RECORD OF DECISION

Onondaga Lake Bottom Subsite
of the Onondaga Lake Superfund Site
Towns of Geddes and Salina, Villages of Solvay and Liverpool, and City of Syracuse, Onondaga County, New York

NYSDEC

USEPA Region 2

JULY 2005

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ALBANY, NEW YORK

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
NEW YORK, NEW YORK

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Onondaga Lake Bottom Subsite
Towns of Geddes and Salina, Villages of Solvay and Liverpool, and City of Syracuse, Onondaga County, New York

Superfund Site Identification Number: NYD986913580
Operable Unit 2

STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) documents the New York State Department of Environmental Conservation (NYSDEC) and US Environmental Protection Agency's (EPA's) selection of a remedy for the Onondaga Lake Bottom Subsite (site), which is chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 US Code (USC.) §9601, et seq., and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) Part 300. This decision document explains the factual and legal basis for selecting the remedy for the site. Appendix III, attached, is an index that identifies the items that comprise the Administrative Record upon which the selection of the remedy is based.

The New York State Department of Health (NYSDOH) was consulted on the planned remedy in accordance with CERCLA Section 121(f), 42 USC §9621(f), and it concurs with the selected remedy (see Appendix IV).

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from the site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy addresses all areas of the lake where the surface sediments exceed a mean probable effect concentration quotient (PECQ) of 1 or a mercury PEC of 2.2 milligrams per kilogram (mg/kg).[1] The selected remedy will also attain a 0.8 mg/kg bioaccumulation-based sediment quality value (BSQV) for mercury on an area-wide basis for the lake and for other applicable areas of the lake to be determined during the remedial design. The selected remedy is also intended to achieve lakewide fish tissue mercury concentrations ranging from 0.14 mg/kg, which is for protection of ecological receptors, to 0.3 mg/kg, which is based on EPA's

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[1] These cleanup criteria were developed to address acute toxicity to the sediment-dwelling (benthic) community in Onondaga Lake.

methylmercury National Recommended Water Quality criterion for the protection of human health for the consumption of organisms. The major components of the selected remedy include:

- Dredging of as much as an estimated 2,653,000 cubic yards (cy) of contaminated sediment/waste from the littoral zone[2] in Sediment Management Units (SMUs)[3] 1 through 7 to a depth that will prevent the loss of lake surface area, ensure cap effectiveness, remove non-aqueous-phase liquids (NAPLs), reduce contaminant mass, allow for erosion protection, and reestablish the littoral zone habitat. Most of the dredging will be performed in the in-lake waste deposit (ILWD) (which largely exists in SMU 1) and in SMU 2.

- Dredging, as needed, in the ILWD to remove materials within areas of hot spots (to improve cap effectiveness) and to ensure stability of the cap.

- Placement of an isolation cap over an estimated 425 acres of SMUs 1 through 7.

- Construction/operation of a hydraulic control system along the SMU 7 shoreline to maintain cap effectiveness. In addition, the remedy for SMUs 1 and 2 will rely upon the proper operation of the hydraulic control system, which is being designed under IRMs presently underway at the Semet Residue Ponds, Willis Avenue, and Wastebed B/Harbor Brook subsites to control the migration of contamination to the lake via groundwater from the adjacent upland areas.

- Placement of a thin-layer cap over an estimated 154 acres of the profundal zone.[4]

- Treatment and/or off-site disposal of the most highly contaminated materials (e.g., pure phase chemicals segregated during the dredging/handling process). The balance of the dredged sediment will be placed in one or more Sediment Consolidation Areas (SCAs), which will be constructed on one or more of Honeywell's Solvay wastebeds that historically received process wastes from Honeywell's former operations. The containment area will include, at a minimum, the installation of a liner, a cap, and a leachate collection and treatment system.

- Treatment of water generated by the dredging and sediment handling processes to meet NYSDEC discharge limits.

- Completion of a comprehensive lakewide habitat restoration plan.

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2 The littoral zone is the portion of the lake in which water depths range from 0 to 9 meters (m) (30 feet [ft]).

3 For investigation and remediation purposes, the site has been divided into eight SMUs based on water depth, sources of water entering the lake, physical and ecological characteristics, and chemical risk drivers. SMUs 1 through 7 cover the littoral zone and SMU 8 covers the profundal zone.

4 The profundal zone is the portion of the lake in which water depths exceed 9 m (30 ft) within SMU 8.

- Habitat reestablishment will be performed consistent with the lakewide habitat restoration plan in areas of dredging/capping.[5]

- A pilot study will be performed to evaluate the potential effectiveness of oxygenation at reducing the formation of methylmercury in the water column, while preserving the normal cycle of stratification within the lake. An additional factor which will be considered during the design of the pilot study will be the effectiveness of oxygenation at reducing fish tissue methylmercury concentrations. If supported by the pilot study results, the pilot study will be followed by full-scale implementation of oxygenation in SMU 8. Furthermore, potential impacts of oxygenation on the lake system will be evaluated during the pilot study and/or the remedial design of the full-scale oxygenation system.

- Monitored natural recovery (MNR) in SMU 8 to achieve the mercury PEC of 2.2 mg/kg in the profundal zone and to achieve the BSQV of 0.8 mg/kg on an area-wide basis within 10 years following the remediation of upland sources, littoral sediments, and initial thin-layer capping in the profundal zone. An investigation will be conducted to refine the application of an MNR model and determine any additional remedial measures (e.g., additional thin-layer capping) needed in the profundal zone.

- Investigation to determine the appropriate area-wide basis for the application of the BSQV of 0.8 mg/kg. During remedy implementation, additional remedial measures may be needed (e.g., thin-layer capping) to meet the BSQV on an area-wide basis.

- Implementation of institutional controls including the notification of appropriate government agencies with authority for permitting potential future activities which could impact the implementation and effectiveness of the remedy.

- Implementation of a long-term operation, maintenance, and monitoring (OM&M) program to monitor and maintain the effectiveness of the remedy.

It will be certified on an annual basis that the institutional controls are in place and that remedy-related OM&M is being performed.

A Phase 1A Cultural Resource Assessment for various areas including Onondaga Lake is currently underway. If, based upon the results of this Cultural Resource Assessment, a Phase 1B Cultural Resource Assessment (to locate culturally sensitive areas) is determined to be necessary, it would be performed during the remedial design phase.

The selected remedy also includes habitat enhancement, which is an improvement of habitat conditions in areas where CERCLA contaminants do not occur at levels that warrant active remediation, but where habitat impairment due to stressors has been identified as a concern. Habitat enhancement will be performed along an estimated 1.5 mi (2.4 km) of shoreline (SMU 3) and over approximately 23 acres (SMU 5). Habitat enhancement will be performed consistent with

[5] The design and construction of the remedy must meet the substantive requirements for permits associated with disturbance to state and federal regulated wetlands (e.g., 6 New York Code of Rules and Regulations [NYCRR] Part 663, Freshwater Wetlands Permit Requirements) and navigable waters (e.g., 6 NYCRR Part 608, Use and Protection of Waters).

the lakewide habitat restoration plan. This component of the remedy is not intended to satisfy the requirements of CERCLA or the NCP, but is included in order to address requirements of state law.

DECLARATION OF STATUTORY DETERMINATIONS

The selected remedy meets the requirements for remedial actions set forth in CERCLA Section 121, 42 USC §9621, because it: 1) is protective of human health and the environment; 2) meets a level or standard of control of the hazardous substances, pollutants, and contaminants, which attains the legally applicable or relevant and appropriate requirements under federal and state laws (with the possible exception of the most stringent surface water standard for dissolved mercury); 3) is cost effective; and 4) utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. In keeping with the statutory preference for treatment that reduces toxicity, mobility, or volume of contaminated media as a principal element of the remedy, NAPLs will be treated and/or disposed of at an off-site permitted facility.

Because this remedy will result in contaminants remaining on-site above levels that would allow for unlimited use and unrestricted exposure to site media, CERCLA requires that the site be reviewed at least once every five years. If justified by the review, additional remedial actions may be implemented to remove, treat, or contain the contaminated sediments.

ROD DATA CERTIFICATION CHECKLIST

The ROD contains the remedy selection information noted below. More details may be found in the Administrative Record file for this site.

- Contaminants of concern and their respective concentrations (see ROD, pages 16 – 21).

- Baseline risk represented by the contaminants of concern (see ROD, pages 27 – 33).

- Cleanup levels established for contaminants of concern and the basis for these levels (see ROD text boxes "Development of Sediment Effect Concentrations/Probable Effect Concentrations," [page 34]; "Development and Use of the Mean PEC Quotient," [page 37]; and "Application of the Mean PEC Quotient for Determining Remedial Areas/Volumes," [page 38]).

- Manner of addressing source materials constituting principal threats (see ROD, page 71).

- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of surface water used in the baseline risk assessment and ROD (see ROD, page 27).

- Potential land and surface water use that will be available at the site as a result of the selected remedy (see ROD, page 27).

- Estimated capital, annual operation and maintenance, and present-worth costs; discount rate; and the number of years over which the remedy cost estimates are projected (see ROD, pages 56 and 81).

- Key factors used in selecting the remedy (e.g., how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision) (see ROD, pages 72 – 73).

AUTHORIZING SIGNATURES

Denise M. Sheehan //ss// 7/1/05

Denise M. Sheehan Date
Acting Commissioner
NYSDEC

Kathleen C. Callahan //ss// 7/1/05

Kathleen C. Callahan Date
Acting Regional Administrator
EPA, Region 2

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RECORD OF DECISION FACT SHEET
EPA REGION 2

Site

Site name:	Onondaga Lake Bottom Site
Site location:	Towns of Geddes and Salina; Villages of Solvay and Liverpool; and City of Syracuse, Onondaga County, New York
HRS score:	50
Listed on the NPL:	December 16, 1994

Record of Decision

Date signed:	July 1, 2005
Selected remedy:	Dredging and capping of contaminated sediments/wastes, oxygenation, and monitored natural recovery
Capital cost:	$414,000,000
Operation and maintenance cost:	$3,000,000 per year
Present-worth cost:	$451,000,000

Lead

NYSDEC

Primary Contact:	Timothy Larson, PE, Project Manager, NYSDEC (518) 402-9767
Secondary Contact:	Donald Hesler, Section Chief, NYSDEC (518) 402-9767

Main PRP

Honeywell International, Inc.

Waste

Waste type:	Volatile and semivolatile organic compounds; polychlorinated biphenyls; metals; and principal threat waste
Waste origin:	Discharges from upland sites to the lake
Contaminated media:	Sediment, surface water, and biota

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DECISION SUMMARY

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Towns of Geddes and Salina; Villages of Solvay and Liverpool; and City of Syracuse, Onondaga County, New York

JULY 2005

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ALBANY, NEW YORK

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REGION 2
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LIST OF ACRONYMS AND ABBREVIATIONS USED IN ROD AND RESPONSIVENESS SUMMARY

ARAR	applicable or relevant and appropriate requirement
ARCS	assessment and remediation of contaminated sediments
ASLF	Atlantic States Legal Foundation
BERA	baseline ecological risk assessment
BSQV	bioaccumulation-based sediment quality value
BTEX	benzene, toluene, ethylbenzene, and xylenes
C&D	construction and demolition
CAC	Citizens Advisory Committee
CAMP	Community Air Monitoring Plan
CCE	Citizens Campaign for the Environment
CEH	Council on Environmental Health [Onondaga County]
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CFR	Code of Federal Regulations
CHASP	Community Health and Safety Plan
cm	centimeter
CNY	Central New York
COC	chemical (or contaminant) of concern
CPOI	chemical parameter of interest
CT	central tendency
CTV	cap threshold value
cy	cubic yard
DNAPL	dense non-aqueous-phase liquid
DO	dissolved oxygen
EIS	environmental impact statement
EPA	Environmental Protection Agency
ER-L	effects range-low
ER-M	effects range-median
ESCSWCS	Empire State Chapter Soil and Water Conservation Society
ESF	Environmental Science and Forestry (SUNY)
FOCUS	Forging Our Community's United Strength
FS	feasibility study
ft	feet/foot
FWCA	Fish and Wildlife Coordination Act
FWIA	fish and wildlife impact analysis
g	gram
GSCC	Greater Syracuse Chamber of Commerce
HASP	health and safety plan
HHRA	human health risk assessment
HSRC	Hazardous Substance Research Center

ILWD	in-lake waste deposit
IRM	interim remedial measure
kg	kilogram
km	kilometer
lb	pound
LCP	Linden Chemicals and Plastics
m	meter
M	million
MANOVA	Multiple Analysis of Variance
Metro	Metropolitan Syracuse Sewage Treatment Plant
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mi	mile
mm	millimeter
MNR	monitored natural recovery
NAPL	non-aqueous-phase liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ng/L	nanograms per liter
NHPA	National Historic Preservation Act
NLSA	no loss of lake surface area
NOAA	National Oceanographic and Atmospheric Administration
NPL	National Priorities List
NRD	Natural Resource Damage
NRRB	National Remedy Review Board
NYCRR	New York Code of Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOL	New York State Department of Law
OLP	Onondaga Lake Partnership
OM&M	operation, maintenance, and monitoring
ORD	Office of Research and Development (USEPA)
OSHA	Occupational Safety and Health Administration
OSRTI	Office of Superfund Remediation and Technology Innovation (USEPA)
OSWER	Office of Solid Waste and Emergency Response
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCDD/PCDF	polychlorinated dibenzo-p-dioxin/polychlorinated dibenzofuran
PEC	probable effect concentration
PECQ	probable effect concentration quotient
ppm	parts per million
PRG	preliminary remediation goal
PRP	potentially responsible party
PSA	preliminary site assessment

QAPP	quality assurance project plan
RA	remedial action
RAGS	Risk Assessment Guidance for Superfund
RAO	remedial action objective
RD	remedial design
RI	remedial investigation
RME	reasonable maximum exposure
ROD	Record of Decision
RS	responsiveness summary
SCA	sediment consolidation area
SEC	sediment effect concentration
SEL	sediment effect level
SLRIDT	St. Louis River/Interlake/Duluth Tar Site
SMU	sediment management unit
SPDES	State Pollutant Discharge Elimination System
SQG	sediment quality guideline
SUNY	State University of New York
SVOC	semivolatile organic compound
SWAC	surface-weighted average concentration
SYW	Syracuse West (from US Geological Survey quadrant sheet; used to identify New York State wetlands)
TAG	Technical Assistance Grant
TSS	total suspended solids
TWA	time-weighted average
UCL	upper confidence limit
UFI	Upstate Freshwater Institute
μg/kg	micrograms per kilogram
μg/L	micrograms per liter
USACE	US Army Corps of Engineers
USC	US Code
USEPA	US Environmental Protection Agency
USFDA	US Food and Drug Administration
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
VOC	volatile organic compound
yr	year

SITE NAME, LOCATION, AND DESCRIPTION

On June 23, 1989, Onondaga Lake was added to the New York State Registry of Inactive Hazardous Waste disposal sites. On December 16, 1994, Onondaga Lake and areas upland that contribute or have contributed contamination to the lake system were added to the U.S. Environmental Protection Agency's (EPA's) National Priorities List (NPL). This NPL listing means that the lake system is among the nation's highest priorities for remedial evaluation and response under the federal Superfund law for sites where there has been a release of hazardous substances, pollutants, or contaminants.

Onondaga Lake itself is a 4.6-square-mile (sq. mi) (12-square-kilometer [sq. km]), 3,000-acre lake, approximately 4.5 mi (7.2 km) long and 1 mi (1.6 km) wide, with an average water depth of 36 ft (11 m). The lake has two deep basins, a northern basin and a southern basin, that have maximum water depths of approximately 62 and 65 ft (19 and 20 m), respectively. The basins are separated by a saddle region at a water depth of approximately 56 ft (17 m). Most of the lake has a broad nearshore shelf in water depths of less than 12 ft (3.7 m). This nearshore shelf is bordered by a steep offshore slope in water depths of 12 to 24 ft (3.7 to 7.3 m).

During the summer months, the upper water of Onondaga Lake warms to a greater degree than the deeper water. This causes the water in the lake to stratify (separate) into two layers of water: the epilimnion, which is the warmer, less dense upper layer and is about 30 ft (9 m) thick, and the hypolimnion, which is the colder, denser, bottom layer. During the summer, the hypolimnion becomes anoxic (runs out of oxygen), which has numerous implications for the lake's chemistry and biota (e.g., fish and insect life).

For the purposes of the remedial investigation and feasibility study (RI/FS) and this Record of Decision (ROD), the sediments in the lake are divided into two regions based on these two layers of water: the littoral zone, which includes sediments along the shoreline in less than 30 ft (9 m) of water and which are in contact with the epilimnion, and the profundal zone, which includes sediments in the deep basins in more than 30 ft (9 m) of water, which are in contact with the hypolimnion.

The two largest tributaries to Onondaga Lake, namely Ninemile Creek and Onondaga Creek, contribute 30.4 and 31.4 percent, respectively, of the total water flow to the lake. Other tributaries, in a clockwise direction from the southeast section of the lake, include Ley Creek, Harbor Brook, the East Flume, Tributary 5A, Sawmill Creek, and Bloody Brook (see Figure 1 in the Figures section of this ROD [Appendix I]). In addition to the tributary streams, the treated effluent from the Onondaga County Metropolitan Wastewater Treatment Plant (Metro), located between Onondaga Creek and Harbor Brook, provides a significant portion (approximately 19 percent) of the water entering the lake.

Various local entities have discharged wastewater directly to these tributary streams and/or have waste sites that have, or potentially have, impacted these tributaries and the lake itself.

In general, the eastern shore of Onondaga Lake is urban and residential, and the northern shore is dominated by parkland, wooded areas, and wetlands. There are approximately 320 acres of state-regulated wetlands and numerous smaller wetlands directly connected to Onondaga Lake or within its floodplains.

The northwest upland areas in Liverpool and Lakeland are mainly residential, with interspersed urban structures and several undeveloped areas. Much of the western and southern lakeshore is covered by wastebeds that received wastes generated from Honeywell's former Solvay operations and, to a lesser extent, dredge spoils from the lake. Many of these wastebeds have been abandoned and recolonized by vegetation. Urban centers and industrial zones in Syracuse and Solvay dominate the landscape surrounding the southern and eastern shores of Onondaga Lake from approximately the New York State Fairgrounds to Ley Creek.

The area around Onondaga Lake is the most urban in central New York State. The region experienced significant growth in the twentieth century, and in 2000, Onondaga County was the tenth most populous county in the state. The city of Syracuse is located at the southern end of Onondaga Lake, and numerous towns, villages, and major roadways surround the lake (see Figure 1).

Historically, Onondaga Lake supported a cold-water fishery. Common species found in the lake included Atlantic salmon (*Salmo salar*), cisco (*Coregonus artedii*), American eel (*Anguilla rostrata*), and burbot (*Lota lota*). Today, Onondaga Lake supports a warm-water fish community that is dominated by gizzard shad (*Dorosoma cepedianum*), freshwater drum (*Aplodinotus grunniens*), carp (*Cyprinus carpio*), and white perch (*Morone americana*). Sunfish are abundant in the littoral zone.

Several important sportfish are found in the lake, including channel catfish (*Ictalurus punctatus*), largemouth bass (*Micropterus salmonides*), smallmouth bass (*Micropterus dolomieui*), and walleye (*Stizostedion vitreum*). The shores of Onondaga Lake provide habitat for various mammal species. Woodchuck (*Marmota monax*), muskrat (*Ondatra zibethicus*), and squirrels (e.g., *Sciurus carolinensis*) are regularly observed on the shores of Onondaga Lake. These and other small-mammal species support predators such as mink (*Mustela vison*), fox (*Vulpes fulva* and *Urocyon cinereoargenteus*), and coyote (*Canis latrans*). The less-disturbed shoreline of the northwest section of the lake provides habitat for more reclusive or larger species, such as beaver (*Castor canadensis*) and deer (*Odocoileus virginianus*). Typically, large bodies of water in urban areas provide important habitat to migrating bird species which use the lakeshore as a resting area during migration. Seasonal and resident bird species around the lake include waterfowl, gulls, shorebirds, songbirds, and raptors.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

Onondaga Lake has been the recipient of industrial and municipal sewage discharges for over 100 years. Honeywell has been a major contributor; however, other industries in the area have contributed contamination as well. Other contaminant sources to the lake include the Metro facility, industrial facilities and landfills along Ley Creek, the Crucible Materials Corporation (via Tributary 5A), and the former Oil City.

Honeywell International, Inc., and its predecessor companies operated manufacturing facilities in Solvay, New York, from 1881 until 1986. When Honeywell merged with its predecessor companies on December 1, 1999 (see the text box below [page 3]), it became liable for the contamination those companies introduced into the environment. For clarity, "Honeywell" is used throughout this ROD to refer to Honeywell International, Inc. and its predecessor companies. Honeywell, as a major contributor of contamination to the lake, has been named a potentially responsible party (PRP).

In the late 1800s and early 1900s, Onondaga Lake supported a thriving resort industry based upon the recreational utilization of the lake, including swimming and recreational fishing. The lake also had a plentiful cold-water fishery, which supported a commercial fishing industry until the late 1800s. However, from the late 1800s to the present, Onondaga Lake has been a receptacle for both industrial and municipal wastes.

Salt springs in the vicinity of Onondaga Lake supported a major salt recovery industry throughout the 1800s and were associated with the development of railroads and the Erie Canal in the region. This infrastructure supported the growth of additional industries, including former Honeywell operations (described in greater detail below), petroleum product storage (once known as "Oil City") adjacent to the southeastern shore of Onondaga Lake, fertilizer production, a steel foundry, a vehicle accessory manufacturing facility, pottery and china manufacturing, manufactured gas plants, and many other industries in the Syracuse area. These and other sites are more fully described in the RI/FS. An evolving municipal wastewater management system (initially with the development of a sewer system and later wastewater treatment facilities), now known as Metro, has been in existence since around 1896.

Honeywell International's Predecessor Companies

Honeywell International, Inc. predecessor companies include:

Allied Chemical and Dye Corp. (incorporated December 17, 1920)
General Chemical
Barrett Company
National Aniline and Chemical Company
Solvay Process Company
Semet Solvay Company
⇓
Allied Chemical Corporation (April 28, 1958)
⇓
Allied Corporation (April 27, 1981)
⇓
AlliedSignal, Inc. (September 18, 1985)
⇓
Honeywell International (Present)

Former Honeywell Operations: Production History and Releases

Honeywell's manufacturing processes were based on four major product lines collectively known as the Syracuse Works (see the text box below entitled "Product Lines and Periods of Production at the Syracuse Works"[page 4]). These processes resulted in releases of primarily mercury, organic contaminants, and calcite-related compounds (see the text box below entitled "What Contaminants are in Onondaga Lake?"[page 5]), as described below:

- Soda ash (sodium carbonate) and related products such as baking soda (sodium bicarbonate), sodium nitrite, sodium sesquicarbonate, ammonium bicarbonate, ammonium chloride, calcium chloride, and caustic soda (sodium hydroxide) were produced by a non-electrolytic cell process. The primary dissolved waste/contaminant associated with this process was ionic constituents (calcium, sodium, and chloride ions [Ca^{2+}, Na^{+}, and Cl^{-}, respectively]), and the primary solid component was Solvay waste, which is a white, chalky, calcite-related material.

- Benzene, toluene, xylene, naphthalene, and tar products from the recovery of coal distillation (coking) byproducts. The primary wastes/contaminants associated with this product line were benzene, toluene, ethylbenzene, and xylenes (BTEX), chlorinated benzenes, and polycyclic aromatic hydrocarbons (PAHs), especially naphthalene.

Product Lines and Periods of Production at the Syracuse Works

Facility	Product Line	Period of Production	Primary Contaminant Releases
Main Plant	Soda ash and related products Benzene, toluene, xylenes, naphthalene	1881 – 1986 1917 – 1970	Ionic waste constituents (Ca^{2+}, Na^{+}, and Cl^{-}), Solvay waste, BTEX, chlorinated benzenes, PAHs (especially naphthalene), and PCBs
Willis Avenue Plant	Chlorinated benzenes, hydrochloric acid, and chlor-alkali products	1918 – 1977	Mercury, BTEX, chlorinated benzenes, PAHs (especially naphthalene), PCBs, and dioxins/furans
Bridge Street Plant	Chlor-alkali products Hydrogen peroxide	1953 – 1979 1956 – 1969	Mercury, PCBs, and xylenes

Note: The Bridge Street Plant was sold to Linden Chemicals and Plastics (LCP) in 1979. LCP operated the plant until it closed in 1988.

- Chlorinated benzenes and byproduct hydrochloric acid from the chlorination of benzene. The primary wastes/contaminants associated with this product line were BTEX, chlorinated benzenes, and PAHs, especially naphthalene.

- Chlor-alkali products, including chlorine, caustic potash (potassium hydroxide), caustic soda (sodium hydroxide) produced by an electrolytic cell process, and related products such as potassium carbonate, hydrogen gas, and hydrogen peroxide produced by further reacting chlor-alkali byproducts with other chemicals. The primary wastes/contaminants associated with this product line were mercury, polychlorinated biphenyls (PCBs), and polychlorinated dibenzo-*p*-dioxin/polychlorinated dibenzofurans (PCDD/PCDFs).

Soda ash production at the Main Plant relied on local supplies of sodium chloride brine and limestone. Benzene, toluene, xylene, and naphthalene production at the Main Plant were based on fractional distillation of light oil, a byproduct that was produced by the coke ovens at the Syracuse Works until 1924, after which it was shipped to Syracuse from other locations. Benzene produced at the Main Plant served as the raw material for production of chlorinated benzenes at the Willis Avenue Plant, while xylene and other imported chemicals were used to produce hydrogen peroxide at the Bridge Street Plant.

Chlor-alkali production at both the Willis Avenue Plant and the Bridge Street Plant used mercury cells and diaphragm cells. Both types of cells are used in electrolytic processes for the production of chlorine, sodium hydroxide, and potassium hydroxide from purified sodium chloride and potassium chloride brine.

What Contaminants are in Onondaga Lake?

Honeywell released several of the major organic contaminants found at the Onondaga Lake subsite (e.g., low molecular weight PAHs [LPAHs], chlorinated benzenes, and BTEX) from at least as early as 1918, and began using PCBs and mercury as of the 1940s or possibly the late 1930s.

Benzene, Toluene, Ethylbenzene, and Xylenes: BTEX compounds are used by a number of manufacturers in industrial processes including the manufacture of other chemicals, some rubbers, paints, paint thinners, lubricants, pesticides, and fuel oil, and as cleaning solvents. Benzene, toluene, and xylenes compounds were produced at the benzol facility located at the Honeywell Main Plant and used at the Honeywell Willis Avenue Plant in the production of chlorinated benzenes. Benzene, toluene, and xylenes which were also part of Honeywell's waste streams, were released to the environment by Honeywell, and are each hazardous substances. In animals, benzene is not highly acutely toxic, but chronic exposure can result in central nervous system depression, immunosuppression, bone marrow depression, degenerative lesions of the gonads, fetal growth retardation, damage to genetic material, and solid tumors in several organs. Chronic exposure in humans can result in bone marrow depression, anemia, and leukemia. Breathing benzene can cause drowsiness, dizziness, and unconsciousness. Benzene is considered to be carcinogenic.

Chlorinated Benzenes: Chlorinated benzenes are a group of 12 cyclic aromatic compounds in which one to six hydrogen atoms of a benzene ring have been replaced by up to six chlorine substituents, including monochlorobenzene, dichlorobenzenes, trichlorobenzenes, tetrachlorobenzenes, pentachlorobenzene, and hexachlorobenzene. Chlorinated benzenes were produced by Honeywell's Willis Avenue Plant, which was in operation from 1918 until 1977. Chlorinated benzenes were also part of Honeywell's waste streams, were released to the environment by Honeywell, and are hazardous substances. Chlorinated benzenes are resistant to chemical and biological degradation and tend to accumulate in lipid- (fat-) containing tissues of animals and humans. Chlorinated benzenes have been shown to cause adverse reproductive effects in invertebrates and fish. Chlorinated benzenes can bioaccumulate in humans, and cause adverse health effects (e.g., hexachlorobenzene may cause liver damage).

