TABLE 2.1
RATIONALE FOR SELECTION OF SEDIMENT MANAGEMENT UNITS (SMUs)

Sediment Management Unit (SMU)	Water Depth	Sources of Surface Water Entering/ Leaving the SMU	Potential Sources of CPOIs in the SMU[a]	Key Risk Concerns in the SMU[a]	Primary Criteria Used to Define SMU
SMU 1 (In-Lake Waste Deposit)	0-9 meters	• East Flume • Harbor Brook	• In-Lake Waste Deposit (ILWD) • Former Willis Avenue Area • Wastebed B/Harbor Brook	Sediment toxicity to benthic macroinvertebrates, sediment exposure to humans by wading, benthic macroinvertebrate/ insect consumption by wildlife, moderately to severely impaired benthic community	Extent of ILWD
SMU 2 (Causeway)	0-9 meters	Tributary 5A	• Semet Residue Ponds • Former Willis Avenue Area	Sediment toxicity to benthic macroinvertebrates, sediment exposure to humans by wading, benthic macroinvertebrate/ insect consumption by wildlife, moderately to severely impaired benthic community	Southern boundary excludes ILWD, northern boundary includes higher concentrations of CPOIs than SMU 3
SMU 3 (Wastebeds 1-8)	0-9 meters	None	Wastebeds 1-8	Sediment toxicity to benthic macroinvertebrates in some areas, impaired habitat conditions, slightly to moderately impaired benthic community	Adjacent to the wastebeds, northern boundary excludes sediments apparently impacted by Ninemile Creek

TABLE 2.1 (CONTINUED)
RATIONALE FOR SELECTION OF SEDIMENT MANAGEMENT UNITS (SMUs)

Sediment Management Unit (SMU)	Water Depth	Sources of Surface Water Entering/ Leaving the SMU	Potential Sources of CPOIs in the SMU[a]	Key Risk Concerns in the SMU[a]	Primary Criteria Used to Define SMU
SMU 4 (Mouth of Ninemile Creek)	0-9 meters	Ninemile Creek	• LCP Bridge Street Site and West Flume • Geddes Brook/Ninemile Creek Area • Wastebeds 9-15	Moderately impaired benthic community	Primary extent of sediment impacted by Ninemile Creek
SMU 5 (Northern Shore)	0-9 meters	• Sawmill Creek • Bloody Brook • Lake Outlet	Bloody Brook Area	Slightly impaired habitat conditions in some areas, slightly to moderately impaired benthic communities	Low concentrations of CPOIs, excludes Ley Creek, not adjacent to any known Honeywell upland sources
SMU 6 (Ley Creek to 700 Feet South of Onondaga Creek)	0-9 meters	• Ley Creek • Onondaga Creek	• Ley Creek Area • Onondaga Creek Area • Oil City Area	Sediment toxicity to benthic macroinvertebrates, sediment exposure to humans by wading, benthic macroinvertebrate/ insect consumption by wildlife, impaired habitat conditions	Boundaries include Ley Creek through Onondaga Creek

TABLE 2.1 (CONTINUED)
RATIONALE FOR SELECTION OF SEDIMENT MANAGEMENT UNITS (SMUs)

Sediment Management Unit (SMU)	Water Depth	Sources of Surface Water Entering/ Leaving the SMU	Potential Sources of CPOIs in the SMU[a]	Key Risk Concerns in the SMU[a]	Primary Criteria Used to Define SMU
SMU 7 (700 Feet South of Onondaga Creek to the ILWD)	0-9 meters	Harbor Brook	Harbor Brook	Sediment toxicity to benthic macroinvertebrates, sediment exposure to humans by wading, benthic macroinvertebrate/ insect consumption by wildlife, impaired habitat conditions	Area potentially impacted by Harbor Brook and the ILWD
SMU 8 (Profundal Area)	Greater than 9 meters	Not Applicable	SMUs 1-7	Impaired benthic community	Water depth

Notes:

[a] Identification of potential sources of CPOIs and key risk concerns for each SMU was based on information provided in the Baseline Ecological Risk Assessment, Human Health Risk Assessment, and Remedial Investigation Report (TAMS, 2002a, b, and c).

