L	--	--	65	590	0/56	ND	ND	0/36	ND	ND	1/12	0.33	0.33	NA	NA	NA

Source: These data were taken from Tables G1-62 to G1-65 of Appendix G1 of the Onondaga Lake RI report.
The NYSDEC screening/guidance values are for Class B/C waters from Division of Water Technical and Operational Guidance Series (1.1.1).
Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. NYSDEC. June 1998.

Notes:
1. ND=Not detected
2. NA=Not analyzed
3. The surface water standards for phenols (1 µg/L for total chlorinated phenols and 5 µg/L for unchlorinated phenols) are for aesthetic considerations rather than for protection of human health or aquatic (ecological) resources.
4. Additional sampling of water from directly above the sediment surface in 2000 had the following results:
   Eight samples for total unfiltered mercury ranged from 6.8 to 595 ng/L with an average of 115 ng/L. Dissolved mercury ranged from 1.2 to 6.1 ng/L with an average of 3.5 ng/L.
   Eight samples for unfiltered methylmercury ranged from 0.21 to 3.84 ng/L with an average of 1.6 ng/L. Dissolved methylmercury ranged from 0.034 to 3.84 ng/L with an average of 1.3 ng/L.
   These data are presented in Table B1-51 of Appendix B1 of the Onondaga Lake RI report.

Table 7: Concentrations of Select Contaminants in Onondaga Lake Fish

Contaminants (only contaminants considered risk drivers are shown)	Units (wet weight)	Target Tissue Concentration Range (mg/kg)		Fish Concentrations 1992 to 2000 data		
				Arithmetic Mean	95% UCL	Max Detection
Human Health Exposure - Fish Fillets		**RME**				
Mercury (as methylmercury) [7]	mg/kg	0.2		1.05	1.08	5.07
Total PCBs [8]	mg/kg	0.03 to 0.3		0.67	0.91	3.90
Arsenic	mg/kg	ND		0.33	0.80	1.05
PCDD/PCDFs - TEQ as 2,3,7,8-TCDD [9]	mg/kg	4E-07 to 4E-06		1.01E-05	1.95E-05	4.60E-05
Ecological Exposure - Small Fish (3 to 18 cm) Whole Fish		**NOAEL**	**LOAEL**			
Mercury (as methylmercury)	mg/kg	0.009	0.187	0.27	0.35	0.91
Total PCBs	mg/kg	0.013	3.15	0.98	3.49	3.49
DDT and metabolites (sum)	mg/kg	0.005	0.049	0.05	0.07	0.10
Ecological Exposure - Large Fish (18 to 60 cm) Whole Fish		**NOAEL**	**LOAEL**			
Mercury (as methylmercury)	mg/kg	0.014	0.341	0.68	0.75	2.88
Total PCBs	mg/kg	0.019	9.6	1.57	2.12	11.1
DDT and metabolites (sum)	mg/kg	0.014	0.15	0.096	0.24	1.44

Sources: -- Human health exposure data (fish fillets) were taken from Table 3.1 from Appendix B of the Onondaga Lake Human Health Risk Assessment (HHRA) report.
-- Ecological exposure data (whole fish) were taken from Tables H-5 and H-6 from Appendix H of the Onondaga Lake Baseline Ecological Risk Assessment (BERA) report and converted from dry weight to wet weight based on the average percent solids in fish (24 percent).
-- Target tissue concentrations were taken from Appendix G of the Onondaga Lake FS.

Notes:
1. Mercury and methylmercury fish data from the BERA were combined and converted from dry weight to wet weight. Results are provided in Section I.3.2 of Appendix I of the Onondaga Lake FS.
2. Contaminant concentrations differ between the various data sets due to factors including the portion of fish analyzed (contaminants accumulate in various body parts) and age and/or species of fish.
3. ND = Not developed because arsenic was only detected in 2 of 11 samples. See Appendix G of the Onondaga Lake FS for details.
4. RME = reasonable maximum exposure; NOAEL = no-observed-adverse-effect-level; LOAEL = lowest-observed-adverse-effect-level
5. NOAELs and LOAELs for small (3 to 18 cm) fish are based on the belted kingfisher and mink.
NOAELs and LOAELs for large (18 to 60 cm) fish are based on the great blue heron, osprey, and river otter.
6. Only avian fish target concentrations are presented for DDT and metabolites.
7. The human health target tissue concentration for mercury (0.2 mg/kg) is based on young child RME (non-cancer effects). The RME target concentration for adults is slightly higher (0.3 mg/kg).
8. The human health target tissue concentrations for total PCBs are based on RME carcinogenic risks at risk targets ranging from 1E-05 (0.03 mg/kg) to 1E-04 (0.3 mg/kg). The RME targets based on non-cancer effects of 0.04 mg/kg for high molecular weight PCBs and 0.1 mg/kg for low molecular weight PCBs fall within the range based on carcinogenic risks. A target concentration based on the 1E-06 risk level was not selected as a goal since it is much lower than mean background concentrations in US waters and may not be achievable (see Appendix G of the Onondaga Lake FS).
9. The human health target tissue concentrations for PCDD/PCDFs are based on RME carcinogenic risks at risk targets ranging from 1E-05 (4E-07 mg/kg) to 1E-04 (4E-06 mg/kg). Non-carcinogenic targets could not be developed for PCDD/PCDFs. A target concentration based on the 1E-06 risk level was not selected as a goal since it is much lower than mean background concentrations in US waters and may not be achievable (see Appendix G of the Onondaga Lake FS).

Table 8

Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Fish Tissue

Exposure Point	Chemical of Concern	Concentration Detected		Concen-tration Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Min	Max					
Fish Fillet	PCBs - total	30	3,903	ug/kg-ww	128/130	9.1E-01	mg/kg	95% UCL-T
	PCDD/PCDFs	0.25	45.98	ng/kg-ww	30/30	2.0E-05	mg/kg	95% UCL-T
	Mercury	0.04	5.07	mg/kg-ww	728/728	1.1	mg/kg	95% UCL-T

Key

ug/kg-ww: micrograms per kilogram wet weight
ng/kg-ww: nanograms per kilogram wet weight
mg/kg-ww: milligrams per kilogram wet weight
mg/kg: milligrams per kilogram
95% UCL-T: 95% Upper Confidence Limit of Log-Transformed Data

Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

This table presents the chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs detected in fish tissue (i.e., the concentration that will be used to estimate the exposure and risk from each COC in the fish tissue). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC, and how the EPC was derived. The table indicates that all three COCs were detected at significant frequencies. The 95% UCL of the log-transformed data was used as the EPC for each COC.

Table 9

Non-Cancer Toxicity Data Summary

Ingestion

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Absorption Efficiency (for Dermal)	Adjusted RfD (for Dermal)	Adjusted Dermal RfD Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD:
PCBs (less chlorinated) (as Aroclor 1016)	Chronic	7E-05	mg/kg-day	1	7E-05	mg/kg-day	Reduced Birth Weight	100	IRIS	02/25/02
PCBs (highly chlorinated) (as Aroclor 1254)	Chronic	2E-05	mg/kg-day	1	2E-05	mg/kg-day	Immune System	300	IRIS	02/25/02
PCDD/PCDFs	Chronic	NA	mg/kg-day	--	NA	mg/kg-day	--	--		
Mercury (as methylmercury)	Chronic	1E-04	mg/kg-day	1	1E-04	mg/kg-day	Develop-mental	10	IRIS	02/25/02

Key

NA: No information available
IRIS: Integrated Risk Information System, U.S. EPA

Summary of Toxicity Assessment

This table provides non-carcinogenic risk information which is relevant to the contaminants of concern in fish tissue. Two of the COCs have toxicity data indicating their potential for adverse non-carcinogenic health effects in humans, while no data are currently available to evaluate non-cancer health effects from exposure to PCDD/PCDFs. Toxicity information is presented for both less chlorinated PCBs (Aroclors 1016, 1221, and 1242) and highly chlorinated PCBs (Aroclors 1248, 1254, 1260, and 1268), as all Aroclors have been detected. Toxicity information for mercury is presented for methylmercury, as this is the toxic form of mercury present in fish tissue.