Mercury: Honeywell used mercury in the production of chlorine and caustic soda at the mercury-cell chlor-alkali plants. Most of the mercury in water, sediments, or plants and animals is in the form of inorganic mercury salts and organic forms of mercury (e.g., methylmercury). Methylation of mercury is a key step in the entrance of mercury into food chains. The biotransformation of inorganic mercury to methylated organic forms in water bodies can occur in the sediment and the water column. Mercury is a known human and ecological toxicant. Methylmercury-induced neurotoxicity is the effect of greatest concern when exposure occurs to the developing fetus. Other adverse effects of mercury include reduced reproductive success, impaired growth and development, and behavioral abnormalities.

Polycyclic Aromatic Hydrocarbons: PAHs is the general term applied to a group of compounds, including naphthalene, comprised of several hundred organic substances with two or more benzene rings. They are released to the environment mainly as a result of incomplete combustion of organic matter and are major constituents of petroleum and its derivatives. Naphthalene and other PAHs were produced by Honeywell in conjunction with the benzene, toluene, and xylenes product line and other industrial activities. PAHs, in particular naphthalene, were also part of Honeywell's waste streams, were released to the environment by Honeywell, and are hazardous substances. While some PAHs are known to be carcinogenic, others display little or no carcinogenic, mutagenic, or teratogenic activity. Several PAHs exhibit low levels of toxicity to terrestrial life forms, yet are highly toxic to aquatic organisms.

Polychlorinated Biphenyls: PCBs are mixtures of up to 209 different compounds (referred to as "congeners") that include a biphenyl and from one to ten chlorine atoms. They have been used commercially since 1930 as dielectric and heat-exchange fluids and in a variety of other applications. PCBs have been used at and released to the environment from the Honeywell facilities. They are persistent and accumulate in food webs. PCBs bioaccumulate in the fatty tissues of humans and other animals. PCBs are considered probable human carcinogens and are linked to other adverse health effects such as developmental effects, reduced birth weights, and reduced ability to fight infection.

Polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans: PCDD/PCDFs are composed of a triple-ring structure consisting of two benzene rings connected to each other by either two (dioxins) or one (furans) oxygen atoms. Dioxins and furans are byproducts of chemical manufacturing or the result of incomplete combustion of materials containing chlorine atoms and organic compounds. Based on evidence collected by Honeywell from their sites, PCDD/PCDFs were apparently generated as the result of a fire in the chlorination building at the Willis Avenue Plant in the 1930s and as trace contaminants during the various manufacturing operations and thus were released into the environment. PCDD/PCDFs tend to be very insoluble in water; adsorb strongly onto soils, sediments, and airborne particulates; and bioaccumulate in biological tissues. These substances have been associated with a wide variety of toxic effects in animals, including acute toxicity, enzyme activation, tissue damage, developmental abnormalities, and cancer.

In addition to the four major product lines, Honeywell facilities produced coke and producer gas (i.e., a mixture of carbon monoxide, nitrogen, hydrogen, methane, carbon dioxide, and oxygen). Other products were produced for short periods of time as pilot plant or developmental laboratory activity or as start-up operations that were later relocated. These products included:

- Nitric and picric acids.
- Salicylic acid and methylsalicylate.
- Benzyl chloride, benzoic acid, benzaldehyde, and phthalic anhydride.
- Phenol.
- Ammonia (via nitrogen fixation at the Bridge Street Plant).

Although not generally considered part of the Syracuse Works, the Barrett Division of the Semet-Solvay Chemical Company (one of Honeywell's predecessor companies) operated a paving material production facility from 1919 to 1983 at a location that is now part of the Wastebed B/Harbor Brook subsite. This part of the Wastebed B/Harbor Brook subsite consists of several buildings, aboveground storage tanks, and a gravel parking lot.

Former Honeywell Operations: Waste Management and Disposal

Waste was generated by most manufacturing processes at the Syracuse Works. Waste streams for disposal were discharged from the three plants to at least four different destinations: the Semet Residue Ponds (coke byproduct recovery only), Geddes Brook and Ninemile Creek (via the West Flume), the Solvay wastebeds, and directly to the lake (via the East Flume). The Solvay wastebeds are located in the towns of Camillus and Geddes, and in the city of Syracuse (see Figure 2). From approximately 1881 to 1986, these wastebeds were the primary means of disposal for the wastes produced by the Solvay operations. Initial Solvay waste disposal practices consisted of filling low-lying land adjacent to Onondaga Lake. Later, unlined wastebeds designed specifically for Solvay waste disposal were built using containment dikes constructed of native soils, Solvay waste, and cinders, or by using bulkheads made with timber along the lakeshore. The Syracuse Works also had a landfill in the center of Solvay Wastebed 15.

The discharge of Honeywell waste through the East Flume caused the formation of a large ILWD. The ILWD extends approximately 2,000 ft (610 m) into the lake, approximately 4,000 ft (1,219 m) along the lakeshore, and contains waste up to 45 ft (13.7 m) thick. The majority of the ILWD is within the boundaries of SMU[1] (see Figure 4), although some of the ILWD extends into the adjoining SMUs 2 and 7. The ILWD contains waste from all of Honeywell's product lines. The discharges of waste to Geddes Brook and Ninemile Creek through the West Flume, as well as the overflow from Solvay Wastebeds 9 to 15, also caused the formation of deposits of Honeywell wastes and resulted in the development of the deposits in the Ninemile Creek delta in the lake in SMU 4. The seeps overflow from Solvay Wastebeds 1 to 8 contributed to the formation of Honeywell wastes in the lake itself.

Two additional sites (the Mathews Avenue Landfill and the Willis Avenue Ballfield site) were used for disposal of industrial wastes and construction and demolition (C&D) debris from the Syracuse Works. A site known as the dredge spoils area located on the lakeshore northwest of the mouth

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[1] For investigation and remediation purposes, the site has been divided into eight SMUs based on water depth, sources of water entering the lake, physical and ecological characteristics, and chemical risk drivers. SMUs 1 through 7 cover the littoral zone and SMU 8 covers the profundal zone. See Figure 3 and the section below entitled "Sediment Management Units."

of Ninemile Creek was used for disposal of dredged material from the Ninemile Creek delta and nearshore areas north of Ninemile Creek. Additional information on these Honeywell sites, including a location map, can be found in Chapter 4 of the Onondaga Lake RI report.

In 1970, the Syracuse Works' Main Plant ceased production of benzene, toluene, xylenes, and naphthalene. In addition, releases of mercury from the Willis Avenue Plant and the Bridge Street Plant were reduced. In 1977, when the Willis Avenue Plant closed, the production of chlorinated benzenes and chlor-alkali products at the plant ceased. In 1979, the Bridge Street Plant was sold to Linden Chemicals and Plastics (LCP), which operated the plant until it closed in 1988. In 1986, the Main Plant ceased production of soda ash and related products, marking the end of manufacturing by Honeywell at the Syracuse Works. A time line of a summary of activities since 1986 is provided below.

Time Line of Activities at the Onondaga Lake Bottom Site Since Cessation of Honeywell Production in 1986

Date	Activity
June 23, 1989	Onondaga Lake was added to the New York State Registry of Inactive Hazardous Waste disposal sites.
	⇓
Consent Decree dated March 16, 1992	Honeywell consented to investigate the lake pursuant to the terms of a New York district court ("Consent Decree" – 89-CV-815).
	⇓
December 16, 1994	Onondaga Lake and areas upland of the lake that contribute or have contributed contamination to the lake system were added to EPA's NPL.
	⇓
1992 to 2000	An RI was conducted by Honeywell.
	⇓
2001	Additional investigation conducted by NYSDEC.
	⇓
December 2002	NYSDEC rewrote the RI report and issued it in December of 2002.
	⇓
November 2004	Honeywell completed the FS report. NYSDEC issued the Proposed Plan for public comment.

Satisfaction of all ROD requirements does not represent a settlement with the State of all statutory claims under the State and federal Superfund laws (e.g., State and federal claims for Natural Resource Damages under the Superfund laws are not resolved by satisfaction of all ROD requirements) or of statutory claims under other State and federal environmental laws or of claims under common law.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

The RI and FS reports describe the nature and extent of the contamination at and emanating from the site and evaluate remedial alternatives to address this contamination. The November 2004 Proposed Plan identifies NYSDEC's preferred remedy[2] and the basis for that preference. These documents were made available to the public in both the Administrative Record and information repositories maintained at the NYSDEC Region 7 Office, 615 Erie Boulevard West, Syracuse, New York; NYSDEC Central Office, 625 Broadway, Albany, New York; Onondaga County Public Library Syracuse Branch at the Galleries, 447 South Salina Street, Syracuse, New York; and Atlantic States Legal Foundation, 658 West Onondaga Street, Syracuse, New York. NYSDEC later added three new repositories at libraries in Camillus, Liverpool, and the State University of New York (SUNY) College of Environmental Science and Forestry (ESF) (see Appendix VI, Responsiveness Summary).

NYSDEC conducted a public availability session in February 2003 to present the findings of the RI report to the public.

A notice of the commencement of the public comment period related to NYSDEC's preferred remedy, the public meeting dates, contact information, and the availability of the above-referenced documents was published in the *Syracuse Post-Standard* on November 29, 2004. The public comment period opened on November 29, 2004. NYSDEC held informal availability sessions on January 6, 2005 from 7:00 to 9:00 P.M. and on January 12 and February 16, 2005 from 3:00 to 5:00 P.M., and held formal public meetings on January 12 and February 16, 2005 at 7:00 P.M. at the Martha Eddy Room in the Art and Home Center of the New York State Fairgrounds to present the findings of the RI/FS and Proposed Plan and to answer questions from the public about the site and the remedial alternatives under consideration. Approximately 200 and 100 people, including residents, environmental groups, local businesspeople, and state and local government officials attended the January 12 and February 16 public meetings, respectively. The public comment period was closed on March 1, 2005.

A notice of the commencement of a subsequent public comment period was published in the *Syracuse Post-Standard* on April 1, 2005. The purpose of the subsequent public comment period was to solicit public comments on the Proposed Plan as approved by EPA on March 25, 2005, on the NRRB's recommendations related to its review of the Proposed Plan, and on NYSDEC and EPA's New York regional office's responses to these recommendations. Responses to the written comments received during the public comment periods and to comments received at the public meetings are included in the Responsiveness Summary (see Appendix VI).

In addition, NYSDEC has performed an extensive outreach program relative to the Proposed Plan. NYSDEC met with local stakeholders including the Onondaga Nation (five meetings), Onondaga County Legislature's Environmental Committee, Onondaga County's Department of the

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[2] EPA abstained from concurring with the Proposed Plan prior to its release to the public in November 2004 since it was not subject to prior review by EPA's National Remedy Review Board (NRRB). The NRRB is an EPA peer review group that reviews all proposed Superfund cleanup decisions that meet certain cost-based or other review criteria to ensure that these proposed decisions are consistent with Superfund law, regulations, and guidance. Subsequent to the issuance of the Onondaga Lake Proposed Plan the NYSDEC met with the NRRB, the NRRB commented on the Proposed Plan and EPA and NYSDEC responded to the NRRB comments. EPA subsequently issued a letter on March 25, 2005 which stated that EPA concurred with NYSDEC's preferred remedy.

Environment, Onondaga Lake Partnership (which consists of federal, state, local, public, and private interests that are involved in managing the environmental issues of Onondaga Lake and the Onondaga Lake watershed), Atlantic States Legal Foundation (Technical Assistance Grant recipient), various local scientists associated with Upstate Freshwater Institute, professors from the State University of New York Syracuse College of Environmental Science and Forestry, and officials and residents of the Town of Camillus (the town in which a sediment consolidation area may be constructed) to discuss the Proposed Plan. NYSDEC also met with environmental organizations, including the Sierra Club, Citizens Campaign for the Environment, and the Central New York Air and Waste Management Association.

SCOPE AND ROLE OF OPERABLE UNIT

The NCP, 40 CFR Part 300, defines an operable unit (OU) as a discrete action that comprises an incremental step toward comprehensively addressing site problems. This discrete portion of a remedial response manages migration or eliminates or mitigates a release, threat of a release, or pathway of exposure. The cleanup of a site can be divided into a number of OUs, depending on the complexity of the problems associated with the site. OUs may address geographical portions of a site, specific site problems, or an initial phase of an action, or may consist of any set of actions performed over time or any actions that are concurrent but located in different parts of a site.

NYSDEC and EPA have, to date, organized the work for the Onondaga Lake NPL site into eight subsites. These subsites, which are shown in Figure 5, are also considered by EPA to be OUs of the NPL site. The Onondaga Lake subsite is one of the OUs at the Onondaga Lake NPL site.

This ROD focuses only on the Onondaga Lake subsite of the Superfund NPL site. The primary objective of this action (the fourth OU for which a ROD has been issued) is to remediate the contamination within Onondaga Lake sediments such that any existing and potential future health and environmental impacts are eliminated or reduced, to the extent practicable.

The status of the other subsites is discussed below. Interim remedial measures (IRMs) are mentioned below to the extent that they address migration of contamination to the lake. The control of contamination migrating from these upland subsites to Onondaga Lake is an integral part of the overall remediation of Onondaga Lake.

Status of Other Onondaga Lake NPL Site Operable Units

The General Motors Ley Creek PCB Dredgings subsite includes areas along the banks of Ley Creek where PCB-contaminated dredge spoils removed from the creek were placed. A ROD was issued by NYSDEC in March 1997. The remediation of a 4,000-ft (1,219-m) stretch of the stream bank containing the dredge spoils (excavation and off-site disposal of PCB-contaminated sediments exceeding 50 parts per million [ppm] and site capping) was completed in August 2001.

In September 2000, NYSDEC issued a ROD for the LCP Bridge Street subsite. In March 2002, Honeywell entered into an administrative consent order with NYSDEC whereby it committed to implement the remedy at the site. The remedial design was approved in September 2004. Remedial construction activities, which include removal of impacted sediments from the West Flume, on-site ditches, and wetlands; restoration of wetlands; installation of a low-permeability cutoff wall around the site; installation of a low-permeability cap; and pumping of groundwater inside the cutoff wall is currently underway. Remediation of the LCP Bridge Street subsite will control discharges of mercury and other contaminants to the West Flume, some of which ultimately migrate to Onondaga Lake through Geddes Brook and Ninemile Creek. It is anticipated that the bulk of the construction will be completed in 2005.

An RI/FS for the Geddes Brook/Ninemile Creek site is underway pursuant to the terms of the Consent Decree referenced in the "Site History" section, above. The RI/FS includes an evaluation of alternatives for remediating channel sediments in lower Ninemile Creek and floodplain soils/sediments along both lower Geddes Brook and lower Ninemile Creek. The remediation of both streams and associated floodplains, in conjunction with remediation of the LCP Bridge Street subsite, is expected to result in a significant reduction of loadings of mercury and other contaminants to Onondaga Lake. In July 2002, Honeywell entered into an administrative consent order with NYSDEC whereby it committed to perform an IRM for Geddes Brook. The IRM will include the removal of all sediments down to the underlying clay layer in the reach of the brook from the West Flume to the confluence with Ninemile Creek. Impacted soils and sediments within the floodplain along lower Geddes Brook will also be remediated. The IRM design is currently underway.

In March 2002, NYSDEC and EPA issued a ROD for the Semet Residue Ponds subsite. The selected remedy includes the excavation of the residue from the Semet Ponds and on-site processing of the residue into benzene, light oil, and a soft tar product to be used in manufacture of driveway sealer. It also includes groundwater collection and on-site treatment. In December 2003, NYSDEC and EPA determined that a potential modification of the remedy, which would allow for the residue to be utilized as an alternative fuel, may be evaluated by way of a focused FS/remedial design/remedial action Consent Order. The Consent Order was executed by NYSDEC and Honeywell in January 2004. A draft focused FS report is currently under review. The remedial design related to the groundwater component of the remedy is currently underway.

The Town of Salina Landfill subsite, which borders Ley Creek, received domestic, commercial, and industrial wastes from the 1950s to the 1970s. A Proposed Plan identifying a preferred remedy for the Salina Town Landfill subsite was released for public comment in January 2003. The proposed remedy included the construction of a 6 NYCRR Part 360 multilayer cap over the landfill areas north and south of the creek and construction of a groundwater and leachate collection trench north and south of the creek.

An RI/FS is presently underway for the Willis Avenue subsite. In March 2002, Honeywell entered into an administrative consent order with NYSDEC whereby it committed to implement an IRM for the lakeshore area downgradient of the Willis Avenue and Semet Residue Ponds subsites. The IRM consists of the design, construction, and operation of a hydraulic containment system. This IRM is planned to eliminate, to the extent practicable, the discharge of groundwater and NAPLs containing contaminants such as chlorinated benzenes, BTEX, naphthalene and other PAHs, and mercury to Onondaga Lake.

Actions will be taken by Honeywell to address wastes to be collected by the hydraulic containment systems for the Willis Avenue and Semet Residue Ponds subsites pursuant to CERCLA. Contaminated groundwater, once collected, will be treated at a wastewater treatment plant that will be constructed on the Willis Avenue subsite. The containment systems will also be designed to collect NAPLs, which will be treated and/or disposed of at an off-site permitted facility. Since these NAPL materials are highly mobile, have high concentrations of toxic compounds, and present a significant risk to human health and the environment should exposure occur, they are characterized as principal threat wastes.

The Willis/Semet IRM is also intended to eliminate, to the extent practicable, direct point-source discharges to the lake through stormwater conveyances (stormwater piping and outfalls associated with I-690), and to eliminate, to the extent practicable, potential impacts to fish and wildlife resources associated with ongoing discharges from the Willis Avenue and Semet Residue Ponds subsites. The design of the IRM is currently underway. Remedial efforts for Tributary 5A are being evaluated by Honeywell as part of the RI/FS for the Willis Avenue subsite.

An amendment to the Willis Avenue RI/FS administrative consent order was signed in 1996 for the performance of an IRM to address the discharge of site-related contaminants from the I-690 storm drain system. As part of the IRM, the system was cleaned and surveyed using video equipment. This work indicated that contaminated groundwater was entering the system through open pipe joints. Remedial work, including the testing and sealing of the open pipe joints, began in 1998 and was completed in 1999. A program for monitoring the effectiveness of the IRM indicated that residual contaminant concentrations were reduced but not eliminated. Due to this residual contamination, a pilot study was initiated in 2002 pursuant to an administrative consent order with NYSDEC to study the isolation of the underdrain (groundwater) flow from the stormwater (from I-690) within the eastern portion of the system. This pilot study is ongoing.

Honeywell is conducting an RI/FS for the Wastebed B/Harbor Brook subsite, which includes the East Flume. In November 2003, Honeywell entered into an administrative consent order with the NYSDEC whereby it committed to implement an IRM for the Wastebed B/Harbor Brook subsite. The IRM consists of the design, construction, and operation of a hydraulic containment system at the Wastebed B/Harbor Brook subsite along the shoreline from the Willis Avenue subsite to Harbor Brook and along the lower portion of Harbor Brook. The IRM is intended to isolate and collect contaminants including mercury, chlorinated benzenes, BTEX, naphthalene and other PAHs, and NAPLs from groundwater before they enter Onondaga Lake and Harbor Brook. Contaminated groundwater, once collected, will be treated at a wastewater treatment plant that is being constructed on Honeywell's Willis Avenue subsite.

The Wastebed B/Harbor Brook subsite IRM design will address collection of NAPLs, which will be treated and/or disposed of at an off-site permitted facility. This IRM will be designed so that it can be integrated with the Willis/Semet IRM (discussed above), resulting in a continuous hydraulic containment system along the entire lakeshore of SMUs 1 and 2 from Tributary 5A to Harbor Brook as well as upstream along the west bank of lower Harbor Brook. Since this IRM involves treatment of source materials constituting principal threat wastes, this IRM also addresses the statutory preference for treatment as a principal element. Pre-design sampling associated with the IRM is underway.

In March 2002, Honeywell entered into an administrative consent order with NYSDEC whereby it committed to implement an IRM for the East Flume. As documented in the Onondaga Lake RI report, the East Flume was historically one of the major discharge locations for mercury and other waste materials to the lake. The IRM for the East Flume includes the excavation of approximately 19,000 cubic yards (cy) (14,500 cubic meters [m^3]) of sediment from within the upper and lower East Flume, the abandonment of an existing 72-inch (183-cm) concrete pipe that discharges to the upper East Flume, and the extension of an existing 60-inch (152-cm) concrete pipe into Onondaga Lake.

An RI/FS is underway at the General Motors former Inland Fisher Guide (IFG) facility subsite. Three significant IRMs have been performed to prevent the migration of PCBs off of the site and into Ley Creek, a tributary to Onondaga Lake. An on-site industrial landfill that contained chromium-and PCB-contaminated material has been capped. The purpose of this IRM was to prevent these contaminants from leaching into the groundwater. A second IRM involved the removal of highly contaminated soil from a former discharge swale. This swale was used, in the 1950s and 1960s, as a conduit for the discharge of liquid process waste to Ley Creek. The swale was subsequently filled in, but the contaminated soil remained until the performance of this IRM. Over 26,000 tons of soil containing hazardous waste levels of PCBs have been removed from the site. The third significant IRM was the construction of a treatment pond and associated water treatment system. This pond collects all water that accumulates on site in any of the storm sewers or abandoned process sewers. The pond water is then sent through the treatment plant in order to meet permitted discharge limits, prior to discharge to Ley Creek. The purpose of this IRM was to stop the intermittent discharge of PCBs and other contaminants that occur during storm events. Construction activities associated with these IRMs have been completed.

SUMMARY OF SITE CHARACTERISTICS

Onondaga Lake is a 4.6-square mile (sq mi) (12-square kilometer [sq km]), 3,000-acre lake, approximately 4.5 mi (7.2 km) long and 1 mi (1.6 km) wide, with an average water depth of 36 ft (11 m). The lake has two deep basins, a northern basin and a southern basin, that have maximum water depths of approximately 62 and 65 ft (19 and 20 m), respectively. The basins are separated by a saddle region at a water depth of approximately 56 ft (17 m). Most of the lake has a broad nearshore shelf in water depths of less than 12 ft (3.7 m). This nearshore shelf is bordered by a steep offshore slope in water depths of 12 to 24 ft (3.7 to 7.3 m).

Site Geology/Hydrogeology

The bedrock geology beneath the lake consists of 500 to 600 ft (150 to 180 m) of sedimentary rocks of the Vernon Shale Formation, which are comprised of soft and erodible mudstones with some localized, discontinuous gypsum seams. The Syracuse Formation overlies the Vernon Formation to the south of Onondaga Lake to an elevation of 300 to 380 ft (90 to 120 m) above mean sea level. The Syracuse Formation is approximately 600 ft (180 m) thick and is comprised of shales, dolostones, and salts. In this formation, groundwater flowing upward to the north toward Onondaga Lake is the source of brines in the area that contribute to the background salinity levels in the lake.

Onondaga Lake is underlain by a thick layer of soft, unconsolidated sediments ranging from approximately 80 ft (24 m) to over 300 ft (90 m) thick beneath the mouth of Onondaga Creek at the south end of the lake.

Two primary hydrogeologic units exist at the lake: unconsolidated deposits and underlying bedrock shale. The unconsolidated deposits were formed by the combination of glacial processes, post-glacial (lacustrine) processes, and human activities. These unconsolidated deposits consist (from top to bottom) of layers of fill, marl, silt and clay, silt and fine sand, sand and gravel, and till overlying the shale bedrock.

Groundwater in the unconsolidated deposits, which overlies the silt and clay layer, comprises an unconfined groundwater zone that provides most of the discharge of groundwater to the lake. There is limited groundwater discharge from the deeper unconsolidated units to the lake. Groundwater from the bedrock discharges to the lower portion of the overlying unconsolidated deposits west of the lake. Total quantities of groundwater discharged to the lake are small compared to discharges of surface water to the lake.

A major influence on groundwater density is salinity (measured by total dissolved solids concentrations). The range in total dissolved solids concentrations in the area of the lake (400 milligrams per liter [mg/L] to almost 194,000 mg/L) is caused by the presence of Honeywell's Solvay wastes and naturally occurring salt brines.

Surface Water Hydrology

Onondaga Lake receives surface runoff from a drainage basin of 285 sq mi (738 sq km). Surface water flows primarily from the south and southeast into the lake through six tributaries: Ninemile Creek, Onondaga Creek, Ley Creek, Harbor Brook, Bloody Brook, and Sawmill Creek. In addition, lesser amounts of surface water are contributed to the lake through two industrial conveyances: the East Flume and Tributary 5A. Ninemile Creek and Onondaga Creek are the largest sources of water flow to the lake and together accounted for approximately 62 percent of the inflow into the lake from surface sources for the period from 1971 to 1989. Discharge from the Metro Plant accounted for approximately 19 percent of the total inflow during the same period. Ley Creek and Harbor Brook accounted for an estimated 8 and 2 percent of the total inflow, respectively. Contributions from all other tributaries, including Bloody Brook, the East Flume, Tributary 5A, and Sawmill Creek were minor in comparison and together accounted for the remaining 9 percent. The highest inflows of water and suspended solids from tributaries occur during the spring due to snowmelt and springtime rain events, peaking in March and April.

Water also enters the lake through an intermittent bidirectional flow from the Seneca River at the outlet of the lake. This bidirectional flow is possible because Onondaga Lake is part of the New York State Barge Canal System, and the elevation of the lake is controlled by a dam on the Oswego River at Phoenix, New York, downstream of the site. Flow from the outlet is sensitive to the rate of tributary inflow, wind speed and direction, water surface elevations in the river and lake, seiche (variation in the lake surface) activity in the lake, elevated salinity, and other factors. Due to the shallowness of the outlet channel, it is likely that only epilimnetic surface water flows out of the lake into the river. The annual contribution of the Seneca River to the lake has not been quantified but is believed to be less than 10 percent of the total flow to the lake on an annual basis.

The lake elevation can influence the characteristics of the nearshore sediments, including wetlands and parts of the littoral sediments that are subject to wave and ice disturbance. The lake is generally at its highest elevation in the early spring due to increased tributary flows and at its lowest elevation during the summer months. For the 30-year period from 1971 to 2000, maximum annual variations in lake levels ranged from 1.6 ft (0.5 m) in 1988 to 7.2 ft (2.2 m) in 1993, with an overall mean of 4.1 ft (1.25 m).

Based on the United States Geological Survey (USGS) data, the following observations have been made:

- The average lake elevation is 362.82 ft (110.59 m) above mean sea level.
- The highest lake level was 369.18 ft (112.53 m) above mean sea level.
- The lowest level was 361 ft (110 m) above mean sea level.

Onondaga Lake is stratified during summer, more weakly stratified in winter, and is vertically mixed in the spring and fall. Summer stratification is most pronounced from May through September due to temperature effects on water density. During summer stratification, the colder (and therefore denser) hypolimnion is unable to mix with the overlying warmer (and therefore less dense) epilimnion. The boundary between the epilimnion and the hypolimnion is called the thermocline and is the region in the water column where the temperature changes most rapidly with depth. In Onondaga Lake, the thermocline is located at approximately 30 ft (9 m) below the water surface. The epilimnetic waters continue to be mixed by wind and wave action, while the hypolimnion is isolated beneath the thermocline.

The hypolimnion receives organic and inorganic solids that settle by gravity from the epilimnion toward the lake bottom. As the summer progresses, biodegradation of the organic solids deplete the oxygen in the hypolimnion, creating anoxic conditions. The presence of an anoxic hypolimnion is not uncommon in stratified lakes. However, oxygen depletion in the hypolimnion of Onondaga Lake is exacerbated by loading of phosphorus to the lake from the Metro Plant discharge, and to a lesser degree from tributaries. Phosphorus is the limiting nutrient that, when it is increased, promotes the growth or productivity of phytoplankton, which in turn increases the organic loading of settling solids to the hypolimnion. Increased phytoplankton productivity also leads to decreased water clarity (due to the high mass of phytoplankton in surface water). In addition to anoxia, elevated concentrations of sulfides and ammonia found in the hypolimnion are considered evidence of advanced cultural eutrophication.

