TABLE 5.1
ONONDAGA LAKE
LAKE-WIDE ALTERNATIVES

	Lake-wide Alternative A	Lake-wide Alternative B	Lake-wide Alternative C	Lake-wide Alternative D	Lake-wide Alternative D2	Lake-wide Alternative E	Lake-wide Alternative F1	Lake-wide Alternative F2	Lake-wide Alternative F3	Lake-wide Alternative F4	Lake-wide Alternative G	Lake-wide Alternative H	Lake-wide Alternative I	Lake-wide Alternative J
	No Action	**Cap with Targeted Dredging**	**Dredge / Cap with Recreation and Habitat Diversification**	**Dredge / Cap with Minimal Armoring**	**Dredge / Cap**	**Dredge**	**Dredge / Cap**	**Dredge / Cap**	**Dredge / Cap**	**Dredge / Cap**	**Dredge / Cap**	**Dredge / Cap**	**Dredge/Cap**	**Dredge/Cap**
Criterion	**NA**	**A - Mean PECQ of 2 + Hg PEC (except SMU 5)**	**A - Mean PECQ of 2 + Hg PEC (except SMU 5)**	**A - Mean PECQ of 2 + Hg PEC (except SMU 5)**	**A - Mean PECQ of 2 + Hg PEC**	**A - Mean PECQ of 2 + Hg PEC (except SMU 5)**	**B - Mean PECQ of 1 + Hg PEC**	**B - Mean PECQ of 1 + Hg PEC**	**B - Mean PECQ of 1 + Hg PEC**	**B - Mean PECQ of 1 + Hg PEC**	**B - Mean PECQ of 1 + Hg PEC**	**B - Mean PECQ of 1 + Hg PEC**	**B - Mean PECQ of 1 + Hg PEC**	**E - ERL**
Dredging Basis	**NA**	**None in SMUs 1, 2, 4, 5, 7 and 8. NLSA, H&E and Targeted Dredging in SMU 3. Targeted Dredging in SMU 6.**	**None in SMUs 4, 5, 7 and 8. NLSA in SMU 1. NLSA, H&E and Targeted Dredging in SMUs 2 and 3. Targeted Dredging in SMU 6.**	**None in SMUs 5 , 7 and 8. NLSA and H&E in SMUs 1 and 4. NLSA, H&E and Targeted Dredging in SMUs 2 and 3. Targeted Dredging in SMU 6.**	**None in SMU 8. NLSA and H&E in SMUs 1, 4, 5, and 7. NLSA, H&E and Targeted Dredging in SMUs 2, 3, and 6.**	**None in SMUs 5 and 8. "Full removal" to the Mean PECQ2 and Hg PEC in SMUs 1, 2, 3, 4, 6, and 7.**	**None in SMU 8. NLSA and H&E in SMUs 1, 4, 5 and 7. NLSA, H&E and Targeted Dredging in SMUs 2, 3 and 6.**	**None in SMU 8. NLSA and H&E in SMUs 1, 4, 5 and 7. 25% of SMU 1. NLSA, H&E and Targeted Dredging in SMUs 2, 3 and 6.**	**None in SMU 8. NLSA and H&E in SMUs 1, 4, 5 and 7. To 3 meters in SMU 1. NLSA, H&E and Targeted Dredging in SMUs 2, 3 and 6.**	**None in SMU 8. NLSA and H&E in SMUs 1, 4, 5 and 7. To 4 meters in SMU 1. NLSA, H&E and Targeted Dredging in SMUs 2, 3 and 6.**	**None in SMU 8. NLSA and H&E in SMUs 1, 4, 5 and 7. To 5 meters in SMU 1. NLSA, H&E and Targeted Dredging in SMUs 2, 3 and 6.**	**None in SMU 8. NLSA and H&E in SMUs 1, 4, 5 and 7. To 5 meters in SMU 1. NLSA, H&E and Targeted Dredging in SMUs 2, 3, and 6. Full NAPL removal in SMU 2**	**None in SMU 8. NLSA and H&E in SMU 5. "Full removal" to the Mean PECQ1 and Hg PEC in SMUs 1, 2, 3, 4, 6, and 7.**	**None in SMU 8. NLSA and H&E in SMU 5. "Full removal" to the ERL in SMUs 1, 2, 3, 4, 6, and 7.**
SMU 1	**No Action**	**Littoral Alternative 3.A** Capping of Entire SMU / Habitat Optimization	**Littoral Alternative 4.A.2** Dredge for NLSA / Capping of Entire SMU / Habitat Optimization	**Littoral Alternative 4.A.3** Dredge for NLSA and H&E / Capping of Entire SMU / Habitat Optimization		**Littoral Alternative 5.A** Full Removal (To Mean PECQ2)	**Littoral Alternative 4.A.3** Dredge for NLSA and H&E / Capping of Entire SMU / Habitat Optimization	**Littoral Alternative 4.A.4** Dredge for Mass Removal to Remove 25% of ILWD / Cappping of Entire SMU / Habitat Optimization	**Littoral Alternative 4.A.5** Dredge for Mass Removal to 3 Meters / Cap of Entire SMU / Habitat Optimization	**Littoral Alternative 4.A.6** Dredge for Mass Removal to 4 Meters / Capping of Entire SMU / Habitat Optimization	**Littoral Alternative 4.A.7** Dredge for Mass Removal to 5 Meters / Cap of Entire SMU / Habitat Optimization		**Littoral Alternative 5.A** Full Removal (To Mean PECQ1)	**Littoral Alternative 5.A** Full Removal (To ERL)
SMU 2	**No Action**	**Littoral Alternative 3.A** Capping to Mean PECQ2 / Habitat Optimization	**Littoral Alternative 4.A.3** Dredge for NLSA and H&E and Targeted Dredging to 4 Meter Depth (For NAPL Removal) / Capping to Mean PECQ2 / Habitat Optimization			**Littoral Alternative 5.A** Full Removal (To Mean PECQ2)	**Littoral Alternative 4.A.3** Dredge for NLSA and H&E and Targeted Dredging to 4 Meter Depth (For NAPL Removal) / Capping to Mean PECQ1 / Habitat Optimization					**Littoral Alternative 4.A.4** Dredge for NLSA, H&E & Full NAPL Removal / Capping to Mean PECQ1 / Habitat Optimization	**Littoral Alternative 5.A** Full Removal (To Mean PECQ1)	**Littoral Alternative 5.D** Full Removal (To ERL)
SMU 3	**No Action**	**Littoral Alternative 2** Habitat Enhancement **Littoral Alternative 4.A.3** Dredge for NLSA and H&E and Targeted Dredging/ Capping to Mean PECQ2 / Habitat Optimization				**Littoral Alternative 5.A** Full Removal (To Mean PECQ2)	**Littoral Alternative 2** Habitat Enhancement - **Littoral Alternative 4.A.3** Dredge for NLSA and H&E and Targeted Dredging / Capping to Mean PECQ1 / Habitat Optimization						**Littoral Alternative 5.A** Full Removal (To Mean PECQ1)	**Littoral Alternative 5.E** Full Removal (To ERL)
SMU 4	**No Action**	**Littoral Alternative 3.A** Capping of Entire SMU / Habitat Optimization		**Littoral Alternative 4.A.3** Dredge for NLSA and H&E / Capping of Entire SMU / Habitat Optimization		**Littoral Alternative 5.A** Full Removal (To Mean PECQ2)	**Littoral Alternative 4.A.3** Dredge for NLSA and H&E / Capping of Entire SMU / Habitat Optimization						**Littoral Alternative 5.A** Full Removal (To Mean PECQ1)	**Littoral Alternative 5.D** Full Removal (To ERL)
SMU 5	**No Action**	**Littoral Alternative 2** Habitat Enhancement			**Littoral Alternative 2** Habitat Enhancement **Littoral Alternative 4.A.3** Dredge for NLSA and H&E / Capping to Mean PECQ2 / Habitat Optimization	**Littoral Alternative 2** Habitat Enhancement	**Littoral Alternative 2** Habitat Enhancement - **Littoral Alternative 4.B.3** Dredge for NLSA and H&E / Capping to Mean PECQ1 / Habitat Optimization							**Littoral Alternative 2/4.E.3** Habitat Enhancement/Dredge for NLSA and H&E / Capping to ERL / Habitat Optimization
SMU 6	**No Action**	**Littoral Alternative 4.A.1** Targeted Dredging / Capping to Mean PECQ2 / Habitat Optimization			**Littoral Alternative 4.A.3** Dredge for NLSA and H&E and Targeted Dredging / Capping to Mean PECQ2 / Habitat Optimization.	**Littoral Alternative 5.A** Full Removal (To Mean PECQ2)	**Littoral Alternative 4.B.3** Dredge for NLSA and H&E and Targeted Dredging / Capping to Mean PECQ1 / Habitat Optimization.						**Littoral Alternative 5.B** Full Removal (To Mean PECQ1)	**Littoral Alternative 5.D** Full Removal (To ERL)
SMU 7	**No Action**	**Littoral Alternative 3.A** Capping of Entire SMU / Habitat Optimization			**Littoral Alternative 4.A.3** Dredge for NLSA and H&E / Capping of Entire SMU / Habitat Optimization.	**Littoral Alternative 5.A** Full Removal (Mean PECQ2)	**Littoral Alternative 4.A.3** Dredge for NLSA and H&E / Capping of Entire SMU / Habitat Optimization.						**Littoral Alternative 5.A** Full Removal (To Mean PECQ1)	**Littoral Alternative 5.C** Full Removal (To ERL)
SMU 8	**No Action**	**Profundal Alternative 6.A** Phased Thin-layer Cap to Mean PECQ2, Hg PEC, and BSQV / Aeration (Oxygenation) / MNR					**Profundal Alternative 6.B** Phased Thin-layer Cap to Mean PECQ1, Hg PEC, and BSQV / Aeration (Oxygenation) / MNR							**Profundal Alternative 6.E** Thin Layer Cap to ERL and BSQV/ Aeration (Oxygenation)
Capped Acres	**0**	**356**	**356**	**356**	**392**	**20**	**579**	**579**	**579**	**579**	**579**	**579**	**214**	**2329**
Dredged Volume (CY)	**0**	**223,000**	**543,000**	**881,000**	**1,180,000**	**11,247,000 ++**	**1,207,000**	**1,868,000**	**2,419,000**	**2,947,000**	**3,490,000**	**3,724,000**	**12,184,000 ++**	**20,121,000 ++**
Cap and Dredge Duration (Years)	**0**	**3**	**3**	**3**	**3**	**9**	**4**	**4**	**4**	**4**	**4**	**4**	**10**	**17**
Total Cost ($ Millions)	**$0**	**$211**	**$243**	**$264**	**$294**	**$1,214**	**$312**	**$370**	**$429**	**$470**	**$514**	**$537**	**$1,327**	**$2,157**

Note:
1. The Cap and Dredge duration in years assumes a seven-month construction season.
++ - The depth limit of SEC exceedances have not been defined, therefore dredge volume and cost liekly to exceed the listed value.