PAHs - polycyclic aromatic hydrocarbons
PCBs - polychlorinated biphenyls
PCDD/PCDFs – Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans

TABLE 2.2

SMU-SPECIFIC RISK CONCERNS IN ONONDAGA LAKE

SMU	Risk Concerns in SMU[a]		SMU's Contribution to Lake-Wide Risk Concerns Related to Fish Consumption	
	Concern	CPOIs/Stressors	CPOIs - Wildlife[c]	CPOIs -Humans[d]
1,2,6,7	Sediment toxicity to benthic macroinvertebrates	Mercury, ethylbenzene, xylenes, chlorobenzene (except SMU 6), dichlorobenzenes, trichlorobenzenes (except SMU 6), PAHs, total PCBs[b]	Mercury, PCBs	Mercury, PCBs, PCDD/PCDFs
	Sediment exposure to humans by wading	Arsenic, PAHs, PCDD/PCDFs, hexachlorobenzene[d]		
	Benthic macroinvertebrate/insect consumption by wildlife[e]	PAHs, barium, chromium, mercury, methylmercury, selenium		
	Moderately to severely impaired benthic community	Sediment toxicity, limited macrophyte cover in SMUs 1 and 2		
	Impaired habitat conditions	Limited macrophyte cover except in SMUs 1 and 2		
3	Sediment toxicity to benthic macroinvertebrates in some areas	Mercury, ethylbenzene, xylenes, dichlorobenzenes, total PCBs[b]	Low[f]	Low[f]
	Impaired habitat conditions	Calcitic sediments, unstable shoreline, limited macrophyte cover except at the border of SMUs 3 and 4		
	Slightly to moderately impaired benthic community	Sediment toxicity in some areas, limited macrophyte cover		
4	Moderately impaired benthic community; sediment toxicity to benthic macroinvertebrates	Limited macrophyte cover in some areas; mercury	Mercury	Mercury

TABLE 2.2 (CONTINUED)

SMU-SPECIFIC RISK CONCERNS IN ONONDAGA LAKE

SMU	Risk Concerns in SMU[a]		SMU's Contribution to Lake-Wide Risk Concerns Related to Fish Consumption	
	Concern	CPOIs/Stressors	CPOIs - Wildlife[c]	CPOIs -Humans[d]
5	Slightly impaired habitat conditions in some areas	Oncolites and limited macrophyte cover in some areas	Low[f]	Low[f]
	Slightly to moderately impaired benthic communities	Limited macrophyte cover in some areas		
8	Impaired benthic community	Anoxia; mercury	Mercury	Mercury

NOTES:

[a] Identification of risk concerns for each SMU was based on information provided in the Baseline Ecological Risk Assessment, Human Health Risk Assessment, and Remedial Investigation Report (TAMS, 2002a, b, and c).

[b] Identification of CPOIs contributing to sediment toxicity in each SMU was based on exceedance of individual PECs for CPOIs identified as contributing to mean PEC quotients in each SMU.

[c] These CPOIs were identified in the BERA (TAMS, 2002a) as having mean LOAEL HQs greater than one for the belted kingfisher, osprey and/or river otter. The mink and great blue heron had no CPOIs with mean HQ LOAELs greater than one. Concentrations of these CPOIs in sediment are elevated in these SMUs relative to other SMUs. DDT was also identified as contributing to risk via fish consumption.

[d] These CPOIs were identified in the HHRA (TAMS, 2002b) as the primary chemicals contributing 10 percent or more to risk estimates greater than 10^{-6} and/or hazard indices greater than one. Arsenic was also identified as a primary chemical contributing to risk via fish consumption.

[e] These CPOIs were identified in the BERA (TAMS, 2002a) as having mean LOAEL HQs greater than one for the tree swallow, mallard, and/or little brown bat. Concentrations of these CPOIs in sediment are elevated in these SMUs relative to other SMUs.

[f] Concentrations of bioaccumulative CPOIs (i.e., mercury, PCBs) in sediment are considerably lower in these SMUs than in other areas of the lake.