Table 10

Cancer Toxicity Data Summary

Ingestion

Chemical of Concern	Oral Cancer Slope Factor	Absorption Efficiency (for Dermal)	Adjusted Cancer Slope Factor (for Dermal)	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
PCBs - total	2.0E+00	1	2.0E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	05/20/02
PCDD/PCDFs	1.5E+05	1	1.5E+05	$(mg/kg\text{-}day)^{-1}$	B2	HEAST	1997
Mercury (as methylmercury)	NA	--	--	$(mg/kg\text{-}day)^{-1}$	C	IRIS	05/20/02

Key:
NA: No information available
IRIS: Integrated Risk Information System, U.S. EPA

EPA Group:
A - Human carcinogen
B1 - Probable Human Carcinogen - Indicates that limited human data are available
B2 - Probable Human Carcinogen - Indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

Summary of Toxicity Assessment

This table provides carcinogenic risk information which is relevant to the contaminants of concern in fish tissue. Toxicity data for cancer risks for PCBs are for PCBs as a class; i.e., total PCBs, without differentiation with regard to level of chlorination or molecular weight. Although mercury is classified as a Group C possible human carcinogen, no cancer slope factor is available for quantitative analysis.

Table 11

Page 1

Risk Characterization Summary - Carcinogens (Reasonable Maximum Exposure)

Scenario Timeframe: Current/Future
Receptor Population: Recreation
Receptor Age: Adult (18 and older)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish	Fish Tissue	Fish Fillet	PCBs (total)	2.8E-04	--	--	2.8E-04
			PCDD/PCDFs	4.5E-04	--	--	4.5E-04
			Mercury	--	--	--	--
						Total Cancer Risk =	**7.3E-04**

Scenario Timeframe: Current/Future
Receptor Population: Recreation
Receptor Age: Young Child (less than 6)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish	Fish Tissue	Fish Fillet	PCBs (total)	8.7E-05	--	--	8.7E-05
			PCDD/PCDFs	1.4E-04	--	--	1.4E-04
			Mercury	--	--	--	--
						Total Cancer Risk =	**2.3E-04**

Table 11

Page 2

Risk Characterization Summary - Carcinogens (Reasonable Maximum Exposure)

Scenario Timeframe: Current/Future
Receptor Population: Recreation
Receptor Age: Older Child (6 to < 18)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish	Fish Tissue	Fish Fillet	PCBs (total)	1.2E-04	--	--	1.2E-04
			PCDD/PCDFs	2.0E-04	--	--	2.0E-04
			Mercury	--	--	--	--
						Total Cancer Risk =	**3.2E-04**

Key

— : Toxicity criteria are not available to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.

Risk Characterization

This table provides carcinogenic risk estimates for the significant routes of exposure for the COCs noted above. These risk estimates are based on a reasonable maximum exposure (RME) and were developed by taking into account various conservative assumptions about the frequency and duration of exposure for each population, as well as the toxicity of the COCs. The total cancer risks for these COCs are 7.3E-04, 2.3E-04, and 3.2E-04 for the adult recreator, young child recreator, and the older child recreator, respectively. The COCs contributing most significantly to the risk level for all three populations are PCBs (total) and PCDD/PCDFs. Although mercury is classified as a Group C possible human carcinogen, no cancer slope factor is available for quantitative analysis. The risk levels for these COCs indicate that if no clean-up action is taken, an individual would have an increased probability of about 7 in 1,000 (adult recreator), 2 in 1,000 (young child recreator), or 3 in 1,000 (older child recreator) of developing cancer as a result of site-related exposure to these COCs. As presented in the HHRA and the text of this ROD, the total RME cancer risks for all COPCs for this route of exposure are 7.8E-04, 2.4E-04, and 3.4E-04 for the adult recreator, young child recreator, and the older child recreator, respectively.

Table 12

Page 1

Risk Characterization Summary - Noncarcinogens (Reasonable Maximum Exposure)

Scenario Timeframe: Current/Future
Receptor Population: Recreation
Receptor Age: Adult (18 and older)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Noncarcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish	Fish Tissue	Fish Fillet	PCBs (less chlorinated)	Reduced BW	2.4	–	--	2.4
			PCBs (highly chlorinated)	Immune System	10.3	--	--	10.3
			PCDD/PCDFs	NA	--	--	--	--
			Mercury (as methylmercury)	Developmental	3.9	–	--	3.9
							Total Non-Cancer Hazards =	**16.6**

Scenario Timeframe: Current/Future
Receptor Population: Recreation
Receptor Age: Young Child (less than 6)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Noncarcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish	Fish Tissue	Fish Fillet	PCBs (less chlorinated)	Reduced BW	3.8	--	--	3.8
			PCBs (highly chlorinated)	Immune System	16.0	--	--	16.0
			PCDD/PCDFs	NA	--	--	--	--
			Mercury (as methylmercury)	Developmental	6.0	--	--	6.0
							Total Non-Cancer Hazards =	**25.8**

Table 12

Page 2

Risk Characterization Summary - Noncarcinogens (Reasonable Maximum Exposure)

Scenario Timeframe: Current/Future
Receptor Population: Recreation
Receptor Age: Older Child (6 to < 18)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Noncarcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish	Fish Tissue	Fish Fillet	PCBs (less chlorinated)	Reduced BW	2.6	--	--	2.6
			PCBs (highly chlorinated)	Immune System	11.2	--	--	11.2
			PCDD/PCDFs	NA	--	--	--	--
			Mercury (as methylmercury)	Developmental	4.2	--	--	4.2
							Total Non-Cancer Hazards =	**18.0**

Risk Characterization

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance for Superfund (RAGS) states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse non-cancer effects. Two of the COCs (PCBs and mercury) have toxicity data indicating their potential for adverse non-carcinogenic health effects in humans, while no data are currently available to evaluate non-cancer health effects from exposure to PCDD/PCDFs. The estimated HIs of 16.6, 25.8, and 18.0 for adult, young child, and older child recreators, respectively, indicate that the potential for adverse non-cancer effects could occur from ingestion of fish fillet tissue containing less chlorinated PCBs, highly chlorinated PCBs, and mercury. As presented in the HHRA and the text of this ROD, the total RME non-cancer HIs for all COPCs for this route of exposure are 18.2, 28.3, and 19.8 for the adult recreator, young child recreator, and the older child recreator, respectively.