Waters within Onondaga Lake are more saline than in most inland lakes. Solvay Wastebeds 1 through 15 as well as Solvay waste that was disposed of directly in the lake and at other locations along and near the lakeshore are known to contribute calcium, sodium, and chloride to Ninemile Creek and/or the lake. In addition, naturally occurring salt brine, which was collected and evaporated in the vicinity of Onondaga Lake for many years, affects both groundwater and nearby surface water quality. Natural salt springs present near the lake result in saline wetlands. The USGS recently documented a saline spring in Onondaga Creek between Kirkpatrick and Spencer Streets; however, the daily load (on the order of 10 tons [9,000 kilograms {kg}]) is a minor contribution to the salt budget of the lake. The Geddes Brook/Ninemile Creek RI report estimated that the daily total dissolved solids load from Solvay Wastebeds 9 through 15 to Ninemile Creek is on the order of 440 tons (400,000 kg) based on two base-flow sampling events in 1998.

Most solids that enter the lake from tributary inflows settle to the lake bottom and are not transported out of the lake through the outlet. Suspended solids from the tributaries initially settle in nearshore sediment, where the water depth is less then 15 ft (4.5 m). With the exception of deltas formed at the mouth of some tributaries (e.g., Ninemile Creek, East Flume, and Ley Creek), nearshore sediment generally does not accumulate because it is frequently resuspended by wind and waves. Over time, sediment is carried to deeper waters by lake circulation and ultimately settles to the bottom in deeper parts of the lake.

Sediment Characteristics

Based on the depth of the thermocline during stratification, the Onondaga Lake RI report defined sediment located above the thermocline (i.e., 30 ft [9 m]) as littoral sediment and sediment located below the thermocline as profundal sediment. The intent of these designations was to distinguish between the different biological, physical, and chemical processes of the epilimnion and hypolimnion.

Littoral Sediment

Much of the sediment in water depths of less than 15 ft (4.5 m) consists generally of fine silts and clays, sand, and shell fragments.

High concentrations of calcite exist within the littoral sediments throughout most of the lake, due to disposal of Solvay waste during operation of the former Honeywell Main Plant from 1881 to 1986 and past and present input of naturally calcitic sediments from the tributaries. Available data indicate that external calcium loading to the lake decreased by 70 percent between 1983 to 1985 and 1987 to 1989, reflecting the cessation of Honeywell's activities at its Main Plant in 1986. Calcium carbonate deposition also decreased by 64 percent over the 1985 to 1989 time frame.

Oncolites are another form of calcite in littoral sediments of Onondaga Lake. Oncolites are small, oval or irregularly rounded, calcareous concretions that resemble elongated pebbles. Made up of calcium carbonate and a small fraction of organic material, they are found throughout the littoral sediments of the lake, especially along the northeast, north, and northwest shorelines. Oncolites are of relatively low mass and therefore are readily moved by waves and currents. Eventually, oncolites may become stationary if they grow to a sufficient size. In Onondaga Lake, oncolite formation is closely associated with discharges of calcium-laden wastes to the lake by Honeywell.

While much of the littoral zone is considered non-depositional due to wind and wave action, discrete areas at the mouths of the tributaries are depositional. These areas, called deltas, are created when the tributary enters the lake, the flow rate drops sharply, and suspended solids settle to the lake bottom. Sediment in these areas accumulates and reflects the composition of the suspended solids that were transported by the tributary into the lake. The delta at the mouth of Ninemile Creek was dredged in the 1960s to remove material that had accumulated over time.

Another historically depositional area within the littoral zone in the southern corner of Onondaga Lake is the area referred to as the ILWD. This area was formed primarily through the precipitation of calcite (calcium carbonate) and other Honeywell wastes from the overflow of dikes around Wastebed B and discharges via the East Flume.

Profundal Sediment

Profundal sediment (i.e., sediment in water depths greater than 30 ft [9 m]) is characterized by small particle size and relatively high moisture content and relatively high concentrations of phosphorus, nitrogen, and organic carbon, when compared to littoral zone sediments. This sediment is comprised of two units. The first unit extends to approximately 35 inches (90 centimeters [cm]) below the sediment surface and is composed of black clay with distinct layers or laminations. The clay has a sulfide smell and gas bubbles (presumably methane) are present. The second unit extends from approximately 35 inches (90 cm) to at least 16 ft (500 cm) below the sediment surface and is composed of dark gray clay with occasional wood fragments and snail shells. This unit also contains laminations, though they are less distinct than in the first unit. The laminations are attributed to deposition of calcite, clays, and diatoms (silica) associated with erosion of the watershed, productivity cycles within the lake, and other annual events.

Areas of Archaeological or Historical Importance

The Onondaga Nation has asserted that Onondaga Lake lies within its aboriginal territory and that Onondaga villages were located on the shores of the Lake. The Nation asserts it relied heavily on the Lake and its tributaries in the past for fishing, gathering of plants for medicinal and nutritional needs, and for recreation. Later, in the late 1800s and early 1900s, Onondaga Lake supported a thriving resort industry based upon the recreational utilization of the lake, including swimming and recreational fishing. The lake also had a plentiful cold-water fishery, which supported a commercial fishing industry until the late 1800s. However, from the late 1800s to the present, Onondaga Lake has been a receptacle for both industrial and municipal wastes.

A draft Phase 1A Cultural Resource Assessment for the project area was produced in October 2004; this report noted the likelihood that the proposed project might encounter both recorded and unrecorded prehistoric and historic resources. Consequently, it is likely that once the area of remedial impact becomes established, additional cultural resource investigations will be required before the remedy is implemented.

Results of the Remedial Investigation

To determine the nature and extent of contamination and assess risks to humans and the environment, as part of the RI, more than 6,000 samples were collected and analyzed for contaminants including metals, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs). A human health risk assessment (HHRA) and baseline ecological risk assessment (BERA) were completed as part of the RI process. These risk assessments are discussed in the "Summary of Site Risks" section of this ROD. The RI, HHRA, and BERA reports were finalized by NYSDEC in December 2002. NYSDEC conducted a public availability session in February 2003 to present the findings of these documents to the public.

As a result of the RI studies and risk assessments, numerous contaminants were identified as chemical parameters of interest (CPOIs) (see the text box entitled "What are Chemical Parameters of Interest?"[page 17]). The RI report presents information on site history, field and laboratory investigations, physical characteristics of the site, sources of contamination, nature and extent of contamination, and fate and transport of contaminants. The results of the RI are summarized below.

Sediments

- Mercury contamination is found throughout the lake, with the most elevated concentrations detected in sediments in the Ninemile Creek delta and in the ILWD, which extends along the southern shoreline from near Tributary 5A to beyond Harbor Brook.

- Mercury contamination is widespread in the upper 6.5 ft (2 m) of the sediments in the lake, and it is even deeper in sediment in the Ninemile Creek delta and the ILWD. At the Ninemile Creek delta, mercury contamination extends to a depth of at least 16.4 ft (5 m) into the sediments. Mercury contamination extends to a depth of about 26.2 ft (8 m) and possibly greater into the sediment/waste in the ILWD.

- The organic contaminants (e.g., BTEX, chlorinated benzenes, low molecular weight PAHs [LPAHs], PCBs, and PCDD/PCDFs) are primarily found in the ILWD and the shoreline area of the Honeywell sites, with concentrations of these CPOIs in the waste several orders of magnitude higher than in most of the lake. At the ILWD, elevated concentrations of these CPOIs extend to a depth of at least 26.2 ft (8 m). High molecular weight PAHs (HPAHs) are concentrated in the sediments throughout much of the southern basin of the lake, with the highest concentrations occurring off the former Oil City shoreline region and the shoreline areas near the Honeywell sites.

- Elevated contaminant concentrations and visual evidence (e.g., liquids, droplets, sheens) indicate that NAPL (e.g., chlorinated benzenes, which were manufactured and released as a waste by Honeywell) exists throughout the ILWD and in an area off the Honeywell causeway. Based on data collected during the RI/FS, it was determined that the NAPLs and highly contaminated waste materials in these areas of the lake are highly mobile, at least when disturbed, have high concentrations of toxic compounds, and present a significant risk to human health and the environment should exposure occur; therefore, they are characterized as principal threat wastes. In the areas of the ILWD that are far from shore (approximately 660 to 980 ft [200 to 300 m]), it is most likely that these NAPLs were disposed of directly into the lake with the other wastes.

As discussed in the "Description of Lakewide Alternatives" section of this ROD, the volume of materials (contaminated sediments/wastes) in the littoral zone that exceed the cleanup criteria range from about 12 million cy to more than 20 million cy.

What are Chemical Parameters of Interest?

The **chemical parameters of interest**, or **CPOIs**, for the Onondaga Lake RI/FS are defined as those elements or compounds that were selected as **contaminants of potential concern (COPCs)**, **chemicals of concern (COCs)**, or **stressors of concern (SOCs)**. The major classes of CPOIs include mercury and other metals, BTEX, chlorinated benzenes, PAHs, PCBs, PCDD/PCDFs, and calcite.

COPCs: COPCs are used in human health risk assessments (HHRAs) to determine contaminants that may be harmful to humans. An HHRA for the Onondaga Lake subsite was performed as part of the RI. COPCs were developed using available contaminant concentration data for lake fish (fillets only; limited to species likely to be consumed by humans), and for water and sediments in the northern and southern basins of the lake. A total of 62 COPCs were identified in the HHRA that fall into the classes identified above plus pesticides and additional VOCs and SVOCs (see Table 1).

COCs: COCs are used in baseline ecological risk assessments (BERAs) to determine chemicals that may be harmful to the environment. A BERA for the Onondaga Lake subsite was performed as part of the RI. COCs were developed using toxicity values to establish conservative thresholds for adverse effects to ecology (water, surface sediment, surface soil, plants, fish, and wildlife). As presented in the BERA, numerous toxic chemicals were detected at elevated concentrations in various lake media. A total of 38 COCs were identified in the BERA that fall into the classes identified above plus pesticides and additional SVOCs (see Table 2).

SOCs: SOCs are used in BERAs to determine those chemical contaminants which may not be addressed as hazardous wastes or hazardous substances, but which may cause effects or conditions that are harmful to the environment. The SOCs identified in the BERA include calcite and oncolites in sediments and calcium, chloride, salinity, ammonia, nitrite, phosphorus, and sulfide in water, as well as depleted dissolved oxygen and reduced water transparency (see Table 2).

Surface Water

- Concentrations of total mercury in lake water are highest in the nearshore areas around both Ninemile Creek and the ILWD. In the deep basins, water column total mercury concentrations increase significantly in the hypolimnion during summer stratification, with a high fraction of this hypolimnetic total mercury occurring in the dissolved phase.

- Concentrations of benzene, chlorobenzene, and dichlorobenzenes in lake water are highest near the Honeywell source areas in the vicinity of the East Flume and Harbor Brook.

Biota

- Mercury, PCBs, hexachlorobenzene, and PCDD/PCDFs have bioaccumulated in Onondaga Lake fish, and mercury has been found at elevated levels in benthic macroinvertebrates. It is likely that these contaminants have bioaccumulated in other biota (e.g., birds, mammals) as well; however, there are insufficient data to quantitatively assess the extent of bioaccumulation in these other biota. Consumption of fish drives the potential cancer risks and non-cancer hazards for humans (see the "Summary of Site Risks" section of this ROD).

- As discussed in the HHRA report, concentrations of mercury (as methylmercury) in tissue of edible-size fish collected from the lake since 1992 range from less than 0.1 to 5.1 milligrams per kilogram (mg/kg) (or ppm), with the average concentration of 1.1 mg/kg exceeding the US Food and Drug Administration limit of 1 mg/kg.

Impacts to Fish and Wildlife Resources

The contamination in the media described above has contributed to negative effects on the fish and wildlife resources around Onondaga Lake in a number of ways, including:

- Oncolite formation.
- Spring and fall turnover, which were not regular occurrences in the lake during the period of ionic waste discharges.
- Chloride loadings to Onondaga Lake from Solvay waste.
- Reduced species richness and a standing crop of macrophytes in the nearshore zone.
- Reduced species richness of zooplankton communities.
- Increased dominance of benthic macroinvertebrate communities by pollution-tolerant taxa.
- Reduced reproduction in the lake by numerous fish species.
- Elimination of cold-water fishery.
- Mercury, PCB, and PCDD/PCDF contamination of fish.
- Lack of amphibian reproduction in wetlands that are directly connected to lake water.
- Reduced species richness of amphibians and reptiles.

A detailed evaluation of the nature and extent of contamination, including contaminant distribution maps and concentration ranges of CPOIs in site media, can be found in Chapter 5 of the RI report.

Fate and Transport of Contaminants

Some of the key findings of the CPOI fate and transport analyses include:

<u>General</u>

- The lake is a sink for essentially all contaminants. For every CPOI examined, the estimated loads of contaminants entering the lake are at least five times greater than the loads leaving the lake.

- Several important contaminant source areas or mechanisms have been identified. These transport routes serve to deliver multiple contaminants to the lake. Among the routes and mechanisms are the following:

  – Ninemile Creek: This tributary has been and continues to be the single largest external source for total mercury. It has also been a source of PCDD/PCDFs, PCBs, lead, and chromium to the lake.

  – Harbor Brook: This tributary has been and continues to be a major source of LPAHs, particularly naphthalene, to the lake.

  – Ley and Onondaga Creeks: These tributaries appear to be ongoing sources of PCBs, and possibly PCDD/PCDFs, and are among the largest sources of lead to the lake.

  – East Flume: This tributary has been a long-term and important conduit for mercury, chlorinated benzenes, PAHs, and PCDD/PCDFs to the lake.

  – Honeywell lakeshore area groundwater: Transport of contaminants to the lake via groundwater represents the most important loading route for several CPOIs, including LPAHs such as naphthalene (from the Wastebed B/Harbor Brook site), chlorobenzene and dichlorobenzenes (from the Willis Avenue site), and all four BTEX compounds(from the Willis Avenue, Semet Residue Ponds, and Wastebed B/Harbor Brook sites). The NAPL plumes, which lie beneath the Willis Avenue and Wastebed B/Harbor Brook sites, contribute to the groundwater contamination and may also be contributing NAPL directly to the lake.

  – ILWD: Resuspension of these materials presents a significant source of mercury to the lake, perhaps representing the largest internal source to the water column. It is also a potentially important source of PCDD/PCDFs, BTEX, chlorinated benzenes, PCBs, PAHs, and other non-mercury CPOIs. Surface concentrations of several CPOIs are highly elevated in this waste area relative to the rest of the lake.

  – Profundal sediments: These sediments appear to be responsible for the increase in the hypolimnetic mercury inventory during summer stratification. This increase is believed to be a major source of mercury in the lake.

Mercury

- The lake sediments contain a huge reservoir of mercury. Both profundal and littoral sediments have high mercury inventories.

- Internal loads of mercury, generated via sediment resuspension and other mechanisms, probably yield a net load to the water column similar in magnitude to the externally derived loads, at least during the period of summer stratification.

- The primary removal mechanism for mercury in the water column of Onondaga Lake is particle settling. Deposition to the profundal sediments is the ultimate fate of most of the mercury in the lake, although data indicate that this mercury is not entirely sequestered from the environment.

- Internal sources of total mercury include the resuspension and transfer of materials from the ILWD and the transfer of dissolved and particulate mercury from the profundal sediments. Resuspension and transfer of materials from the ILWD contributes a significant flux to the epilimnion mercury budget, while the transfer of materials from profundal sediments is an additional source of total mercury to the hypolimnion.

- Wind-driven resuspension (i.e., resuspension of lake sediments during windy conditions) is a major mechanism for the release of contaminants from the ILWD and possibly other littoral zone sediments. Groundwater advection through these materials may also transport significant quantities of mercury, as well as other CPOIs, to the lake.

- Particle resuspension and increased diffusion associated with methane gas ebullition in the anoxic sediments (i.e., disturbance of the lake bottom sediments by escaping methane bubbles) are the likely mechanisms for the release of mercury from profundal sediments to the hypolimnetic water column.

- The primary source of methylmercury to the water column is the methylation of total mercury in the hypolimnetic water column during the recurring anoxic stratified period. Diffusion of methylmercury across the thermocline provides the majority of the methylmercury budget to the epilimnion during the summer stratified period. The methylmercury produced in the hypolimnion during stratification escapes to the oxic waters of the lake during the process of fall turnover, resulting in a substantial increase in the epilimnetic concentrations.

Chemical Parameters of Interest Other than Mercury

- The lake sediments represent a huge reservoir of contaminant mass for many other CPOIs. Significant contamination other than mercury exists in the littoral zone near the Honeywell lakeshore area, extending along the shore as far as Ley Creek for some compounds. This inventory of contamination cannot be considered sequestered as it is in an area subject to wind-driven waves. The ILWD is located in this region, representing a clear source of contamination to the water column of the lake.

- Low molecular weight organics, such as BTEX, chlorinated benzenes, and LPAHs, tend to be found in sediments offshore of Honeywell's former facilities. An apparent combination of rapid deposition and rapid biodegradation, as well as groundwater-based releases, has resulted in a sediment inventory that is primarily located near the source area.

- High molecular weight organics, such as HPAHs, PCDD/PCDFs, and PCBs, are present at elevated levels throughout the lake bottom sediments, reflecting their resistance to biodegradation as well as the extended period of discharge to the lake by Honeywell and possibly other sources.

- The likely sources of the current loads of BTEX, chlorinated benzenes, and LPAHs include groundwater and NAPL from the various Honeywell upland sites and the ILWD area.

- The largest sources of PCBs to the lake are likely the ILWD and Ley Creek.

- The largest sources of PCDD/PCDFs to the lake are likely Ninemile Creek (octachlorodibenzodioxin- and tetrachlorodibenzofuran-dominant), the East Flume (tetrachlorodibenzofuran-dominant), and Ley Creek (octachlorodibenzodioxin-dominant).

- Elevated levels of cadmium, chromium, copper, lead, nickel, and zinc are found in the lake sediments. The pattern of contamination suggests sources other than, or in addition to, Honeywell for many of these metals. In part because of their longevity in the environment, these metals can be found at levels above background throughout the sediments of the lake bottom.

<u>Calcite Precipitation and Ionic Wastes</u>

- The rate of calcite formation has diminished by at least half since the closure of Honeywell's Main Plant. Current sedimentation rates are about half of the pre-1986 sedimentation rates.

- Currently, ionic concentrations remain elevated with respect to other nearby water bodies, even though, overall, ionic concentrations in the lake water have been significantly reduced from conditions in the 1980s and earlier.

- Oncolites are found throughout the littoral zone along most of the northern part of the lake and may have had a significant effect on the ecological structure of the lake by creating an unstable substrate for macrophyte (aquatic plant) colonization, thus limiting macrophyte distribution.

A detailed evaluation of the fate and transport of CPOIs can be found in Chapter 6 of the RI report.

See Tables 3, 4, and 5 (in the Tables section of this ROD [Appendix II]) for summaries of sediment data from all depths, Table 6 for surface water data from all depths, and Table 7 for fish data.

Sediment Management Units

For investigation and remediation purposes, the site has been divided into eight SMUs based on water depth, sources of water entering the lake, and physical, ecological, and chemical characteristics (see Figure 3). The division of the site into SMUs allowed the development and evaluation of remedial alternatives appropriate to each area. The remedial alternatives evaluated for each SMU were then used in combination to develop comprehensive, lakewide remedial alternatives which would reduce site risks to humans and the environment. SMUs 1 through 7 are located in the littoral zone of the lake (i.e., water depths of 0 to 30 ft [0 to 9 m]), and SMU 8 covers the profundal zone (i.e., water depths of greater than 30 ft [9 m]).

SMU 1

SMU 1 is located at the southern end of Onondaga Lake and encompasses the majority of the ILWD. The ILWD was formed primarily through the deposition of calcium carbonate and other wastes from the overflow of dikes around Wastebed B and through discharges via the East Flume. These discharges into the lake are believed to have included a combination of cooling water, sanitary waste, Solvay waste, mercury wastes, and organic chemical wastes, which settled out and formed a large delta that is at a higher elevation than surrounding areas of the lake bottom. This waste material is typically described as very soft to soft, although there are some harder crusts. This softness, along with geophysical evidence of historical failures (i.e., underwater slumping or "landslides" associated with the ILWD), causes concern as to whether the wastes in their current configuration are sufficiently stable to prevent a portion of the ILWD from slumping in the future.

SMU 1 is located directly offshore of Wastebed B, and the East Flume and Harbor Brook enter Onondaga Lake here. SMU 1 extends approximately 3,850 ft (1,170 m) west from the mouth of Harbor Brook, encompassing a surface area of approximately 84 acres. At its widest point, SMU 1 extends approximately 2,200 ft (671 m) into the lake. Lake bathymetry indicates that the nearshore shelf (at water depths less than 13 ft [4 m]) is relatively broad and is bordered by a steeper offshore slope at water depths from 13 to 30 ft (4 to 9 m).

A portion of the SMU 1 shoreline is contiguous with the state-regulated wetland SYW-19 (see Figure 6), which is dominated by Phragmites while the rest of the shoreline is partially forested. Nearshore sediments are dominated by Solvay waste (e.g., calcium carbonate deposits). Macrophyte beds are lacking, fish reproduction appears low, and there is a severely impaired benthic community.

Multiple external sources for most of the CPOIs present in the lake have been identified in the vicinity of SMU 1, including the Wastebed B/Harbor Brook and the Willis Avenue subsites.

NAPL is present within layers of the ILWD and is typically found in small brown nodules. The NAPL does not appear to be present in continuous layers. Sheens were also noted on the lake surface at every location in this area during intrusive activities. There is evidence of mobility of the NAPL residual in the lake during intrusive activities such as well placement, sediment coring and sample collection, and likely during sediment resuspension caused by wind-driven waves. Since these NAPLs and other highly contaminated materials in the lake in this area are highly mobile, have high concentrations of toxic compounds, and present a significant risk to human health and the environment should exposure occur, they are characterized as principal threat wastes.

Risk concerns and associated CPOIs and stressors in SMU 1 include sediment toxicity to benthic macroinvertebrates (mercury, ethylbenzene, xylenes, chlorobenzene, dichlorobenzenes, trichlorobenzenes, PAHs, total PCBs); exposure of humans to sediments by wading (arsenic, PAHs, PCDD/PCDFs, hexachlorobenzene); exposure of fish to mercury and other CPOIs and subsequent human and wildlife consumption of fish; benthic macroinvertebrate/insect consumption by wildlife (PAHs, barium, chromium, mercury, methylmercury, selenium); a moderately to severely impaired benthic community (sediment toxicity); and impaired habitat conditions (limited macrophyte cover).

SMU 2

SMU 2 is located in the southern portion of the lake offshore from the causeway formerly used by Honeywell for loading and unloading materials. The SMU extends approximately 3,000 ft (914 m) along the southern shore of the lake, from the border with SMU 1 toward Tributary 5A. At its widest point, SMU 2 extends approximately 550 ft (170 m) into the lake. Lake bathymetry indicates that the nearshore shelf is relatively broad, except near the mouth of Tributary 5A, where it becomes steeper (*i.e.*, greater than 15 percent slope). Storm drains associated with I-690 discharge into this SMU.

Natural shoreline features, including vegetation, are lacking in SMU 2. The littoral zone sediments are dominated by calcium carbonate deposits. Macrophyte beds are lacking, there is a moderately impaired to severely impaired benthic community, and evidence of fish reproduction in the area is low to none.

Multiple external sources for most of the CPOIs present in the lake were identified in the vicinity of SMU 2, including the Semet Residue Ponds and the Willis Avenue subsites.

Stained fill material was observed at one location within SMU 2. The 0 to 10.5 ft (0 to 3.2 m) depth interval at this location contained black impacted fill material that was granular in nature (slag, brick, wood, etc.) and was, according to Honeywell, likely placed during the construction of the causeway in the 1970s. The staining of the fill material may be a result of NAPL in this area. The source of the contamination at this location is likely related to the NAPL (chlorinated benzenes) plume from the Willis Avenue site or from the I-690 storm drains in the area, which intercept a portion of the contaminated groundwater from the Honeywell site. The NAPLs and other highly contaminated materials in the lake in this area are also characterized as principal threat wastes.

Risk concerns and associated CPOIs and stressors in SMU 2 include sediment toxicity to benthic macroinvertebrates (mercury, ethylbenzene, xylenes, chlorobenzene, dichlorobenzenes, trichlorobenzenes, PAHs, total PCBs); exposure of humans to sediments by wading (arsenic, PAHs, PCDD/PCDFs, hexachlorobenzene); exposure of fish to mercury and other CPOIs and subsequent human and wildlife consumption of fish; benthic macroinvertebrate/insect consumption by wildlife (PAHs, barium, chromium, mercury, methylmercury, selenium); a moderately to severely impaired benthic community (sediment toxicity); and impaired habitat conditions (limited macrophyte cover and oncolites).

SMU 3

SMU 3 is located offshore of Honeywell's inactive Solvay Wastebeds 1 through 8, which were used to dispose of wastes from the manufacturing of soda ash via the Solvay process. SMU 3 extends approximately 8,000 ft (2,440 m) west from SMU 2. At its widest point, it extends approximately 825 ft (250 m) into the lake. Lake bathymetry indicates that the shelf is relatively steep in the southern part of SMU 3, becoming broader to the north.

The sediments are dominated by calcium wastes including oncolites. Macrophyte beds are generally sparse, but increase at the border with SMU 4. The immediate shoreline is erosional, but vegetation on the Solvay wastebeds supports terrestrial wildlife. Evidence suggests that fish reproduction is low. The benthic community impacts vary widely from slightly to severely impacted.

Risk concerns and associated CPOIs and stressors in SMU 3 include sediment toxicity to benthic macroinvertebrates in some areas (mercury, ethylbenzene, xylenes, dichlorobenzenes, total PCBs); impaired habitat conditions (calcitic sediments, unstable shoreline, limited macrophyte cover [except at the border of SMUs 3 and 4]); a slightly to moderately impaired benthic community (sediment toxicity in some areas); and impaired habitat conditions (limited macrophyte cover and oncolites).

SMU 4

SMU 4 is located along the shore of Onondaga Lake west of SMU 3 and includes the delta where Ninemile Creek discharges into the lake. SMU 4 extends approximately 3,300 ft (1,006 m) along the shore of the lake. At its widest point, it extends approximately 1,375 ft (420 m) into the lake. Lake bathymetry indicates that the shelf is relatively steep in the northern part of SMU 4, becoming broader to the south. The sediment load at the mouth of Ninemile Creek drives the depositional processes along the central portion of this SMU by discharging fine- and coarse-grained material to the lake. The sediment load from the creek influences the bathymetry and water depth in the central portion of this SMU.

SMU 4 is contiguous with state-regulated wetland SYW-10 (see Figure 6), which is a floodplain forest. Macrophyte beds are prevalent in the depositional areas of Ninemile Creek. During low water events in late summer, exposed sediments attract shorebirds. Evidence suggests significant fish reproduction in the area. Some sediments of the SMU include eroded Solvay wastebed materials and oncolites. The benthic community is moderately impacted.

Multiple external sources were identified in the vicinity of SMU 4, including the LCP Bridge Street site, West Flume, Geddes Brook and Ninemile Creek, and Honeywell's Solvay Wastebeds 1 through 15. The LCP Bridge Street site is located along the West Flume and consists of 20 acres of land used by Honeywell for chlor-alkali production. The West Flume discharges into Geddes Brook, which discharges into Ninemile Creek.

Risk concerns and associated CPOIs and stressors in SMU 4 include moderately impaired benthic community; habitat conditions (limited macrophyte cover in some areas); and exposure of fish to mercury and other CPOIs and subsequent human and wildlife consumption of fish.

SMU 5

SMU 5 includes the littoral zone along the northern and western shores of the lake. Sawmill Creek and Bloody Brook discharge into SMU 5. The Seneca River, the main discharge point for Onondaga Lake, is also located within SMU 5 at the northwestern end of the lake. SMU 5 extends approximately 30,000 ft (9,144 m) from the Ninemile Creek delta to the Ley Creek delta. At its widest point, it extends approximately 1,375 ft (420 m) into the lake. Lake bathymetry indicates that the nearshore shelf (at water depths less than 13 ft [4 m]) is relatively broad and is bordered by a steep offshore slope at water depths from 13 to 30 ft (4 to 9 m).

Habitat conditions vary significantly across SMU 5. The northwest section is contiguous with state-regulated wetland SYW-6 (see Figure 6), which includes floodplain forest and emergent wetlands. There are large macrophyte beds and overhanging vegetation that encourage fish reproduction. The remainder of the shoreline is dominated by human uses, including the Onondaga Lake Park and roadways. Some shoreline vegetation is present. The sediments throughout the SMU are dominated by calcium carbonate and oncolites. Macrophytes and fish reproduction decrease along the northeast section of the SMU. The benthic community is slightly to moderately impacted.