TABLE 2.3
REMEDIAL ACTION OBJECTIVES AND PRELIMINARY REMEDIATION GOALS

Remedial Action Objectives (RAOs)	Risk Concern	Preliminary Remediation Goals (PRGs)	Rationale for PRGs
RAO 1 To eliminate or reduce, to the extent practicable, methylation of mercury in the hypolimnion	Human and wildlife exposure to methylmercury in fish tissue.	**PRG 1** Reduce, contain or control CPOIs in profundal and littoral sediments by achieving SECs[1], to the extent practicable.	Achieving PRG 1 will reduce the mass of mercury available for release into the hypolimnion and epliminion from littoral and profundal sediments. This reduction will reduce mercury methylation and bioaccumulation in fish tissue[2].
RAO 2 To eliminate or reduce, to the extent practicable, releases of contaminants from the ILWD and other littoral areas around the lake.	Human and wildlife exposure to methylmercury and other CPOIs in fish tissue, exposure of aquatic organisms to CPOIs in water**.**	**PRG 1** Reduce, contain or control CPOIs in profundal and littoral sediments by achieving SECs[1], to the extent practicable.	Achieving PRG 1 will reduce the mass of CPOIs available for release when surface sediments are resuspended from littoral areas. This reduction in CPOI release will reduce mercury methylation and the bioaccumulation of methylmercury[2] and other CPOIs in fish tissue. Reduction in CPOI release will also reduce concentrations of CPOIs in water.
RAO 3 To eliminate or reduce, to the extent practicable, releases of mercury from profundal sediments	Human and wildlife exposure to methylmercury in fish tissue.	**PRG 1** Reduce, contain or control CPOIs in profundal and littoral sediments by achieving SECs[1], to the extent practicable.	Achieving PRG 1 will reduce the mass of mercury available for release from profundal sediments. Reduction in mercury release will, in turn, reduce mercury methylation and bioaccumulation in fish tissue[2].

TABLE 2.3 (CONTINUED)
REMEDIAL ACTION OBJECTIVES AND PRELIMINARY REMEDIATION GOALS

Remedial Action Objectives (RAOs)	Risk Concern	Preliminary Remediation Goals (PRGs)	Rationale for PRGs
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.	Human and wildlife exposure to methylmercury and other CPOIs in fish tissue; human, wildlife, and benthic macroinvertebrate exposure to CPOIs in surface sediment.	**PRG 1** Reduce, contain or control CPOIs in profundal and littoral sediments by achieving SECs[1], to the extent practicable.	Achieving PRG 1 will reduce adverse effects on humans, wildlife, and benthic macroinvertebrates by reducing CPOI concentrations in surface sediments. Reduction of CPOI concentrations in surface sediment will also reduce mercury methylation and the bioaccumulation of methylmercury[2] and other CPOIs in fish tissue.
		PRG 2 Achieve CPOI[3] concentrations in fish tissue that are protective of humans and wildlife that consume fish, to the extent practicable.	Achieving PRG 2 will reduce adverse effects on humans and wildlife by reducing the concentrations of methylmercury and other bioaccumulative CPOIs in fish tissue.
		PRG 3 Achieve surface water quality standards, to the extent practicable, associated with CPOIs.	Achieving PRG 3 will result in reduced concentrations of CPOIs in water and reduced bioaccumulation of methylmercury in fish tissue.
RAO 5 To achieve surface water quality standards, to the extent practicable, associated with chemical parameters of interest.	Human and wildlife exposure to methylmercury in fish tissue, exposure of aquatic organisms to CPOIs in water	**PRG 3** Achieve surface water quality standards, to the extent practicable, associated with CPOIs.	Achieving PRG 3 will result in reduced concentrations of CPOIs in water and reduced bioaccumulation of methylmercury in fish tissue.

[1] SECs are defined as the site-specific ER-L, PEC, AET, and the mean PECQ 1 and 2. The ER-L, PEC, and AET values are presented in Section 1.

[2] This reduction assumes that mercury methylation is at least in part a function of the mass of mercury supplied to the hypolimnion. Mercury methylation depends on at least three factors: 1) the bioavailability of inorganic mercury (the substrate for methylation), 2) the composition of the microbial community in the anoxic environment, and 3) the metabolic activity of the microbial community.