Table 13

Contaminants Used in Mean PEC Quotient for Onondaga Lake

Group	Contaminant
Metals	Mercury
Aromatics	Ethylbenzene
	Xylenes
Chlorinated Benzenes	Chlorobenzene
	Dichlorobenzenes
	Trichlorobenzenes
Polycyclic Aromatic Hydrocarbons (PAHs)	Acenaphthene
	Acenaphthylene
	Anthracene
	Benz[a]anthracene
	Benzo[a]pyrene
	Benzo[b]fluoranthene
	Benzo[g,h,i]perylene
	Benzo[k]fluoranthene
	Chrysene
	Dibenz[a,h]anthracene
	Fluoranthene
	Fluorene
	Indeno[1,2,3-cd]pyrene
	Naphthalene
	Phenanthrene
	Pyrene
Polychlorinated Biphenyls (PCBs)	Total PCBs

Table 14: ONONDAGA LAKE SUBSITE RECORD OF DECISION – LAKEWIDE ALTERNATIVES

Cleanup Criterion	Lakewide Alternative 1 No Action	Lakewide Alternative 2 Mean PEC Quotient of 1 and Mercury PEC	Lakewide Alternative 3 Mean PEC Quotient of 1 and Mercury PEC	Lakewide Alternative 4 Mean PEC Quotient of 1 and Mercury PEC	Lakewide Alternative 5 Mean PEC Quotient of 1 and Mercury PEC	Lakewide Alternative 6 Mean PEC Quotient of 1 and Mercury PEC	Lakewide Alternative 7 ER-L
Description	Lakewide Alternative 1 consists of No Action and is retained as a baseline condition per the NCP.	Lakewide Alternative 2 consists of the following remedial activities on a SMU-specific basis: • SMU 1 – Dredging for NLSA and H&E / Capping / Habitat Reestablishment • SMU 2 – Dredging for NLSA and H&E and Targeted Dredging to 4 Meter Depth (for NAPL Removal) / Capping / Habitat Reestablishment • SMU 3 – Habitat Enhancement / Dredging for NLSA and H&E and Targeted Dredging / Capping / Habitat Reestablishment • SMU 4 – Dredging for NLSA and H&E / Capping / Habitat Reestablishment • SMU 5 – Habitat Enhancement / Dredging for NLSA and H&E / Capping / Habitat Reestablishment • SMU 6 – Dredging for NLSA and H&E and Targeted Dredging / Capping / Habitat Reestablishment • SMU 7 – Dredging for NLSA and H&E / Capping / Habitat Reestablishment • SMU 8 – Phased Thin-Layer Capping to Mean PECQ1, Mercury PEC and BSQV / Oxygenation / MNR	Lakewide Alternative 3 consists of the following remedial activities on a SMU-specific basis: • SMU 1 – Dredging of the ILWD to 2 Meter Depth /Capping / Habitat Reestablishment • SMU 2 – Dredging for NLSA and H&E and Targeted Dredging to 4 Meter Depth (for NAPL Removal) / Capping / Habitat Reestablishment • SMU 3 – Habitat Enhancement / Dredging for NLSA and H&E and Targeted Dredging / Capping / Habitat Reestablishment • SMU 4 – Dredging for NLSA and H&E / Capping / Habitat Reestablishment • SMU 5 – Habitat Enhancement / Dredging for NLSA and H&E / Capping / Habitat Reestablishment • SMU 6 – Dredging for NLSA and H&E and Targeted Dredging / Capping / Habitat Reestablishment • SMU 7 – Dredging for NLSA and H&E / Capping / Habitat Reestablishment • SMU 8 – Phased Thin-Layer Capping to Mean PECQ1, Mercury PEC and BSQV / Oxygenation / MNR	Lakewide Alternative 4 consists of the following remedial activities on a SMU-specific basis: • SMU 1 – Dredging of the ILWD to 2 Meter Depth with Removal in Hot Spot Areas / Capping / Habitat Reestablishment • SMU 2 – Dredging for NLSA, H&E and Targeted Dredging to 9 Meter Depth (for NAPL Removal) / Capping / Habitat Reestablishment • SMU 3 – Habitat Enhancement / Dredging for NLSA and H&E and Targeted Dredging / Capping / Habitat Reestablishment • SMU 4 – Dredging for NLSA and H&E / Capping / Habitat Reestablishment • SMU 5 – Habitat Enhancement / Dredging for NLSA and H&E / Capping / Habitat Reestablishment • SMU 6 – Dredging for NLSA and H&E and Targeted Dredging / Capping / Habitat Reestablishment • SMU 7 – Dredging for NLSA, and H&E / Capping / Habitat Reestablishment • SMU 8 – Phased Thin-Layer Capping to Mean PECQ1, Mercury PEC and BSQV / Oxygenation / MNR	Lakewide Alternative 5 consists of the following remedial activities on a SMU-specific basis: • SMU 1 – Dredging to 5 Meter Depth / Capping / Habitat Reestablishment • SMU 2 – Dredging for NLSA, H&E and Targeted Dredging to 9 Meter Depth (for NAPL Removal) / Capping / Habitat Reestablishment • SMU 3 – Habitat Enhancement / Dredging for NLSA and H&E and Targeted Dredging / Capping / Habitat Reestablishment • SMU 4 – Dredging for NLSA and H&E / Capping / Habitat Reestablishment • SMU 5 – Habitat Enhancement / Dredging for NLSA and H&E / Capping / Habitat Reestablishment • SMU 6 – Dredging for NLSA and H&E and Targeted Dredging / Capping / Habitat Reestablishment • SMU 7 – Dredging for NLSA and H&E / Capping / Habitat Reestablishment • SMU 8 – Phased Thin-Layer Capping to Mean PECQ1, Mercury PEC and BSQV/ Oxygenation / MNR	Lakewide Alternative 6 consists of the following remedial activities on a SMU-specific basis: • SMU 1 - Full Removal (Dredging to Mean PECQ1 and Mercury PEC) • SMU 2 – Full Removal (Dredging to Mean PECQ1 and Mercury PEC) • SMU 3 – Full Removal (Dredging to Mean PECQ1 and Mercury PEC) • SMU 4 – Full Removal (Dredging to Mean PECQ1 and Mercury PEC) • SMU 5 – Habitat Enhancement / Dredging for NLSA and H&E / Capping to Mean PECQ1 / Habitat Reestablishment • SMU 6 – Full Removal (Dredging to Mean PECQ1 and Mercury PEC) • SMU 7 – Full Removal (Dredging to Mean PECQ1 and Mercury PEC) • SMU 8 – Phased Thin-Layer Capping to Mean PECQ1, Mercury PEC and BSQV / Oxygenation / MNR	Lakewide Alternative 7 consists of the following remedial activities on a SMU-specific basis: • SMU 1 – Full Removal (Dredging to ER-L) • SMU 2 – Full Removal (Dredging to ER-L) • SMU 3 – Full Removal (Dredging to ER-L) • SMU 4 – Full Removal (Dredging to ER-L) • SMU 5 – Habitat Enhancement / Dredging for NLSA and H&E / Capping to ER-L / Habitat Reestablishment • SMU 6 – Full Removal (Dredging to ER-L) • SMU 7 – Full Removal (Dredging to ER-L) • SMU 8 – Thin-Layer Capping to ER-L / Oxygenation
Capped Acres Total Littoral/ Profundal	0	579 425/154	579 425/154	579 425/154	579 425/154	214 60/154	2,329 349/1,980
Dredged Volume (cy)	0	1,207,000	1,868,000	2,653,000	3,724,000	12,184,000++	20,121,000++
Capping & Dredging Duration (Years)	0	4	4	4	4	10	17
Total Cost	$0	$312,000,000	$370,000,000	$451,000,000	$537,000,000	$1,327,000,000++	$2,157,000,000++