TABLE 5.2
LAKE-WIDE ALTERNATIVES AREAS AND VOLUMES

SMU	Lake-wide Alternative A No Action	Lake-wide Alternative B Cap with Targeted Dredging	Lake-wide Alternative C Dredge / Cap with Recreation and Habitat Diversification	Lake-wide Alternative D Dredge / Cap with Minimal Armoring	Lake-wide Alternative D2 Dredge / Cap	Lake-wide Alternative E Dredge	Lake-wide Alternative F1 Dredge / Cap	Lake-wide Alternative F2 Dredge / Cap
SMU 1	**No Action**	**Capping of Entire SMU / HO**	**Dredging for NLSA/ Capping of Entire SMU / HO**	**Dredging for NLSA and H&E / Capping of Entire SMU / HO**		**Full Removal (to Mean PECQ2)**	**Dredging for NLSA and H&E / Capping of Entire SMU/ HO**	**Dredging to Remove 25% of ILWD / Capping of Entire SMU / HO**
Cap Area (acres)	0	84	84	84		0	84	84
Dredge Volume (CY)	0	0	151,000	354,000		4,028,000 ++	354,000	1,015,000
SMU 2	**No Action**	**Capping to Mean PECQ2 / HO**	**Dredging for NLSA and H&E and Targeted Dredging / Capping to Mean PECQ2 / HO**			**Full Removal (to Mean PECQ2)**	**Dredging for NLSA and H&E and Targeted Dredging / Cap to Mean PECQ1 / HO**	
Cap Area (acres)	0	16	16			0	16	
Dredge Volume (CY)	0	0	169,000			533,000 ++	169,000	
SMU 3	**No Action**	**Habitat Enhancement and Dredging for NLSA and H&E and Targeted Dredging / Capping to Mean PECQ2 / HO**				**Full Removal (to Mean PECQ2)**	**Habitat Enhancement / Dredging for NLSA and H&E and Targeted Dredging / Capping to Mean PECQ1 / HO**	
Cap Area (acres)	0	29				0	29	
Dredge Volume (CY)	0	75,000				381,000 ++	75,000	
SMU 4	**No Action**	**Capping of Entire SMU / HO**		**Dredging for NLSA and H&E / Capping of Entire SMU / HO**		**Full Removal (to Mean PECQ2)**	**Dredging for NLSA and H&E / Capping to Entire SMU / HO**	
Cap Area (acres)	0	75		75		0	75	
Dredge Volume (CY)	0	0		135,000		2,170,000 ++	135,000	
SMU 5	**No Action**	**Habitat Enhancement**			**Dredge for NLSA and H&E and Targeted Dredging/ Capping to Mean PECQ2 / HO / HE**	**Habitat Enhancement**	**Habitat Enhancement / Dredge for NLSA and H&E / Capping to Mean PECQ1 / HO**	
Cap Area (acres)		0			36	0	60	
Dredge Volume (CY)		0			124,000	0	140,000	
SMU 6	**No Action**	**Targeted Dredging / Capping to Mean PECQ2 / HO**			**Dredge for NLSA and H&E and Targeted Dredging/ Capping to Mean PECQ2 / HO**	**Full Removal (to Mean PECQ2)**	**Dredge for NLSA and H&E and Targeted Dredging/ Capping to Mean PECQ1 / HO**	
Cap Area (acres)	0	94			94	0	123	
Dredge Volume (CY)	0	148,000			234,000	2,650,000 ++	245,000	
SMU 7	**No Action**	**Capping of Entire SMU / HO**			**Dredge for NLSA and H&E / Capping of Entire SMU / HO**	**Full Removal (to Mean PECQ2)**	**Dredge for NLSA and H&E / Capping of Entire SMU / HO**	
Cap Area (acres)	0	38			38	0	38	
Dredge Volume (CY)	0	0			89,000	1,485,000 ++	89,000	
SMU 8	**No Action**	**Phased Thin-Layer Capping to Mean PECQ2, Hg PEC, and BSQV / Aeration (Oxygenation) / MNR**					**Phased Thin-Layer Capping to Mean PECQ1, Hg PEC and BSQV/ Aeration (Oxygenation) / MNR**	
Cap Area (acres)	0	20					154	
Dredge Volume (CY)	0	0					0	
Total								
Cap Area (acres)	0	356	356	356	392	20	579	579
Dredge Volume (CY)	0	223,000	543,000	881,000	1,180,000	11,247,000 ++	1,207,000	1,868,000

TABLE 5.2 (CONTINUED)
LAKE-WIDE ALTERNATIVES AREAS AND VOLUMES

SMU	Lake-wide Alternative F3 Dredge / Cap	Lake-wide Alternative F4 Dredge / Cap	Lake-wide Alternative G Dredge / Cap	Lake-wide Alternative H Dredge / Cap	Lake-wide Alternative I Dredge / Cap	Lake-wide Alternative J Dredge / Cap
SMU 1	**Dredging to 3 Meters / Capping of Entire SMU / HO**	**Dredging to 4 Meters / Capping of Entire SMU / HO**	**Dredging to 5 Meters / Capping to Mean PECQ1 / HO**		**Full Removal (to Mean PECQ1)**	**Full Removal (to ERL)**
Cap Area (acres)	84	84	84		0	0
Dredge Volume (CY)	1,566,000	2,094,000	2,637,000		4,028,000 ++	4,028,000 ++
SMU 2	**Dredging for NLSA and H&E and Targeted Dredging / Capping to Mean PECQ1 / HO**			**Dredging for NAPL Removal / Capping to Mean PECQ1 / HO**	**Full Removal (to Mean PECQ1)**	**Full Removal (to ERL)**
Cap Area (acres)	16			16	0	0
Dredge Volume (CY)	169,000			403,000	533,000 ++	1,016,000 ++
SMU 3	**Habitat Enhancement / Dredging for NLSA and H&E and Targeted Dredging / Capping to Mean PECQ1 / HO**				**Full Removal (to Mean PECQ1)**	**Full Removal (to ERL)**
Cap Area (acres)	29				0	0
Dredge Volume (CY)	75,000				381,000 ++	1,427,000 ++
SMU 4	**Dredging for NLSA and H&E / Capping of Entire SMU / HO**				**Full Removal (to Mean PECQ1)**	**Full Removal (to ERL)**
Cap Area (acres)	75				0	0
Dredge Volume (CY)	135,000				2,170,000 ++	3,563,000 ++
SMU 5	**Habitat Enhancement / Dredging for NLSA and H&E / Capping to Mean PECQ1 / HO**					**Habitat Enhancement / Dredging for NLSA and H&E / Capping to ERL / HO**
Cap Area (acres)	60					349
Dredge Volume (CY)	140,000					610,000
SMU 6	**Dredging for NLSA and H&E and Targeted Dredging/ Capping to Mean PECQ1 / HO**				**Full Removal (to Mean PECQ1)**	**Full Removal (to ERL)**
Cap Area (acres)	123				0	0
Dredge Volume (CY)	245,000				3,447,000 ++	7,309,000 ++
SMU 7	**Dredging for NLSA and H&E / Capping of Entire SMU / HO**				**Full Removal (to Mean PECQ1)**	**Full Removal (to ERL)**
Cap Area (acres)	38				0	0
Dredge Volume (CY)	89,000				1,485,000 ++	2,168,000 ++
SMU 8	**Phased Thin-Layer Capping to Mean PECQ1, Hg PEC and BSQV / Aeration (Oxygenation) / MNR**					**Thin-Layer Capping to ERL and BSQV / Aeration (Oxygenation)**
Cap Area (acres)	154					1980
Dredge Volume (CY)	0					0
Total						
Cap Area (acres)	579	579	579	579	214	2329
Dredge Volume (CY)	2,419,000	2,947,000	3,490,000	3,724,000	12,184,000 ++	20,121,000 ++

Notes:
1. Dredge for NLSA: Dredge for no loss of lake surface area
2. Dredge for H&E: Dredge to optimize habitat and minimize erosive forces
3. HO: Habitat Optimization
4. ++: The depth limit of SEC exceedances have not been defined, therefore dredge volume and cost likely to exceed the listed value