External sources for some CPOIs present in the lake were identified within the vicinity of SMU 5 in the Bloody Brook area. Bloody Brook runs through an industrial complex, some suburbs, and some major transportation rights of way, discharging into the middle of the northern side of the lake.

Risk concerns and associated CPOIs and stressors in SMU 5 include slightly impaired habitat conditions in some areas (oncolites and limited macrophyte cover in some areas) and slightly to moderately impaired benthic communities and limited macrophyte cover in some areas.

SMU 6

SMU 6 extends approximately 5,000 ft (1,500 m) along the eastern end of Onondaga Lake from the mouth of Ley Creek to 700 ft (213 m) south of the mouth of Onondaga Creek, and includes where Ley Creek, Onondaga Creek, and Metro discharge into Onondaga Lake. At its widest point, it extends approximately 1,925 ft (590 m) north into the lake. Lake bathymetry indicates that the nearshore shelf is relatively broad.

The SMU 6 shoreline is contiguous with state-regulated wetland SYW-12 (see Figure 6), which includes floodplain forest and emergent wetlands. Sediments are less dominated by calcium carbonate deposits than some other SMUs and oncolites are not abundant. Macrophyte beds are present, especially at the mouth of Onondaga Creek. Fish reproduction appears low. The benthic community is moderately to severely impacted.

Multiple external sources and potential sources for some of the CPOIs present in the lake were identified in the vicinity of SMU 6, including Ley Creek, Onondaga Creek, and the former Oil City area. The Ley Creek area contains the GM – IFG site, the GM Ley Creek Dredgings site, the Town of Salina Landfill, and the GM Old Ley Creek Channel site. The Onondaga Creek area includes the Niagara Mohawk – Erie Boulevard Manufactured Gas Plant site, the Niagara Mohawk – Hiawatha Boulevard Manufactured Gas Plant site, the Roth Steel site, and the American Bag and Metal site. The former Oil City area was used as a bulk storage and transfer facility for numerous industries. These sites are discussed further in the Onondaga Lake RI report. Although the Honeywell sites and former facilities (and related discharge points) are not located adjacent to the shoreline of SMU 6, the effects of Honeywell's facilities and discharges are evident in the sediments of this SMU based on the presence of Honeywell CPOIs.

Risk concerns and associated CPOIs and stressors in SMU 6 include sediment toxicity to benthic macroinvertebrates (mercury, ethylbenzene, xylenes, dichlorobenzenes, PAHs, total PCBs); sediment exposure to humans by wading (arsenic, PAHs, PCDD/PCDFs, hexachlorobenzene); exposure of fish to mercury and other CPOIs and subsequent human and wildlife consumption of contaminated fish; benthic macroinvertebrate/insect consumption by wildlife (PAHs, barium, chromium, mercury, methylmercury, selenium); and impaired habitat conditions (limited macrophyte cover).

SMU 7

SMU 7 is located at the southern corner of Onondaga Lake and includes the littoral zone located between SMU 1 and SMU 6. SMU 7 is located between Harbor Brook to the west and the

Onondaga Creek delta to the east and extends approximately 1,375 ft (420 m) along the shore of the lake. At its widest point, it extends approximately 2,200 ft (670 m) into the lake. Lake bathymetry indicates that the shelf is relatively broad near the shore, becoming slightly steeper at a water depth greater than 13 ft (4 m).

A portion of SMU 7 is contiguous with part of state-regulated wetland SYW-19 (see Figure 6), which is dominated by Phragmites. The remainder of the shoreline is in close proximity to the railway. Macrophyte beds are present. Calcium carbonate deposits and associated oncolites are less dominant than in other SMUs. Fish reproduction appears low and the benthic community is severely impacted.

Multiple external sources for most of the CPOIs present in the lake were identified in the vicinity of SMU 7, including Harbor Brook, which flows adjacent to the Lakeshore Area and the Penn-Can property (both part of the Wastebed B/Harbor Brook subsite). NAPL was observed in one boring in SMU 7. In addition, sheen was consistently noted at the water surface during installation of borings, consistent with the observations at the ILWD. NAPL was also noted in a number of sediment samples collected from Harbor Brook, as well as in samples of the marl deposit collected from beneath the sediments of Harbor Brook. Based on historic photos and sampling, it can be seen that the ILWD extends into a portion of SMU 7.

Risk concerns and associated CPOIs and stressors in SMU 7 include sediment toxicity to benthic macroinvertebrates (mercury, ethylbenzene, xylenes, chlorobenzene, dichlorobenzenes, trichlorobenzenes, PAHs, total PCBs); sediment exposure to humans by wading (arsenic, PAHs, PCDD/PCDFs, hexachlorobenzene); exposure of fish to mercury and other CPOIs and subsequent human and wildlife consumption of contaminated fish; benthic macroinvertebrate/insect consumption by wildlife (PAHs, barium, chromium, mercury, methylmercury, selenium); and impaired habitat conditions (limited macrophyte cover).

SMU 8

SMU 8 includes the entire profundal zone of Onondaga Lake, where the water depth is greater than 30 ft (9 m). It is approximately 22,000 ft (6,710 m) long and approximately 5,225 ft (1,590 m) wide at its widest part. SMU 8 has two basins, northern and southern, which are separated by a slight ridge, or saddle, that is approximately 56 ft (17 m) deep. The maximum depths of the northern and southern basins are 62 ft (19 m) and 65 ft (20 m), respectively. Lake bathymetry indicates that the profundal nearshore shelf is relatively steep, becoming broader towards the center of the lake.

SMU 8 is dominated by anoxic conditions during the summer months that limit the use of the sediments by the benthic community. Anoxic conditions also prevent fish from using the deepwater habitat during the summer. The extent to which fish use the hypolimnion under oxic conditions is unknown.

The ultimate fate of most of the sediment entering Onondaga Lake is burial in the profundal sediment. Therefore, the sources contributing to the contamination within SMUs 1 through 7, as discussed above, are also sources of contamination to the profundal sediments in SMU 8.

Risk concerns and associated CPOIs and stressors in SMU 8 include habitat impairment, with exclusion of the benthic community during periods of anoxia and exposure of fish to mercury and other CPOIs (e.g., PCBs) in the epilimnion and in the hypolimnion during those times that oxygen is available and subsequent human and wildlife consumption of contaminated fish.

CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

The State of New York, Onondaga County, and the City of Syracuse have jointly sponsored the preparation of a land-use master plan to guide future development of the Onondaga Lake area (Reimann-Buechner Partnership, 1991). The primary objective of land-use planning efforts is to enhance the quality of the lake and lakeshore for recreational and commercial uses. Anticipated recreational uses of the lake include fishing without consumption restrictions and swimming. The Onondaga Nation similarly asserts it seeks to safely make greater use of lake.

Land Use

In general, the eastern shore of Onondaga Lake is mainly urban and residential, and the northern shore is dominated by parkland, wooded areas, and wetlands. The northwest upland is primarily residential, with interspersed urban structures and several undeveloped areas. Solvay wastebeds cover much of the western lakeshore. Urban centers and industrial zones dominate the landscape surrounding the south end of Onondaga Lake from approximately the New York State Fairgrounds to Ley Creek. Land around the southwest corner and southern portion of the lake is generally industrial and has been significantly modified as part of long-term development of the Syracuse area. Land around much of the lake is recreational, providing hiking and biking trails, picnicking, sports, and other recreational activities.

Surface Water Use

Approximately the northern two-thirds of Onondaga Lake is classified by the State of New York as Class B water (best usages defined as "primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival" [6 NYCRR Part 701.7]). The southern third of Onondaga Lake and the area at the mouth of Ninemile Creek are classified as Class C water (best usage defined as "fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes" [6 NYCRR Part 701. 8]). No permitted swimming beaches or sanctioned swimming areas exist at Onondaga Lake (NYSDOH, 1995).

Fishing occurs, but the NYSDOH has a specific, restrictive advisory for Onondaga Lake which warns against eating walleye (*Stizostedion vitreum*), with consumption of all other species limited to no more than once per month (NYSDOH, 2005). The specific advisory also stipulates that infants, children under 15, and women of childbearing age should eat no fish from the lake. The more general, statewide advisory for the state's fresh waters advises that consumption be limited to no more than one meal per week. Onondaga Lake and the associated tributaries do not serve as potable-water sources (Syracuse Department of Water, 2000). The shoreline of the lake (especially in the park) is used for water-related recreation such as fishing and boating. In 1990, more than one million people used Onondaga Lake County Park, located along the northern half of the lake (Moore, pers. comm., 1991).

SUMMARY OF SITE RISKS

As part of the RI process, baseline risk assessments were conducted for the site to estimate the risks to human health and the environment. The baseline risk assessments, consisting of an HHRA, which evaluated risks to people, and a BERA, which evaluated risks to the environment, analyzed the potential for adverse effects both under current conditions and if no actions are taken to control or reduce exposure to hazardous substances at the Onondaga Lake subsite. As indicated below, based upon the results of the RI and the risk assessments, NYSDEC and EPA have determined that active remediation is necessary to protect public health or welfare and the environment from actual and threatened releases of hazardous substances into the environment.

Human Health Risk Assessment

A site-specific HHRA was performed to quantitatively evaluate both cancer risks and non-cancer health hazards associated with potential current and/or future exposures to chemicals present in Onondaga Lake surface water, sediments, and fish in the absence of any action to control or mitigate those chemicals. The HHRA was prepared to evaluate potential risks associated with exposure to elevated concentrations of mercury, benzene, chlorobenzene, and other COPCs in surface water; mercury, benzene, xylenes, chlorinated benzenes, PAHs, PCBs, PCDD/PCDFs, and other COPCs in sediments; and mercury, hexachlorobenzene, PCBs, PCDD/PCDFs, and other COPCs in fish.

Hazard Identification

In addition to mercury (including methylmercury), approximately 60 other chemicals were identified as COPCs in one or more site media using a screening process comparing measured concentrations to risk-based concentrations. Risks were calculated for these COPCs in the HHRA. The COPCs that are associated with unacceptable levels of cancer risk or non-cancer hazard are known as COCs.

Exposure Assessment

Recreational visitors to Onondaga Lake are the receptors or individuals with the greatest potential for exposure to COPCs. Cancer risks and non-cancer health hazards were evaluated for young children (less than 6 years old), older children (6 years to less than 18 years old), and adults (18 years and over). In addition, it was assumed that people eat fish caught in Onondaga Lake, even though NYSDOH currently advises that women of childbearing age, infants, and children under the age of 15 should not eat any fish from Onondaga Lake and all others should eat no more than one meal per month of any species, with no walleye to be eaten at all. Recreational visitors were assumed to include anglers who eat fish from Onondaga Lake; people who swim, wade, or boat in the lake; and people who play or walk along the shoreline of the lake. The exposure point concentrations for the COCs, along with detection frequencies for these contaminants, are presented in Table 8.

In addition to consumers of fish, the HHRA also evaluated exposure to those who may contact contaminated sediments and water; specifically, current and future recreational users of Onondaga Lake and future construction workers. A summary of the results of the risk estimates is provided below in the "Risk Characterization" section.

In order to allow risk managers to consider various options when evaluating remediation strategies, the HHRA estimated cancer risks and non-cancer hazards based on a range of potential exposures under both the reasonable maximum exposure (RME) scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, and the central tendency (CT, or "typical") scenario. Cancer risks and non-cancer health hazards were assessed for recreational visitors to Onondaga Lake and future construction workers under both these scenarios.

Toxicity Assessment

Risk estimates for all COPCs were based on use of toxicity values, using carcinogenic slope factors (CSFs) to assess potential carcinogenic effects and reference doses (RfDs) to assess potential non-cancer effects. These measures were primarily derived and published by EPA. The three COCs (or COC groups) responsible for a majority of estimated site risks are methylmercury, PCBs, and PCDD/PCDFs.

- Methylmercury, which is the predominant form (95 percent or more) of total mercury in fish tissue, is a toxic chemical with which a number of adverse health effects have been associated in both human and animal studies. The critical health endpoint from exposure to methylmercury is developmental neurotoxicity.

- PCBs cause cancer in animals and probably cause cancer in humans. In addition, serious non-cancer health effects have been observed in animals exposed to PCBs. Studies of Rhesus monkeys exposed to PCBs indicate a reduced ability to fight infection and reduced birth weight in offspring exposed in utero.

- PCDD/PCDFs are probable human carcinogens, based on evidence in laboratory animals. They have also been associated with a wide variety of toxic effects in animals, including acute toxicity, enzyme activation, tissue damage, and developmental abnormalities.

A summary of the toxicity information for both non-cancer health effects as well as cancer endpoints is presented in Tables 9 and 10, respectively.

Risk Characterization

The HHRA shows that cancer risks and non-cancer health hazards associated with ingestion of chemicals in sport fish (e.g., largemouth bass) from Onondaga Lake are above levels of concern. Fish ingestion is the primary pathway for exposure to COCs and for potential adverse health effects. Cancer risks and non-cancer health hazards calculated for the consumption of Onondaga Lake fish exceeded the target risk level range, as follows:

- **Cancer risks:** The calculated RME cancer risks (ranging from 2.4×10^{-4} to 7.8×10^{-4}) exceeded the high end of the target risk range (10^{-4}), and exceeded the low end of the target cancer risk (10^{-6}) by more than two orders of magnitude.[3] The CT fish ingestion cancer risk (about 4.5×10^{-5} for all recreational receptors) was below the high end of the target range but above the low end of the range. The cancer risk estimates for the COCs for the RME scenario are presented in Table 11.

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[3] In an HHRA, exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a "one-in-ten-thousand excess cancer risk," or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions explained in the Exposure Assessment of the HHRA. Current federal Superfund guidelines for acceptable exposures are "generally concentration levels that represent an excess upper bound cancer to an individual of between 10^{-4} to 10^{-6}" (40 CFR § 300.430[e][2][A][2]) (corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk). The 10^{-6} risk is used as the point of departure for determining remediation goals.

- **Non-cancer health hazards:** The RME non-cancer hazard indices (ranging from about 18 to 28) exceeded the target hazard index (1) by more than an order of magnitude.[4] The calculated CT non-cancer hazard index (ranging from about 4.5 to 7) also exceeded the target. The non-cancer hazard quotients and indices for the COCs for the RME scenario are presented in Table 12.

RME cancer risks for most recreational exposure pathways (e.g., swimming, wading, boating) other than fish ingestion equaled or exceeded the low end of the target risk range of 1×10^{-6}, with the highest of these being about 3.5×10^{-5} for older child exposure to nearshore sediments from the southern basin of the lake. For the CT cancer risk calculations, the low end of the target range was equaled and slightly exceeded in one pathway other than fish ingestion, with a maximum CT risk of about 2×10^{-6} for young child exposure to nearshore sediments from the southern basin. RME cancer risks (3.7×10^{-6}) for exposure to south basin sediments for future construction workers exceeded the low end of the target risk range of 1×10^{-6}. All other RME and CT risks for future construction workers were less than the target range.

None of the calculated non-cancer hazards (for both RME and CT scenarios) associated with pathways other than fish ingestion exceeded the target threshold of 1, indicating that exposure to lake COPCs from all pathways except fish consumption are not predicted to result in adverse non-cancer effects. (Note that risks due to the sediments and soils in the wetlands around the lake and the dredge spoils area near Ninemile Creek were calculated in the Onondaga Lake risk assessments but are not presented in this ROD. These areas are now being addressed as part of investigations taking place at other upland sites; i.e., the Ninemile Creek Dredge Spoils Area for state-regulated wetland SYW-6 [see Figure 6], Geddes Brook/Ninemile Creek for state-regulated wetland SYW-10, and the Wastebed B/Harbor Brook site for state-regulated wetlands SYW-12 and SYW-19.)

Baseline Ecological Risk Assessment

The BERA evaluated the likelihood that adverse ecological effects are occurring or may occur as a result of exposure to one or more chemicals or stressors. The BERA was prepared to evaluate potential risks associated with exposure to elevated concentrations of mercury, chlorinated benzenes, and other COCs and stressors in surface water; mercury, BTEX, chlorinated benzenes, PAHs, PCBs, PCDD/PCDFs, and other COCs and stressors in sediments; and mercury, chlorinated benzenes, PAHs, PCBs, PCDD/PCDFs, and other COCs in fish and other wildlife. The framework used for assessing site-related ecological risks is similar to that used for HHRAs and consists of problem formulation, ecological exposure assessment, ecological effects assessment, and risk characterization.

Problem Formulation

Problem formulation identifies the major factors to be considered in a BERA, including COC and SOC (e.g., ionic waste) characteristics, ecosystems and/or species potentially at risk, and ecological effects to be evaluated. It establishes the goals, breadth, and focus of the assessment,

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[4] For non-cancer health effects, a “hazard quotient” (HQ) is calculated for each contaminant. An HQ represents the ratio of the estimated exposure to the corresponding reference doses (RfDs). The sum of the HQs is termed the “hazard index” (HI). The key concept for a non-cancer HI is that a “threshold level” (measured as an HQ or HI of 1) exists, below which non-cancer health effects are not expected to occur.

develops a conceptual model, and selects assessment endpoints, which are explicit expressions of the environmental value that is to be protected. In an HHRA, only one species (humans) is evaluated and the cancer and non-cancer effects are the usual assessment endpoints. In contrast, a BERA involves multiple species that are likely to be exposed to differing degrees and respond differently to the same contaminant. Assessment endpoints focus the risk assessment on particular components of the ecosystem that could be adversely affected by contaminants from the site.

Assessment endpoints selected for Onondaga Lake are based on the sustainability of plant and animal communities and populations. "Sustainability" relates to survival, growth, and reproduction. The assessment endpoints include:

- Sustainability of an aquatic macrophyte community to provide food and shelter for aquatic organisms and wildlife.

- Sustainability of phytoplankton and zooplankton communities as a food source for aquatic organisms and wildlife.

- Sustainability of a terrestrial plant community to provide food and shelter to invertebrates and wildlife.

- Sustainability of a benthic invertebrate community to serve as a food source for local fish and wildlife.

- Sustainability of fish populations.

- Sustainability of amphibian and reptile populations.

- Sustainability of insectivorous, benthivorous, piscivorous (fish-eating), and carnivorous bird populations.

- Sustainability of insectivorous and piscivorous mammal populations.

Detailed quantitative assessment of sustainability of selected populations of fish and wildlife were conducted by selecting individual species representative of various feeding preferences, predatory levels, and habitats. Receptors selected to represent the Onondaga Lake ecological community for the BERA included eight species of fish, six species of birds, and four species of mammals. The remaining receptors (i.e., both aquatic and terrestrial plants, phytoplankton and zooplankton, amphibians, reptiles) were evaluated qualitatively.

Ecological Exposure Assessment

The assumptions and models used to predict the potential exposure of plants and animals to COCs associated with Onondaga Lake are addressed in this component. Exposure parameters (e.g., body weight, prey ingestion rate, home range) of wildlife species selected as representative receptors and site-specific fish, sediment, and water COC concentrations were used to calculate the exposure concentrations or dietary doses using food-web models.

Ecological Effects Assessment

Mercury and numerous other potentially toxic chemicals, including metals, PCBs, PAHs, BTEX, chlorinated benzenes, and PCDD/PCDFs, were detected at concentrations above ecological screening levels in various lake media.

Measures of toxicological effects were selected based on lowest-observed-adverse-effect levels (LOAELs) and no-observed-adverse-effect levels (NOAELs) from studies reported in the scientific literature. Reproductive effects (e.g., egg maturation, egg hatchability, and survival of juveniles) were generally the most sensitive endpoints.

Risk Characterization

Multiple lines of evidence, based on various measurement endpoints (measures of effect), were used to evaluate major components of the Onondaga Lake ecosystem to determine if contamination has adversely affected plants and animals in and around the lake. Almost all lines of evidence indicate that input of chemicals and ionic waste in Onondaga Lake has produced adverse ecological effects at all trophic levels (levels of the food chain) examined.

As discussed in the BERA, mercury and possibly other chemicals have bioaccumulated in most organisms serving as a food source for biota in the lake, resulting in risks to fish and wildlife above acceptable levels. Comparisons of measured tissue concentrations and modeled doses of chemicals to measures of toxicological effects show exceedances of hazard quotients for chemicals in the lake. Many of the chemicals in the lake are persistent (i.e., would remain in the same chemical state without breaking down); therefore, the risks associated with these chemicals are unlikely to decrease significantly unless remediation is performed.

Exceedances of site-specific sediment effects concentrations based on macroinvertebrate toxicity tests (see the text box entitled "Development of Sediment Effect Concentrations/Probable Effect Concentrations"[page 34]) suggest that adverse effects to benthic invertebrates due to contact with surface sediments will frequently occur in most areas of the lake. The greatest number of contaminants with exceedances and the greatest magnitude of those exceedances were found in areas in the southern portion of the lake (i.e., SMUs 1, 2, 6, and 7) and near Ninemile Creek (i.e., SMU 4).

This is confirmed by benthic community analysis, which indicates that these areas are moderately to severely impacted. As defined in the BERA, "moderately impacted" indicates that the macroinvertebrate community is altered to a large degree from the reference condition and "severely impacted" indicates that the macroinvertebrate community is limited to a few tolerant species, usually midges or worms, and often only one or two species are abundant. In addition, the aquatic macrophytes in the lake have been adversely affected by lake conditions, and the resulting loss of macrophyte habitat that formerly provided valuable feeding, spawning, and nursery areas has likely adversely affected the aquatic invertebrates and vertebrates living in Onondaga Lake.

Summary of Human Health and Ecological Risks

Key results of the HHRA include the finding that contamination in Onondaga Lake presents risks to human health that are above EPA guidelines. In addition, the primary sources of these cancer risks and non-cancer health hazards are due to mercury, PCBs, and PCDD/PCDFs as a result of the consumption of Onondaga Lake fish.

Key results of the BERA indicate that comparisons of measured tissue concentrations and modeled doses of chemicals to toxicity reference values show exceedances of hazard quotients for site-related chemicals throughout the range of the point estimates of risk. Site-specific sediment toxicity data indicate that sediments are toxic to benthic macroinvertebrates on both an acute (short-term) and chronic (long-term) basis. Many of the contaminants in the lake are persistent and, therefore, the risks associated with these contaminants are unlikely to decrease significantly in the absence of remediation. On the basis of these comparisons, it has been determined through the BERA that all receptors of concern are at risk. Contaminants and stressors in the lake have either impacted or potentially impacted every trophic level examined in the BERA.

Based upon the results of the RI and the risk assessments, NYSDEC and EPA have determined that active remediation is necessary to protect public health or welfare and the environment from actual and threatened releases of hazardous substances into the environment.

Basis for Action

Actual or threatened releases of hazardous substances from the site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

The documents that form the basis of NYSDEC and EPA's selection of a remedy are included in the Administrative Record Index (see Appendix III) and include the final RI report, BERA, and HHRA (all dated December 2002), the final FS report (dated November 29, 2004), the Proposed Plan (dated November 29, 2004), the comments on the Proposed Plan and RI/FS received from the public during the comment period, the comments on the Proposed Plan issued by EPA's National Remedy Review Board (NRRB) (dated February 18, 2005), the responses of NYSDEC and EPA Region 2 to the NRRB's comments (dated March 25, 2005), and this ROD (which includes the Responsiveness Summary).

Development of Sediment Effect Concentrations/Probable Effect Concentrations

To evaluate sediment quality in Onondaga Lake, toxicity of the sediment to sediment-dwelling (benthic) invertebrates was tested. Laboratory tests involved exposing the midge *Chironomus tentans* and the amphipod *Hyalella azteca* to Onondaga Lake sediments and observing their growth and survival. Since the results for *Chironomus tentans* were found to be the more sensitive test, these acute toxicity data were then used to develop the following five site-specific SECs:

Effects Range-Low (ER-L) – The concentration that represents the lowest 10th percentile of the concentrations at which toxic effects were observed. At concentrations below the ER-L, toxic effects are rarely expected.

Threshold Effect Level (TEL) – The geometric mean of the concentration that represents the lowest 15th percentile of the concentrations at which toxic effects were observed and the 50th percentile (median) of the concentrations at which no toxic effects were observed. At concentrations below the TEL, toxic effects are rarely expected.

Effects Range-Median (ER-M) – The concentration that represents the 50th percentile (median) at which toxic effects were observed. At concentrations above the ER-M, toxic effects are likely to occur.

Probable Effect Level (PEL) – The geometric mean of the ER-M and the 85th percentile of the concentration distribution for the no-effects data. At concentrations above the PEL, toxic effects are likely to occur.

Apparent Effect Threshold (AET) – The concentration of a chemical in sediment above which a particular toxic effect (e.g., increased mortality or decreased biomass) is always significant compared to reference concentrations. At concentrations above the AET, toxic effects are predicted to always occur.

The geometric mean of these five Onondaga Lake SECs was calculated to provide a single consensus-based probable effect concentration (PEC) for each contaminant. At concentrations above the PEC, adverse effects in sediments are expected to frequently occur. The derivation of these site-specific values is presented in the Onondaga Lake BERA. SECs and PECs were calculated for each of the CPOIs in the BERA. For mercury, the following SEC values were calculated: 0.51 mg/kg for ER-L, 0.99 mg/kg for TEL, 2.8 mg/kg for ER-M, 2.84 mg/kg for PEL, and 13 mg/kg for AET. Based on these five SECs, the PEC for mercury is 2.2 mg/kg. As discussed in the BERA, the SECs and PECs do not consider the potential effects that could occur throughout the food web as a result of bioaccumulation. However, bioaccumulation is considered in the development of PRGs for fish tissue and for a sediment quality value for mercury. See text boxes entitled, “Preliminary Remediation Goals for Fish Tissue” (page 40)and “Bioaccumulation-Based Sediment Quality Values (page 41).”

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are specific goals to protect human health and the environment. These objectives are based on available information and standards, such as applicable or relevant and appropriate requirements (ARARs), to-be-considered (TBC) guidance, and site-specific risk-based levels. There are no federal or New York State sediment cleanup standards for mercury or the other CPOIs found in Onondaga Lake sediments. Although the sediments are the primary focus of the remediation, the degree of attainment of New York State’s surface water standards and guidance values and site-specific fish target concentrations were also evaluated.

The RAOs for Onondaga Lake were based on site-specific information, including the nature and extent of CPOIs, the transport and fate of mercury and other CPOIs, and the baseline human health and ecological risk assessments. The RAOs were developed in the RI report as goals for controlling CPOIs within the lake and protecting human health and the environment. The RAOs for Onondaga Lake are:

- **RAO 1**: To eliminate or reduce, to the extent practicable, methylation of mercury in the hypolimnion.

- **RAO 2**: To eliminate or reduce, to the extent practicable, releases of contaminants from the ILWD and other littoral areas around the lake.

- **RAO 3**: To eliminate or reduce, to the extent practicable, releases of mercury from profundal sediments.

- **RAO 4**: To be protective of fish and wildlife by eliminating or reducing, to the extent practicable, existing and potential future adverse ecological effects on fish and wildlife resources and to be protective of human health by eliminating or reducing, to the extent practicable, potential risks to humans.

- **RAO 5**: To achieve surface water quality standards, to the extent practicable, associated with CPOIs.

In order to achieve these RAOs, preliminary remediation goals (PRGs) were established to provide additional information/goals with which remedial alternatives can be developed and selected. Onondaga Lake contains three primary media that have been impacted by CPOIs: sediments, biological tissue, and surface water. The following three PRGs have been developed, each addressing one of the affected media:

- **PRG 1**: Achieve applicable and appropriate sediment effect concentrations (SECs) for CPOIs and the bioaccumulation-based sediment quality value (BSQV) of 0.8 mg/kg for mercury, to the extent practicable, by reducing, containing, or controlling CPOIs in profundal and littoral sediments.

- **PRG 2**: Achieve CPOI concentrations in fish tissue that are protective of humans and wildlife that consume fish. This includes a mercury concentration of 0.2 mg/kg in fish tissue (fillets) for protection of human health based on the reasonable maximum exposure scenario and EPA's methylmercury National Recommended Water Quality criterion for the protection of human health for the consumption of organisms of 0.3 mg/kg in fish tissue. This also includes a mercury concentration of 0.14 mg/kg in fish (whole body) for protection of ecological receptors. These values represent the range of fish tissue PRGs.