TABLE 15
COST ESTIMATE INPUT DATA FOR SELECTED REMEDY

SMU	DREDGING		CAPPING			
	Dredged Area (AC)	Sediment (CY)	Cap Area (AC)	Sand [1] (CY)	Gravel (CY)	Rock (CY)
Quantities						
1	84	1,566,000	84	635,200	80,700	5,100
2	10	403,000	16	312,523	10,400	4,300
3	11	75,000	29	129,400	17,600	0
4	22	135,000	75	300,600	60,500	0
5	24	140,000	60	248,900	40,900	0
6	33	245,000	123	471,000	103,900	0
7	13	89,000	38	293,100	38,900	900
8	0	0	154	91,100	0	0
TOTAL	197	2,653,000	579	2,481,823	352,900	10,300
Durations						
Number Crews:		4		4	4	2
Production Rate (CY/HR):		600		400	380	140
Duration (HR):		4,422		6,204	929	74
Shifts/Day:		2		2	2	2
Hours/Shift:		8		8	8	8
Duration (DA):		276		388	58	5
Days/Month:		20		20	20	20
Duration (MO):		15		20	3	1
Months/Year:		7		7	7	7
Duration (YR):		2.1		2.8	0.4	0.1

SCA Size	232	AC
SCA Dike Height	14	FT

TOTAL CONSTRUCTION DURATION		
Dredging Duration:	15	MO
Capping Duration:	21	MO
In Lake Construction Duration [2]:	23	MO
In Lake Construction Duration [3]:	4	YR

Notes:
(1) Sand volume includes volume of wetland substrate material, when applicable (See Appendix E of the Onondaga Lake FS).
(2) Assumes capping can be performed concurrent with dredging after a two month lag.
(3) Based on 7 working months per year.

TABLE 16
COST SUMMARY FOR SELECTED REMEDY

Note: Cost estimates assumed that all disposal was onsite at an SCA. Based on evaluations to be conducted during design, as well as during construction, it is likely that a portion of the dredged materials (e.g., NAPLs) will be treated and/or disposed of at an off-site permitted facility rather than at the SCA.

Direct Construction Costs

Task	Qty	Unit	Cost				
			Labor	Equipment	Materials	Subcont	TOTAL
Mobilization/ Demobilization							
Equipment Fabrication	1	LS	0	594,000	0	0	594,000
Mobilization	1	LS	1,649,726	758,951	1,519,471	11,666	3,939,815
Demobilization	1	LS	1,478,489	530,434	57,024	43,276	2,109,223
Interim Year Startup	3	EA	1,059,999	798,268	19,958	477	1,878,703
Site Preparation and Facility Construction							
Clearing and Grubbing	235	AC	0	0	0	1,255,385	1,255,385
Install Fence	14,140	LF	0	0	0	254,664	254,664
Construct Gravel Equipment Area	200	LF	0	0	9,302	0	9,302
Construct Gravel Admin. Area	200	LF	0	0	9,302	0	9,302
Install Work Lighting	95	EA	0	342,079	0	0	342,079
Electrical Power	1	LS	0	0	0	5,940	5,940
Water Line	1	LS	0	0	0	5,940	5,940
Contaminated Water Control System	1	LS	0	0	118,800	0	118,800
Decon Facility	1	LS	1,323	0	594	8,465	10,382
Barrier Wall	65,000	SF	0	0	0	3,427,024	3,427,024
Dredging - SMU 1 thru SMU 7							
Bathymetry Survey - Pre-Dredging	1	LS	0	0	0	3,858	3,858
Sediment Sampling - Pre-Dredging	579	AC	2,188,471	580,409	117,018	1,574,912	4,460,810
Recover and Remove Barge	1	LS	0	0	0	154,440	154,440
Hydraulic Dredging with Cutter Head	2,653,000	CY	13,007,189	6,721,632	945,530	0	20,674,349
Transfer to SCA	2,653,000	CY	3,293,621	596,393	216,684	0	4,106,697
Operation of SCA	1	LS	354,469	141,777	39,396	364,832	900,474
Sheen Treatment	13	MO	427,897	9,896	4,503	602,231	1,044,525
Dredge Containment	2,653,000	CY	141,771	125,883	447,854	0	715,508
Dredge Monitoring	2,653,000	CY	2,056,291	1,379,632	157,589	316,634	3,910,145
Bathymetry Survey - Post Dredging	1	LS	0	0	0	3,858	3,858
Sediment Sampling - Post Dredging	197	AC	744,631	197,545	39,828	207,067	1,189,071
Sediment Cap							
Cap Containment	579	AC	407,046	369,854	1,173,353	0	1,950,253
Sand	579	AC	22,484,012	10,261,658	22,879,933	0	55,625,602
Rock	579	AC	144,481	57,547	318,540	24,779	545,347
Gravel	579	AC	3,388,409	1,444,901	8,321,952	0	13,155,263
Backfill							
Backfill	0	CY	0	0	0	0	0
Habitat & Vegetation Restoration							
Habitat & Vegetation Restoration	1	LS	0	0	0	1,526,272	1,526,272
Rip Rap	1	LF	1,977	2,262	60,178	0	64,417
SCA Construction							
Construct SCA	232	AC	6,847,096	2,396,179	11,036,410	7,060,604	27,340,288
Preloading	1	LS	6,945,712	894,780	29,009,892	197,708	37,048,092
Stabilization under Dikes	1	LS	0	0	0	17,151,837	17,151,837
Construct Cap over SCA	232	AC	2,772,406	1,143,276	16,284,669	0	20,200,351
Water Treatment							
Construct Water Treatment Facility	1	LS	1,187,454	976,864	1,590,039	44,930,160	48,684,516
Water treatment for dredged material	3,435,635,000	GA	0	0	0	20,521,085	20,521,085
Dismantle WTP	1	LS	0	0	0	1,188,000	1,188,000
Indirect Construction Costs							
Institutional Controls	1	LS	305,649	0	0	0	305,649
Studies, Design, and Planning							
Pre-Design, Remedial Design, Agency Oversight	1	LS	11,845,025	0	0	0	11,845,025
Engineering and Const. Oversight							
Project Management	1	LS	8,883,768	0	0	0	8,883,768
Construction Management	1	LS	11,845,025	0	0	0	11,845,025
Health and Safety	4,422	HR	1,026,950	52,529	570,101	0	1,649,580
Construction Cost Contingency							
Construction Cost Contingency	1	LS	82,663,666	0	0	0	82,663,666
CONSTRUCTION COSTS SUBTOTAL							***414,000,000***

Operation and Maintenance

Task	NPV Factor	Qty	Unit	Cost					NPV TOTAL
				Labor	Equipment	Materials	Subcont	TOTAL	
O&M During Construction and Off Season									
Off-hour security	1.000	34	MO	1,505,338	0	0	0	1,505,338	1,505,338
Long Term O&M (30 years)									
O&M Management and Technical Support	12.409	1	YR	305,668	0	0	0	305,668	3,793,030
Natural recovery monitoring - Profundal Zone	12.409	1	YR	65,768	29,462	5,940	140,136	241,307	2,994,373
O&M for SCA - 1st 5 years	4.100	1	YR	28,807	1,901	4,424	77,067	112,199	460,014
O&M for SCA - Remaining 25 years	8.309	1	YR	14,403	950	475	38,534	54,362	451,705
Lake Cap Monitoring	12.409	1	YR	190,233	85,220	17,181	261,059	553,693	6,870,780
5-Year Reviews	2.156	1	YR	242,656	0	0	0	242,656	523,167
Lake Cap Maintenance	2.156	1	YR	714,294	282,720	964,461	0	1,961,475	4,228,941
Aeration in Profundal Zone - Capital	1.000	4	LS	0	0	0	6,177,600	6,177,600	6,177,600
Aeration in Profundal Zone - Operation	4.100	4	YR	0	0	0	190,080	190,080	779,328
SMU 5 Pilot Study	4.100	1	YR	0	0	0	118,800	118,800	487,080
SMU 7 Barrier Wall Pump and Treat	12.409	1	YR	0	0	0	121,760	121,760	1,510,926
Waste and O&M Contingency									
Waste and O&M Contingency	1.000	1	LS	7,069,236	0	0	0	7,069,236	7,069,236
OPERATION AND MAINTENANCE COSTS SUBTOTAL									***37,000,000***
Total Lake Remediation Project Costs									**451,000,000**