TABLE 5.3
DETAILED EVALUATION AND COMPARATIVE ANALYSIS OF LAKE-WIDE ALTERNATIVES

Evaluation Criteria	Lake-wide Alternative A – No Action	Lake-wide Alternative B – Capping with Targeted Dredging	Lake-wide Alternative C – Dredging / Capping with Recreation and Habitat Diversification	Lake-wide Alternative D – Dredging / Capping with Minimal Armoring	Lake-wide Alternative D.2 – Dredging / Capping with Minimal Armoring	Lake-wide Alternative E – Dredging
Description	Lake-wide Alternative A consists of No Action and is retained as a baseline condition per the NCP.	Lake-wide Alternative B consists of the following remedial activities on a SMU-specific basis: • SMU 1 – Capping of Entire SMU / Habitat Optimization • SMU 2 – Capping to Mean PECQ2 / Habitat Optimization • SMU 3 – Habitat Enhancement and Dredging for NLSA and H&E and Targeted Dredging / Capping to Mean PECQ2 or PEC / Habitat Optimization • SMU 4 – Capping Entire SMU / Habitat Optimization • SMU 5 – Habitat Enhancement • SMU 6 – Targeted Dredging / Capping to Mean PECQ2 / Habitat Optimization • SMU 7 – Capping of Entire SMU / Habitat Optimization • SMU 8 – Phased Thin-Layer Capping to Mean PECQ2, Hg PEC and BSQV / Aeration (Oxygenation) / MNR	Lake-wide Alternative C consists of the following remedial activities on a SMU-specific basis: • SMU 1 – Dredging for NLSA / Capping of Entire SMU / Habitat Optimization • SMU 2 – Dredging for NLSA and H&E and Targeted Dredging / Capping to Mean PECQ2 / Habitat Optimization • SMU 3 – Habitat Enhancement and Dredging for NLSA and H&E and Targeted Dredging / Capping to Mean PECQ2 or PEC / Habitat Optimization • SMU 4 – Capping of Entire SMU / Habitat Optimization • SMU 5 – Habitat Enhancement • SMU 6 – Targeted Dredging / Capping to Mean PECQ2 / Habitat Optimization • SMU 7 – Capping Entire SMU / Habitat Optimization • SMU 8 – Phased Thin-Layer Capping to Mean PECQ2, Hg PEC and BSQV / Aeration (Oxygenation) / MNR	Lake-wide Alternative D consists of the following remedial activities on a SMU-specific basis: • SMU 1 – Dredging for NLSA and H&E / Capping of Entire SMU / Habitat Optimization • SMU 2 – Dredging for NLSA and H&E and Targeted Dredging / Capping to Mean PECQ2 / Habitat Optimization • SMU 3 – Habitat Enhancement and Dredging for NLSA and H&E and Targeted Dredging / Capping to Mean PECQ2 or PEC / Habitat Optimization • SMU 4 – Dredging for NLSA and H&E / Capping of Entire SMU / Habitat Optimization • SMU 5 – Habitat Enhancement • SMU 6 – Targeted Dredging / Capping to Mean PECQ2 / Habitat Optimization • SMU 7 – Capping of Entire SMU / Habitat Optimization • SMU 8 – Phased Thin-Layer Capping to Mean PECQ2,Hg PEC and BSQV / Aeration (Oxygenation) / MNR	Lake-wide Alternative D2 consists of the following remedial activities on a SMU-specific basis: • SMU 1 – Dredging for NLSA and H&E to Mean PECQ2/ Capping of Entire SMU / Habitat Optimization • SMU 2 – Dredging for NLSA and H&E and Targeted Dredging / Capping to Mean PECQ2 / Habitat Optimization • SMU 3 – Habitat Enhancement and Dredging for NLSA and H&E and Targeted Dredging / Capping to Mean PECQ2 or PEC / Habitat Optimization • SMU 4 – Dredging for NLSA and H&E / Capping of Entire SMU / Habitat Optimization • SMU 5 – Habitat Enhancement and Dredging for NLSA and H&E / Capping to Mean PECQ2 / Habitat Optimization • SMU 6 – Dredging of NLSA and H&E and Targeted Dredging / Capping to Mean PECQ2 / Habitat Optimization • SMU 7 – Dredging for NLSA and H&E / Capping of Entire SMU / Habitat Optimization • SMU 8 – Phased Thin-Layer Capping to Mean PECQ2,Hg PEC and BSQV / Aeration (Oxygenation) / MNR	Lake-wide Alternative E consists of the following remedial activities on a SMU-specific basis: • SMU 1 – Full Removal (Dredging to Mean PECQ2) • SMU 2 – Full Removal (Dredging to Mean PECQ21) • SMU 3 – Full Removal (Dredging to Mean PECQ2) • SMU 4 – Full Removal (Dredging to Mean PECQ2) • SMU 5 – Habitat Enhancement • SMU 6 – Full Removal (Dredging to Mean PECQ2) • SMU 7 – Full Removal (Dredging to Mean PECQ2) • SMU 8 – Phased Thin-Layer Capping to Mean PECQ2, Hg PEC and BSQV / Aeration (Oxygenation) / MNR
Overall Protection of Human Health and the Environment	The No Action Alternative would not be protective of human health and the environment. This alternative would not reduce or control risk to receptors or release and transport of CPOIs at the site. The RAOs or PRGs would not be met under this alternative.	Lake-wide Alternative B would be protective of human health and the environment because it would meet RAOs and PRGs for littoral and profundal areas. Following remediation, the mean PECQ for surface sediment in the lake (i.e., capped areas, dredged and capped or backfilled areas, and areas not explicitly addressed by remediation) would be less than 2. Although there may be localized exceedances of individual SECs, such as the effects range-low (ERL) in areas not addressed by remediation, these exceedances are not expected to contribute substantially to sediment toxicity, and this alternative is sufficiently protective. Specifically, Alternative B would:	Slightly greater overall protection than Lake-wide Alternative B, since there would be no loss of lake surface area and minimized potential for erosive forces, as well as greater habitat value for submerged macrophytes, in SMU 1 and SMU 2. Alternative C provides the greatest diversity of habitat of any of the alternatives.	Slightly greater overall protection than Lake-wide Alternative C, since there would be dredging to maximize habitat and minimize erosive forces in SMUs 4 that would allow optimization of submerged macrophyte growth in those SMUs. Dredging in SMU 4 would expose sediments with higher CPOI concentrations; therefore, CPOI concentrations directly below the cap would be higher than for Alternative C. However, the cap model indicates that the cap would still be effective.	Slightly greater overall protection than Lake-wide Alternative D, since there would be additional dredging in SMUs 5, 6, and 7 to maximize habitat and minimize erosive forces, which would allow optimization of submerged macrophyte growth in those SMUs.	Similar overall protection as Lake-wide Alternative D; however, the protectiveness would be achieved through sediment removal in the littoral zone instead of capping. The duration for potential short-term risks, such as water quality (mercury, PCBs, and benzo[a]pyrene) exceedances due to resuspension and supernatant discharge would be significantly longer under Lake-wide Alternative E than other alternatives because of the increased dredging; therefore, the overall protectiveness during remedy implementation is decreased. More details associated with implementation risks are provided under

TABLE 5.3
DETAILED EVALUATION AND COMPARATIVE ANALYSIS OF LAKE-WIDE ALTERNATIVES

Evaluation Criteria	Lake-wide Alternative A – No Action	Lake-wide Alternative B – Capping with Targeted Dredging	Lake-wide Alternative C – Dredging / Capping with Recreation and Habitat Diversification	Lake-wide Alternative D – Dredging / Capping with Minimal Armoring	Lake-wide Alternative D2 – Dredging / Capping with Minimal Armoring	Lake-wide Alternative E – Dredging
Overall Protection of Human Health and the Environment (Continued)		• Reduce methylation of mercury in the hypolimnion through MNR, aeration (oxygenation), and phased thin-layer capping (addresses RAO 1—To eliminate or reduce, to the extent practicable, methylation of mercury in the hypolimnion); • Reduce releases of contaminants from the ILWD and other littoral areas around the lake via capping and/or dredging (addresses RAO 2—To eliminate or reduce, to the extent practicable, releases of contaminants from the ILWD and other littoral areas around the lake). However, this alternative does not include dredging to minimize erosive forces that may contribute to releases in SMUs 1, 2, 4, 6, and 7; • Reduce releases of mercury from profundal sediments through MNR, aeration (oxygenation), and phased thin-layer capping (addresses RAO 3—To eliminate or reduce, to the extent practicable, releases of mercury from profundal sediments); • Reduce existing and potential future adverse ecological effects (including bioaccumulation) on fish and wildlife resources, and reduce potential risks to humans through capping, dredging, and/or habitat enhancement and optimization (addresses RAO 4—To eliminate or reduce, to the extent practicable, existing and potential future adverse ecological effects on fish and wildlife resources, and potential risks to humans); • Achieve surface water quality standards, to the extent practicable, associated with CPOIs through isolation or removal of CPOI-impacted sediments and aeration (oxygenation) (addresses RAO 5 and PRG 3—To achieve surface water quality standards, to the extent practicable, associated with CPOIs); • Reduce, contain, and/or control CPOIs,				the discussion of short-term effectiveness in Section 4.

TABLE 5.3
DETAILED EVALUATION AND COMPARATIVE ANALYSIS OF LAKE-WIDE ALTERNATIVES

Evaluation Criteria	Lake-wide Alternative A – No Action	Lake-wide Alternative B – Capping with Targeted Dredging	Lake-wide Alternative C – Dredging / Capping with Recreation and Habitat Diversification	Lake-wide Alternative D – Dredging / Capping with Minimal Armoring	Lake-wide Alternative D2 – Dredging / Capping with Minimal Armoring	Lake-wide Alternative E – Dredging
Overall Protection of Human Health and the Environment (Continued)		to the extent practicable, in profundal and littoral surface sediments by capping to the mean PECQ2 throughout the lake (PRG 1); • Achieve CPOI concentrations in fish tissue that are protective of humans and wildlife that consume fish through capping and removal of CPOI-impacted sediment, as well as aeration (oxygenation) (PRG 2); • Create suitable conditions for macrophytes, benthic macroinvertebrates, and fish spawning through habitat enhancement and optimization; and • Provide the required monitoring and maintenance for the sediment cap and SCA.				
Compliance with ARARs	The no action alternative would not meet any site-specific ARARs.	Lake-wide Alternative B is expected to comply with all of the designated chemical-specific ARARs to the extent practicable. In addition, this alternative is expected to comply with all of the designated location-specific and action-specific ARARs. This alternative would also comply with the substantive requirements of the dredge and fill permit program under Section 404 of the federal Clean Water Act, and may comply with NYS Article 15, Part 608, if potential loss of an estimated 13 acres of lake surface area through conversion to upland habitat, and loss of water depth over approximately 115 acres is deemed acceptable. During remedy implementation, there would likely be short-term exceedances of surface water ARARs because of dredging (resuspension) and capping. These exccedances are expected to be limited to the period of remedial action implementation.	Same as described for Lake-wide Alternative B; however, short-term exceedances would potentially occur for a slightly longer period because of the increased dredging required under Alternative C. This alternative may comply with NYS Article 15, Part 608, if potential loss of an estimated 6 acres of lake surface area through conversion to upland habitat, and loss of water depth over approximately 91 acres is deemed acceptable.	Same as described for Lake-wide Alternative C; however, short-term exceedances would potentially occur for a slightly longer period because of the increased dredging required under Alternative D. This alternative may comply with NYS Article 15, Part 608, if potential loss of water depth over approximately 65 acres is deemed acceptable.	Same as described for Lake-wide Alternative D; however, short-term exceedances would potentially occur for a slightly longer period because of the increased dredging required under Alternative D2. This alternative may comply with NYS Article 15, Part 608, if potential loss of water depth over approximately 65 acres is deemed acceptable.	Same as described for Lake-wide Alternative D, except short-term exceedances would potentially occur for an extended period because of the volume of dredging required under Alternative E and the length of time estimated for remedial action (nine years versus three years for Alternatives B through D2. This alternative would be compliant with NYS Article 15, Part 608 since there would be no loss of lake surface area or water depth.