- **PRG 3**: Achieve surface water quality standards, to the extent practicable, associated with CPOIs.

PRG 1– Sediments

Toxicity

The sediment PRG (PRG 1) is based on five site-specific SECs and one consensus-based probable effect concentration (PEC) for the CPOIs evaluated in the RI and risk assessments (see the text box called "Development of Sediment Effect Concentrations/Probable Effect Concentrations"[page 34]). The SECs and PECs were calculated using data from acute sediment toxicity testing using benthic macroinvertebrates. Benthic macroinvertebrates live in and around the sediments for most of their lives, and therefore experience the highest direct exposure to contamination in the lake.

As part of the FS report, the PEC values were incorporated into a mean PEC quotient (PECQ) approach to provide a consistent method of comparing the overall acute toxicity risk from the mixture of contaminants at various locations of the lake (see the text boxes called "Development and Use of the Mean PEC Quotient" [page 37] and Table 13) and to select a level of remediation that would address the risk of direct acute toxicity to the benthic macroinvertebrate community from the contamination in the lake sediments. Although chronic toxicity tests were conducted as part of the RI, insufficient data were available to develop SECs based on results of chronic toxicity testing.

The mean PECQ can be used as a basis for delineating areas of the lake to be remediated. The areas of the lake in which CPOI concentrations in the littoral sediment exceed a mean PECQ of 1 (see the text box called "Application of the Mean PEC Quotient for Determining Remedial Areas/Volumes" [page 38]) generally coincide well with those areas where acute toxicity to benthic macroinvertebrates was observed in the sediment toxicity tests. Therefore, the mean PECQ of 1 was determined to be protective and selected as a remediation goal to address direct acute toxicity to benthic invertebrates. In addition, since mercury in the lake is a primary concern and elimination or reduction of mercury is part of all five RAOs, the mercury PEC of 2.2 mg/kg was also selected as a remediation goal.

Figure 7 presents the mean PECQ distribution and the exceedances of the mercury PEC.

For all but one of the lakewide alternatives evaluated in this ROD, the primary criteria for remediation of sediment toxicity are the mean PECQ of 1 and the mercury PEC. To assess the feasibility of a cleanup based on an SEC to achieve a lower level of residual contamination, one alternative was developed using the effects range-low (ER-L) as the sediment toxicity remediation goal rather than the mean PECQ of 1 and mercury PEC criteria. The ER-L is the concentration at which acute toxic effects are rarely expected, and is more likely to also protect the macroinvertebrate community from chronic effects. (See Figure 8 for exceedances of the ER-L.)

Development and Use of the Mean PEC Quotient

The Onondaga Lake SECs and PECs were used to identify sediments in the lake to be considered for remediation, due to the sediment's direct, acute toxicity to the benthic community. Because of the large number of CPOIs and the differences in sources, transport, and fate, a further refinement of the SEC/PEC approach was used to develop a single number, the mean PECQ, which takes into account the presence and the concentrations of multiple chemicals in the sediments. Similar approaches have been used in many different regions of the US and Canada by federal and state agencies, monitoring programs, and ecological risk assessors to focus remediation on areas that are likely to have the greatest overall toxicity.

Mean PECQs for sediment samples were calculated in the following four-step process:

- The CPOIs were divided into five groups based on chemical class (i.e., metals, aromatics, chlorinated benzenes, PAHs, and PCBs).
- Each detected chemical concentration in a sample was divided by its PEC, resulting in a quotient of the concentration of that chemical in the sample to its respective PEC (e.g., a mercury concentration of 4.4 mg/kg was divided by the mercury PEC of 2.2 mg/kg for a mercury PECQ of 2).
- For each chemical group, all the resulting PECQs for a particular sample were summed, and the sum of the individual PECQs is divided by the total number of CPOIs for the group in that sample.
- The mean PECQs for each chemical group were summed, and the sum was divided by the total number of groups in the sum.

A simplified hypothetical example of the calculation of the mean PECQ for a sediment sample would be where only five CPOIs are present in the sample, and PECQs of 1, 2, 3, 4, and 5 were calculated for the five CPOIs. The mean PECQ for the sample would be the sum of the five individual PECQs (1 + 2 + 3 + 4 + 5 = 15) divided by the total number of PECQs calculated in the sample (i.e., 5), resulting in a mean PECQ of 3 (15/5) for the sample.

One component of the evaluation was to determine which CPOIs appeared to exhibit the strongest influence on observed acute toxicity on a lakewide basis. This analysis resulted in 23 of the 46 CPOIs for which SECs and PECs were calculated being included in the calculation of the final mean PECQ (see Table 13). In the case of Onondaga Lake, the mean PECQ for a sample was calculated based on the PECQs for each of the five chemical groups, which were then averaged to produce the overall mean PECQ for that sample.

Bioaccumulation

The mercury in fish is derived from a combination of food sources such as benthic macroinvertebrates, uptake from the water column through skin or gills, and incidental intake of suspended particles in the water column. Together, these exposure pathways result in the bioaccumulation of mercury in fish. To address the risk to wildlife and humans from consumption of contaminated fish, a BSQV was developed for this contaminant in addition to the benthic toxicity-based PEC of 2.2 mg/kg (see discussion under PRG 2 and associated text box [page 40]). As calculated, the BSQV of 0.8 mg/kg represents a concentration in sediments that, if not exceeded, is predicted to result in mercury concentrations in fish below levels of concern for wildlife that consume fish. Since this ecological-based target level was less than that for protection of adults (i.e., is also protective of human health), it was selected as the target BSQV against which surface-weighted average sediment concentrations will be compared.

Concentrations of PCBs, hexachlorobenzene, and PCDD/PCDFs in fish tissue were also determined to be risk drivers for human health and wildlife. PCBs, hexachlorobenzene, and

PCDD/PCDFs are not widespread in sediments in the lake and are found primarily in a few specific areas of the lake (e.g., SMUs 1, 2, 6, and 7). The NYSDEC sediment screening criteria for protection of wildlife and humans from bioaccumulation were used as the comparison values for these three CPOIs. Therefore, site specific BSQVs were not developed for these CPOIs. The areas where these CPOIs are elevated are generally co-located with areas that exceed the cleanup criteria of the mean PECQ of 1 plus the mercury PEC and would be addressed under the remedial alternatives evaluated in this ROD.

Application of the Mean PEC Quotient for Determining Remedial Areas/Volumes

For Onondaga Lake, the mean PECQ for each sample is an indication of the relative risk of acute sediment toxicity posed by the suite of CPOIs at that location. Mean PECQs can be useful for ranking various stations with respect to relative risk and for prioritizing stations for remedial action. For example, if the mean PECQs at two stations are 20 and 1, the station with the higher quotient could be considered a higher priority for remediation.

The relationship of the mean PECQ to toxicity was evaluated by comparing the mean PECQ for each sediment station to the 1992 chironomid mortality data for that same station. There was a general trend showing that as the mean PECQs increased, mortality also increased. An analysis of this relationship suggested that there is an inflection point in the toxicity data around a mean PECQ value of 1 to 2, but the correlation coefficient for these data is rather small, and the data about this inflection point show a high degree of uncertainty. However, a mean PECQ value of 1 can be supported by the concept that if the concentration of a CPOI is equal to or greater than a corresponding acute toxicity threshold (i.e., the PEC for that CPOI), then toxicity would be anticipated to occur. The mean PECQ is simply the “average” quotient for the number of CPOIs detected in the sediments. A mean PECQ value of 1 suggests that on average, the concentrations of CPOIs do not exceed their corresponding PECs.

After evaluating the relationship of the mean PECQ to chironomid acute toxicity, along with the results for the 1992 amphipod acute mortality data, 2000 chironomid and amphipod chronic mortality data, and 2000 chironomid chronic non-emergence data, NYSDEC concluded that remediation of sediments in areas exceeding a mean PECQ of 1 would remediate those sediments where acute toxicity had been observed.

The use of the mean PECQ value of 1 (plus the PEC for mercury; see text) provides a measure of the areal limits of remediation of Onondaga Lake sediments that would protect the benthic community from acute toxicity resulting from direct exposure to CPOIs in the sediments. The mean PECQ methodology itself does not explicitly address chronic toxicity. However, the alternatives discussed in this ROD, other than the No Action Alternative, would result in a reduction of chronic toxicity to the benthic community in those areas of the lake where existing contaminated littoral sediments would be capped (assuming the cap is effective in keeping levels below the PECs) or where existing contaminated littoral sediments would be removed to the ER-L.

Applicability to RAOs

PRG 1 addresses RAOs 1 through 4 to various degrees, as follows.

- **RAO 1**: Methylation of mercury in the hypolimnion is influenced by two primary factors: anoxic conditions (meaning there is no oxygen) and the availability of mercury for methylation. By reducing mercury concentrations in the surface sediments to achieve a specific SEC value, PRG 1 reduces the amount of mercury that may be released into the hypolimnion. The reduction in the amount of mercury released from littoral and profundal sediments into the water column would, in turn, reduce methylation of mercury in the hypolimnion, thus addressing RAO 1.

- **RAO 2**: Reducing the concentration of CPOIs in the ILWD and other contaminated littoral sediments would limit the amount of CPOIs available for release, thus addressing RAO 2.

- **RAO 3**: Reducing, containing, or controlling mercury concentrations in profundal sediments would limit the amount of mercury available for release into the lake through methane gas ebullition or diffusion, thus addressing RAO 3.

- **RAO 4**: Remediating littoral and profundal sediment concentrations to achieve a specific SEC value would directly reduce adverse ecological effects to the benthic community. In addition, reductions of CPOI concentrations in sediment would reduce adverse effects associated with direct exposure of humans, fish, and wildlife to sediment, as well as adverse effects associated with bioaccumulation of CPOIs from sediment. Reductions of mercury concentrations in sediment would also reduce the amount of mercury released to the water column, thereby reducing mercury methylation in the hypolimnion. This, in turn, would make mercury less available for uptake by lake biota and would ultimately reduce potential risks to fish, wildlife, and humans, thus addressing RAO 4.

PRG 2 – Fish Tissue

The fish tissue PRG (PRG 2) primarily addresses RAO 4, which is to be protective of fish and wildlife by eliminating or reducing, to the extent practicable, existing and potential future adverse ecological effects on fish and wildlife resources and to be protective of human health by eliminating or reducing, to the extent practicable, potential risks to humans. A result of such a reduction could be that humans may consume fish in accordance with the state's general advisory for eating sport fish, which states that an individual eat no more than one meal (one-half pound) per week. The current fish consumption advisory in Onondaga Lake (see "Current and Potential Future Site and Resource Uses" section) is much more restrictive than this state-wide general advisory.

Quantitative target concentration ranges for protection of wildlife and humans consuming mercury-contaminated fish from Onondaga Lake were developed (see the text box on "Preliminary Remediation Goals for Fish Tissue" [page 40]). Of the overall concentration range (based on different degrees of ecological and human-health risk) presented in the text box, a range of 0.14 mg/kg for protection of wildlife to 0.3 mg/kg for protection of human health was selected as reasonable fish tissue PRGs. These values are based on site-specific risk calculations. The 0.3 mg/kg PRG is also the EPA National Recommended Water Quality criterion for methylmercury in fish tissue for the protection of humans consuming fish.

Preliminary Remediation Goals for Fish Tissue

Methylmercury is a bioaccumulative contaminant that was calculated to pose potential risks (i.e., hazard quotients above 1) to piscivorous birds, mammals, and humans consuming fish from Onondaga Lake. PRGs for mercury (as methylmercury) concentrations in fish tissue were developed for Onondaga Lake using risk-based methods. There are no federal or New York State cleanup standards for mercury in fish.

The concentrations of methylmercury for the PRGs for fish were calculated based on a hazard quotient of 1 for ecological receptors and non-cancer risk for humans. The hazard quotients for ecological receptors were based on both the no-observed-adverse-effect level (NOAEL), representing the highest CPOI concentration at which no adverse effects are seen, and the lowest-observed-adverse-effect level (LOAEL), representing the lowest CPOI concentration shown to produce adverse effects. The human health hazard quotient of 1 for individual CPOIs indicates the "threshold level" below which non-cancer effects are not expected to occur. The PRGs were calculated using the same exposure assumptions and toxicity values as the HHRA and BERA.

Mercury fish and wildlife PRGs range from 0.01 to 0.3 mg/kg wet weight (ww) (i.e., 0.01 to 0.3 parts per million [ppm]), depending on species and whether the NOAEL or LOAEL is used to set the target hazard quotient. Avian mercury target levels range from 0.01 to 0.3 mg/kg ww in fish tissue and mammalian target levels range from 0.01 to 0.2 mg/kg ww in fish tissue.

Human health mercury PRG fish tissue concentrations for the reasonable maximum exposure (RME) scenario are 0.2 mg/kg ww and 0.3 mg/kg ww for young children and adults, respectively. In January 2001, EPA released a methylmercury National Recommended Water Quality criterion of 0.3 mg/kg in fish tissue for the protection of human health for the consumption of organisms. This criterion, which is slightly higher than and equal to the two site-specific human-health PRGs based on the RME exposure (0.2 mg/kg for children and 0.3 mg/kg for adults), is also considered to be a human health fish tissue PRG.

In addition, BSQVs were developed as estimates of the concentrations of total mercury in the surface sediments in the lake needed to reach human and wildlife fish tissue target concentrations (see the text box on "Bioaccumulation-Based Sediment Quality Values" [page 41]). The selected BSQV for mercury of 0.8 mg/kg was based on the most sensitive ecological receptor for assessing bioaccumulation. This value is expected to be protective of other ecological receptors and adult human consumers of fish. This BSQV (0.8 mg/kg) will be used to assess whether additional areas of the lake (beyond that needed to address areas exceeding the toxicity-based cleanup criteria) would need to be addressed during remedy implementation in order to meet the fish tissue PRGs.

Bioaccumulation-Based Sediment Quality Values

Since a variety of dynamic factors affect mercury levels in fish, mercury bioaccumulation-based sediment quality values (BSQVs) were also developed for Onondaga Lake to estimate the sediment mercury concentrations associated with the fish tissue PRGs. These BSQVs were derived to be protective of human health and the environment by reducing the potential for mercury bioaccumulation from the sediments into fish. The first step entailed calculating site-specific biota-sediment accumulation factors (BSAFs) for fish fillets consumed by people and for whole fish consumed by wildlife using lakewide fish and surface sediment data. BSAFs were calculated by dividing the average mercury concentration in fish tissue by the lakewide average mercury concentration in sediment. Lakewide averages were used because fish were assumed to move over large areas of the lake (i.e., animals that bioaccumulate mercury, such as fish, are typically not limited to one location in the lake), and because the locations of fish tissue samples collected in the lake were not specified.

The mercury PRGs for fish based on human and wildlife fish consumption were divided by the BSAF to calculate the target concentration of mercury in sediments. The fish tissue PRG of 0.14 mg/kg ww for protection of the river otter, the most sensitive ecological receptor for assessing bioaccumulation, was used to calculate a LOAEL-based sediment target of 0.8 mg/kg. As the ecological-based target level was less than the human health concentration (i.e., also protective of adult human health), it was selected as the target BSQV against which surface-weighted average sediment concentrations will be compared.

PRG 3 – Surface Water

The surface water PRG (PRG 3) directly addresses RAO 5, which is to achieve surface water quality standards, to the extent practicable, associated with CPOIs. With the exception of mercury, surface water concentrations of most of the CPOIs do not currently consistently exceed applicable standards and guidance values. New York State surface water quality standards (6 NYCRR Part 703) for mercury (i.e., the standard for protection of wildlife of 2.6 nanograms per liter [ng/L] dissolved mercury and the standard for protection of human health [via fish consumption] of 0.7 ng/L dissolved mercury) are currently consistently exceeded in Onondaga Lake. These two standards are considered to be protective of wildlife and humans exposed to mercury via fish consumption. They therefore take into account bioaccumulation of mercury from water into fish tissue.

Higher concentrations of dissolved mercury in surface waters are found primarily in the hypolimnion in summer and early fall, where the anoxic conditions cause mercury to change into more soluble forms. Exceedances of the standards for protection of wildlife and human health are found almost exclusively in the anoxic hypolimnion, with a maximum dissolved mercury concentration of 24 ng/L at the north deep basin station in 1999 at a depth of 59 ft (18 m). Reductions in the releases of mercury into the hypolimnion and eliminating anoxic conditions would help to achieve this PRG.

It is also noted that the highest total mercury concentration found in the lake in surface waters was 595 ng/L from the water column immediately above the sediment surface in SMU 1 in 2000, while the highest total mercury concentration closer to the surface of the water column was 103 ng/L at the border of SMUs 1 and 7 in 1999. Concentrations of dissolved mercury in 1999 and 2000 from the epilimnion (including nearshore areas) ranged from 1 to 7.8 ng/L, with some samples exceeding the standard of 2.6 ng/L and all samples exceeding the lowest standard of 0.7 ng/L.

There have also been exceedances of applicable surface water standards for other CPOIs related to Honeywell, such as chlorobenzene and dichlorobenzenes. The highest concentration of chlorobenzene recorded in the RI report was 12 µg/L in SMU 1 near the border with SMU 2 in 1999. This concentration exceeds the NYSDEC (6 NYCRR Part 703) standard for the protection of aquatic life (chronic) of 5 µg/L. The highest concentration of dichlorobenzenes recorded in the RI report was 6.6 µg/L in this same sample. This concentration exceeds the NYSDEC (6 NYCRR Part 703) surface water standard for total dichlorobenzenes for the protection of aquatic life (chronic) of 5 µg/L. Remediation of the external sources and contaminated sediments and NAPLs in this area would be needed to achieve this PRG for these CPOIs.

The narrative water quality standards for several of the physical parameters listed in 6 NYCRR Part 703.2 (i.e., turbidity, suspended and settleable solids, oil and floating substances) are consistently exceeded in the lake for various reasons (e.g., due to NAPLs and ionic wastes). Remediation of sediments and NAPLs, as defined in the selected remedy, will aid in achieving these standards.

Attainment of any one individual PRG will not be sufficient to establish the success or failure of the remedial program for the lake, in part because a variety of dynamic factors affect levels of mercury and other CPOIs in each medium. Rather, as per the NCP, the success or failure of the Onondaga Lake remedial program, as assessed every five years, will be based on attainment of all PRGs.

Because of the importance of Onondaga Lake as a natural resource, and to ensure that the remedy complies with NYSDEC regulations, the protection of habitat through remediation and restoration has been an important consideration in the development of the various capping and dredging alternatives. Throughout the analysis of the various alternatives, the goal of reestablishing productive aquatic habitat in the lake has been considered along with the need to provide an effective and permanent remedy to the adverse impacts of contamination on the fish and wildlife resources of the lake. Of particular concern is the protection of shoreline habitat and the ecological integrity of the littoral zone. A lakewide habitat restoration plan will be required as part of the remedial design.

DESCRIPTION OF ALTERNATIVES

CERCLA §121(b)(1), 42 U.S.C. §9621(b)(1), mandates that remedial actions must be protective of human health and the environment, comply with ARARs, be cost-effective, and utilize permanent solutions, alternative treatment technologies, and resource recovery alternatives to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, and contaminants at a site. CERCLA §121(d), 42 U.S.C. §9621(d), further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants, which at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA §121(d)(4), 42 U.S.C. §9621(d)(4).

Principal threat wastes are those source materials considered to be highly toxic and which present a significant risk to human health or the environment should exposure occur, or are highly mobile such that they generally cannot be reliably contained. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of alternatives using the remedy selection criteria which are described below. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.[5]

Detailed descriptions of the remedial alternatives for addressing the contamination associated with the site can be found in the FS report and the Proposed Plan. The FS report presents 14 lakewide alternatives. To facilitate the presentation and evaluation of these alternatives, the FS report alternatives were reorganized to formulate the seven remedial alternatives discussed below.[6] The alternatives presented below involve the following remedial technologies:

- Dredging (removal)
- Disposal and treatment at a sediment consolidation area (SCA)
- Isolation capping
- Thin-layer capping
- Oxygenation of the hypolimnion
- Monitored Natural Recovery (MNR)[7]

Each of the action alternatives also includes habitat improvement and/or restoration elements (i.e., habitat reestablishment and habitat enhancement). *Habitat reestablishment* is the restoration of habitat in areas where remediation substantially alters existing conditions. Reestablishment can be either restoring the same type of habitat that existed prior to remediation, or establishing a different type of habitat that has been deemed appropriate for the ecological conditions of the area. *Habitat enhancement* is improvement of habitat conditions in areas where CERCLA contaminants do not occur at levels that warrant active remediation, but where habitat impairment due to stressors has been identified as a concern. The design and construction of habitat improvement and restoration elements must be consistent with the substantive requirements for permits associated with disturbance to state and federal regulated wetlands (e.g., 6 NYCRR Part 663, Freshwater Wetlands Permit Requirements) and navigable waters (e.g., 6 NYCRR Part 608, Use and Protection of Waters). A comprehensive lakewide habitat restoration plan will be developed during the remedial design. Habitat reestablishment and habitat enhancement will be performed consistent with the lakewide habitat restoration plan. Any "habitat enhancement" actions performed at the site would be performed in conformance with the requirements of state law and not pursuant to the requirements of CERCLA or the NCP.

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[5] *A Guide to Principal Threat and Low Level Threat Wastes*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, 9380.3-06FS, November 1991.

[6] The descriptions of the remedial alternatives and the selected remedy presented below do not represent an offer of settlement by the State of the State's pending litigation claims concerning the lake or lake system.

[7] MNR involves allowing natural processes to decrease a number of factors – the concentration, mobility, bioavailability, toxicity and/or exposure – involving chemicals, combined with a systematic monitoring program to ensure that the recovery process is proceeding appropriately. MNR can occur through a variety of processes including the degradation of organic compounds, the burial of sediments containing chemicals by incoming clean sediments (although much of the sediment deposition continues to originate from the Tully Valley, including the residual effects of solution mining), and the conversion of compounds to less toxic forms. Much of SMU 8 appears to exhibit the types of processes (for example, the continuing deposition of sediments and the limited resuspension of pollutants) and the chemical characteristics that support the progress of natural recovery.

Technologies

Dredging

Dredging would involve permanent removal of sediments and wastes from Onondaga Lake to a specific design depth. Sediments can be dredged hydraulically, mechanically, or by a combination of the two. While hydraulic dredging was selected as the representative process for detailed evaluation, the actual dredging method(s) would be determined during the design phase. In developing alternatives that incorporate removal of contaminated sediments, the following six potential removal options were considered. These potential removal options are not mutually exclusive. In other words, combinations of these options could be employed as part of a remedial alternative for addressing lake contamination. For all dredging options, the littoral zone in the vicinity of the dredging would be restored to reestablish appropriate habitat and function following removal of contaminated sediments.

- Targeted dredging in areas with high CPOI concentrations and high groundwater upwelling velocities. Targeted dredging would increase the effectiveness of an isolation cap.
- Dredging (prior to capping) to ensure that the placement of the isolation cap would result in no loss of lake surface area.
- Dredging for erosion protection and to reestablish habitat.
- Dredging to remove NAPL.
- Dredging to reduce CPOI concentrations prior to capping, which would result in removal of a significant mass of CPOIs.
- Dredging to remove materials in areas of hot spots within the ILWD.
- Dredging for full removal to an SEC.

Targeted dredging would be performed to increase long-term cap effectiveness through removal of contaminated sediments in nearshore areas where groundwater upwelling velocities are high. Groundwater modeling indicates that predicted upwelling velocities are at their greatest near shore, which may prevent the cap from providing complete chemical isolation.

Dredging (prior to capping) would be performed to ensure that the placement of the isolation cap would not result in the loss of lake surface area. Under this option, sufficient sediment would be removed so that there would be no loss of lake surface area following isolation cap placement.

Dredging for erosion protection and to reestablish habitat would consist of removal to an optimal depth for reducing the erosive forces on the cap and reestablishing littoral zone habitat. The reestablished habitat may differ from the pre-remediation habitat primarily due to a change in bathymetry or water depth (in addition to the elimination of contamination through the placement of clean material). As part of the remedial design, the final water depth would be designed to meet a particular natural resource goal for each particular SMU while also maintaining littoral zone function.

The isolation cap would be armored (as needed) to prevent erosion caused by wind-driven waves, ice scour, currents from tributaries, and scour from propeller wash. The influence from these effects tends to decrease with increasing water depths. Therefore, with regard to minimizing erosive forces, the goal under this option is to remove nearshore sediments to a depth where erosion is not significant, which allows minimal armoring.

Dredging to remove NAPL would target NAPL in sediments and waste, which constitute an ongoing source (and potential source) of contamination to other media in the lake. As such, they are "principal threat wastes."

This option includes a dredging/backfilling combination that removes material known, or anticipated, to contain NAPL, such as the southeast portion of SMU 2 (which is immediately adjacent to where NAPLs have accumulated in the shoreline area in the vicinity of the Honeywell causeway and where an onshore NAPL recovery IRM is underway). While NAPLs have been observed in the sediments (up to 13 ft [4 m]) in this area, the full extent is unknown. Based on the vertical extent of NAPLs in the NAPL recovery IRM area, the possibility exists that the NAPLs are as deep as 30 ft (9 m) below the top of the sediments. Accordingly, some of the alternatives assume a removal depth of 30 ft (9 m) in the area near the causeway, rather than the 13 ft (4 m) assumed for the other alternatives. As the depth estimates above are based on limited information, the actual areal and vertical extent of NAPL, as well as the volume of NAPL would be refined in the remedial design.

Dredging to reduce CPOI concentrations prior to capping, which would result in removal of a significant mass of CPOIs. The southern area of the lake near the Honeywell sites represents the largest repository of CPOIs within the lake, based on volume and CPOI concentrations. The removal of portions of the ILWD prior to isolation capping has the potential to greatly reduce the mass of CPOIs in SMU 1 and portions of SMUs 2 and 7, leaving behind significantly lower volumes and masses of wastes (and residual NAPLs) and significantly lower concentrations of CPOIs beneath the cap. The occurrence of "slumps," or slope failures, within the ILWD, as noted during side-scan sonar imaging of the lake bottom, as well as the generally soft nature of the wastes/sediments (resulting in very low shear strengths in certain areas), represents a major engineering concern in the consideration of capping in this area. Thus, dredging to improve slope stability of the ILWD as well as dredging to improve overall geotechnical conditions for cap placement is also an important considerations.

While the ILWD in SMU 1 has been defined based on historical photographs, the extent of elevated concentrations of CPOIs and the extent of Solvay waste, based on visual observations has not been fully determined. Based on the existing data, the ILWD may be as deep as 45 ft (14 m) below the top of the sediments and extends into nearby SMUs 2 and 7. As the depth and volume estimates are based on limited information, the full areal and vertical extent of the ILWD, the distribution of highly elevated CPOI concentrations, and the geotechnical characteristics of the wastes would need to be refined in the remedial design.

Dredging to remove hot spots in the ILWD would be performed to remove additional waste material which would be defined as those wastes/sediments that contain CPOIs above threshold concentrations. This is included in one of the alternatives discussed below. The purpose of this additional removal in hot spot areas is to improve capping effectiveness, by reducing the concentrations of contaminants in the sediments before the isolation cap is placed. The hot spot threshold concentrations that would trigger the additional dredging are as follows:

- Benzene – 208 mg/kg

- Chlorobenzene – 114 mg/kg
- Dichlorobenzenes – 90 mg/kg
- Naphthalene – 20,573 mg/kg
- Xylene – 142 mg/kg
- Ethylbenzene – 1,655 mg/kg
- Toluene – 2,626 mg/kg
- Mercury – 2,924 mg/kg

The hot spots are defined as those wastes/sediments that contain select CPOIs (based on their presence at significantly elevated concentrations in the ILWD materials and/or the compounds to which the cap model was most sensitive) above threshold concentrations. Based on existing data only chlorobenzene, dichlorobenzenes, and xylenes exceed their respective cap threshold values in the ILWD.