TABLE 17

CHEMICAL-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Medium/Authority	Citation	Status	Requirement Synopsis
WATER			
Clean Water Act [Federal Water Pollution Control Act; as amended], 33 USC §§ 1251-1387	40 CFR Part 129	ARAR	Toxic Pollutant Effluent Standards for aldrin/dieldrin, DDT, endrin, toxaphene, benzidene and PCBs.
Clean Water Act	40 CFR Parts 122, 125 and 401	ARAR	Wastewater Discharge Permits; Effluent Guidelines, Best Available Technology and Best Management Practices.
Clean Water Act	40 CFR § 403.5	ARAR	Discharge to Publicly-Owned Treatment Works
Safe Drinking Water Act	40 CFR Parts 144-147	ARAR	Underground Injection Control Program
Safe Drinking Water Act, 42 USC §§ 300f - 300j-26	40 CFR Part 141	ARAR	National Primary Drinking Water Regulations
Toxic Substances Control Act (TSCA), Title 1,15 USC § 2601	40 CFR §§ 761.65 – 761.75	ARAR	TSCA facility requirements: Establishes siting guidance and criteria *for* storage (761.65), chemical waste landfills (761.75), and incinerators (761.70).
USEPA	USEPA Federal Register, Volume 57, No. 246, December 22, 1992	ARAR	Ambient Water Quality Criteria
New York State Environmental Conservation Law (ECL) Article 15, Title 3 and Article 17, Titles 3 and 8			Part 608 includes the requirement to obtain a SPDES permit for certain discharges in any navigable waters of the State (6 NYCRR 608.5). The regulations contained in 6 NYCRR Parts 700 – 706 include water quality classifications, standards and guidance values.
	6 NYCRR Part 608	ARAR	Note that: C Section 608.6(a) requires development and submission of a sufficiently detailed construction plan with a map); C Section 608.9(a) requires that construction or operation of facilities that may result in a discharge to navigable waters demonstrate compliance with CWA §§ 301 – 303, 306 and 307 and 6 NYCRR §§ 751.2 (prohibited discharges) and 754.1 (effluent prohibitions; effluent limitations and water quality-related effluent limitations; pretreatment standards; standards of performance for new sources.)
	6 NYCRR Part 700	ARAR	Part 700 provides definitions and describes collection and sampling procedures.
	6 NYCRR Part 701	ARAR	Part 701 establishes classifications for surface waters and groundwater.

Medium/Authority	Citation	Status	Requirement Synopsis
	6 NYCRR Part 702	ARAR	Part 702 establishes the deviation and use of these standards and guidance values.
	6 NYCRR Part 703	ARAR	Part 703 establishes surface water and groundwater quality standards and groundwater effluent limitations.
	6 NYCRR Part 704	ARAR	Part 704 establishes criteria for thermal discharges.
	6 NYCRR Part 705	ARAR	Part 705 contains reference sources for related regulations.
	6 NYCRR Part 706	ARAR	Part 706 establishes additional procedures for the derivation of standards and guidance values that are protective of aquatic life from acute and chronic effects.

TABLE 18

CHEMICAL-SPECIFIC POTENTIAL CRITERIA, ADVISORIES AND GUIDANCE TO BE CONSIDERED (TBC)

Medium/Authority	Citation	Status	Requirement Synopsis
BIOTA			
International Joint Commission – United States and Canada	Great Lakes Water Quality Agreement of 1978, as amended	TBC	The concentration of total PCBs in fish tissue (whole fish, wet weight basis) should not exceed 0.1 µg/g for the protection of birds and animals that consume fish. Criterion for mercury is 0.5 µg/g mercury in whole fish [wet weight basis].
NOAA – Damage Assessment Center	Reproductive, Developmental and Immunotoxic Effects of PCBs in Fish: A Summary of Laboratory and Field Studies, March 1999 (Monosson, E.)	TBC	The effective concentrations for reproductive and developmental toxicity fall within the ranges of the PCB concentrations found in some of the most contaminated fish. There are currently an insufficient number of studies to estimate the immunotoxicity of PCBs in fish. Improper functioning of the reproductive system and adverse effects on development may result from adult fish liver concentrations of 25 to 71 ppm Aroclor 1254. PCB Congener BZ #77: 0.3 to 5 ppm (wet wt) in adult fish livers reduces egg deposition, pituitary gonadotropin, and gonadosomatic index, alters retinoid concentration (Vitamin A), and reduces larval survival. 1.3 ppm in eggs reduces larval survival.
DEC Division of Fish and Wildlife	Niagara River Biota Contamination Project: Fish Flesh Criteria for Piscivorous Wildlife, Technical Report 87-3, July 1987, pp. 41-48 and Table 26 (Newell *et al.)*	TBC	Provides a method for calculating concentrations of organochlorines in fish flesh for the protection of wildlife. The fish flesh criterion is 0.11 mg/kg wet wt for PCBs, 3 mg/kg for dioxin/furans, and 0.33 mg/kg for hexachlorobenzene.
SEDIMENT			
EPA Office of Emergency and Remedial Response	Guidance on Remedial Actions for Superfund Sites with PCB Contamination, EP A/540/G- 90/007, August 1990 (OSWER Dir. No. 9355.4-01).	TBC	Provides guidance in the investigation and remedy selection process for PCB-contaminated Superfund sites. Provides preliminary remediation goals for various contaminated media, including sediment (pp. 34-36) and identifies other considerations important to protection of human health and the environment.
NOAA – Damage Assessment Office	Development and Evaluation of Consensus-Based Sediment Effect Concentrations for PCBs in the Hudson River, MacDonald Environmental Services Ltd., March 1999	TBC	Estuarine, freshwater and saltwater sediment effects concentrations for total PCBs: Threshold Effect Concentration: 0.04 mg/kg Mid-range Effect Concentration: 0.4 mg/kg Extreme Effect Concentration: 1.7 mg/kg
NOAA (compilation of other literature sources for Sediment Quality Guidelines [SQGs])	Screening Quick Reference Tables for Organics (SQRTs)	TBC	Tables with screening concentrations for inorganic and organic contaminants.