TABLE 5.3
DETAILED EVALUATION AND COMPARATIVE ANALYSIS OF LAKE-WIDE ALTERNATIVES

Evaluation Criteria	Lake-wide Alternative A – No Action	Lake-wide Alternative B – Capping with Targeted Dredging	Lake-wide Alternative C – Dredging / Capping with Recreation and Habitat Diversification	Lake-wide Alternative D – Dredging / Capping with Minimal Armoring	Lake-wide Alternative D2 – Dredging / Capping with Minimal Armoring	Lake-wide Alternative E – Dredging
Short-term Effectiveness						
Protection of the community during remedial actions	No action would be taken; therefore, there would be no protection of the community during remedial construction.	The effects on the community during the construction and implementation phase of this alternative would potentially include volatilization of organic constituents during dredging and materials handling, creating air emissions and odors. Based on experience at other capping sites, the impacts are not anticipated to be significant. Proven, available engineering controls would be employed during implementation of this alternative to minimize emissions and odors during dredging and capping activities, if required.	Same as described in Lake-wide Alternative B except: • Additional potential risk presented by volatilization of organics during dredging and materials handling; • Dredging, sediment handling, and dewatering may create air emissions and odors through release of SVOCs and VOCs from the dredge materials. However, significant odors and air emissions are not expected unless NAPL-containing VOCs are encountered. This short-term impact may be minimized or mitigated through engineering controls (e.g., silt curtains, surface absorbent booms and gunderbooms), including controlled dredging, wearing proper personal protective equipment (PPE), and adequate monitoring.	Same as described for Lake-wide Alternatives B and C except: • Without controls, the odor threshold may be exceeded for SAC air emissions for Alternative D. Engineering controls could be used for mitigation.	Same as described in Lake-wide Alternatives B and C except: • Without controls, the hazard index for SCA air emissions is greater than 1 for this alternative (i.e., excessive non-cancer risk). Engineering controls could be used to mitigate some of this risk.	Same as described for Lake-wide Alternatives B and C.
Environmental impacts and impacts to workers during remedial actions	No action would be taken; therefore, there would be no environmental impacts to workers during remedial construction.	The effects on workers during the construction and implementation phase of this alternative would potentially include: • Potential for on-site worker and transportation accidents associated with remedial construction issues related to capping (see Table 5.4 and Figure 5.1). • Potential for on-site workers to receive adverse impacts through dermal contact with contaminated sediment. However, since no sediment is being removed the potential risk associated with adverse dermal contact is minimal. It is anticipated that the potential to on-site workers could be mitigated by following appropriate health and safety protocols, by exercising sound engineering practices, and by utilizing proper protective equipment.	Same as described in Lake-wide Alternative B.	Same as described in Lake-wide Alternative B.	Same as described in Lake-wide Alternative B except: • There would be significantly greater short-term risks due to resuspension of CPOIs, release of NAPLs, air emissions of volatile CPOIs, due the larger volume of sediment being removed (see Table 5.4 and Figure 5.1). The predicted incidence of fatalities for Alternative E, the alternative with the highest dredged volume, is approximately 8 times higher than for Alternative B. A similar pattern is estimated for non-fatal accidents.	Same as described for Lake-wide Alternative B except: • Fatal injury frequencies related to vehicular accidents are several times higher for Alternative E than B. Non-fatal injuries area also expected to be significantly higher for Alternative E versus B.
Elapsed time until remedial action objectives would be achieved	No action would be taken; therefore, there would be no elapsed time until the remedial action objectives would be achieved.	Implementation of this alternative would likely be completed within three years. Some of the objectives for the dredging and capping portions of this alternative would be achieved sooner (e.g., removal of impacted sediment, reduction of surface sediment concentrations), whereas objectives related to habitat development and aquatic organisms would take longer to	Same as described under Lake-wide Alternative B, except implementation duration would be slightly longer because of the increased dredging volume.	Same as described under Lake-wide Alternative B, except implementation duration would be slightly longer because of increased dredging.	Same as described under Lake-wide Alternative B, except implementation duration would be slightly longer because of increased dredging.	The elapsed time until remedial objectives would be achieved is significantly longer than any of the preceding combination dredging/capping alternatives because the remedy would take an estimated nine years to implement compared to three years for Alternatives B through D.

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		achieve. MNR would take several years to achieve objectives in the profundal area, while aeration (oxygenation) would produce immediate benefits in terms of methylmercury reduction.				
Environmental impacts	No action would be taken; therefore, there would be no impacts to ecological community, such as habitat loss.	Short-term impacts to the ecological community would include: • Temporary loss of lake habitat and aquatic communities and • Temporary loss of terrestrial habitat due to SCA construction and use.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B; however, the impact duration would be significantly greater because of the additional dredging and backfilling required under this alternative. This would substantially increase the time required for re-colonization.
Long-term Effectiveness						
Permanence of the remedial alternative	No action would be taken; therefore, there would be no permanence associated with this alternative.	The overall permanence of this remedy is high. This alternative would provide permanence through the following activities: • Targeted dredging in SMUs 3 and 6 to enhance cap effectiveness; • Installation of an on-shore barrier wall in SMUs 1, 2, and 7 to prevent upwelling of contaminants through the sediment cap (It should be noted that these barrier systems will be constructed and operated to address ongoing migration of CPOIs into the lake from adjacent upland areas. Their continued operation is necessary to maintain the effectiveness of the cap); • Installation of a cap designed to ensure long-term chemical isolation and prevent ice scour; Monitoring programs will be designed and carried out to ensure the effectiveness of these remedial actions, including: • Development and implementation of a monitoring and maintenance program for the isolation and thin-layer cap to confirm that cap integrity is maintained; • Development and implementation of a monitoring and maintenance program for the SCA; and • Development of a monitoring program to evaluate the effectiveness of MNR and aeration (oxygenation).	Same as described for Lake-wide Alternative B, except sediment removal would also occur in SMUs 1 and 2 to enhance cap effectiveness and/or optimize habitat and minimize erosive forces.	Same as described for Lake-wide Alternative C, except sediment removal would also occur in SMU 4, and additional dredging would occur in SMU 1 to maximize habitat and minimize erosive forces.	Same as described for Lake-wide Alternative D, except additional sediment removal would also occur in SMUs 5, 6, and 7 to maximize habitat and minimize erosive forces.	The overall permanence of this remedy is high. This alternative provides long-term effectiveness and permanence by removal of the impacted sediment from SMUs 1 through 7. The removed sediment would be consolidated in a monitored and maintained SCA. Sediment removal may increase the long-term permanence of the remedy.

TABLE 5.3
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Magnitude of residual risk	No action would be taken; therefore, there would be no risk reduction associated with this alternative.	Based on the residual risk evaluation, there would be no unacceptable risks following implementation. The magnitude of residual risk would be low due to: • Reduction of lake-wide risks associated with consumption of fish containing CPOIs; • Reduction of risks associated with exposure to sediment containing CPOIs; • Reduction in lake-wide fish and food chain risks (e.g., bioaccumulation) from exposure to mercury and other CPOIs; • Reduction of sediment toxicity to benthic macroinvertebrates; • Improvements to benthic macroinvertebrate communities; • Reduction of mercury and other CPOI releases to the lake water via diffusion, advection, and sediment resuspension; and • Improvements to habitat conditions for fish and wildlife. (Long-term habitat conditions would be similar to those currently present, minus the impacts of CPOIs on the sediments.)	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.
Adequacy and reliability of controls	No action would be taken; therefore, there would be no control measures associated with this alternative.	High Failure of a properly-designed cap is unlikely. If a failure did occur, it is likely to involve one of three scenarios, as follows: • Extreme episodic events involving extreme wave action or ice scour are unlikely to affect more than ten percent of the cap and could remove portions of the cap and/or displace the armoring layer. These impacts can be repaired using similar specifications as for the original cap and armor design. • Potential slope failure in SMU 1 only is unlikely but could occur if seismic event exceeds the conservative seismic design parameters. Failure would likely impact no more than ten percent of the ILWD and would involve movement of a portion of the deposit and cap to deeper portions of the lake. These	High Same as described for Lake-wide Alternative B.	High Same as described for Lake-wide Alternative B.	High Same as described for Lake-wide Alternative B.	High Same as described for Lake-wide Alternative B.

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Adequacy and reliability of controls (Cotinued)		impacts could be repaired by removing some material from the head of the slump and cap replacement using similar specifications. • A failure of chemical isolation effectiveness is unlikely, but possible if the physical and/or chemical properties of the sediment were mischaracterized, and could result in the release of CPOIs through the cap if cap effectiveness integrity was compromised. Such a failure would be limited in extent, and would likely require hot spot removal. This alternative would provide adequacy and reliability of controls, as follows: • Capping – Long-term monitoring of the cap would be conducted, and cap integrity issues would be addressed, as required. • Dredging – The removed sediments would be consolidated in a properly designed and monitored SCA. • Habitat Enhancement – Biological monitoring (e.g., abundance and diversity of macrophytes evaluation) would be implemented to ensure that the alternative is effective in achieving enhanced macrophyte establishment and fish spawning. • Habitat Optimization – Dredging in SMU 3 would optimize habitat for submerged macrophytes by providing capped surface area within the two to six foot water depth range. • MNR – Additional contingency measures would be taken in profundal areas that do not achieve acceptable goals during the MNR period, including potential additional thin-layer capping.				

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Reduction of Toxicity, Mobility, and Volume through Treatment						
Containment and treatment process used and materials treated	No action would be taken; therefore, there would be no containment or treatment associated with this alternative.	The type of containment and treatment used for Lake-wide Alternative B would include: • Isolation capping in littoral areas; • Thin-layer capping in profundal area; • Dredging with on-site containment of dredge spoils; • Treatment of dewatered sediment water; • Stabilization of calcitic sediments and oncolites; • MNR; and • Aeration (oxygenation).	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	Only dredging is associated with this Lake-wide alternative, so the type of containment and treatment would include: • Dredging with on-site containment of dredge spoils; and • Treatment of dewatered sediment water.
Amount of hazardous materials destroyed or treated	None	Mass of hazardous and nonhazardous CPOIs removed in dredging action: Total chlorinated benzenes 1,133 kg Total mercury 1,798 kg Total BTEX 1,011 kg PCBs 637 kg LPAHs 3,944 kg HPAHs 10,090 kg Mass of hazardous and nonhazardous CPOIs contained through capping: Total chlorinated benzenes 205,559 kg Total mercury 141,064 kg Total BTEX 305,912 kg PCBs 8,651 kg LPAHs 515,810 kg HPAHs 366,809 kg Mass of hazardous and nonhazardous CPOIs not addressed through dredging, capping, or MNR/thin-layer capping: Total chlorinated benzenes 643 kg Total mercury 3,274 kg Total BTEX 3,711 kg PCBs 1,998 kg LPAHs 3,564 kg HPAHs 26,807 kg	Mass of hazardous and nonhazardous CPOIs removed in dredging action: Total chlorinated benzenes 21,651 kg Total mercury 4,966 kg Total BTEX 11,272 kg PCBs 1,030 kg LPAHs 19,871 kg HPAHs 16,809 kg Mass of hazardous and nonhazardous CPOIs contained through capping: Total chlorinated benzenes 185,040 kg Total mercury 137,897 kg Total BTEX 295,650 kg PCBs 8,258 kg LPAHs 499,883 kg HPAHs 360,090 kg Mass of hazardous and nonhazardous CPOIs not addressed through dredging, capping, or MNR/thin-layer capping: Total chlorinated benzenes 643 kg Total mercury 3,274 kg Total BTEX 3,711 kg PCBs 1,998 kg LPAHs 3,564 kg HPAHs 26,807 kg	Mass of hazardous and nonhazardous CPOIs removed in dredging action: Total chlorinated benzenes 47,071 kg Total mercury 10,202 kg Total BTEX 23,843 kg Total PCBs 1,382 kg LPAHs 37,901 kg HPAHs 24,977 kg Mass of hazardous and nonhazardous CPOIs contained through capping: Total chlor. benzenes 159,621 kg Total mercury 132,660 kg Total BTEX 283,079 kg PCBs 7,906 kg LPAHs 481,853 kg HPAHs 351,921 kg Mass of hazardous and nonhazardous CPOIs not addressed through dredging, capping, or MNR/thin-layer capping: Total chlorinated benzenes 643 kg Total mercury 3,274 kg Total BTEX 3,711 kg PCBs 1,998 kg LPAHs 3,564 kg HPAHs 26,807 kg	Mass of hazardous and nonhazardous CPOIs removed in dredging action: Total chlorinated benzenes 54,662 kg Total mercury 13,110 kg Total BTEX 25,591 kg PCBs 1,930 kg LPAHs 43,627 kg HPAHs 35,910 kg Mass of hazardous and nonhazardous CPOIs contained through capping: Total chlor. benzenes 152,033 kg Total mercury 130,336 kg Total BTEX 281,337 kg PCBs 7,417 kg LPAHs 476,187 kg HPAHs 341,534 kg Mass of hazardous and nonhazardous CPOIs not addressed through dredging, capping, or MNR/thin-layer capping: Total chlorinated benzenes 639 kg Total mercury 2,690 kg Total BTEX 3,706 kg PCBs 1,939 kg LPAHs 3,504 kg HPAHs 26,262 kg	Mass of hazardous and nonhazardous CPOIs removed in dredging action: Total chlor. benzenes 2,954 kg Total mercury 1,992 kg Total BTEX 1,064 kg PCBs 604 kg LPAHs 4,616 kg HPAHs 5,992 kg Mass of hazardous and nonhazardous CPOIs contained through capping: Total chlor. benzenes 205,559 kg Total mercury 141,064 kg Total BTEX 305,912 kg PCBs 8,651 kg LPAHs 515,810 kg HPAHs 366,809 kg Mass of hazardous and nonhazardous CPOIs not addressed through dredging, capping, or MNR/thin-layer capping: Total chlor. benzenes 643 kg Total mercury 3,274 kg Total BTEX 3,711 kg PCBs 1,998 kg LPAHs 3,564 kg HPAHs 26,807 kg
Degree of expected reduction in toxicity, mobility, or volume through treatment	No action would be taken; therefore, there would be no reduction in toxicity, mobility, or volume of impacted sediments through treatment. However, the	Aeration (oxygenation), consolidation and dewatering of dredged material in the SCA, and treatment of SCA supernatant prior to discharge into the lake would reduce toxicity, mobility, and/or volume through treatment.	Same as described for Lake-wide Alternative B, except dredging and capping would also occur in SMUs 1 and 2. Therefore, the volume of impacted sediment remaining in SMUs 1 and 2 would be reduced compared to Alternative	Same as described for Lake-wide Alternative C, except dredging would also occur in SMU 4 and additional dredging would occur in SMU 1 to maximize habitat optimization and minimize erosive forces. Therefore, the volume of impacted	Same as described for Lake-wide Alternative D, except additional dredging would also occur in SMUs 5, 6, and 7 to maximize habitat optimization and minimize erosive forces. Therefore, the volume of impacted sediment in SMUs 5,	This alternative would result in substantially more dredging than Alternative B, and would result in an increase in treatment of the CPOIs in the dredged sediments through supernatant treatment, and reduce the mobility of the