[3] The PRGs are presented in Table 2.5.

TABLE 2.4

CPOIs CONTRIBUTING TO SEDIMENT TOXICITY TO BENTHIC MACROINVERTEBRATES IN ONONDAGA LAKE

Metals
- Mercury

Organic Compounds

BTEX Compounds
- Ethylbenzene
- Xylenes

Chlorinated Benzenes
- Chlorobenzene
- Dichlorobenzenes
- Trichlorobenzenes

PAH Compounds
- Acenaphthene
- Acenaphthylene
- Anthracene
- Benz[a]anthracene
- Benzo[a]pyrene
- Benzo[b]fluoranthene
- Benzo[ghi]perylene
- Benzo[k]fluoranthene
- Chrysene
- Dibenz[a,h]anthracene
- Fluoranthene
- Fluorene
- Indeno[1,2,3-cd]pyrene
- Naphthalene
- Phenanthrene
- Pyrene

Polychlorinated Biphenyls
- Total PCBs

Notes:
See Appendix J for a description of how CPOIs were identified.
BTEX - benzene, toluene, ethylbenzene, xylenes
PCB - polychlorinated biphenyl
PAH - polycyclic aromatic hydrocarbon

TABLE 2.5
TARGET FISH TISSUE CONCENTRATION RANGES FOR ONONDAGA LAKE

	Target Tissue Concentration for Piscivorous Wildlife		Target Tissue Concentration for Humans	
CPOI	NOAEL	LOAEL	Lower-End	Upper-End
Metals				
Mercury/methylmercury	0.01	0.3	0.2	0.6
Organic Compounds				
Total PCBs	0.01	9.6	0.003	0.2
PCDD/PCDFs (human TEQ)	--	--	4×10^{-8}	5×10^{-5}

Note: All units in mg/kg wet weight

--
LOAEL
NOAEL
PCB
PCDD/PCDF
TEQ

TABLE 2.6
IMPACTED SEDIMENT AREAS AND VOLUMES FOR ALL CPOIs

SMU	PECQ2[1] + Hg PEC		PECQ1[2] + Hg PEC		AET		PEC		ER-L	
	Volume (CY x 1000)[3]	Area (Acres)	Volume (CY x 1000)[3]	Area (Acres)	Volume (CY x 1000)[3]	Area (Acres)	Volume (CY x 1000)[3]	Area (Acres)	Volume (CY x 1000)[3]	Area (Acres)
1 - ILWD	3,574+	84	3,574+	84	3,574+	84	3,574+	84	3,574+	84
2 - Causeway	166+	16	166+	16	166+	16	358+	34	358+	34
3 - Wastebeds	306+	29	306+	29	79+	7	306+	29	1,195+	113
4 - Ninemile Creek	1,984	75	1,984	75	1,984	75	3,176+	75	3,176+	75
5 - North Shore	191+	36	314+	59	123+	23	1,238+	234	1,845+	349
6 - Ley Creek to Onondaga Creek	2,497	94	3,249	123	4,459+	103	6,614+	156	6,614+	156
7 - Onondaga Creek to ILWD	1,200	38	1,200	38	1,600+	38	1,600+	38	1,600+	38
Littoral Total	**9,632+**	**372**	**10,384+**	**424**	**11,862**	**346**	**16,738 +**	**650**	**18,362 +**	**849**
8 - Profundal	9,393	1,544	9,393	1,544	2,154+	82	10,122	1,599	15,077	1,980
9 - Wetland Area	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Notes:

Volumes followed by "+" indicate that SEC exceedences extend deeper than the available data; therefore, it is not possible to accurately calculate the volume. The listed volume is based on the extent of data.

Area and volume estimates are based on Thiessen polygon interpolation of sample points from samples collected from the lake sediment during previous investigations. These areas and volumes will be revised in Section 4 during the development of dredging and capping scenarios to consider the application various remedial alternatives.

(1) Mean PECQ less than 2.
(2) Mean PECQ less than 1.
(3) Volumes are *in situ* . Actual dredged volumes will increase based on overdredging, sloughing, etc.
TBD - To Be Determined