Medium/Authority	Citation	Status	Requirement Synopsis
EPA Great Lakes National Program Office, Assessment and Remediation of Contaminated Sediments (ARCS) Program	Calculation and Evaluation of Sediment Effect Concentrations for the Amphipod *Hyalella azteca* and the midge *Chironomus riparius*, EPA 905- R96-008, September 1996	TBC	Provides sediment effect concentrations (SECs), which are defined as the concentrations of a contaminant in sediment below which toxicity is rarely observed and above which toxicity is frequently observed.
DEC Division of Fish, Wildlife and Marine Resources	Technical Guidance for Screening Contaminated Sediment, January 1999	TBC	Includes a methodology to establish sediment criteria for the purpose of identifying contaminated sediments. Provides sediment quality screening values for non-polar organic compounds, such as PCBs, and metals to determine whether sediments are contaminated (above screening criteria) or clean (below screening criteria). Screening values are not cleanup goals. Also discusses the use of sediment criteria in risk management decisions.
DEC	TAMS, Onondaga Lake Baseline Ecological Risk Assessment (2002)	TBC	DEC/TAMS developed 5 site-specific SECs based on mortality results found for the chironomid sediment toxicity test in 1992: C Effects Range-Low (ER-L): 10th percentile of the concentration distribution for effects data C Threshold Effect Level (TEL): Geometric mean of the 15th percentile of the concentration distribution for the effects data and the median distribution for the no-effects data C Effects Range-Median (ER-M): Median of the concentration distribution for the effects data C Probable Effect Level (PEL): Geometric mean of the ERM and the 85th percentile of the concentration distribution for the no-effects data C Apparent Effects Threshold (AET): Concentration above which effects are always expected (i.e., the highest no-effects concentration)
SOIL			
DEC-Division of Environmental Remediation	Technical Administrative Guidance Memorandum No. 94- Remediation HWR-4046	TBC	Recommended Soil Cleanup Objectives
WATER			
International Joint Commission – United States and Canada	Great Lakes Water Quality Agreement of 1978, as amended	TBC	The concentration of total PCBs in fish tissue (whole fish, wet weight basis) should not exceed 0.1 µg/g for the protection of birds and animals that consume fish. Criterion for mercury is 0.5 µg/g mercury in whole fish [wet weight basis].
DEC	DEC TOGS 1.1.2	TBC	New York State Groundwater Effluent Limitations
AIR			
DEC	New York Air Cleanup Criteria, January 1990	TBC	Provides guidance for the control of ambient air contaminants in New York State.

TABLE 19

LOCATION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Medium/Authority	Citation	Status	Requirement Synopsis
Fish and Wildlife Coordination Act	16 USC § 662	ARAR	Whenever the waters of any stream or other body of water are proposed or authorized to be impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose, by any department or agency of the United States, such department or agency first shall consult with the United States Fish and Wildlife Service, Department of the Interior, and with the head of the agency exercising administration over the wildlife resources of the particular State in which the impoundment, diversion, or other control facility is to be constructed, with a view to the conservation of wildlife resources by preventing loss of and damage to such resources.
Clean Water Act	33 CFR Parts 320-330	ARAR	Dredge and Fill in Wetlands
Section 404 of the Clean Water Act [Federal Water Pollution Control Act, as amended], 33 USC § 1344	33 CFR Parts 320-329	ARAR	Includes requirements for issuing permits for the discharge of dredged or fill material into navigable waters of the United States. A permit is required for construction of any structure in a navigable water.
National Historic Preservation Act, 16 USC § 470 et seq.	36 CFR Part 800	ARAR	Remedial Actions must take into account effects on properties in or eligible for inclusion in the National Registry of Historic Places.
Fish and Wildlife Coordination Act 16. U.S.C. § 662	N/A	ARAR	Whenever the waters of any stream or other body of water are proposed or authorizes to be impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose, by any department or agency of the United States, such department or agency first shall consult with the Unite States Fish and Wildlife Service, Department of the Interior, and with the head of the agency exercising administration over wildlife resources of the particular State in which the impoundment, diversion or other control facility is to be constructed, with a view to the conservation of wildlife resources by preventing loss of and damage to such resources.

Medium/Authority	Citation	Status	Requirement Synopsis
Statement of Procedures on Floodplain Management and Wetlands Protection	40 CFR Part 6, Appendix A	ARAR	Sets forth EPA policy and guidance for carrying out Executive Orders 11990 and 11988. Executive Order 11988: Floodplain Management requires federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid, to the extent possible, adverse effects associated with direct and indirect development of a floodplain. Federal agencies are required to avoid adverse impacts or minimize them if no practicable alternative exists. Executive order 11990: Protection of Wetlands requires federal agencies conducting certain activities to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands if a practicable alternative exists. Federal agencies are required to avoid adverse impacts or minimize them if nor practicable alternative exists.
Clean Water Act Section 401, 33 USC 1341	40 CFR Part 121	ARAR	State Water Quality Certification Program
Clean Water Act, Section 404, 33 USC § 1344	40 CFR Parts 230 and 231	ARAR	No activity which adversely affects an aquatic ecosystem, including wetlands, shall be permitted if a practicable alternative that has less adverse impact is available. If there is no other practical alternative, impacts must be minimized.
New York State ECL Article 11, Title 5	6 NYCRR Part 182	ARAR	The taking of any endangered or threatened species is prohibited, except under a permit or license issued by DEC. The destroying or degrading the habitat of a protected animal likely constitutes a "taking" of that animal under NY ECL § 11-0535.
New York State ECL Article 3, Title 3; Article 27, Titles 7 and 9	6 NYCRR § 373-2.2	ARAR	Establishes construction requirements for hazardous waste facilities within the 100-year floodplain.
New York State ECL Article 15, Title 5, 6 NYCRR Part 608 Use and Protection of Waters	6 NYCRR Part 608	ARAR	Protection of Waters Program
New York State Freshwater Wetlands Law, Environmental Conservation Law (ECL) Article 24, Title 7	6 NYCRR Parts 662-665	ARAR	Defines procedural requirements for undertaking different activities in and adjacent to freshwater wetlands, and establishes standards governing the issuance of permits to alter or fill freshwater wetlands.

TABLE 20

LOCATION-SPECIFIC POTENTIAL CRITERIA, ADVISORIES AND GUIDANCE TO BE CONSIDERED (TBC)

Medium/Authority	Citation	Status	Requirement Synopsis
EPA Office of Solid Waste and Emergency Response	Policy on Floodplains and Waste and Wetland Assessments for CERCLA Actions, August 1985	TBC	Superfund actions must meet the substantive requirements of the Floodplain Management Emergency Executive Order (E.O. 11988) and the Protection of Response 1985 Wetlands Executive Order (E.O. 11990) (see RI Table 9-3: Location-Specific ARARs). This memorandum discusses situations that require preparation of a floodplain or wetlands assessment and the factors that should be considered in preparing an assessment for response actions taken pursuant to Section 104 or 106 of CERCLA. For remedial actions, a floodplain/wetlands assessment must be incorporated into the analysis conducted during the planning of the remedial action.
Executive Order No. 11988, 42 Fed. Reg. 26951 (May 25, 1977)	Floodplain Management	TBC	Executive Order describes the circumstances where federal agencies should manage floodplains.
Executive Order No. 11990, 42 Fed. Reg. 26961 (May 25, 1977)	Protection of Wetlands	TBC	Executive Order describes the circumstances where federal agencies should manage wetlands.