The above concentrations were derived using a cap model developed by Honeywell and represent the maximum concentrations that could be present in the wastes/sediments and not cause failure of a cap with a 2.5-ft-thick isolation layer assuming an upwelling rate of 2.4 inches/year (6 cm/year). Capping effectiveness is related to cap thickness, contaminant concentrations below the cap, and the upwelling rate (rate at which groundwater flows up through the capped sediments/wastes). With regard to the upwelling rate, Honeywell's cap model predicts that the cap would be effective based on an assumed upwelling rate of 0.8 inches/year (2 cm/year). This assumption relies upon the proper construction/operation of a hydraulic control system which would be installed (as part of the Wastebed B/Harbor Brook IRM) along the lakeshore adjacent to SMU 1. While the capping model assumes an upwelling rate of 0.8 inches/year (2 cm/year), the hot spot threshold concentrations would be based on a higher (2.4 inches/year [6 cm/year]) upwelling rate.

The use of a higher upwelling rate in the development of these values would result in lower (more conservative) hot spot threshold concentrations than would be developed by assuming lower (e.g., 0.8 inches/year [2 cm/year] or 1.6 inches/year [4 cm/year]) upwelling rates. The use of these threshold concentrations for identifying hot spots within the ILWD provides a method for increasing the effectiveness of capping at the site. As refined cap modeling would be performed during the remedial design, it is possible that these concentrations may be modified. However, the hot spot concentrations would be based on an assumed upwelling rate of 2.4 inches/year (6 cm/year).

Dredging to an SEC relies primarily on full removal of contaminated sediments down to the SEC selected as the cleanup criterion. Some backfill would be required to establish reasonable bottom contours (bathymetry) and to reduce the impact of any residual CPOIs.

Disposal

Large sediment-dredging projects require large areas for dredged materials management (which includes dewatering, treatment, and final disposal) of the dredged sediment. Typically, the dredged sediment from a remediation project is either consolidated in an on-site location such as an SCA, if sufficient land area is available, or is solidified and transported to an off-site permitted landfill.

The assessment of various management disposal options included hydraulic dredging with disposal in an SCA and mechanical dredging with off-site disposal (at one or more permitted landfills). On-site consolidation of the sediment in an SCA is the selected sediment management option. On-site management in an SCA, designed, constructed, and monitored in accordance with federal and state guidance, is a proven and reliable technology for sediment and waste management that is protective of human health and the environment.

Management of the dredged sediments in an SCA would also be more cost-effective than off-site disposal, especially at sediment volumes exceeding 100,000 cy (76,500 m^3). Therefore, all of the action alternatives in the ROD assume that the dredged sediments would be disposed in an SCA(s). More specifically, the FS report and the alternatives discussed in this ROD assume that such an SCA would be constructed on one or more of the Solvay wastebeds (e.g., Wastebed 13). Wastebed 13 could accommodate a large sediment volume (potentially 2,400,000 cy [1,800,000 m^3] or more, depending on final elevation), and its relatively remote location would minimize disruption to and impacts on the community during construction and operation of an SCA. However, the actual Solvay wastebed location(s) on which the SCA(s) would be constructed would be based on geotechnical testing and screening that would be performed during the remedial design. Potential SCA locations include Wastebeds 1 through 8, Wastebeds 9 through 11, and Wastebeds 12 through 15. The remedial design of the SCA would be undertaken in accordance with state and federal requirements and guidance and would include the installation of an impermeable liner, leachate collection and treatment, and a cap.

It is assumed that preloading and stabilization of the wastebed materials would be required prior to construction of the SCA, but the extent to which preloading and stabilization would be required, if any, would be determined during the remedial design.

In keeping with the statutory preference for treatment that reduces toxicity, mobility, or volume of contaminated media as a principal element of the remedy, the remedy would include treatment and/or disposal of the most highly contaminated materials (e.g., pure phase chemicals segregated during the dredging/handling process) at an off-site permitted facility.

Water Treatment

Hydraulic dredging in Onondaga Lake would be performed SMU by SMU. Silt barriers would be used to contain resuspended sediment within each SMU dredging work zone. Sediment slurry, containing approximately 10 percent solids by weight, would be transported via a pipeline to the SCA for consolidation and treatment of the entrained water to remove CPOIs (including NAPL).

Four different treatment options (primary treatment, enhanced primary treatment, enhanced primary treatment with multimedia filtration, and advanced treatment), providing incrementally higher degrees of treatment, were considered for the supernatant. The specific treatment process used will be developed during the remedial design after additional sampling and treatability testing. In order to be sure that the cost of treatment was not underestimated, this ROD assumes that “advanced treatment” would be used.

The treatment train for “advanced treatment” consists of enhanced primary treatment, multimedia filtration, air stripping, and granular activated carbon treatment for additional VOC removal. This option includes pH adjustment to promote chemical precipitation of metals, including mercury.

During the remedial design, NYSDEC will issue discharge limits that would need to be met by the treated water at the point of discharge (end of pipe) to the lake. It is assumed that supernatant water will require advanced treatment before discharge. However, the actual level of treatment needed to ensure compliance with discharge limits would be determined during the remedial design and might vary depending on the levels and types of contaminants present in lake sediments in various areas (or SMUs) of Onondaga Lake.

Isolation Capping

Isolation capping involves placement of an engineered cap on top of the contaminated sediment. This material helps to prevent or retard the movement of contaminated porewater into the water column and minimize exposure of benthic organisms to the contaminated sediments. Most of the alternatives involve capping portions of the lake bottom to meet the following objectives:

- Provide physical isolation of the impacted sediments from benthic organisms and other animals, and human contact.
- Physically stabilize the sediment to prevent resuspension, contaminant mobilization, and sediment transport.
- Provide chemical isolation of impacted sediments from advective or diffusive flux or resuspension into the overlying surface waters.

Specific factors that would be evaluated as part of the design of the engineered cap include erosion, bioturbation, chemical isolation, habitat protection, settlement, static and seismic stability, and placement techniques. Modeling performed for chemical isolation was used to produce preliminary cap designs (see the text boxes below entitled "Groundwater Flow Model" [page 49] and "Isolation Capping Model" [page 50]), to ensure that there would be no predicted exceedances of the PEC of any of the CPOIs that have been shown to exhibit acute toxicity on a lakewide basis or NYSDEC sediment screening criteria for benzene, toluene, and phenol.

The results of a preliminary capping evaluation were used to produce the cap designs presented in the alternatives. Since the cap would be designed such that none of the PECs for the individual CPOIs (or the NYSDEC sediment criteria for benzene, toluene, and phenol) would be exceeded in the bioturbation layer, the model-predicted mean PECQ of the surficial materials following cap placement would be less than 1. The modeling indicates that the chemical isolation component of these caps should be between 1 to 2.5 ft (0.3 to 0.76 m) thick, depending on the area of the lake.

To ensure protection of human health and the environment, the caps would be designed to be an additional 50 percent thicker as a safety factor, plus an additional 6 inches (15.2 centimeters) to address possible mixing with underlying sediment and uneven application, which results in a total thickness of 2 to 4.25 ft (0.6 to 1.3 m) for the various SMUs. Settlement analysis was incorporated into the preliminary cap design to estimate the final elevation of the cap following settlement due to the weight of the cap.

Evaluations of wind-generated waves, flood flows at the mouths of tributaries, propeller wash from vessels, and ice scour predict that a cap armor layer consisting of gravel or sand (depending on location and water depth) and armor stone along the shoreline would provide physical stability for the cap. A 6-inch "habitat/bioturbation" layer was assumed for cap modeling purposes in order to incorporate assumed mixing of contaminants in the top layer of the isolation cap by benthic invertebrates. Actual habitat restoration requirements were not considered in the model.

For the isolation cap to be effective in certain areas of the lake, hydraulic control systems would need to be in place to minimize upwelling velocities in these areas. Due to the elevated concentrations of CPOIs and unstable areas within the littoral zone, as well as concerns for fish and wildlife exposures, isolation capping (rather than thin-layer capping) is evaluated in the alternatives for all littoral-zone SMUs (0 to 30 ft [0 to 9 m] water depths). However, if the evaluation of data collected during remedial design identifies areas, within the deeper portion of the littoral zone (i.e., 6 to 9 m), where thin-layer capping would be effective at isolating the contaminated sediments, NYSDEC will consider the use of thin-layer capping in these areas.

Groundwater Flow Model

A groundwater flow model was developed using the software programs Groundwater Vistas and SEAWAT-2000 to simulate groundwater flow beneath and in the vicinity of the southern part of Onondaga Lake.

The groundwater flow model domain encompasses an area of approximately 13 sq mi (34 sq km) surrounding the southern shoreline of Onondaga Lake and centered on the Honeywell sites. The nine-layer model represents seven hydrogeologic units, which were identified through 216 soil borings. Estimates of hydraulic conductivity of the hydrogeologic units were derived from in situ conductivity tests, laboratory permeability tests, specific capacity tests, and pumping tests.

The density of groundwater influences groundwater flow, and therefore a rigorous representation of the groundwater density distribution was incorporated into the model. A major influence on groundwater density is salinity (measured by groundwater total dissolved solids concentrations). The range in total dissolved solids concentrations in the area of the lake (400 mg/L to almost 194,000 mg/L) is caused by the presence of both leachate from Honeywell's inactive Solvay wastebeds and naturally occurring salt brines.

The results of the groundwater flow model included an estimate of the amount and velocity of the groundwater that flows upward through the lake sediments in the various SMUs, both with and without the proposed groundwater barrier wall and collection system along the lakeshore in the southern corner. These results were used in the isolation capping model.

Thin-Layer Capping

Thin-layer capping is included in all of the action alternatives for portions of the profundal sediments of Onondaga Lake. The objective of thin-layer capping is to provide an immediate decrease in surface sediment concentrations by introducing clean substrate into the upper layer of sediment, rather than to isolate surface sediments. It is anticipated that construction of the thin-layer cap and subsequent natural processes, such as bioturbation and sedimentation, would mix the new substrate with the underlying material or cover contaminated sediments, thereby reducing the surface concentration of the profundal sediments and the potential for adverse effects associated with CPOIs. During the remedial design the appropriate thickness and type of substrate would be identified. A thin-layer cap thickness of 4 inches (10 cm) was used for cost estimating purposes. The suitability of thin-layer capping at the base of the ILWD in the profundal zone (SMU 8) would be reviewed during the remedial design based on extensive data to be collected as part of the pre-design program.

Isolation Capping Model

A model was developed to assess the effectiveness of in-situ isolation capping of the littoral sediments of Onondaga Lake. In-situ capping involves placement of an engineered cap over contaminated sediment to prevent or limit the movement of contaminated porewater from the sediment into the water column and minimize exposure of benthic organisms to the contaminated sediments. An isolation cap would consist of three layers:

1. An isolation layer, designed to prevent or limit vertical chemical migration.
2. An armor layer, designed to protect the isolation layer from erosional processes such as waves, ice scour, and propeller wash.
3. A habitat/bioturbation layer, designed to provide habitat for benthic macroinvertebrates and allow for bioturbation processes without exposure to contaminated sediment or disruption of the isolation layer material.

There are varying degrees of contamination in the sediments of each SMU; thus, each cap would need to be of a SMU-specific thickness to ensure that contaminants are contained. Therefore, the model was developed for each littoral zone SMU. The model was used to predict chemical concentrations in the habitat/bioturbation layer at steady state, with the primary means of contaminant transport within the isolation layer being through the processes of porewater advection and diffusion. This model assumes that the cap is armored, so that erosion of the cap is minimal and does not provide the primary means of contaminant migration. In addition, the bioturbation or biologically active zone is assumed to be confined to an approximately 6 inch (15 cm) layer above the chemical isolation layer, so that few contaminants are transported to the surface of the cap by organisms mixing the sediments.

The predicted concentrations of contaminants in sediments at the top of the cap were compared to the chemicals' PECs for the 23 CPOIs and NYSDEC sediment screening criteria* for benzene, toluene, and phenol to ensure that these concentrations would not be exceeded in the habitat/bioturbation layer in the future. The cap model was then used to determine the appropriate cap thickness in each littoral zone SMU and whether sediment removal is necessary in areas of high upwelling rates. The cap model will be re-run as part of the remedial design, incorporating any new remedial design data, and the cap design may be modified as appropriate.

* NYSDEC Technical Guidance for Screening Contaminated Sediments, January 1999.

Oxygenation

Oxygenation, as defined for this ROD, involves the introduction of oxygen into the hypolimnion to prevent the development of anoxic (no oxygen) conditions, which currently exist in summer and early fall (June through September). Oxygenation can be achieved using a number of methods including introducing pure oxygen, atmospheric air, or oxygen-enriched air to the water column. Maintaining oxygenated conditions in the hypolimnion is expected to reduce mercury methylation in the hypolimnion and reduce the concentrations of dissolved mercury. These effects, in turn, would be expected to result in decreased concentrations of mercury in fish tissue and decreased risk to fish consumers. Maintaining oxygenated conditions would also be expected to reduce the flux of methylmercury from profundal sediments.

A specific oxygenation system technology would be determined as appropriate, during the remedial design. The specific technology assumed for the purposes of the FS report involves a downflow contact oxygenation system that mixes pure oxygen bubbles with oxygen-depleted water inside a contact chamber so that no bubbles are released to the surrounding water column. This system uses a submersible pump, which draws water from the hypolimnion into the conical unit. Oxygen supplied from an onshore facility is injected at the top of the cone. The oxygenated water is then discharged back to the lake through a horizontal diffuser pipe at the same depth from which it was withdrawn. Oxygenation has been performed in other lakes and reservoirs, but not to specifically control methylmercury production. A pilot study would be performed to evaluate the potential effectiveness of oxygenation at reducing the formation of methylmercury in the water column, while preserving the normal cycle of stratification within the lake. An additional factor which would be considered during the design of the pilot study would be the effectiveness of oxygenation at reducing fish tissue methylmercury concentrations. If supported by the pilot study results, the pilot study would be followed by full-scale implementation of oxygenation in SMU 8. Furthermore, potential impacts of oxygenation on the lake system would be evaluated during the pilot study and/or the remedial design of the full-scale oxygenation system. Pilot testing may be coordinated, if feasible, with the Onondaga Lake Partnership, which is planning a similar pilot oxygenation study on the lake.

Monitored Natural Recovery

MNR is a sediment management tool that depends on a variety of physical, chemical, and biological processes that reduce chemical concentrations, exposure, and mobility. MNR requires a goal that defines the expected contaminant concentrations to be reached in a specified time period (assumed in the FS report to be 10 years following the remediation of upland sources, littoral sediments, and initial thin-layer capping in the profundal zone). The MNR alternative includes the completion of investigations during the remedial design to refine the application of a monitored natural recovery model (see the text box below entitled “Monitored Natural Recovery Model” [page 52]), long-term monitoring, and institutional controls to protect the integrity of the remedy and ensure long-term protectiveness of human health and the environment. Monitoring the effectiveness of natural recovery would be described in a long-term monitoring plan to be developed during the remedial design and would include evaluations of mercury and other CPOI concentrations in sediment, water, and fish over time.

Monitored Natural Recovery Model

Natural recovery can occur through a variety of physical, chemical, and biological processes that act singly or in combination to reduce contaminant concentrations, exposure, or mobility. This process can occur in various media at a site (e.g., water and sediments.

A one-dimensional, numerical model was developed using STELLA® Research software in order to determine whether MNR is a feasible technology for remediating the contaminated profundal sediments in Onondaga Lake which represent an important sink for contaminants and a potential exposure pathway to organisms. The primary purpose of the MNR model is to understand how natural recovery might occur (or fail to occur) in the future based on what is known about the lake system. The output or results from the model are presented in terms of expected mercury concentrations in surface sediments in the profundal areas of the lake. The model looks at present-day conditions and predicts how those conditions are expected to change several years in the future.

Another purpose of the model is to provide information on how sediment surfaces might react during and after remedial actions. The model focuses on changes in the sediment surface and provides information on reactions to inputs such as isolation or thin-layer caps. Thin-layer capping is a remediation technique (along with MNR) that is evaluated for profundal sediments. The model was used to assess the long-term solid and dissolved contaminant fate and transport associated with natural recovery by simulating the diffusion, bioturbation, groundwater mediated advection, settling, burial, and degradation mechanisms likely to be present at the Onondaga Lake site. By assessing these mechanisms over time, a prediction of contaminant concentrations and fluxes in the future was obtained. Using the sediment data currently available (primarily from 1992 for the profundal sediments), the model predicts that any area that had an observed total mercury concentration of 6.7 mg/kg or less in 1992 would be expected to achieve the mercury PEC of 2.2 mg/kg by 2014. Thus, the model suggests that most of the profundal zone would be amenable to MNR as a remedial alternative. However, additional MNR modeling would need to be performed during the remedial design phase based upon additional sampling that would take place prior to remediation.

Description of Lakewide Alternatives

The No-Action Alternative and all other alternatives assume that controls of upland sources of hazardous substances will be implemented separately pursuant to CERCLA and the state Superfund law. Costs for remediating upland sources are not included in the costs for these alternatives. With the exception of the No-Action Alternative, all alternatives for the littoral zone (SMUs 1 through 7) include varying amounts of dredging, isolation capping, NAPL removal, and habitat reestablishment and enhancement. With the exception of the No-Action Alternative, all alternatives for the profundal zone (SMU 8) include oxygenation, MNR, and varying amounts of thin-layer capping. Table 14 presents the littoral- and profundal-specific alternatives for each SMU for each alternative.

Alternative 1 – No Action

Dredged Volume (cy):	0
Capital Cost:	$0
Average O&M Annual Costs:	$0
Present-Worth O&M Costs:	$0
Present-Worth Cost:	$0
Construction Time:	0 years

The Superfund program requires that the "no-action" alternative be considered as a baseline for comparison with the other alternatives. The no-action remedial alternative does not include any physical remedial measures that address the problem of sediment contamination at the site.

Because this alternative would result in contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure to site media, CERCLA requires that the site be reviewed at least once every five years. If justified by the review, remedial actions may be implemented to remove, treat, or contain the contaminated sediments.

Alternative 2 – Dredging for No Loss of Lake Surface Area and Erosion Protection and to Reestablish Habitat, and Isolation Capping in SMUs 1 to 7; Targeted Dredging to 4 m (13 ft) for NAPL Removal in SMU 2; Targeted Dredging in SMUs 3 and 6; and Phased Thin-Layer Capping, Oxygenation, and Monitored Natural Recovery in SMU 8.

Dredged Volume (cy):	1,207,000
Capital Cost:	$275,000,000
Annual O&M Costs:	$3,000,000
Present-Worth O&M Costs:	$37,000,000
Present-Worth Cost:	$312,000,000
Construction Time:	4 years

Under this alternative, all areas of the lake where the surface sediments exceed a mean PECQ of 1 or the mercury PEC (2.2 mg/kg) would be addressed (see Figure 7). This alternative includes:

- Dredging of an estimated 354,000 cy (271,000 m^3) of sediment in SMU 1, prior to capping, to minimize erosive forces on the cap, prevent a loss of lake surface area, and reestablish habitat. Capping of approximately 84 acres in SMU 1.

- Dredging of an estimated 169,000 cy (129,000 m^3) of sediment in SMU 2, prior to capping, to remove NAPL to a 13-ft (4-m) depth in the vicinity of the causeway, minimize erosive forces on the cap, prevent a loss of lake surface area, and reestablish habitat. Capping of approximately 16 acres in SMU 2.

- Dredging of an estimated 75,000 cy (57,000 m^3) of sediment in SMU 3, prior to capping, to maintain cap effectiveness in the absence of hydraulic containment, to minimize erosive forces on the cap, prevent a loss of lake surface area, and reestablish habitat. Capping of approximately 29 acres in SMU 3.

- Dredging of an estimated 135,000 cy (103,000 m^3) of sediment in SMU 4, prior to capping, to minimize erosive forces on the cap, prevent a loss of lake surface area, and reestablish habitat. Capping of approximately 75 acres in SMU 4.

- Dredging of an estimated 140,000 cy (107,000 m^3) of sediment in SMU 5, prior to capping, to minimize erosive forces on the cap, prevent a loss of lake surface area, and reestablish habitat. Capping of approximately 60 acres in SMU 5.

- Dredging of an estimated 245,000 cy (187,000 m^3) of sediment in SMU 6, prior to capping, to maintain cap effectiveness in the absence of hydraulic containment, to minimize erosive forces on the cap, prevent a loss of lake surface area, and reestablish habitat. Capping of approximately 123 acres in SMU 6.

- Dredging of an estimated 89,000 cy (68,000 m^3) of sediment in SMU 7, prior to capping, to minimize erosive forces on the cap, prevent a loss of lake surface area, and reestablish habitat. Construction/operation of a hydraulic control system along the SMU 7 shoreline to maintain cap effectiveness. Capping of approximately 38 acres in SMU 7.

- Isolation capping over an estimated 425 acres of the littoral zone, as noted for each littoral SMU above.

- Thin-layer capping over an estimated 154 acres of the profundal area (SMU 8) based on the current extent of exceedances of mean PECQ of 1.

- Oxygenation of the hypolimnion (SMU 8) to reduce methylation of mercury, reduce dissolved mercury concentrations, and reduce methylmercury flux from profundal sediments, thereby reducing mercury bioaccumulation in fish tissue.

- MNR in the profundal area (SMU 8), with a contingency of additional capping.

- Treatment and/or disposal of the most highly contaminated materials (e.g., pure phase chemicals segregated during the dredging/handling process) at an off-site permitted facility. Consolidation of the balance of the dredged sediments in one or more SCAs constructed on one or more of the Honeywell wastebeds.[8] The SCA(s) will include, at a minimum, the installation of a liner, a cap, and a leachate collection and treatment system.

- Treatment of water generated by sediment dewatering, produced at the SCA(s) through sediment consolidation, prior to discharge of the water back to Onondaga Lake.

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[8] Wastebed 13, which was evaluated in the FS report, could accommodate a large sediment volume (potentially 2,400,000 cy [1,800,000 m^3] or more, depending on final elevation). The actual Solvay wastebed location(s) on which the SCA(s) would be constructed would be determined during the remedial design and be based on an evaluation of the potential impacts on the local community, geotechnical stability of the wastebeds, SCA construction requirements, wastebed size, the means for transporting dredged materials to the SCA, costs, etc.

- Institutional controls including the notification of appropriate government agencies with authority for permitting potential future activities which could impact the implementation and effectiveness of the remedy.

This alternative would also include habitat enhancement along an estimated 1.5 mi (2.4 km) of shoreline (SMU 3) and over approximately 23 acres (SMU 5) to stabilize calcite deposits and oncolites and promote submerged macrophyte growth.[9]

The dredging and capping components of this alternative would occur over a period of approximately four years.

Because this alternative would result in contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure to site media, CERCLA requires that the site be reviewed at least once every five years. If justified by the review, additional remedial actions may be implemented to remove, treat, or contain the contaminated sediments.

Alternative 3 – Dredging of the ILWD to 2 m (6.5 ft) and Isolation Capping in SMU 1; Dredging for No Loss of Lake Surface Area and Erosion Protection and to Reestablish Habitat, and Isolation Capping in SMUs 2 to 7; Targeted Dredging to 4 m (13 ft) for NAPL Removal in SMU 2; Targeted Dredging in SMUs 3 and 6; and Phased Thin-Layer Capping, Oxygenation, and Monitored Natural Recovery in SMU 8.

Dredged Volume (cy):	1,868,000
Capital Cost:	$333,000,000
Annual O&M Costs:	$3,000,000
Present-Worth O&M Costs:	$37,000,000
Present-Worth Cost:	$370,000,000
Construction Time:	4 years

This alternative is the same as Alternative 2, except for how it addresses the ILWD in SMU 1. Under this alternative, dredging would be performed to a depth of 6.5 ft (2 m) on average in the ILWD prior to capping, resulting in an additional 661,000 cy (505,000 m^3) waste/sediment being removed. This alternative would result in the dredging of 1,868,000 cy (1,427,000 m^3) of sediments and the capping of 579 acres.

Because this alternative would result in contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure to site media, CERCLA requires that the site be reviewed at least once every five years. If justified by the review, additional remedial actions may be implemented to remove, treat, or contain the contaminated sediments.

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[9] This component of the remedy is not intended to satisfy the requirements of CERCLA or the NCP, but is included in order to address requirements of state law.

Alternative 4 – Dredging of the ILWD to 2 m (6.5 ft); Removal in Areas of Hot Spots in the ILWD to a Maximum Depth of 3 m (10 ft) and Isolation Capping in SMU 1; Dredging for No Loss of Lake Surface Area and Erosion Protection and to Reestablish Habitat, and Isolation Capping in SMUs 2 to 7; Targeted Dredging to 9 m (30 ft) for NAPL Removal in SMU 2; Targeted Dredging in SMUs 3 and 6; and Phased Thin-Layer Capping, Oxygenation, and Monitored Natural Recovery in SMU 8.

Dredged Volume (cy):	2,653,000
Capital Cost:	$414,000,000
Annual O&M Costs:	$3,000,000
Present-Worth O&M Costs:	$37,000,000
Present-Worth Cost:	$451,000,000
Construction Time:	4 years

This alternative is the same as Alternative 2 except that it includes the performance of additional dredging of the ILWD to reduce average CPOI concentrations in sediments/wastes remaining under the cap, as well as additional dredging in SMU 2 to remove NAPLs.

Under this alternative, dredging would be performed to a depth of 6.5 ft (2 m) on average in the ILWD, as for Alternative 3; however, dredging would also be performed to remove material from hot spot areas to a depth of 3.3 ft (1 m) below the 6.5 ft (2 m) dredge cut for a total depth of removal of up to 10 ft (3 m) in hot spot areas. The hot spots would be defined as those wastes/sediments that contain CPOIs above threshold concentrations. The purpose of this additional removal in hot spot areas would be to improve capping effectiveness. The hot spot threshold concentrations that would trigger the additional dredging are as follows:

- Benzene – 208 mg/kg
- Chlorobenzene – 114 mg/kg
- Dichlorobenzenes – 90 mg/kg
- Naphthalene – 20,573 mg/kg
- Xylene – 142 mg/kg
- Ethylbenzene – 1,655 mg/kg
- Toluene – 2,626 mg/kg
- Mercury – 2,924 mg/kg

Capping effectiveness is related to cap thickness, contaminant concentrations below the cap, and the upwelling rate at which groundwater flows upward through the capped sediments/wastes. These concentrations, which were developed using the cap model developed by Honeywell, represent the maximum concentrations that could be present in the wastes/sediments and not cause failure of a cap with a 2.5-ft-thick isolation layer, assuming an upwelling rate of 2.4 inches/year (6 cm/year).

The remedy would include additional dredging, if needed, to address geotechnical concerns with the ILWD.[10] Accordingly, up to 10 ft (3 m) on average of the ILWD would be removed under this alternative prior to capping and would result in an additional 1,212,000 cy (927,000 m^3) of waste/sediment being removed (relative to Alternative 2) from the ILWD.

Under this alternative, NAPLs would be removed from SMU 2 to an estimated depth of 30 ft (9 m). However, the actual depth of removal would be determined during the remedial design based on the extent of NAPLs delineated as a result of remedial design sampling. This would include the NAPL removal described in Alternative 2, as well as the removal of the NAPL which may be present within the marl unit beneath the lake sediments. Accordingly, this alternative would result in an additional 234,000 cy (179,000 m^3) of additional sediments/marl being removed (relative to Alternative 2) from SMU 2.

Because this alternative would result in contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure to site media, CERCLA requires that the site be reviewed at least once every five years. If justified by the review, additional remedial actions may be implemented to remove, treat, or contain the contaminated sediments.

Alternative 5 – Dredging of the ILWD to 5 m (16.4 ft) and Isolation Capping in SMU 1; Dredging for No Loss of Lake Surface Area and Erosion Protection and to Reestablish Habitat, and Isolation Capping in SMUs 2 to 7; Targeted Dredging to 9 m (30 ft) for NAPL Removal in SMU 2; Targeted Dredging in SMUs 3 and 6; and Phased Thin-Layer Capping, Oxygenation, and Monitored Natural Recovery in SMU 8.