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Degree of expected reduction in toxicity, mobility, or volume through treatment (Continued)	overall bioavailability and mobility of contaminants in the sediment may be reduced over time, as cleaner sediments are naturally deposited over more impacted sediments in some areas of the lake.	There are three remedial actions being conducted under this alternative: dredging, capping, and oxygenation of the hypolimnion. The dredging process would cause the concentration of several of the more soluble, volatile, or degradable CPOIs in the sediments to be reduced significantly as they partition/dissolve into the supernatant, and are also subjected to highly aerobic conditions. These CPOIs are then removed from the supernatant by the treatment process to varying degrees. These sediments with reduced concentrations of CPOIs are then placed in a secure SCA resulting in a reduced mobility for these materials. In addition, NAPL will also be removed from the dredged material. Thus, handling and treatment of the sediment in the dredging process results in reduction of the toxicity of the wastes and a reduction of the mobility through containment. Capping will also reduce the mobility of the CPOIs by containment. Aeration (oxygenation of the hypolimnion) will reduce the toxicity due to mercury methylation in the water column. The degree of expected reduction in toxicity, mobility, or volume, on a SMU-specific basis, is as follows: • SMUs 1, 2, 4 and 7– Capping would effectively isolate impacted sediment and reduce the mobility of the impacted sediments (no reduction in toxicity or volume of impacted sediment). • SMUs 3 and 6 – Sediment removal followed by capping would reduce the volume of impacted sediments and isolate residual site-related CPOIs. The supernatant would be treated reducing toxicity. The dredged sediments would be placed in an on-site SCA. • SMUs 3 and 5 – Habitat enhancement would reduce the mobility of the calcitic sediments (i.e., erosion of the	B, and additional supernatant would be treated as a result of sediment consolidation/dewatering in the SCA. This would result in an increase in treatment of the CPOIs in the dredged sediments through supernatant treatment, and reduce the mobility of the CPOIs through placement in the SCA.	sediment in SMUs 1 and 4 would be further reduced and additional supernatant would be treated. This would result in an increase in treatment of the CPOIs in the dredged sediments through supernatant treatment, and reduce the mobility of the CPOIs through placement in the SCA. Since SMU 4 currently has a thin layer of lower-concentration sediment as compared to underlying material, dredging would expose sediments with higher concentrations. Therefore, the cap would be installed on sediments with higher mercury concentrations compared to Alternative C.	6, and 7 would be further reduced and additional supernatant would be treated. This would result in an increase in treatment of the CPOIs in the dredged sediments through supernatant treatment, and reduce the mobility of the CPOIs through placement in the SCA.	CPOIs through placement in the SCA. Significantly more supernatant would be treated under this alternative compared to Alternatives B through D because of the substantial increase in dredge volume. Removal of impacted sediment exceeding mean PECQ2 concentrations would reduce the volume of impacted sediments present in the lake compared to Alternatives B through D2, and F1 through H.

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Degree of expected reduction in toxicity, mobility, or volume through treatment (Continued)		calcite deposits) and oncolites. • SMU 8 – Aeration (oxygenation) would effectively reduce mercury methylation, and MNR would reduce surface concentrations. Thin-layer capping would effectively reduce surface sediment concentrations. As a result, the overall contaminant toxicity would be reduced. The volume of mercury and other key CPOIs in profundal sediment would not be reduced under this alternative; however, the overall bioavailability and mobility of contaminants in the profundal sediment would be reduced through thin-layer capping, MNR, and aeration (oxygenation). Oncolites and calcitic sediments would also still be present, but their mobility would be reduced through stabilization.				
Degree to which treatment would be irreversible	No action would be taken; therefore, no treatment would be necessary.	The remedy included in Lake-wide Alternative B is a permanent remedy, although there is a small risk of cap failure. Treatment of residuals in the SCA supernatant is permanent and irreversible.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.
Type and quantity of residuals remaining after treatment	No action would be taken; therefore, residuals of an estimated 19,216,000 CY of sediments above the mean PECQ2 would remain. An estimated 20,091,000 CY of sediments above the mean PECQ1 would remain, and an estimated 33,439,000 CY of sediments above the ER-L would remain.	The sediment isolation cap in the littoral area would isolate impacted sediment, significantly reducing their mobility and bioavailability or residual contamination present. Targeted dredging would reduce the quantity of residuals present in the littoral area in some SMUs. Thin-layer capping in the profundal zone would reduce CPOI concentrations in the surface sediment thus reducing potential exposure to residuals (i.e., impacted sediment) left in place. An estimated 18,993,000 CY of sediments above the mean PECQ2 would remain in the lake.	Same as described for Lake-wide Alternative B except, additional impacted sediment would be removed in some SMUs, decreasing the amount of residuals present to an estimated 18,676,000 CY above the mean PECQ2.	Same as described for Lake-wide Alternative C, except, additional impacted sediment would be removed in some SMUs, decreasing the amount of residuals present to an estimated 18,338,000 CY above the mean PECQ2.	Same as described for Lake-wide Alternative D, except, additional impacted sediment would be removed in some SMUs, decreasing the amount of residuals present to an estimated 18,039,000 CY above the mean PECQ2.	Same as described in Lake-wide Alternative D, except a much larger amount of impacted sediment would be removed in some SMUs, decreasing the amount of residuals present to an estimated 9,584,000 CY above the mean PECQ2. This alternative would also reduce the concentrations of CPOIs remaining in the lake.
The USEPA preference for treatment as a principal remedy element	This alternative does not meet this preference.	Aeration (oxygenation) in the profundal area, and treatment of SCA supernatant prior to discharge into the lake directly meet the treatment preference, whereas sediment dredging, consolidation, and dewatering in the SCA indirectly meet this preference.	There will be some increase in the degree of treatment compared to Lake-wide Alternative B, due to the higher volume of dredged material removed from the lake and placed in the SCA.	There will be some increase in the degree of treatment compared to Lake-wide Alternative C, due to the higher volume of dredged material removed from the lake and placed in the SCA.	There will be some increase in the degree of treatment compared to Lake-wide Alternative D, due to the higher volume of dredged material removed from the lake and placed in the SCA.	There will be some increase in the degree of treatment compared to Lake-wide Alternative D, due to the higher volume of dredged material removed from the lake and placed in the SCA.

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Implementability						
Ability to construct/operate technology	No action would be taken; therefore, no construction or operation would take place with this alternative.	High Capping (isolation and thin-layer), dredging, habitat enhancement, aeration (oxygenation), and MNR are all implementable technologies that have been used at other sites. In addition, SCA-type facilities have been constructed at numerous sites. Based on the highest observed dissolved contaminant and/or sediment concentrations in any SMU, isolation capping would be effective and implementable. Proper controls would be implemented for any NAPL that would be mobilized through the dredging conducted under this alternative.	High Same as described for Lake-wide Alternative B.	High Same as described for Lake-wide Alternative B.	High Same as described for Lake-wide Alternative B.	Moderate All the technologies proposed for Lake-wide Alternative E are implementable; however, implementation may not be practical because of the significant dredging volume, dredging depth, and duration (approximately nine years). Construction of the SCA would also be significantly more challenging because of its size (i.e., 260 acres with 50-ft [15.2-m] dikes).
Reliability of technology		High The reliability of isolation and thin-layer capping and dredging has been established at similar sites (see Appendix H, capping issues, and Appendix L, dredging issues). The primary implementability issue is designing a cap that can withstand wind/wave/current erosion, bioturbation, consolidation, and ice scour. Shoreline armoring and surface materials of appropriate sizes can be used to protect against these various stressors.	High Same as described for Lake-wide Alternative B.	High Same as described for Lake-wide Alternative B.	High Same as described for Lake-wide Alternative B.	High Same as described for Lake-wide Alternative B.
Ability to monitor effectiveness of remedy	Not applicable	High The effectiveness of this alternative would be monitored as follows: • Cap integrity would be monitored through periodic core sampling. Repairs could be made to the cap as required based on the monitoring. • Habitat enhancement in SMUs 3 and 5 would be evaluated based on the results of biological monitoring, and adjustments could be made accordingly. • Aeration (oxygenation) would be	High Same as described for Lake-wide Alternative B.	High Same as described for Lake-wide Alternative B.	High Same as described for Lake-wide Alternative B.	High Same as described for Lake-wide Alternative B.