TABLE 21

ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Medium/Authority	Citation	Status	Requirement Synopsis
Section 10, Rivers and Harbors Act, 33 USC § 403	33 CFR Parts 320 - 330	ARAR	U.S. Army Corps of Engineers approval is generally required to excavate or fill, or in any manner to alter or modify the course, location, condition, or capacity of the channel of any navigable water of the United States.
Clean Air Act, 42 USC s/s 7401 et seq. (1970)	40 CFR Part 52	ARAR	Approval and Promulgation of Implementation Plans
Clean Air Act, 42 USC s/s 7401 et seq. (1970)	40 CFR Part 60	ARAR	Standards of Performance for New Stationary Sources
Clean Air Act, 42 USC s/s 7401 et seq. (1970)	40 CFR Parts 61 and 63	ARAR	Part 61- National Emission Standards for Hazardous Air Pollutants. Part 63 - National Emission Standards for Hazardous Air Pollutants for Source Categories.
Section 402 of the Clean Water Act	40 CFR Parts 121, 122, 125, 401 and 403.5	ARAR	Provisions related to the implementation of the National pollutant Discharge Elimination System (NPDES) program
Safe Drinking Water Act	40 CFR Parts 144 - 147	ARAR	SDWA underground injection control program
Section 404(b) of the Clean Water Act,	40 CFR Part 230	ARAR	Guidelines for Specification of Disposal Sites for Dredged or Fill Material. Except as otherwise provided under Clean Water Act Section 404(b)(2), no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. Includes criteria for evaluating whether a particular discharge site may be specified.
Section 404©) of the Clean Water Act, 33 USC § 1344(b)	33 CFR Parts 320, 323, 325, 329 and 330	ARAR	These regulations apply to all existing, proposed, or potential disposal sites for discharges of dredged or fill materials into U.S. waters, which include wetlands. Includes special policies, practices, and procedures to be followed by the U.S. Army Corps of Engineers in connection with the review of applications for permits to authorize the discharge of dredged or fill material into waters of the United States pursuant to Section 404 of the Clean Water Act.
Resource Conservation and Recovery Act	40 CFR Part 257	ARAR	Criteria for Classification of Waste Disposal Facilities

Medium/Authority	Citation	Status	Requirement Synopsis
Resource Conservation and Recovery Act 42 USC s/s 6901 et seq. (1976) Subtitle C – Wastes	40 CFR Part 261	ARAR	Identification and listing of hazardous waste
Resource Conservation and Recovery Act 42 USC s/s 6901 et seq. (1976)	40 CFR Part 262	ARAR	Standards applicable to generators of hazardous waste
Resource Conservation and Recovery Act 42 USC s/s 6901 et seq. (1976)	40 CFR § 262.11	ARAR	Hazardous waste determination
Resource Conservation and Recovery Act, 42 USC s/s 6901 et seq. (1976)	40 CFR Part 262.34	ARAR	Standards for Hazardous Waste Generators, 90-Day Accumulation Rule
Resource Conservation and Recovery Act, 42 USC s/s 6901 et seq. (1976)	40 CFR Part 264 and 265, Subparts B-264.10 - .19 F-264.90 - .101 G-264.110 - .120 J-264.190 - .200 S-264.550 - .555 X-264.600 - .603	ARAR	Standards for Owners/Operators of Hazardous Waste Treatment, Storage and Disposal Facilities. B- General Facility Standards F- Releases from Solid Waste Management Units G- Closure and Post Closure J- Tank Systems S- Special Provisions for Cleanup X- Miscellaneous Units
Section 3004 of the Resource Conservation and Recovery Act (Solid Waste Disposal Act, as amended), 42 USC § 6924	40 CFR § 264. 13(b)	ARAR	Owner or operator of a facility that treats, stores or disposes of hazardous wastes must develop and follow a written waste analysis plan.
Resource Conservation and Recovery Act, 42 USC s/s 6901 et seq. (1976)	40 CFR Part 264 and 265, Subparts K-264.220 - .232 L-264.250 - .259 N – 264.300 - .317	ARAR	Standards for Owners/Operators of Hazardous Waste Treatment, Storage and Disposal Facilities. K- Surface Impounds L- Waste Piles – Landfills, Subtitle C
Section 3004 of the Resource Conservation and Recovery Act, as amended, 42 USC § 6924	40 CFR § 264.232	ARAR	Owners and operators shall manage all hazardous waste placed in a surface impoundment in accordance with 40 CFR Subparts BB (Air Emission Standards for Equipment Leaks) and CC (Air Emission Standards for Tanks, Surface Impoundments and Containers).
Resource Conservation and Recovery Act, 42 USC s/s 6901 et seq. (1976)	40 CFR Part 268	ARAR	Land disposal restrictions C- Prohibitions on Land Disposal
Toxic Substances Control Act (TSCA), Title 1,15 USC § 2605	40 CFR Part 761	ARAR	Polychlorinated biphenyls (PCBs) manufacturing, processing, distribution in commerce, and use prohibitions
Hazardous Materials Transportation Act, as amended, 49 USC §§ 5101 – 5127	49 CFR Part 170.	ARAR	Transport of hazardous materials program procedures.

Hazardous Materials Transportation Act, as amended, 49 USC §§ 5101 – 5127	49 CFR Part 171	ARAR	Department of Transportation Rules for Transportation of Hazardous Materials, including procedures for the packaging, labeling, manifesting and transporting of hazardous materials.
Resource Conservation and Recovery Act, 42 USC s/s 6901 et seq. (1976)	62 Fed. Reg. 25997 and 63 Fed. Reg. 65874	ARAR	Subtitle C, Phase IV Supplemental Proposal on Land Disposal of Mineral Processing Wastes (62 FR 25997), and Hazard Remediation Waste Management requirements (63 FR 65874)
New York State ECL Article 17, Title 5	____	ARAR	It shall be unlawful for any person, directly or indirectly, to throw, drain, run or otherwise discharge into such waters organic or inorganic matter that shall cause or contribute to a condition in contravention of applicable standards identified at 6 NYCRR § 701.1.
New York State ECL Article 11, Title 5	NY ECL § 11-0503	ARAR	Fish & Wildlife Law against water pollution. No deleterious or poisonous substances shall be thrown or allowed to run into any public or private waters in quantities injurious to fish life, protected wildlife, or waterfowl inhabiting those waters, or injurious to the propagation of fish, protected wildlife, or waterfowl therein.
New York State ECL Article 19, Title 3 - Air Pollution Control Law. Promulgated pursuant to the Federal Clean Air Act, 42 USC § 7401	6 NYCRR Parts 200, 202, 205, 207, 211, 212, 219, and 257.	ARAR	Air Pollution Control Regulations. The emissions of air contaminants that jeopardize human, plant, or animal life, or is ruinous to property, or causes a level of discomfort is strictly prohibited.
New York State ECL Article 27, Title 7	6 NYCRR Part 360	ARAR	Solid Waste Management Facilities New York State regulations for design, construction, operation, and closure requirements for solid waste management facilities.
New York State ECL Article 27, Title 11	6 NYCRR Part 361	ARAR	Siting of Industrial Hazardous Waste Facilities establishes criteria for siting industrial hazardous waste treatment, storage and disposal facilities. Regulates the siting of new industrial hazardous waste facilities located wholly or partially within New York State. Identifies criteria by which the facilities siting board will determine whether to approve a proposed industrial hazardous waste facility.
New York State ECL Article 27, Title 3	6 NYCRR Part 364	ARAR	Standards for Waste Transportation Regulations governing the collection, transport and delivery of regulated wastes, including hazardous wastes.
New York State ECL Article 27, Title 9	6 NYCRR Parts 370 and 371	ARAR	New York State regulations for activities associated with hazardous waste management.