Dredged Volume (cy):	3,724,000
Capital Cost:	$499,000,000
Annual O&M Costs:	$3,100,000
Present-Worth O&M Costs:	$38,000,000
Present-Worth Cost:	$537,000,000
Construction Time:	4 years

This alternative is the same as Alternative 2, except that it includes the performance of additional dredging in the ILWD in SMU 1 to reduce average CPOI concentrations in sediments/wastes remaining under the cap, as well as additional dredging of the NAPL-contaminated sediments in SMU 2. Specifically, under this alternative, approximately 16.4 ft (5 m) of the ILWD would be removed prior to capping and would result in an additional 2,283,000 cy (1,745,000 m^3) of waste/sediment being removed from SMU 1. In addition, 403,000 cy (308,000 m^3) of NAPL and other contaminated sediments would be removed from SMU 2 (as would be done under Alternative 4).

Because this alternative would result in contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure to site media, CERCLA requires that the site be reviewed

[10] The nature of the wastes, as well as geophysical evidence of historical failures (i.e., underwater slumping or “landslides” associated with the ILWD) might require the removal of additional wastes to ensure the long-term stability of the cap.

at least once every five years. If justified by the review, additional remedial actions may be implemented to remove, treat, or contain the contaminated sediments.

Alternative 6 – Dredging for Full Removal (based on mean PECQ of 1 and the mercury PEC criteria) in SMUs 1 to 4, 6, and 7; Dredging for No Loss of Lake Surface Area and Erosion Protection and to Reestablish Habitat, and Isolation Capping in SMU 5; and Phased Thin-Layer Capping, Oxygenation, and Monitored Natural Recovery in SMU 8.

Dredged Volume (cy):	12,184,000++
Capital Cost:	$1,292,000,000
Average O&M Annual Cost:	$2,800,000
Present-Worth O&M Costs:	$35,000,000
Present-Worth Cost:	$1,327,000,000
Construction Time:	10 years

Alternative 6 differs from Alternative 2 by utilizing dredging to remove all sediments in all SMUs (except 5 and 8) that exceed the mean PECQ of 1 or the mercury PEC. This alternative includes dredging for no loss of lake surface area, for erosion protection, and for habitat reestablishment prior to isolation capping in SMU 5. This alternative includes thin-layer capping in SMU 8 to the same criteria.

This alternative involves dredging approximately 10,977,000 cy (8,400,000 m^3) more than Alternative 2, for a total of 12,184,000 cy (9,315,300 m^3) from 385 acres of the littoral zone, and capping 60 acres in SMU 5. This amount of dredging would require placement of roughly 8,200,000 cy (6,270,000 m^3) of backfill material to maintain reasonable water depths and bathymetry.

Because this alternative would result in contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure to site media, CERCLA requires that the site be reviewed at least once every five years. If justified by the review, additional remedial actions may be implemented to remove, treat, or contain the contaminated sediments.

Alternative 7 – Dredging for Full Removal (based on ER-L criteria) in SMUs 1 to 4, 6, and 7; Dredging for No Loss of Lake Surface Area and Erosion Protection and to Reestablish Habitat, and Isolation Capping in SMU 5; and Thin-Layer Capping and Oxygenation in SMU 8.

Dredged Volume (cy):	20,121,000
Capital Cost:	$2,086,000,000
Average O&M Annual Cost:	$5,700,000
Present-Worth O&M Costs:	$71,000,000
Present-Worth Cost:	$2,157,000,000
Construction Time:	17 years

This alternative is based on remediating areas of the lake where sediments exceed the ER-Ls (rather than the mean PECQ of 1 and the mercury PEC). It is included to evaluate removal and capping based on a more protective site-specific SEC.

Alternative 7 differs from Alternative 2 by dredging in the littoral zone to the ER-L (except for SMU 5) of any of the CPOIs shown to exhibit a relationship with benthic toxicity on a lakewide basis (see Figure 8). The remediation of the lake to the ER-L expands upon Alternative 2 by capping an additional 289 acres in SMU 5 (for a total of 349 acres in the littoral zone). This alternative includes dredging for no loss of lake surface area, for erosion protection, and for habitat reestablishment prior to isolation capping in SMU 5. An additional 1,826 acres in the profundal zone (for a total of 1,980 acres in the profundal zone) exceed the ER-L criteria (instead of the mean PECQ criteria) and would be capped. This alternative would include dredging an additional 18,914,000 cy (14,461,000 m^3) of sediment (for a total of 20,121,000 cy [15,384,000 m^3]) from the littoral zone. This would require more than 14,600,000 cy (11,163,000 m^3) of backfill material to maintain reasonable water depths and bathymetry. In addition, the entire bottom of the lake in SMU 8 would be covered with a thin-layer cap.

Because this alternative would result in contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure to site media, CERCLA requires that the site be reviewed at least once every five years. If justified by the review, additional remedial actions may be implemented to remove, treat, or contain the contaminated sediments.

COMPARATIVE ANALYSIS OF ALTERNATIVES

In selecting a remedy, NYSDEC and EPA considered the factors set out in CERCLA Section 121, 42 USC §9621, by conducting a detailed analysis of the viable remedial alternatives pursuant to the NCP, 40 CFR §300.430(e)(9), and OSWER Directive 9355.3-01 (*Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA: Interim Final*, October 1988). The detailed analysis consisted of an assessment of the individual alternatives against each of nine evaluation criteria and a comparative analysis focusing upon the relative performance of each alternative against those criteria.

The following "threshold" criteria are the most important and must be satisfied by any alternative in order to be eligible for selection:

1. *Overall protection of human health and the environment* addresses whether or not a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. *Compliance with ARARs* addresses whether or not a remedy would meet all of the applicable or relevant and appropriate requirements of federal and state environmental statutes and regulations or provide grounds for invoking a waiver. Other federal or state advisories, criteria, or guidance are TBCs. TBCs are not required by the NCP, but may be very useful in determining what is protective of a site or how to carry out certain actions or requirements.

The following "primary balancing" criteria are used to make comparisons and to identify the major tradeoffs between alternatives:

3. *Long-term effectiveness and permanence* refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

4. *Reduction of toxicity, mobility, or volume through treatment* is the anticipated performance of the treatment technologies, with respect to these parameters, a remedy may employ.

5. *Short-term effectiveness* addresses the period of time needed to achieve protection from any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

6. *Implementability* is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. *Cost* includes estimated capital, O&M, and present-worth costs. Present-worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

The following "modifying" criteria are used in the final evaluation of the remedial alternatives after the formal comment period, and may prompt modification of the preferred remedy that was presented in the Proposed Plan:

8. *Support Agency acceptance* indicates whether, based on its review of the RI/FS reports and Proposed Plan, NYSDOH concurs with, opposes, or has no comments on the selected remedy.

9. *Community acceptance* refers to the public's general response to the alternatives described in the RI/FS report, RI/FS report addendum (if any), and Proposed Plan.

A comparative analysis of these alternatives based upon the evaluation criteria noted above, follows.

Overall Protection of Human Health and the Environment

Alternative 1, the no-action alternative, would not be protective of human health and the environment, since it would not actively address the contaminated sediments and water in Onondaga Lake. The "active" remediation alternatives would be more protective of human health and the environment than the no-action alternative, since they would, to varying degrees, meet the RAOs and PRGs for the littoral and profundal areas and would result in residual risks less than the no-action alternative. With regard to eliminating or reducing releases of contaminants from the ILWD and other littoral areas around the lake (RAO 2), Alternatives 2 through 7, which result in dredging to depths ranging from 1 to 8 m in the ILWD, would result in progressively greater reduction in the concentration and mass of CPOIs prior to capping.

Alternatives 2 through 6 are equally protective of fish and wildlife by eliminating or reducing existing and potential future adverse ecological effects on fish and wildlife resources and are equally protective of human health by eliminating or reducing potential risks to humans (RAO 4), achieve CPOI concentrations in fish tissue that are protective of humans and wildlife that consume fish (PRG 2), reduce methylation of mercury in the hypolimnion (RAO 1), reduce releases of mercury from profundal sediments (RAO 3), and achieve surface water quality standards (RAO 5 and PRG 3), to the extent that they also meet RAO 2. With regard to achieving applicable and appropriate SECs for CPOIs and the BSQV for mercury (PRG 1), Alternatives 2 through 6 are equally proficient, however, they are not predicted, in the short-term, to achieve the BSQV for mercury on a lakewide basis or in SMU 8.

Since Alternative 7 includes thin-layer capping throughout all of SMU 8, as well as oxygenation, it would be the most effective alternative in achieving RAOs 1 and 3. In addition, Alternative 7 would meet the BSQV for mercury on a lakewide basis and in SMU 8, and it would be the most effective at meeting RAOs 2, 4, and 5 and PRGs 1, 2, and 3, since it would address all areas exceeding the ER-L.

Modeling performed for chemical isolation was used to produce preliminary cap designs to ensure that there would be no predicted exceedances of the PEC of any of the CPOIs that have been shown to exhibit acute toxicity on a lakewide basis or NYSDEC sediment screening criteria for benzene, toluene, and phenol. All of the alternatives which employ capping would be protective to the extent that the cap functions properly. If the cap fails via contaminant breakthrough and/or a catastrophic event (e.g., slope failure), the cap would need to be repaired and sediments contaminated by the release would need to be remediated (e.g., removed, capped in place). In the event of failure, the impacts would be expected to be greatest under those alternatives that involve capping of the greatest mass/highest concentrations of contaminants. Accordingly, Alternative 4 provides more protection than Alternatives 2 and 3. While Alternative 5 would remove more material than Alternative 4, similar concentrations would remain. In addition, Alternative 4 includes cap enhancement in residual hot spot areas and additional dredging, if needed, to address geotechnical concerns with the ILWD. These components of Alternative 4, which are not components of Alternative 5, provide Alternative 4 with greater cap reliability relative to Alternative 5. Alternative 6 would provide greater protection than Alternative 5, and Alternative 7 would be the most protective alternative, because it would result in the further reduction of surface concentrations.

Alternatives 3, 4, and 5 address (through dredging to various depths in the ILWD and removal of NAPL-contaminated sediments in SMU 2) the masses and concentrations of the CPOIs that would remain under the cap in SMUs 1 and 2. While the cap under Alternative 2 would be protective based on modeling studies, reducing the masses and concentrations increases the reliability of and, therefore, the protectiveness of the cap. Accordingly, with regard to the ILWD, the level of protectiveness increases progressively from Alternative 2 through Alternative 7 (with the exception of Alternative 5 discussed above).

With regard to contaminant mass removal, Alternatives 2 and 3 also address a portion of the NAPL within SMU 2. The information currently available indicates that the NAPL present in sediments in the area of the causeway in SMU 2 extends to a depth of approximately 13 ft (4 m), and the corresponding volume of sediment that would be required to remove this NAPL along with other contaminated sediments (under Alternatives 2 and 3) is about 169,000 cy (129,000 m^3). Alternatives 4 and 5 provide for greater mass removal in SMU 2 relative to Alternatives 2 and 3, as they include the NAPL removal described above, as well as the removal of the NAPL which may be present within the marl unit beneath the lake sediments. This would provide greater protectiveness by preventing the NAPL from further impacting the environment.

For Alternatives 6 and 7, which consist of full removal to the cleanup criteria for the littoral zone SMUs (with the exception of SMU 5), an additional level of long-term protectiveness would be achieved through sediment removal, instead of capping.

Compliance with ARARs

Since there are currently no federal or state promulgated standards for contaminant levels in sediments, the ER-Ls, mean PECQ of 1, and mercury PEC have been used in this ROD as TBC criteria. New York State has promulgated surface water standards which are enforceable standards for various surface water contaminants. In addition, EPA publishes water quality criteria under the authority of Section 304(a) of the Clean Water Act (CWA) based solely on data and scientific judgments about the relationship between pollutant concentrations and environmental and human health effects. CWA Section 303©) and its implementing regulations require states and authorized tribes to adopt water quality criteria to protect designated uses in their water quality standards.

In general, Alternatives 2, 3, 4, 5, 6, and 7 would be expected to comply with all of the designated chemical-specific ARARs, while Alternative 1 (no action) would not, since there would be no active remediation associated with the sediments. However, it may not be feasible to meet the New York State surface water quality standards for mercury (i.e., the standard for protection of wildlife of 2.6 ng/L dissolved mercury and the standard for protection of human health [via fish consumption] of 0.7 ng/L dissolved mercury). Oxygenation of the hypolimnion, as proposed in all of the active alternatives, would change the lake's anoxic chemical conditions, which is a primary cause of high concentrations of dissolved mercury (total mercury as well as methylmercury). While this, along with a reduction in inputs of mercury, would substantially reduce the frequency and magnitude of the exceedances of these two standards, it is possible that these standards would not be met all of the time during the post-remediation period. If the post-remediation monitoring indicates that it would be technically impracticable to consistently meet these standards, an ARAR waiver might be needed.

Alternative 7 would be expected to reduce water column concentrations to a greater degree than would Alternatives 2, 3, 4, 5, and 6.

During remedy implementation, any short-term exceedances of surface water ARARs in the lake due to dredging or capping would be expected to be limited to the area in the vicinity of the work zone. Sufficient engineering controls would need to be put in place during dredging and capping to prevent or minimize exceedances of surface water ARARs outside of the work zone. Furthermore, compliance with the discharge limits (to be established by NYSDEC) should ensure that there are no exceedances of surface water ARARs caused by the supernatant discharge from the SCA.

The principal location-specific ARARs applicable to the remediation are Environmental Conservation Law (ECL) Article 24 Freshwater Wetlands, ECL Article 15 Use and Protection of Waters, and CWA Section 404. For freshwater wetlands, 6 NYCRR Part 663 regulates activities conducted in or adjacent to regulated wetlands. Article 15 is implemented by 6 NYCRR Part 608, which regulates alterations to protected waters, such as dredging and filling. The design and construction of the remedy must meet the substantive requirements for permits associated with disturbance to state and federal regulated wetlands (e.g., 6 NYCRR Part 663, Freshwater Wetlands

Permit Requirements) and navigable waters (e.g., 6 NYCRR Part 608, Use and Protection of Waters).

CWA Section 404 includes requirements related to the discharge of dredged or fill material into navigable waters of the United States and prohibits activities which adversely affect an aquatic ecosystem, including wetlands. In addition, Superfund actions must be taken in accordance with 40 CFR Part 6, Appendix A, “Statement of Procedures on Floodplain Management and Wetlands Protection,” Executive Order 11990, “Protection of Wetlands,” Executive Order 11988, Floodplain Management, EPA’s 1985 Policy on Floodplains and Wetland Assessments for CERCLA Actions, and the Fish & Wildlife Coordination Act. 40 CFR Part 6, Appendix A sets forth EPA policy and guidance for carrying out Executive Orders 11990 and 11988. Executive Order 11990 requires federal agencies conducting certain activities to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands if a practicable alternative exists, and to avoid adverse impacts or minimize them if no practicable alternative exists. Executive Order 11988 requires federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid, to the extent possible, adverse effects associated with direct and indirect development of a floodplain, and to avoid adverse impacts or minimize them if no practicable alternative exists.

EPA’s 1985 Policy on Floodplains and Wetland Assessments for CERCLA Actions discusses situations that require preparation of a floodplains or wetlands assessment, and the factors that should be considered in preparing an assessment, for response actions taken pursuant to Section 104 or 106 of CERCLA. In addition, it requires that in cases where a proposed remedial action will take place within or affect wetlands or the 100-year and 500-year floodplains, a Statement of Findings be prepared to document this decision in the ROD. This statement must include: the reasons why the proposed action must be located in or affect the floodplain or wetlands; a description of significant facts considered in making the decision to locate in or affect the floodplain or wetlands including alternative sites and actions; a statement indicating whether the proposed action conforms to applicable state or local floodplain/wetland protection standards; a description of the steps taken to design or modify the proposed act to minimize the potential harm to or within the floodplain or wetlands; and a statement indicating how the proposed action affects the natural or beneficial values of the floodplains or wetlands. The Statement of Findings has been attached as Appendix V of this ROD.

The Fish & Wildlife Coordination Act requires that whenever the waters of any stream or other body of water are proposed or authorized to be impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose, by any department or agency of the United States, such department or agency first shall consult with the United States Fish and Wildlife Service (USFWS), Department of the Interior, and with the head of the agency exercising administration over wildlife resources of the particular state in which the impoundment, diversion or other control facility is to be constructed, with a view to the conservation of wildlife resources by preventing loss of and damage to such resources. Consultation with the USFWS will be undertaken during the remedial design.

In addition, the National Historic Preservation Act (NHPA) has also been determined to be an ARAR for this project. The NHPA requires that remedial actions must take into account effects on properties in or eligible for inclusion in the National Registry of Historic Places. Cultural resource investigations conducted pursuant to the NHPA are ongoing. A draft Phase 1A Cultural Resource Assessment for the project area was produced in October 2004; this report noted the likelihood that the proposed project might encounter both recorded and unrecorded prehistoric and historic resources. Consequently, it is likely that once the area of remedial impact becomes established, additional cultural resource investigations will be required before the remedy is implemented.

Since all of the alternatives except the no-action alternative include dredging and/or capping within the lake, the final design of the remedy must meet the substantive requirements of the regulations (e.g., ECL Article 15). Alternatives that reestablish appropriate littoral zone habitat and function, that do not result in unacceptable changes in water depth or the loss of lake surface area, and do not result in a diminishment of natural resource values throughout the lake would more readily meet the requirements. All of the alternatives except the no-action alternative would be designed to comply with all of the designated location-specific and action-specific ARARs. The development of a lakewide habitat restoration plan is essential to provide a comprehensive evaluation of the selected alternative's ability to meet the requirements of Articles 15 and 24 and to develop appropriate bathymetry and habitat reestablishment requirements for each SMU.

Long-Term Effectiveness and Permanence

Permanence of the Remedial Alternative

Since Alternative 1 would involve no active remedial measures, it would not be effective in the long-term in controlling exposure.

Alternatives 6 and 7 provide the greatest long-term effectiveness and permanence by removal of all of the sediment that exceeds the cleanup criteria from SMUs 1 through 7 (with the exception of SMU 5). For SMU 8 (profundal zone), all of the action alternatives include MNR and/or thin-layer capping to remediate the contaminated sediments and oxygenation to maintain the proper chemical conditions (and, hence, greatly reduce the methylation of mercury) in the hypolimnion. Oxygenation of the hypolimnion would need to be actively maintained for Alternatives 2, 3, 4, 5, 6, and 7 to be effective. If the oxygenation system was suspended during the summer months, the oxygen demand of the profundal sediments would rapidly cause the loss of oxygen in the hypolimnion. This would result in the resumption of mercury methylation in the hypolimnion, and could adversely impact biota acclimated to the oxygenated conditions in the profundal zone.

Alternatives 2, 3, 4, and 5 incorporate the removal of increasing volumes of contaminated sediments prior to capping. These alternatives include an isolation cap in the littoral zone, which is a key component of these alternatives' protectiveness. Consolidation and disposal in an aboveground containment area (i.e., SCA) is more proven, more easily maintained, and more easily monitored than capping of wastes and contaminated sediments in an underwater environment, thereby making it more permanent and more reliable. Therefore, as the volume of material being removed increases, the permanence of the alternative increases.

For the contaminated sediments that would be left in the lake, the isolation cap would be designed to ensure long-term chemical isolation, including the ability to prevent ice scour and other types of erosion and to ensure its structural integrity. The integrity of the cap would be maintained through active operation and maintenance of an on-shore groundwater barrier wall and collection system along SMUs 1 and 2 (which will be installed as IRMs associated with the Willis Avenue, Semet Residue Ponds, and Wastebed B/Harbor Brook upland sites) and SMU 7 to prevent upwelling of contaminants through the sediment cap. In addition, the development and implementation of a monitoring and maintenance program to ensure that cap integrity and effectiveness is maintained would be included.

With regard to SMU 2, Alternatives 4 and 5 would remove sediments/marl contaminated with NAPL down to a depth of approximately 30 ft (9 m) and would be more effective in satisfying EPA's preference for treatment of principal threat waste than would Alternatives 2 and 3, which would remove and treat contaminated NAPL down to a depth of approximately 13 ft (4 m).

Reduction of Residual Risk

Residual risk in Onondaga Lake can be evaluated on the basis of direct toxicity, bioaccumulation, and potential for recontamination.

Since Alternative 1 would involve no active remedial measures, it would not, therefore, be effective in reducing residual risk.

Alternatives 2, 3, 4, 5, and 6 would remediate all areas of the lake that exceed either the mean PECQ of 1 or the mercury PEC. These cleanup criteria address acute sediment toxicity to benthic macroinvertebrates. For those areas that are capped and covered with a clean substrate layer, it is expected that the concentrations of CPOIs in the clean substrate overlying the isolation cap would remain low enough to reduce chronic toxicity. Alternative 7 would remediate all areas of the lake exceeding the ER-Ls and, therefore, would result in the lowest residual risk of acute and chronic toxicity.

A mercury concentration goal in sediments of 0.8 mg/kg was developed for the site to address bioaccumulation concerns (see the text box entitled "Bioaccumulation-Based Sediment Quality Values" [page 41]). In order to evaluate alternatives with respect to the bioaccumulation goal, the estimated post-remediation surface area-weighted average concentration (SWAC) in each SMU corresponding to each respective alternative was compared to the 0.8 mg/kg goal, since animals that bioaccumulate mercury, such as fish, are not limited to one location in the lake.

An analysis of the SWACs predicted to remain in the lake after the remediation indicates that all alternatives other than the no-action alternative would be protective for the littoral zone as a whole (SMUs 1 to 7). The residual mercury concentrations in the profundal zone (SMU 8) surface sediments are predicted to drop significantly from the 1992 concentrations. However, based on the 10-year MNR modeling with oxygenation, they may not reach the 0.8 mg/kg value throughout the profundal sediments under Alternatives 2 through 6, and may therefore require additional remedial measures (e.g., thin-layer capping). Under Alternative 7, the 0.8 mg/kg goal would be attained throughout the profundal sediments. Measuring the progress toward meeting the 0.8 mg/kg BSQV, along with the fish tissue PRGs (upon which the BSQV is based), will be one of the goals of the monitoring program.

Adequacy and Reliability of Controls

Since Alternative 1 would involve no active remedial measures, the migration of contaminants would continue.

Alternatives 6 and 7 provide the greatest long-term effectiveness and reliability of controls, since these alternatives would remove the largest volumes of contaminated sediment and place them in a secure SCA. The technology used in constructing containment facilities, such as the SCA, is well established and dependable. Since the contamination would be removed from the environment, the control and maintenance of the contained material is highly reliable, and monitoring of the SCA and treatment systems would be easily accomplished.

The progressive removal of additional contaminated sediments from the lake under Alternatives 2, 3, 4, and 5 provides increasing reliability, since each alternative relies progressively less on an isolation cap in order to be protective. Therefore, the greater the amount of sediment that is removed, the more permanent and reliable is the alternative. For the contaminated sediments left in the lake, reliability would be addressed through installation of a cap designed to ensure long-term chemical isolation, prevent ice scour and other types of erosion, and provide long-term stability. The integrity of this cap would be maintained through active operation and maintenance of an on-shore groundwater barrier wall and collection system along SMUs 1, 2, and 7 to prevent upwelling of contaminants through the sediment. All of the removed sediments would be permanently secured.

All of the action alternatives include oxygenation and thin-layer capping in SMU 8. An oxygenation system would have to be actively maintained in order to oxygenate the hypolimnion. The system's ability to address the mercury methylation in Onondaga Lake would need to be assessed as part of a pilot study during the remedial design phase. Alternatives 2 through 6 also include MNR in the profundal zone. Areas that do not achieve the mercury BSQV of 0.8 mg/kg and the PRGs for fish during the MNR period would require additional remedial measures. This may include thin-layer capping beyond the initial estimate of 154 acres, which is based on current exceedances of the mean PECQ of 1, if monitoring indicates it has been effective in reducing surface sediment concentrations.

Reduction of Toxicity, Mobility, or Volume through Treatment

Degree of Expected Reduction in Toxicity, Mobility, or Volume Through Treatment

Alternative 1 (no action) would provide no reduction in toxicity, mobility, or volume through treatment or otherwise. For the action alternatives, the dredging of contaminated sediments and their placement in a secure, lined SCA would result in a reduced mobility for these materials, as would in-lake capping. In addition, those NAPLs removed from the dredged material would be treated and/or disposed of off site.

Oxygenation, which is included in Alternatives 2, 3, 4, 5, 6, and 7, is expected to reduce the toxicity of mercury in SMU 8 by reducing methylation and the degree to which mercury is dissolved in the hypolimnion. Although thin-layer capping and MNR are expected to reduce the surface sediment concentrations in the profundal zone under all of the action alternatives, the volume of mercury and other key CPOIs in profundal sediments would not be reduced, since there would be no sediment removal prior to thin-layer capping. However, a combination of all three remedial components (oxygenation, MNR, and thin-layer capping),along with control of upland sites and remediation of the littoral zone, would be expected to reduce the overall bioavailability and mobility of contaminants in the profundal zone and hypolimnion.

Degree to Which Treatment Would Be Irreversible

For the NAPLs that are treated, the treatment would be irreversible and permanent.

Oxygenation of the hypolimnion would need to be actively maintained for Alternatives 2, 3, 4, 5, 6, and 7 to be effective. If the oxygenation system was suspended during the summer months, the oxygen demand of the profundal sediments would rapidly cause the loss of oxygen in the hypolimnion and would result in the resumption of mercury methylation in the hypolimnion. Thus, the treatment afforded by oxygenation is reversible. As a result, the overall irreversibility of this treatment in the hypolimnion would be low, but equivalent, in Alternatives 2, 3, 4, 5, 6, and 7.

Type and Quantity of Residuals

Alternatives 6 and 7 would remove all contaminated sediments down to their respective cleanup criteria in the littoral zone, except for areas within SMU 5 which would be capped. Alternatives 2, 3, 4, and 5 would isolate littoral sediments using an engineered isolation cap and would also progressively remove higher concentrations and/or masses of CPOIs in the ILWD and the NAPL in SMU 2, with Alternative 2 removing the least volume and Alternative 5 removing the greatest volume. Alternatives 2, 3, 4, 5, and 6 would address contamination in the profundal sediments through oxygenation, thin-layer capping, and MNR.

All of the action alternatives would generate treatment residuals which would have to be appropriately handled.

EPA Preference for Treatment as a Principal Remedy

The treatment and/or disposal of NAPLs at an off-site facility and oxygenation in the hypolimnion are critical components of the alternatives that meet EPA's treatment preference. The larger the volume of NAPLs that are removed from the lake and treated, the more an alternative satisfies this EPA preference for treatment.

EPA's statutory preference for treatment of principal threat materials has been considered as part of this remedy. Given the extraordinary volume of materials being evaluated (e.g., greater than 4,000,000 cy [3,060,000 m^3] of sediments and wastes within the ILWD, some of which contain NAPLs), treatment of all principal threat wastes (which are present in various portions of the ILWD) is impracticable. However, the implementation of any of these alternatives would include the off-site treatment and/or disposal of all NAPLs that were segregated during the dredging/handling process.

Short-Term Effectiveness

Alternative 1 (no action) does not include any physical construction measures in any areas of contamination and, therefore, would not present any potential adverse impacts to on-site workers, the environment, or the community as a result of its implementation.

Alternatives 2 through 7 could present some limited adverse impacts to on-site workers through dermal contact and inhalation related to dredging activities. Noise from the dredging work and from the on-site treatment processes could present some limited adverse impacts to on-site workers and nearby residents. In addition, post-dredging sampling activities could pose some risk to on-site workers. Another potential adverse impact associated with dredging would be odors associated with the dredged sediments. The risks to on-site workers and nearby residents under all of the alternatives would, however, be mitigated by following appropriate health and safety protocols, by exercising sound engineering practices, and by utilizing proper protective equipment.

Alternatives 2 through 7 would require the transport of significant volumes of capping and backfill material, which may involve use of local roadways and would cause an increase in traffic. Alternatives 6 and 7 would result in the greatest amount of traffic related to the transport of these materials. If mechanical dredging is used, the amount of traffic on local roads would increase commensurate with the amount of dredging. However, during the remedial design, various means would be evaluated for minimizing potential adverse impacts (e.g., traffic, odors associated with dredged sediments) on the community.

Under Alternatives 2, 3, 4, 5, and 6, MNR would take up to 10 years to achieve objectives in the profundal area, while oxygenation would be expected to produce immediate benefits in terms of methylmercury reduction. Since no activities would be performed under the no-action alternative, no time would be required to implement this alternative. Construction activities associated with the implementation of Alternatives 2, 3, 4, and 5 would be completed within four years. Implementation of Alternatives 6 and 7 would take significantly longer because of the increased dredging volumes, requiring 10 and 17 years, respectively.