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Evaluation Criteria	Lake-wide Alternative A – No Action	Lake-wide Alternative B – Capping with Targeted Dredging	Lake-wide Alternative C – Dredging / Capping with Recreation and Habitat Diversification	Lake-wide Alternative D – Dredging / Capping with Minimal Armoring	Lake-wide Alternative D2 – Dredging / Capping with Minimal Armoring	Lake-wide Alternative E – Dredging
Ability to monitor effectiveness of remedy (Continued)		monitored to determine how effectively it reduces mercury methylation in the hypolimnion. • Monitoring would be used to establish MNR effectiveness. • SCA cover integrity would be monitored and maintained to prevent potential exposure of humans or wildlife to dredged sediment. In addition, groundwater sampling would be used to confirm the integrity of the SCA. • Monitoring would also include residual CPOIs in the environment (e.g., fish tissue, water) and effects on the environment (e.g., benthic toxicity). The effectiveness of containment would be easier to monitor at the SCA than for the capped sediments in the lake.				
Ease of undertaking additional remedial actions as needed	No applicable	High. Implementation of Alternative B would not preclude additional future actions, if needed. Dredging and/or capping of additional littoral areas could be easily undertaken, if necessary, although removal of capped material may be needed. Similarly, additional thin-layer capping of profundal areas could be conducted if necessary.	High	High	High	High
Ability to obtain approvals from other agencies	Not applicable	High	High	High	High	Medium (due to extended duration required for implementation)
Availability of adequate on-site or off-site treatment, storage capacity, and disposal services	Not applicable	There is sufficient on-site capacity to contain the sediment that would be generated for this alternative.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	Due to the large volume of sediment removal associated with this alternative, some impacted sediment would likely have to be sent off-site for disposal..
Availability of necessary equipment and personnel	Not applicable	The equipment, subcontractors, personnel, and facilities required to successfully complete this alternative are available in the environmental marketplace.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	The equipment, subcontractors, personnel, and facilities required to successfully complete this alternative are available in the environmental marketplace. However, due to the magnitude of dredging required and the current market, it may be difficult to obtain four dredges for nine consecutive seasons, although it may be possible to purchase the equipment.

TABLE 5.3
DETAILED EVALUATION AND COMPARATIVE ANALYSIS OF LAKE-WIDE ALTERNATIVES

Evaluation Criteria	Lake-wide Alternative A – No Action	Lake-wide Alternative B – Capping with Targeted Dredging	Lake-wide Alternative C – Dredging / Capping with Recreation and Habitat Diversification	Lake-wide Alternative D – Dredging / Capping with Minimal Armoring	Lake-wide Alternative D2 – Dredging / Capping with Minimal Armoring	Lake-wide Alternative E – Dredging
Availability of prospective technologies	Not applicable	The technologies required to successfully complete this alternative are readily available.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.
Capital Cost	$0	$180,000,000	$210,000,000	$231,000,000	$260,000,000	$1,183,000,000
Operating and Maintenance Costs	$0	$31,000,000	$33,000,000	$33,000,000	$34,000,000	$31,000,000
Total Present Worth Cost	$0	$211,000,000	$243,000,000	$264,000,000	$294,000,000	$1,214,000,000

Notes:

BSQV	Bioaccumulation-based -sediment quality value	H&E	habitat and erosive forces	NLSA	no loss of surface area	PRG	preliminary remediation goal
CPOI	chemical parameter of interest	Hg	mercury	PCB	polychlorinated biphenyl	RAO	remedial action objective
CY	cubic yard	ILWD	in-lake waste deposit	PEC	probable effect concentration	SCA	sediment consolidation area
ERL	effects range-low	MNR	monitored natural recovery	PECQ	PEC quotient	SMU	sediment management unit

TABLE 5.3
DETAILED EVALUATION AND COMPARATIVE ANALYSIS OF LAKE-WIDE ALTERNATIVES

Evaluation Criteria	Lake-wide Alternatives F and G – Dredging / Capping	Lake-wide Alternative H – Dredging / Capping	Lake-wide Alternative I – Dredging / Capping	Lake-wide Alternative J – Dredging / Capping
Description	Lake-wide Alternatives F1, F2, F3, F4, and G consist of the following remedial activities on a SMU-specific basis: • SMU 1 – Dredging / Capping of Entire SMU / Habitat Optimization Alternatives F1, F2, F3, F4, and G differ only in the dredging goal in SMU 1, as listed below: o Alt F1 – Dredging for NLSA and H&E to Mean PECQ1 o Alt F2 – Dredging to Remove 25 percent of the ILWD for Mass Removal o Alt F3 – Dredging to 3 m for Mass Removal o Alt F4 – Dredging to 4 m for Mass Removal o Alt G – Dredging to 5 m for Mass Removal • SMU 2 – Dredging for NLSA and H&E and Targeted Dredging to 4 Meter Depth (for NAPL Removal) / Capping to Mean PECQ1 / Habitat Optimization • SMU 3 – Habitat Enhancement / Dredging for NLSA and H&E and Targeted Dredging / Capping to Mean PECQ1 / Habitat Optimization • SMU 4 – Dredging for NLSA and H&E / Capping of Entire SMU / Habitat Optimization • SMU 5 – Habitat Enhancement / Dredging for NLSA and H&E / Capping to Mean PECQ1 / Habitat Optimization • SMU 6 – Dredging for NLSA and H&E and Targeted Dredging / Capping to Mean PECQ1 / Habitat Optimization • SMU 7 – Dredging for NLSA and H&E / Capping of Entire SMU / Habitat Optimization • SMU 8 – Phased Thin-Layer Capping to Mean PECQ1, Hg PEC and BSQV / Aeration (Oxygenation) / MNR	Lake-wide Alternative H consists of the following remedial activities on a SMU-specific basis: • SMU 1 – Dredging to 5 m for Mass Removal, Capping of Entire SMU / Habitat Optimization • SMU 2 – Dredging for Full NAPL Removal / Capping to Mean PECQ1 / Habitat Optimization • SMU 3 – Habitat Enhancement / Dredging for NLSA and H&E and Targeted Dredging / Capping to Mean PECQ1 / Habitat Optimization • SMU 4 – Dredging for NLSA and H&E / Capping of Entire SMU / Habitat Optimization • SMU 5 – Habitat Enhancement / Dredging for NLSA and H&E / Capping to Mean PECQ1 / Habitat Optimization • SMU 6 – Dredging for NLSA and H&E and Targeted Dredging / Capping to Mean PECQ1 / Habitat Optimization • SMU 7 – Dredging for NLSA and H&E / Capping of Entire SMU / Habitat Optimization • SMU 8 – Phased Thin-Layer Capping to Mean PECQ1, Hg PEC and BSQV / Aeration (Oxygenation) / MNR	Lake-wide Alternative I consists of the following remedial activities on a SMU-specific basis: • SMU 1 – Full Removal (Dredging to Mean PECQ1) • SMU 2 – Full Removal (Dredging to Mean PECQ1) • SMU 3 – Full Removal (Dredging to Mean PECQ1) • SMU 4 – Full Removal (Dredging to Mean PECQ1) • SMU 5 – Habitat Enhancement / Dredging for NLSA and H&E / Capping to Mean PECQ1 / Habitat Optimization • SMU 6 – Full Removal (Dredging to Mean PECQ1) • SMU 7 – Full Removal (Dredging to Mean PECQ1) • SMU 8 – Phased Thin-Layer Capping to Mean PECQ1, Hg PEC and BSQV / Aeration (Oxygenation) / MNR	Lake-wide Alternative J consists of the following remedial activities on a SMU-specific basis: • SMU 1 – Full Removal (Dredging to ERL) • SMU 2 – Full Removal (Dredging to ERL) • SMU 3 – Full Removal (Dredging to ERL) • SMU 4 – Full Removal (Dredging to ERL) • SMU 5 – Habitat Enhancement / Dredging for NLSA and H&E / Capping to Mean ERL / Habitat • SMU 6 – Full Removal (Dredging to ERL) • SMU 7 – Full Removal (Dredging to ERL) • SMU 8 – Thin-Layer Capping to ER-L and BSQV / Aeration (Oxygenation) /
Overall Protection of Human Health and the Environment	Similar overall protection as Lake-wide Alternative D2; however additional areas would be addressed in SMUs 2, 3, 5, 6, and 8. Targeted dredging in SMU 2 would remove NAPL in the top 4m. Alternatives F and G would reduce, contain, and/or control CPOIs, to the extent practicable, in profundal and littoral surface sediments by capping/sediment removal to the mean PECQ1(rather than the mean PECQ2) throughout the lake (PRG 1). Remediating these additional areas would reduce uncertainties associated with sediment toxicity, and would reduce surface sediment CPOI concentrations, which would also reduce CPOIs in other media such as surface water and fish tissue. The varying amount of dredging and backfilling associated with SMU 1 (i.e., dredging for NLSA and H&E or dredging to remove 25 percent of the ILWD or dredging to 3, 4, or 5 m) would result in varying post-remediation habitat value due to variations in the final sediment elevation. Dredging and backfilling for NLSA and H&E (Alternative F1), and for	Same overall protection as Lake-wide Alternatives F and G, except targeted dredging would occur in SMU 2 to fully remove NAPL to a depth of 9 m. This alternative would reduce, contain, and/or control CPOIs, to the extent practicable, in profundal and littoral surface sediments by capping/sediment removal to the mean PECQ1 (rather than the mean PECQ2) throughout the lake (PRG 1).	Same overall protection as Lake-wide Alternative E, except that full removal in SMUs 1, 2, 3, 4, 6, and 7 would be to the PECQ1 rather than the PECQ2. Also, thin-layered capping associated with SMU 8 would be to the PECQ1 rather than the PECQ2. This alternative would reduce, contain, and/or control CPOIs, to the extent practicable, in profundal and littoral surface sediments by capping/sediment removal to the mean PECQ1 (rather than the mean PECQ2) throughout the lake (PRG 1).	Same overall protection as Lake-wide Alternative E, except that full removal in SMUs 1, 2, 3, 4, 6, and 7 would be to the ER-L rather than the PECQ2. Also, thin-layered capping associated with SMU 8 would be to the ERL and BSQV rather than the PECQ2.