New York State ECL Article 3, Title 3; Article 27, Titles 7 and 9	6 NYCRR Part 372	ARAR	Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities. Includes Hazardous Waste Manifest System requirements for generators, transporters, and treatment, storage or disposal facilities, and other requirements applicable to generators and transporters of hazardous waste.
New York State ECL Article 3, Title 3; Article 27, Titles 7 and 9	6 NYCRR Part 373	ARAR	Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities. Includes Hazardous Waste Manifest System requirements for generators, transporters, and treatment, storage or disposal facilities, and other requirements applicable to generators and transporters of hazardous waste.
New York State ECL Article 27 Title 13	6 NYCRR Part 375	ARAR	Inactive Hazardous Waste Disposal Sites. Establishes standards for the development and implementation of inactive hazardous waste disposal site remedial programs.
New York State ECL Article 27, Title 9	6 NYCRR Part 376	ARAR	Land Disposal Restrictions. PCB wastes including dredge spoils containing PCBs greater than 50 ppm must be disposed of in accordance with federal regulations at 40 CFR Part 761.
New York State ECL Article 15, Title 5, and Article 17, Title 3	6 NYCRR Part 608	ARAR	Use and Protection of Waters. A permit is required to change, modify, or disturb any protected stream, its bed or banks, or remove from its bed or banks sand or gravel or any other material; or to excavate or place fill in any of the navigable waters of the state. Any applicant for a federal license or permit to conduct any activity which may result in any discharge into navigable waters must obtain a State Water Quality Certification under Section 401 of the Federal Water Pollution Control Act. 33 USC § 1341
New York State ECL, Article 1. Title 1, Article 3 Title 3, Article 15 Title 3, Article 17 Title 1, 3, and 8	6 NYCRR Part 700-706	ARAR	New York limitations on discharges of sewage, industrial waste or other wastes.
New York State ECL Article 17, Title 8	6 NYCRR Parts 750 – 758	ARAR	New York State Pollutant Discharge Elimination System (SPDES) Requirements Standards for Storm Water Runoff, Surface Water, and Groundwater Discharges, In general, no person shall discharge or cause a discharge to NY State waters of any pollutant without a permit under the New York State Pollutant Discharge Elimination System (SPDES) program.
Local County or Municipality Pretreatment Requirements	Local regulations	ARAR	Local regulations

TABLE 22

ACTION-SPECIFIC POTENTIAL CRITERIA, ADVISORIES, AND GUIDANCE TO BE CONSIDERED (TBC)

Medium/ Authority	Citation	Status	Requirement Synopsis
USEPA	Covers for Uncontrolled Hazardous Waste Sites (EPA/540/2-85-002; September 1985)	TBC	Covers for Uncontrolled Hazardous Waste Sites should include a vegetated top cover, middle drainage layer, and low permeability layer.
USEPA	Rules of Thumb for Superfund Remedy Selection (EPA 540-R-97- 013, August 1997)	TBC	Describes key principles and expectations, as well as "best practices" based on program experience for the remedy selection process under Superfund. Major policy areas covered are risk assessment and risk management, developing remedial alternatives, and groundwater response actions.
USEPA	Land Use in the CERCLA Remedy Selection Process (OSWER Directive No. 9355.7-04, May 1995)	TBC	Presents information for considering land use in making remedy selection decisions at NPL sites.
USEPA	Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites (OSWER Directive 9285.6-08, February 2002)	TBC	Presents risk management principles that site managers should consider when making risk management decisions at contaminated sediment sites.
USEPA	Contaminated Sediment Strategy (EPA-823-R-98- 001, April 1998)	TBC	Establishes an Agency-wide strategy for contaminated sediments, with the following four goals: 1) prevent the volume of contaminated sediments from increasing; 2) reduce the volume of existing contaminated sediment; 3) ensure that sediment dredging and dredged material disposal are managed in an environmentally sound manner; and 4) develop scientifically sound sediment management tools for use in pollution prevention, source control, remediation, and dredged material management.
USEPA	Contaminated Sediment Remediation Guidance for Hazardous Waste Sites (OSWER 9355.0-85 draft November 2002)	TBC	Provides technical and policy guidance for addressing contaminated sediment sites nationwide primarily associated with CERCLA actions.
USEPA	Structure and Components of Five-Year Reviews (OSWER Directive 9355.7- 02, May 1991) Supplemental Five-Year Review Guidance (OSWER Directive 9355.7-02A, July 1994) Second Supplemental Five-Year Review Guidance (OSWER 9355.7-03A, December 1995)	TBC	Provides guidance on conducting Five-Year Reviews for sites at which hazardous substances, pollutants, or contaminants remain on-site above levels that allow for unrestricted use and unlimited exposure. The purpose of the Five-Year Review is to evaluate whether the selected response action continues to be protective of public health and the environment and is functioning as designed:
USEPA	40 CFR Part 50	ARAR	Clean Air Act, National Ambient Air Quality Standards

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USACE	USACE, Notice on Issuance of Nationwide Permits, 67 Fed. Reg. 2020 (Jan. 15, 2002).	TBC	Reissues Nationwide permits, General Conditions, and definitions with some modifications and one new general condition. Modifications include additional requirements to enhance aquatic protection.
DEC	Letter from William R. Adriance, Chief Permit Administrator, to Richard Tomer and Paul G. Leuchner, Chiefs of the New York and Buffalo Districts of USACE, re. *Section 401 Water Quality Certification*, January 15, 2002 Nationwide Permits (Mar. 15, 2002).	TBC	
DEC	New York Guidelines for Soil Erosion and Sediment Control	TBC	
DEC	Air Guide 1 - Guidelines for the Control of Toxic Ambient Air Contaminants, 2000	TBC	Provides guidance for the control of toxic ambient air contaminants in New York State. Current annual guideline concentrations (AGCs) for PCBs are 0.01 µg/m3 for inhalation of evaporative congeners (Aroclor 1242 and below) and 0.002 µg/m3 for inhalation of persistent highly chlorinated congeners (Aroclor 1248 and above) in the form of dust or aerosols.
DEC	Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water	TBC	Provides guidance for ambient water quality standards and guidance values for pollutants
DEC	Technical and Operational Guidance Series (TOGS) 1.2.1 Industrial SPDES Permit Drafting Strategy for Surface Waters	TBC	Provides guidance for writing permits for discharges of wastewater from industrial facilities and for writing requirements equivalent to SPDES permits for discharges from remediation sites.
DEC	Technical and Operational Guidance Series (TOGS) 1.3.1 Waste Assimilative Capacity Analysis & Allocation for Setting	TBC	Provides guidance to water quality control engineers in determining whether discharges to water bodies have a reasonable potential to violate water quality standards and guidance values.
DEC	Technical and Operational Guidance Series (TOGS) 1.3.2 Toxicity Testing in the SPDES Permit Program	TBC	Describes the criteria for deciding when toxicity testing will be required in a permit and the procedures which should be followed when including toxicity testing requirements in a permit.
DEC	Technical and Operational Guidance Series (TOGS) 2.1.1, Guidance on Groundwater Contamination Strategy	TBC	
DEC, Division of Environ-mental Remedi-ation	Technical and Administrative Guidance Memorandum (TAGM) 4031 Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites	TBC	Provides guidance on fugitive dust suppression and particulate monitoring for inactive hazardous waste sites.
DEC	Interim Guidance on Freshwater Navigational Dredging, October 1994	TBC	Provides guidance for navigational dredging activities in freshwater areas.
DEC Division of Fish, Wildlife and Marine Resources	Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (FWIA), October 1994	TBC	Provides rationale and methods for sampling and evaluating impacts of a site on fish and wildlife during the remedial investigation and other stages of the remedial process

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DEC TAGM 3028	"Contained-In Criteria for Environmental Media (November 30, 1992).	TBC	Provides "contained-in" concentrations/ action levels for environmental media and the basis for these criteria.