TABLE 5.3
DETAILED EVALUATION AND COMPARATIVE ANALYSIS OF LAKE-WIDE ALTERNATIVES

Evaluation Criteria	Lake-wide Alternatives F and G – Dredging / Capping	Lake-wide Alternative H – Dredging / Capping	Lake-wide Alternative I – Dredging / Capping	Lake-wide Alternative J – Dredging / Capping
Overall Protection of Human Health and the Environment (Continued)	removal of 25 percent of the ILWD (Alternative F2) would result in the optimal habitat value, given the backfilling envisioned under these options. Dredging and backfilling to 3, 4, or 5 m (Alternatives F3, F4, and G) would result in significantly reduced habitat value due to the greater water depth.			
Compliance with ARARs	Same as described for Lake-wide Alternative B, except short-term exceedances would potentially occur for a slightly longer period of time (approximately four years versus three years for Alternative B) depending on the option chosen and because of the volume of dredging required under Alternatives F & G. This alternative may comply with NYS Article 15, Part 608, if potential loss of water depth over approximately 65 acres is deemed acceptable.	Same as described for Lake-wide Alternative B, except short-term exceedances would potentially occur for a slightly longer period of time (approximately four years versus three years for Alternative B) because of the volume of dredging required under Alternative H. This alternative may comply with NYS Article 15, Part 608, if potential loss of water depth over approximately 65 acres is deemed acceptable.	Same as described for Lake-wide Alternative B, except short-term exceedances would potentially occur for an extended period of time (approximately 10 years versus 3 years for Alternative B) because of the volume of dredging required under Alternative I. This alternative would be compliant with NYS Article 15, Part 608 since there would be no loss of lake surface area or water depth.	Same as described for Lake-wide Alternative B, except short-term exceedances would potentially occur for an extended period of time(approximately 17 years versus three years for Alternative B) because of the volume of dredging required under Alternative J. This alternative would be compliant with NYS Article 15, Part 608 since there would be no loss of lake surface area or water depth.
Short-term Effectiveness				
Protection of the community during remedial actions	Same as described in Alternatives B and C except; • Without controls, the hazard index for SCA air emissions is greater than 1 for this alternative (i.e., excessive non-cancer risk). Engineering controls could be used to mitigate some of this risk. • Without controls, the odor threshold may be exceeded for the SAC for Alternatives F and G. Engineering controls could be used for mitigation.	Same as described in Alternatives B and C except: • Without controls, the hazard index for SCA air emissions is greater than 1 for this alternative (i.e., excessive non-cancer risk). Engineering controls could be used to mitigate some of this risk. • Without controls, the odor threshold may be exceeded for SAC air emissions for Alternative H. Engineering controls could be used for mitigation.	Same as described in Alternatives B and C except: • Without controls, the hazard index for SCA air emissions is greater than 1 for this alternative (i.e., excessive non-cancer risk). Engineering controls could be used to mitigate some of this risk.	Same as described in Alternatives B and C except: • Using WQI index values, the overall water quality impacts of Alternative J would be more than 2,600 times as severe as the impacts of Alternative B. • Without controls, the odor threshold could be exceeded for SAC air emissions for Alternative J. Engineering controls could be used for mitigation.
Environmental impacts and impacts to workers during remedial actions	Same as described in Alternative B.	Same as described in Alternative B.	Same as described in Alternative B except: • The predicted incidence of fatalities for Alternative I, the alternative with the highest dredged volume, is approximately 8 times higher than for Alternative B. A similar pattern is observed for non-fatal accidents. • Fatal injury frequencies related to vehicular accidents are several times higher for Alternative I versus B. Non-fatal injuries area also expected to be significantly higher for Alternative I versus B.	Same as described in Alternative B except: • The predicted incidence of fatalities for Alternative J, the alternative with the highest dredged volume, is approximately 14 times higher than for Alternative B. A similar pattern is observed for non-fatal accidents. • Fatal injury frequencies related to vehicular accidents are several times higher for Alternative J versus B. Non-fatal injuries area also expected to be significantly higher for Alternative J versus B.
Elapsed time until remedial action objectives would be achieved	Similar to the description under Lake-wide Alternative B, except implementation duration would be slightly longer (estimated four years) because of increased dredging.	Same as described in Lake-wide Alternative F.	The elapsed time until remedial objectives would be achieved is significantly longer than any of the other alternatives, except Alternatives E and J.	Same as described for Lake-wide Alternative I except that the elapsed time until the remedial objectives would be achieved would take significantly longer than for Alternatives B through H.
Environmental impacts	Short-term impacts to the ecological community under Alternatives F & G would vary depending on the option selected. The time required for re-colonization would slightly increase (from approximately 3 to 4 years) due to the increased dredging involved with the alternative compared to Alternative B.	The time required for re-colonization would slightly increase (from approximately 3 to 4 years) due to the increased dredging involved with the alternative compared to Alternative B.	Similar short-term impacts to the ecological community as described under Alternative E, although the duration would be slightly longer (10 rather than 9 years).	Similar to those described for Lake-wide Alternative I except that due to the greater amount of dredging associated with this alternative, there would be a substantial increase in time required for re-colonization (by approximately 8 years [total of 17 years]).

TABLE 5.3
DETAILED EVALUATION AND COMPARATIVE ANALYSIS OF LAKE-WIDE ALTERNATIVES

Evaluation Criteria	Lake-wide Alternatives F and G – Dredging / Capping	Lake-wide Alternative H – Dredging / Capping	Lake-wide Alternative I – Dredging / Capping	Lake-wide Alternative J – Dredging / Capping
Long-term Effectiveness				
Permanence of the remedial alternative	Same as described for Lake-wide Alternative D, except that the capped area and dredged volume is greater.	Same as described for Lake-wide Alternative F, except additional sediment removal would occur in SMU 2 related to the NAPL that is present. The NAPL removal in SMU 2 would include removing NAPL to the bottom of the marl unit.	The overall permanence of this remedy is high. This alternative provides long-term effectiveness and permanence by removal of the impacted sediment from SMUs 1 through 7. The removed sediment would be consolidated in a monitored and maintained SCA. This alternative provides the added benefit of sediment removal, which may increase the long-term permanence of the remedy.	Same as described for Lake-wide Alternative I.
Magnitude of residual risk	Similar residual risk as Lake-wide Alternative D; however, additional areas would be addressed in SMUs 3, 5, 6, and 8. Remediating these additional areas would reduce uncertainties associated with sediment toxicity that may be present in these areas and would lower the residual risk.	Same as described for Lake-wide Alternative F.	The magnitude of residual risk would be low, as described for Lake-wide Alternative E. Residual CPOI concentrations would be at or below the Mean PECQ1.	The magnitude of residual risk would be low, as described for Lake-wide Alternative I. Residual CPOI concentrations would be at or below the mean ERL.
Adequacy and reliability of controls	High The adequacy and reliability of controls is slightly greater than for Alternatives B and since Alternatives F1 through G include additional removal to minimize erosive forces.	High Same as described for Lake-wide Alternatives F1 through G.	High Same as described for Lake-wide Alternative B.	High Same as described for Lake-wide Alternative B.
Reduction of Toxicity, Mobility and Volume through Treatment				
Containment and treatment process used and materials treated	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative E.	Same as described for Lake-wide Alternative E.
Amount of hazardous materials destroyed or treated	Mass of hazardous and nonhazardous CPOIs removed in dredging action/ contained through capping/ not addressed through dredging, capping, or MNR/thin-layer capping: Total chlorinated benzenes 54,393 kg / 156,249 kg / 470 kg (F1) 112,308 kg / 98,334 kg / 470 kg (F2) 141,797 kg / 68,845 kg / 470 kg (F3) 150,421 kg / 60,221 kg / 470 kg (F4) 154,988 kg / 55,654 kg / 470 kg (G) Total mercury 12,834 kg / 138,701 kg / 1,988 kg (F1) 25,045 kg / 126,490 kg / 1,988 kg (F2) 31,723 kg / 119,812 kg / 1,988 kg (F3) 38,396 kg / 113,139 kg / 1,988 kg (F4) 40,889 kg / 110,646 kg / 1,988 kg (G) Total BTEX 25,447 kg / 288,443 kg / 2,682 kg (F1) 84,960 kg / 228,929 kg / 2,682 kg (F2) 122,272 kg / 191,618 kg / 2,682 kg (F3) 199,751 kg / 114,139 kg / 2,682 kg (F4) 231,901 kg / 81,989 kg / 2,682 kg (G) PCBs 1,850 kg / 9,156 kg / 1,292 kg (F1) 2,739 kg / 8,276 kg / 1,292 kg (F2)	Mass of Hazardous and nonhazardous CPOIs removed in dredging action: Total chlorinated benzenes 154,988 kg Total mercury 40,889 kg Total BTEX 231,901 kg PCBs 3,471 kg LPAHs 338,027 kg HPAHs 101,110 kg Mass of hazardous and nonhazardous CPOIs contained through capping: Total chlorinated benzenes 55,654 kg Total mercury 110,646 kg Total BTEX 81,989 kg PCBs 7,535 kg LPAHs 196,162 kg HPAHs 306,422 kg Mass of hazardous and nonhazardous CPOIs not addressed through dredging, capping, or MNR/thin-layer capping: Total chlorinated benzenes 470 kg Total mercury 1,988 kg Total BTEX 2,682 kg PCBs 1,292 kg	Mass of Hazardous and nonhazardous CPOIs removed in dredging action: Total chlorinated benzenes 203,901 kg Total mercury 141,762 kg Total BTEX 306,883 kg PCBs 9,344 kg LPAH 517,084 kg HPAHs 385,670 kg Mass of hazardous and nonhazardous CPOIs contained through capping: Total chlorinated benzenes 6,741 kg Total mercury 9,722 kg Total BTEX 7,007 kg PCBs 1,662 kg LPAHs 17,105 kg HPAHs 21,862 kg Mass of hazardous and nonhazardous CPOIs not addressed through dredging, capping, or MNR/thin-layer capping: Total chlorinated benzenes 470 kg Total mercury 1,988 kg Total BTEX 2,682 kg PCBs 1,292 kg	Mass of Hazardous and nonhazardous CPOIs removed in dredging action: Total chlorinated benzenes 206,514 kg Total mercury 143,244 kg Total BTEX 309,516 kg PCBs 10,572 kg LPAHs 520,674 kg HPAHs 396,543 kg Mass of hazardous and nonhazardous CPOIs contained through capping: Total chlorinated benzenes 12,357 kg Total mercury 99,576 kg Total BTEX 44,842 kg PCBs 11,320 kg LPAHs 73,081 kg HPAHs 152,798 kg Mass of hazardous and nonhazardous CPOIs not addressed through dredging, capping, or MNR/thin-layer capping: Total chlorinated benzenes 58 kg Total mercury 602 kg Total BTEX 26 kg PCBs 103 kg

TABLE 5.3
DETAILED EVALUATION AND COMPARATIVE ANALYSIS OF LAKE-WIDE ALTERNATIVES

Evaluation Criteria	Lake-wide Alternatives F and G – Dredging / Capping	Lake-wide Alternative H – Dredging / Capping	Lake-wide Alternative I – Dredging / Capping	Lake-wide Alternative J – Dredging / Capping
Amount of hazardous materials destroyed or treated (Continued)	3,071 kg / 7,935 kg / 1,292 kg (F3) 3,225 kg / 7,781 kg / 1,292 kg (F4) 3,471 kg / 7,535 kg / 1,292 kg (G) LPAHs 42,806 kg / 491,383 kg / 1,545 kg (F1) 159,171 kg / 375,018 kg / 1,545 kg (F2) 269,443 kg / 264,746 kg / 1,545 kg (F3) 314,061 kg / 220,128 kg / 1,545 kg (F4) 338,027 kg / 196,162 kg / 1,545 kg (G) HPAHs 35,537 kg / 371,995 kg / 11,194 kg (F1) 61,809 kg / 345,724 kg / 11,194 kg (F2) 83,721 kg / 323,811 kg / 11,194 kg (F3) 93,516 kg / 314,016 kg / 11,194 kg (F4) 101,110 kg / 306,422 kg / 11,194 kg (G)	LPAHs 1,545 kg HPAHs 11,194 kg	LPAHs 1,545 kg HPAHs 11,194 kg	LPAHs 171 kg HPAHs 1,709 kg
Degree of expected reduction in toxicity, mobility, or volume through treatment	Same as described for Lake-wide Alternative D, except additional areas would be addressed through dredging. The dredge volume would vary in SMU 1 depending on the option selected. Therefore, the volume of impacted sediment would be further reduced. As more sediment was dredged, this would result in an increase in treatment of the CPOIs in the dredged sediments through supernatant treatment, and reduce the mobility of the CPOIs through placement in the SCA.	Same as described for Lake-wide Alternative F, except that the volume of impacted sediment that would be removed is higher. This includes additional removal in SMU 1 (i.e., 16 ft [5 m] deep) and additional NAPL removal associated with SMU 2 to the bottom of the marl unit. The additional dredging would result in an increase in treatment of the CPOIs in the dredged sediments through supernatant treatment, and reduce the mobility of the CPOIs through placement in the SCA.	Same as described for Lake-wide Alternative E except: • Significantly more supernatant would be treated under this alternative, as compared to Alternatives B through H, because of the substantial increase in dredge volume. • Removal of impacted sediment exceeding the mean PECQ1 would reduce the volume of impacted sediments present in the lake. This would result in an increase in treatment of the CPOIs in the dredged sediments through supernatant treatment, and reduce the mobility of the CPOIs through placement in the SCA.	Same as described for Lake-wide Alternative I except: • Significantly more supernatant would be treated under this alternative, as compared to Alternatives B through H, because of the substantial increase in dredge volume. • Removal of impacted sediment exceeding ERL concentrations would reduce the volume of impacted sediments present in the lake. This would result in an increase in treatment of the CPOIs in the dredged sediments through supernatant treatment, and reduce the mobility of the CPOIs through placement in the SCA.
Degree to which treatment would be irreversible	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.
Type and quantity of residuals remaining after treatment	Same as described for Lake-wide Alternative D, except additional impacted sediment would be removed in some SMUs, decreasing the amount and concentrations of residuals present. For Alternative F1, an estimated 18,887,000 CY of sediments would remain above the mean PECQ1. For Alternative F2, an estimated 18,226,000 CY of sediments would remain above the mean PECQ1. For Alternative F3, an estimated 17,675,000 CY of sediments would remain above the mean PECQ1. For Alternative F4, an estimated 17,147,000 CY of sediments would remain above the mean PECQ1. For Alternative G, an estimated 16,604,000 CY of sediments would remain above the mean PECQ1.	Same as described for Lake-wide Alternatives F and G, except additional impacted sediment would be removed in some SMUs, decreasing the amount and concentrations of residuals present. For Alternative H, an estimated 15,667,000 CY of sediments would remain above the mean PECQ1.	Same as described for Lake-wide Alternative I, except additional impacted sediment would be removed in some SMUs, decreasing the amount and concentrations of residuals present. For Alternative I, an estimated 9,567,000 CY of sediments would remain above the mean PECQ1.	Same as described for Lake-wide Alternative E, except additional impacted sediment would be removed in some SMUs, decreasing the amount and concentrations of residuals present. For Alternative J, an estimated 16,312,000 CY of sediments would remain above the ER-L.

TABLE 5.3
DETAILED EVALUATION AND COMPARATIVE ANALYSIS OF LAKE-WIDE ALTERNATIVES

Evaluation Criteria	Lake-wide Alternatives F and G – Dredging / Capping	Lake-wide Alternative H – Dredging / Capping	Lake-wide Alternative I – Dredging / Capping	Lake-wide Alternative J – Dredging / Capping
The USEPA preference for treatment as a principal remedy element	There will be some increase in the degree of treatment compared to Lake-wide Alternative D2, due to the higher volume of dredged material removed from the lake and placed in the SCA. The degree of treatment will increase from Lake-wide Alternative F1 to G as the dredged volume increases.	There will be some increase in the degree of treatment compared to Lake-wide Alternative G, due to the higher volume of dredged material removed from the lake and placed in the SCA.	There will be some increase in the degree of treatment compared to Lake-wide Alternatives E and H, due to the higher volume of dredged material removed from the lake and placed in the SCA.	There will be some increase in the degree of treatment compared to Lake-wide Alternative I, due to the higher volume of dredged material removed from the lake and placed in the SCA.
Implementability				
Ability to construct/operate technology	High Same as described for Lake-wide Alternative B, except that some of the larger sediment removal volumes associated with this alternative may be more difficult to implement because of the significant dredging volume and dredging depth.	Moderate Same as described in Lake-wide Alternative F, except it may be difficult, but possible, to dredge the required depth at SMU 2 (i.e., approximately 30 feet deep). In addition, there would be added implementation risk associated with the presence of NAPL which could be easily mobilized during dredging activities. However, proper controls would be implemented for any NAPL that would be mobilized through the dredging conducted under this alternative.	Moderate All the technologies proposed for Lake-wide Alternative I are implementable; however, implementation may not be practical because of the significant dredging volume, dredging depth, and duration. Construction of the SCA would also be significantly more challenging because of its size. Proper controls would be implemented for any NAPL that would be mobilized through the dredging conducted under this alternative.	Moderate Same as described for Lake-wide Alternative I except that this alternative may not be practical because of the significant dredging volume, dredging depth, and duration.
Reliability of technology	High Same as for Lake-wide Alternative B.	High Same as Alternatives B.	High Same as Alternatives B.	High Same as described for Lake-wide Alternative B.
Ability to monitor effectiveness of remedy	High Same as described for Lake-wide Alternative B.	High Same as described for Lake-wide Alternative B.	High Same as described for Lake-wide Alternative B.	High Same as described for Lake-wide Alternative B.
Ease of undertaking additional remedial actions as needed	High	High	High	High
Ability to obtain approvals from other agencies	High	High	Medium (due to extended duration required for implementation)	Medium (due to extended duration required for implementation)
Availability of adequate on-site or off-site treatment, storage capacity, and disposal services	Same as described for Lake-wide Alternative B	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative E	Same as described for Lake-wide Alternative E, except due to the large volume of sediment removed, there may be issues associated with off-site disposal.

TABLE 5.3
DETAILED EVALUATION AND COMPARATIVE ANALYSIS OF LAKE-WIDE ALTERNATIVES

Evaluation Criteria	Lake-wide Alternatives F and G – Dredging / Capping	Lake-wide Alternative H – Dredging / Capping	Lake-wide Alternative I – Dredging / Capping	Lake-wide Alternative J – Dredging / Capping
Availability of necessary equipment and personnel	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative E.	The equipment, subcontractors, personnel, and facilities required to successfully complete this alternative are available in the environmental marketplace. Due to the magnitude of dredging required and the current market, it may be difficult to obtain four dredges for 17 consecutive seasons. However, given the magnitude of the remedial effort, equipment purchase is likely.
Availability of prospective technologies	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.	Same as described for Lake-wide Alternative B.
Capital Cost	$275,000,000 (F1), $333,000,000 (F2), $392,000,000 (F3), $433,000,000 (F4), and $477,000,000 (G)	$499,000,000	$1,292,000,000	$2,086,000,000
Operating and Maintenance Costs	$37,000,000 (F1 through G)	$38,000,000	$35,000,000	$71,000,000
Total Present Worth Cost	$312,000,000 (F1), $370,000,000 (F2), $429,000,000 (F3), $470,000,000 (F4), and $514,000,000 (G).	$537,000,000	$1,327,000,000	$2,157,000,000

Notes:

BSQV	Bioaccumulation-based sediment quality value	H&E	habitat and erosive forces	NLSA	no loss of surface area	PRG	preliminary remediation goal
CPOI	chemical parameter of interest	Hg	mercury	PCB	polychlorinated biphenyl	RAO	remedial action objective
CY	cubic yard	ILWD	in-lake waste deposit	PEC	probable effect concentration	SCA	sediment consolidation area
ER-L	effects range-low	MNR	monitored natural recovery	PECQ	PEC quotient	SMU	sediment management unit

TABLE 5.4

SUMMARY OF TRANSPORTATION ACCIDENT RISK ESTIMATES – FATAL (COMPARISON OF LAKE-WIDE ALTERNATIVES)

Alternative	In-place volume (cy)	Predicted incidence of fatalities
Alt. B	223,000	2.7E-01
Alt. C	543,000	3.5E-01
Alt. D	881,000	4.2E-01
Alt. D2	1,196,000	5.1E-01
Alt. E	11,247,000	2.7E+00
Alt. F1	1,207,000	5.3E-01
Alt. F2	1,868,000	7.0E-01
Alt. F3	2,419,000	7.9E-01
Alt. F4	2,947,000	9.1E-01
Alt. G	3,490,000	1.1E+00
Alt. H	3,724,000	1.1E+00
Alt. I	12,184,000	3.0E+00
Alt. J	20,121,000	5.1E+00

SUMMARY OF TRANSPORTATION ACCIDENT RISK ESTIMATES – NON-FATAL (COMPARISON OF LAKE-WIDE ALTERNATIVES)

Alternative	In-place volume (cy)	Predicted Incidence of Non-Fatal Injuries
Alt. B	223,000	7.1E+00
Alt. C	543,000	9.1E+00
Alt. D	881,000	1.1E+01
Alt. D2	1,196,000	1.3E+01
Alt. E	11,247,000	7.0E+01
Alt. F1	1,207,000	1.4E+01
Alt. F2	1,868,000	1.8E+01
Alt. F3	2,419,000	2.0E+01
Alt. F4	2,947,000	2.3E+01
Alt. G	3,490,000	2.7E+01
Alt. H	3,724,000	2.8E+01
Alt. I	12,184,000	7.7E+01
Alt. J	20,121,000	1.3E+02

TABLE 5.5

LAKE-WIDE ALTERNATIVES COST SUMMARY

Alternative	Capital Cost	O & M Present Value	Total Cost
Alternative A – No Action	$0	$0	$0
Alternative B – Capping with Targeted Dredging	$180,000,000	$31,000,000	$211,000,000
Alternative C – Dredging/Capping with Recreation and Habitat Diversification	$210,000,000	$33,000,000	$243,000,000
Alternative D – Dredging/Capping with Minimal Armoring	$231,000,000	$33,000,000	$264,000,000
Alternative D2 – Dredging/Capping	$260,000,000	$34,000,000	$294,000,000
Alternative E – Dredging	$1,183,000,000	$31,000,000	$1,214,000,000
Alternative F1 – Dredging/Capping	$275,000,000	$37,000,000	$312,000,000
Alternative F2 – Dredging/Capping	$333,000,000	$37,000,000	$370,000,000
Alternative F3 – Dredging/Capping	$392,000,000	$37,000,000	$429,000,000
Alternative F4 – Dredging/Capping	$433,000,000	$37,000,000	$470,000,000
Alternative G – Dredging/Capping	$477,000,000	$37,000,000	$514,000,000
Alternative H – Dredging/Capping	$499,000,000	$38,000,000	$537,000,000
Alternative I – Dredging/Capping	$1,292,000,000	$35,000,000	$1,327,000,000
Alternative J –Dredging/Capping	$2,086,000,000	$71,000,000	$2,157,000,000

Notes:

A summary of the cost estimates is provided in Appendix F.

Details and backup are available upon request.