Short-term impacts to the ecological community from implementation of all of the alternatives, except the no-action alternative, would include temporary loss of lake habitat and aquatic communities. The impact duration could be significantly greater for the implementation of Alternatives 6 and 7 because of the additional dredging and backfilling required under these alternatives, which could substantially increase the time before the area could be recolonized. However, if the construction was phased (i.e., not performed over the entire lake at once), this impact would be decreased.

The public would be excluded from the work areas of the lake during the time they are under remediation. The impact duration would be significantly greater for the implementation of Alternatives 6 and 7 because of the 10- to 17-year estimated construction durations, respectively.

Implementability

Reliability of Technology

Alternative 1 would be the easiest to implement, as there are no activities to undertake. Aquatic capping (isolation and thin-layer), dredging, treatment of segregated NAPLs (if employed), oxygenation, and MNR are all implementable technologies that have been used at other sites. However, aquatic capping presents challenges not typically associated with capping of upland sites (e.g., landfills). These issues would be addressed during the remedial design. SCA-type facilities have been successfully constructed and operated at numerous sites. Furthermore, the application of oxygenation (to address mercury methylation within Onondaga Lake) would require pilot testing before full-scale implementation.

Reliability (in terms of being able to construct and operate the technology) of the remedial components to be used in all of the alternatives is high. All of the action alternatives can be constructed and operated; however, Alternatives 6 and 7 would involve dredging and containing a much larger volume of sediments than the other alternatives. Construction of the SCA under Alternatives 6 and 7 would be challenging because of its size (i.e., approximately 282 and 442 acres, respectively, with 50 ft [15 m] high dikes). The large volumes of sediment involved in these alternatives might stretch the limits of the ability to contain the dredge spoils on nearby Honeywell properties. For Alternatives 2, 3, 4, and 5, there would be sufficient capacity at the proposed SCA location(s) on one or more the Solvay wastebeds to contain the sediment generated. Alternative 5, while implementable, would be more difficult to implement than Alternative 4 due to the removal of an additional 1,071,000 cy associated with Alternative 5.

All of the action alternatives include near-shore capping. As a result, institutional controls would be required. Institutional controls would include notification of appropriate government agencies with authority for permitting potential future activities which could impact the implementation and effectiveness of the remedy. Institutional controls would be needed to ensure long-term effectiveness of alternatives containing a capping component. The duration of these institutional controls would be dependent on lake conditions and the specifics of the institutional control.

Ability to Monitor Effectiveness of Remedy

A monitoring program would be developed during the design that would be used to assess remedy effectiveness. Monitoring to ensure that the remedial technologies are performing as specified in the design (e.g., cap integrity) would also be a component of the monitoring program. Monitoring programs would be needed for each of the action alternatives and are expected to include, at a minimum, sampling of biological tissue (e.g., fish, invertebrates), surface water, and sediments within the lake before, during, and following remediation; sampling of the aquatic cap to determine its integrity (chemically and structurally); determining the effectiveness of the thin-layer cap; and sampling of the SCA to determine its integrity (chemically and structurally). The specific monitoring programs required to evaluate remedy effectiveness would depend on the specific alternative. The scope of the program, including sampling and analytical details, would be determined during the remedial design.

The monitoring program, although comprehensive and broad in scope, would be comprised of sampling and analytical methods that should be readily implementable. Since direct visual inspections of the aquatic cap may be complicated by underwater conditions, alternative methods to determine cap structural integrity would need to be developed during the remedial design.

Ease of Undertaking Additional Remedial Actions as Needed

The remedial technologies to be utilized as part of the alternatives, generally, do not preclude other remedial actions from being implemented as needed. For example, settling of the cap could potentially necessitate adding more material to maintain suitable littoral water depths. In addition, capped materials could be excavated, if necessary, or additional cap material could be placed. However, such additional remedial actions would need to comply with ARARs (e.g., 6 NYCRR Part 608).

Ability to Obtain Approvals from Other Agencies

It is expected that the necessary administrative approvals from other agencies can be acquired for all alternatives.

Availability of Adequate On-Site or Off-Site Treatment, Storage Capacity, and Disposal Services

There would be sufficient capacity at the SCA to contain the sediment generated under Alternatives 2, 3, 4, and 5. However, due to the large volume of sediment removal associated with Alternatives 6 and 7, it is possible that the capacity at the SCA would be inadequate and that additional containment cells would need to be constructed or that a significant volume of material would have to be disposed of at an off-site facility.

Availability of Necessary Equipment and Personnel

The technology, equipment, subcontractors, personnel, and facilities required to successfully complete all alternatives are available in the environmental marketplace.

Cost

The cost estimates presented in this ROD are based upon capital (construction) costs and the present-worth of the annual O&M costs calculated using a discount rate of 7 percent and a 30-year time interval. The actual costs will vary depending on the specifications contained in the detailed remedial design. Further, the actual costs will also vary because the cost estimates provided are developed conservatively and have an accuracy of +50 percent to -30 percent, in compliance with the 1988 EPA guidance document, "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA."

The estimated capital, operation, maintenance, and monitoring (OM&M), and present-worth costs for each of the alternatives are presented below.

Lakewide Alternative	Capital Costs	Average O&M Annual Cost	Present-Worth O&M Costs	Present-Worth Costs
1	$0	$0	$0	$0
2	$275,000,000	$3,000,000	$37,000,000	$312,000,000
3	$333,000,000	$3,000,000	$37,000,000	$370,000,000
4	$414,000,000	$3,000,000	$37,000,000	$451,000,000
5	$499,000,000	$3,100,000	$38,000,000	$537,000,000
6	$1,292,000,000	$2,800,000	$35,000,000	$1,327,000,000
7	$2,086,000,000	$5,700,000	$71,000,000	$2,157,000,000

As can be seen by the cost estimates, in general, the cost of each alternative increases with increases in the area of the lake bottom remediated and with the amount of sediment removed.

There is no cost associated with Alternative 1, the no-action alternative. Alternatives 2, 3, 4, and 5, which include the use of dredging and capping technologies to address sediments that exceed a mean PECQ of 1 or the mercury PEC, as well as significant removals in the ILWD and in SMU 2, range in estimated present-worth cost from $312,000,000 (for Alternative 2) to $537,000,000 (for Alternative 5). Alternatives 6 and 7, which depend upon full removal in the littoral zone with the exception of SMU 5 (versus partial removal and capping) to the appropriate cleanup criteria, range in estimated present-worth cost from $1,327,000,000 to $2,157,000,000, respectively.

Support Agency Acceptance

EPA has determined that the remedy selected by NYSDEC, the lead agency for this site, meets the requirements for remedial action set forth in CERCLA Section 121, 42 USC §9621. EPA has adopted this remedy's selection by cosigning this ROD. NYSDOH concurs with the selected remedy; its letter of concurrence is attached (see Appendix IV).

Community Acceptance

Comments received during the public comment period indicate that the public, generally, supports the selected remedy. The public's comments are summarized and addressed in the Responsiveness Summary, which is attached as Appendix VI to this document.

The Onondaga Nation asserted a lack of coordination with it regarding the proposed remedy and the timing of the public comment period. However, EPA Region 2 and NYSDEC have had five meetings with the Onondaga Nation since the NRRB meeting concerning the Proposed Plan and intend to continue discussions with the Onondaga Nation throughout the design phase of the project. The concerns raised by the Onondaga Nation are further discussed in the Responsiveness Summary.

PRINCIPAL THREAT WASTE

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430 (a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for the migration of contamination to groundwater, surface water, or air, or act as a source for direct exposure. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of alternatives, using the remedy selection criteria which are described below. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

Elevated contaminant concentrations and visual evidence (e.g., liquids, droplets, sheens) indicate that NAPL (e.g., chlorinated benzenes, which were manufactured and released as a waste by Honeywell) exists throughout the ILWD and in an area off the Honeywell causeway. Based on data collected during the RI/FS, it was determined that the NAPLs and highly-contaminated waste materials in these areas of the lake are highly mobile, at least when disturbed, have high concentrations of toxic compounds, and present a significant risk to human health and the environment should exposure occur; therefore, they are characterized as principal threat wastes.

EPA's statutory preference for treatment of principal threat materials has been considered as part of this remedy. Given the extraordinary volume of materials being evaluated (e.g., greater than 4,000,000 cy [3,060,000 m^3] of sediments and wastes within the ILWD, some of which contain NAPLs), treatment of all principal threat wastes (which are present in various portions of the ILWD) is impracticable. However, the implementation of any of these alternatives would include the off-site treatment and/or disposal of all NAPLs that would be segregated during the dredging/handling process. The appropriate means for collecting and handling these sediments and materials would be determined during the remedial design.

SELECTED REMEDY

Summary of the Rationale for the Selected Remedy

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives, and public comments, NYSDEC and EPA have determined that Alternative 4 (Dredging of the ILWD to 2 m [6.5 ft]; Removal in Areas of Hot Spots in the ILWD to a Maximum Depth of 3 m [10 ft] and Isolation Capping in SMU 1; Dredging for No Loss of Lake Surface Area and Erosion Protection and to Reestablish Habitat, and Isolation Capping in SMUs 2 to 7; Targeted Dredging to 9 m (30 ft) for NAPL Removal in SMU 2; Targeted Dredging in SMUs 3 and 6; and Phased Thin-Layer Capping, Oxygenation, and Monitored Natural Recovery in SMU 8) best satisfies the requirements of CERCLA Section 121, 42 U.S.C. §9621, and provides the best balance of tradeoffs among the remedial alternatives with respect to the NCP's nine evaluation criteria, 40 CFR §300.430(e)(9).

Alternatives 2 through 6 address the same surface area of contaminated lake bottom sediments. The major difference between Alternatives 2 through 6 is how each respective alternative would address SMU 1. In general, the alternatives call for successively greater depths of excavation and, therefore, increasing volumes of waste to be removed. Specifically, Alternatives 2, 3, 4, 5, and 6 call for removal depths of up to 0.8, 2, 3, 5, and 8 meters, respectively, within the ILWD. The long-term effectiveness of the alternatives for the ILWD increases with increasing amounts of removal, since less waste would be contained in the aquatic environment. The reliability of the aquatic cap is enhanced with removal of the more highly concentrated wastes. Therefore, Alternative 4, which includes hot spot removals to a depth of 3 m (10 ft) below grade, provides a greater degree of reliability than Alternatives 2 and 3. The highest concentrations of the majority of CPOIs, on average, are found in the upper 3 m (10 ft) of the ILWD. While Alternative 5 includes approximately 2 m (6.5 ft) of additional removal within SMU 1 (relative to Alternative 4), this removal does not target hot spot areas. Therefore, it does not increase cap reliability commensurate with the increased $86 million in estimated present-worth costs over Alternative 4. In addition, unlike Alternative 5, Alternative 4 includes cap enhancements in any residual hot spot areas. Since the cap enhancements would be placed over the most highly-contaminated sediments, this component of Alternative 4 provides greater cap reliability than does Alternative 5.

Another significant difference among Alternatives 2 through 6 relates to SMU 2. Alternatives 4, 5, and 6 would remove NAPLs to a depth of 9 m (30 ft) in the vicinity of the causeway (the assumed area of NAPLs is shown on Figure 4.26 of Honeywell's November 2004 FS report) and, thus, result in a greater reduction in the concentrations and masses of CPOIs prior to capping than would Alternatives 2 and 3, thus, providing greater long-term effectiveness and cap reliability. Since Alternatives 4, 5, and 6 would remove and treat a larger volume of NAPLs than Alternatives 2 and 3 would, they would satisfy the NCP's preference for treatment of principal threat waste to a greater degree than Alternatives 2 and 3.

Under Alternatives 6 and 7, an estimated 11 million and 18.9 million additional cy of material, respectively, would be removed from the lake, compared to Alternative 2. While Alternatives 6 and 7 would provide greater long-term effectiveness than Alternative 4, the greater volumes of material to be removed and disposed would likely exceed the capacity for a single SCA. Multiple containment cells would likely be needed or, alternatively, significant volumes of material would have to be disposed of at an off-site facility. The $876,000,000 and $1,706,000,000 in incremental costs over Alternative 4 associated with the additional removals called for under Alternatives 6 and 7, respectively, would not be cost effective. A properly designed and constructed aquatic cap, together with the other elements of Alternative 4, would provide a similar degree of protection offered by Alternatives 6 and 7 at significantly less cost, in less time and with greater ease of implementation.

Alternative 4 would remove up to 3 m (10 ft) of some of the most highly-concentrated wastes from the ILWD. This removal would facilitate construction of a structurally-stable cap and would result in the removal of substantial quantities of the principal threat waste. The residual waste could be effectively contained under the engineered cap. The sediments removed from the lake could be contained in one or more SCAs on one or more of Honeywell's Solvay wastebeds. Finally, continued OM&M of the cap would ensure its continued effectiveness. For all of these reasons, Alternative 4 is protective of human health and the environment, provides long-term effectiveness, is able to achieve the ARARs more quickly, or as quickly, as the other alternatives, is cost-effective, and offers the best balance of tradeoffs among the alternatives.

Therefore, the selected remedy will provide the best balance of tradeoffs among alternatives with respect to the evaluation criteria. NYSDEC and EPA believe that the selected remedy will treat principal threat wastes, be protective of human health and the environment, comply with ARARs, be cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The selected remedy also will meet the statutory preference for the use of treatment as a principal element.

Description of the Selected Remedy

The selected remedy (Alternative 4) will address all areas of the lake where the surface sediments exceed a mean probable effect concentration (PEC) quotient of 1 or the mercury PEC of 2.2 mg/kg (see Figure 7). The selected remedy will also attain a 0.8 mg/kg bioaccumulation-based sediment quality value (BSQV) for mercury on an area-wide basis for the lake and for other applicable areas of the lake to be determined during the remedial design. The selected remedy is also intended to achieve lakewide fish tissue mercury concentrations ranging from 0.14 mg/kg, which is for protection of ecological receptors, to 0.3 mg/kg, which is based on EPA's methylmercury National Recommended Water Quality criterion for the protection of human health for the consumption of organisms. The remedy includes dredging prior to isolation capping in SMUs 1 to 7 to a depth that will prevent the loss of lake surface area, ensure cap effectiveness, remove NAPLs, reduce contaminant mass, allow for erosion protection, and reestablish habitat. Dredging will also be performed as needed in the ILWD (which largely exists in SMU 1) to remove materials within areas of hot spots and to ensure stability of the cap. Most of the dredging will be performed in the ILWD (which largely exists in SMU 1) and in SMU 2. In SMU 8, the remedy calls for phased thin-layer capping, oxygenation, and MNR. The littoral zone in the vicinity of the dredging/capping will be restored to reestablish appropriate habitat and function following removal of contaminated sediments.

The selected remedy (see Figure 9) will include the dredging of as much as an estimated 2,653,000 cy (2,030,000 m^3) of sediments and/or wastes from the littoral zone, with most of the dredging (approximately 75 percent) being performed in SMUs 1 and 2. It will also include the use of isolation capping over an estimated 425 acres (approximately 42 percent) of the littoral zone (between SMUs 1 to 7). An estimated 154 acres (approximately 8 percent) of the profundal zone (SMU 8) will receive a thin-layer cap. Specifically, the components of the selected remedy within each SMU include:

- **SMU 1** – Dredging of an estimated 1,566,000 cy (1,197,000 m^3) of sediments and/or wastes from the ILWD, prior to capping, to prevent a loss of lake surface area, reduce average CPOI concentrations in sediments and/or wastes remaining under the cap, for erosion protection, and to reestablish habitat. Capping of the entire SMU (approximately 84 acres). Capping effectiveness will rely upon the proper functioning of the hydraulic control system which will be installed, operated, monitored and maintained as part of the Wastebed B/Harbor Brook Barrier IRM.

  Dredging will be performed to remove sediments and/or wastes to an average depth of 6.5 ft (2 m) prior to capping. This will provide an adequate water depth to allow for the establishment of a productive habitat after capping, reduce average CPOI concentrations in sediments and/or wastes remaining under the cap, and allow for erosion protection for the cap. While the average dredge cut across SMU 1 will be 6.5 ft (2 m), the actual depth of dredging in the various portions of SMU 1 will be determined during the remedial design. The determination will be based on various factors, including contaminant distribution, habitat needs, and erosional concerns.

  In areas defined as hot spots, dredging will also be performed to remove an additional 3.3 ft (1 m) of sediments and/or wastes (below the dredge cut described above). The hot spots will be defined as those sediments and/or wastes that contain CPOIs above threshold concentrations. The purpose of this additional removal in hot spot areas is to improve capping effectiveness. The hot spot threshold concentrations that will trigger the additional dredging are as follows:

  - Benzene – 208 mg/kg
  - Chlorobenzene – 114 mg/kg
  - Dichlorobenzenes – 90 mg/kg
  - Naphthalene – 20,573 mg/kg
  - Xylene – 142 mg/kg
  - Ethylbenzene – 1,655 mg/kg
  - Toluene – 2,626 mg/kg
  - Mercury – 2,924 mg/kg

  As refined modeling will be performed during the remedial design, it is possible that these concentrations may be modified. However, the hot spot concentrations will be based on an assumed upwelling rate of 2.4 inches/year (6 cm/yr).

  If during the remedial design or construction it becomes apparent that concentrations (hot spots) exceeding these threshold values are present at depths greater than 3.3 ft (1 m) below the dredge cut, NYSDEC and EPA will evaluate the need for additional remediation (e.g., increase the cap thickness to contain those CPOIs to ensure cap effectiveness) in these areas of the ILWD.

The removal of an average of 6.5 ft (2 m) of materials and deeper removal in the area of the hot spots is expected to improve the reliability of capping of the ILWD. This removal will likely reduce the average contaminant concentrations, as well as the maximum concentrations of some of the contaminants, in the residual waste. Furthermore, the available data indicate that the remedy will result in the removal of a significant portion of the contaminant mass present within the ILWD.

The remedy will include additional dredging, if needed, to address geotechnical concerns with the ILWD. The nature of the sediments and/or wastes, as well as geophysical evidence of historical failures (i.e., underwater slumping or "landslides" associated with the ILWD), might require the removal of additional sediments and/or wastes or other engineering measures to ensure the long-term stability of the cap. Adequate data will be gathered during the remedial design to enable the determination of appropriate measures to ensure that the cap will be structurally sound and otherwise effective in all areas of the lake slated for remediation.

As the ILWD extends to some extent beyond SMU 1's boundary into SMUs 2 and 7, the removal and capping of the ILWD sediments and/or wastes in the adjacent SMUs will be performed in a similar fashion to SMU 1.

- **SMU 2** – Dredging of an estimated 403,000 cy (308,000 m^3) of sediments and/or wastes prior to capping. This includes dredging to remove NAPL to an estimated 30-ft (9-m) depth in the vicinity of the causeway (the assumed area of NAPLs is shown on Figure 4.26 of Honeywell's November 2004 FS), as well as dredging to shallower depths in other areas to prevent a loss of lake surface area, for erosion protection and to reestablish habitat. Dredging will also be performed to remove sediments and/or wastes from the portion of the ILWD which extends into SMU 2. The removal of these ILWD materials in SMU 2 will be performed consistent with how these materials will be addressed in SMU 1.

  Capping of approximately 16 acres in SMU 2. Capping effectiveness will rely upon the proper functioning of the hydraulic control system which will be installed, operated, monitored, and maintained as part of the Willis/Semet Barrier IRM (the design of which is underway).

- **SMU 3** – Dredging of an estimated 75,000 cy (57,000 m^3) of sediments and/or wastes prior to capping to maintain cap effectiveness (targeted dredging) in the absence of a hydraulic control system, to prevent a loss of lake surface area, for erosion protection and to reestablish habitat. Capping of approximately 29 acres.

  If data collected as part of the remedial design of the Onondaga Lake remediation indicate that the construction/operation of a hydraulic control system along the SMU 3 shoreline to maintain cap effectiveness (in lieu of the portion of dredging described above that is otherwise necessary to maintain cap effectiveness) would be at least as effective as the dredging described above, NYSDEC may allow the construction/operation of a hydraulic control system in place of a portion (that required to maintain cap effectiveness) of the dredging described above.

- **SMU 4** – Dredging of an estimated 135,000 cy (103,000 m^3) of sediments and/or wastes prior to capping to prevent a loss of lake surface area, for erosion protection and to reestablish habitat. Although mercury does not exceed the PEC in the surface sediment interval at all of the sampling stations in SMU 4, concentrations of mercury exceed the PEC at sediment intervals just below the surface in the top 3.3 ft (1 m) at all stations in this SMU. Since these surface sediments are subject to erosion, it is assumed that all of SMU 4 (approximately 75 acres) will require capping.

- **SMU 5** – Dredging of an estimated 140,000 cy (107,000 m^3) of sediments and/or wastes prior to capping to prevent a loss of lake surface area, for erosion protection and to reestablish habitat. Capping of approximately 60 acres.

  In SMU 5, there were a limited number of sampling locations where CPOI concentrations in sediment exceeded either the mean PECQ of 1 or the mercury PEC. The above remedial actions are proposed to address the estimated areas represented by these sample results. During remedial design, an additional investigation of the sediments in the vicinity of these locations will be conducted to delineate the extent of the actual sediment areas and volumes exceeding the mean PECQ of 1 or the mercury PEC. This further delineation will be used to determine the scope and extent of capping and/or dredging activities needed to address these limited areas.

- **SMU 6** – Dredging of an estimated 245,000 cy (187,000 m^3) of sediments and/or wastes prior to capping to maintain cap effectiveness (targeted dredging) in the absence of a hydraulic control system, to prevent a loss of lake surface area, for erosion protection and to reestablish habitat. Capping of approximately 123 acres.

  If data collected as part of the remedial design of the Onondaga Lake remediation indicate that the construction/operation of a hydraulic control system along the SMU 6 shoreline to maintain cap effectiveness (in lieu of the portion of the dredging described above that is otherwise necessary to maintain cap effectiveness) would be at least as effective as the dredging described above, NYSDEC may allow the construction/operation of a hydraulic control system in place of a portion (that required to maintain cap effectiveness) of the dredging described above.

- **SMU 7** – Dredging of an estimated 89,000 cy (68,000 m^3) of sediments and/or wastes prior to capping, to prevent a loss of lake surface area, for erosion protection and to reestablish habitat. Dredging will also be performed to remove sediments and/or wastes from the portion of the ILWD which extends into SMU 7. The removal of these ILWD materials will be performed consistent with how these materials will be addressed in SMU 1. The selected remedy also includes the construction/operation of a hydraulic control system along the SMU 7 shoreline to maintain cap effectiveness. Capping of approximately 38 acres.

  If data collected as part of the remedial design of the Onondaga Lake remediation indicate that targeted dredging in SMU 7 (in lieu of the construction/operation of a hydraulic control system described above) would be at least as effective as the hydraulic control system, NYSDEC may allow targeted dredging in place of a hydraulic control system for SMU 7.

- **SMU 8** – Thin-layer capping over an estimated 154 acres (approximately 8 percent) of the profundal area. The appropriate thickness and type of substrate for thin-layer capping will be determined during the remedial design. The suitability of thin-layer capping at the base of the ILWD in the profundal zone (SMU 8) will be reviewed during the remedial design based on extensive data to be collected as part of the pre-design program. An MNR program will be performed in the profundal area, as discussed further below.

A pilot study will be performed to evaluate the potential effectiveness of oxygenation at reducing the formation of methylmercury in the water column, while preserving the normal cycle of stratification within the lake. An additional factor which will be considered during the design of the pilot study will be the effectiveness of oxygenation at reducing fish tissue methylmercury concentrations. If supported by the pilot study results, the pilot study will be followed by full-scale implementation of oxygenation in SMU 8. Furthermore, potential impacts of oxygenation on the lake system will be evaluated during the pilot study and/or the remedial design of the full-scale oxygenation system.

- The isolation caps that will be constructed in the littoral zone (SMUs 1 through 7) will consist of various layers each of which serves a specific purpose. The first layer on top of the sediments is referred to as the mixing layer. The mixing layer addresses the fact that mixing takes place between sediments and the initial layer of cap material during actual cap placement. Above the mixing layer is the chemical isolation layer which “isolates” contaminants in the sediments below the cap. The chemical isolation layer will be a minimum of 12 inches (30 cm) thick. The thickness of the chemical isolation layer is determined, based on computer modeling, such that concentrations of contaminants within the sediments do not result in unacceptable levels of exposure to aquatic life . For any given contaminant, a concentration greater than the PEC of any of the CPOIs that have been shown to exhibit acute toxicity on a lakewide basis or NYSDEC sediment screening criteria for benzene, toluene, and phenol, is considered an unacceptable level of exposure. During the remedial design the actual thickness of the chemical isolation layer will be determined, based on additional sediment sampling and additional cap modeling.

  Above the chemical isolation layer is the habitat restoration layer. The habitat restoration layer will consist of a minimum thickness of 12 inches (30 cm) of suitable habitat material. The specific thickness(es) and type(s) of substrate material to be used for the habitat layer will be determined as part of the remedial design based on the comprehensive lakewide habitat restoration plan.

  Because of the limitations of computer modeling and other factors associated with cap construction, a 50 percent buffer or safety layer will be added during cap construction. The thickness of the overall cap is thereby increased by a thickness equal to 50 percent of the thickness of the chemical isolation layer. As part of the remedial design, a decision will be made as to what portion of the buffer layer will be considered part of the habitat restoration layer. The remaining portion of the buffer layer will be added to the modeled chemical isolation layer to represent the actual chemical isolation layer portion of the cap.

  An erosion (armor) layer will be included in the cap design/construction, where needed, and at a location between the chemical isolation layer and the habitat restoration layer.

  The point of compliance, with respect to ensuring that the isolation portion of the cap is effective in preventing unacceptable concentrations of contaminants (i.e. a concentration greater than the PEC of any of the CPOIs that have been shown to exhibit acute toxicity on a lakewide basis or NYSDEC sediment screening criteria for benzene, toluene, and phenol) from entering the habitat restoration layer portion of the cap, will be at the bottom of the habitat restoration layer.

  The remedial design will include flexibility in dredge depth (with regard to hot spot threshold concentrations as they may be modified as a result of the additional cap modeling that will be performed during the remedial design) and cap thickness so that cap effectiveness and cost effectiveness can be attained.

Predicted settlement of the cap will be determined based on pre-design sampling. The estimated settlement will be evaluated to determine if additional removal beyond that contained in the ROD is necessary in order to maintain an acceptable water depth.

The cap in the areas in front of Ninemile Creek and other tributaries will be designed to meet multiple objectives, including protecting against erosion forces from the tributary and from within the lake, providing a natural transition between fish and wildlife habitats in the lake and tributary, and ensuring that the cap will not disrupt the water flow into Onondaga Lake, including under 100-year-flow conditions. If it is determined during the pre-design investigation that the flow would be affected, additional dredging will be included to ensure that the impact to the flow is minimized to the extent practicable.

- Habitat reestablishment will be performed in areas where dredging/capping will occur. The habitat restoration layer with a minimum thickness of 12 inches (30 cm) will be placed on all areas capped within the littoral zone. The specific thickness(es) and type(s) of substrate material to be used for the habitat layer in these areas will be determined during the remedial design as part of the comprehensive lakewide habitat restoration plan.

- The design and construction of the remedy, including the habitat restoration layer, will need to meet the substantive requirements for permits associated with disturbance to state and federal regulated wetlands (e.g., 6 NYCRR Part 663, Freshwater Wetlands Permit Requirements) and navigable waters (e.g., 6 NYCRR Part 608, Use and Protection of Waters). The details for habitat restoration will be developed as part of the lakewide habitat restoration plan.

- The majority of the dredged sediments will be disposed in one or more SCAs constructed on one (or more) of the Solvay wastebeds. Based on evaluations to be conducted during the design, as well as during construction, it is likely that a portion of the dredged materials (e.g., NAPLs) will be treated and/or disposed of at an off-site permitted facility rather than at the SCA. The appropriate means for collecting and handling these sediments and materials will be determined during the remedial design. The FS report assumed that the SCA would be constructed on Wastebed 13 based on its capacity, as well as other factors. However, the actual Solvay wastebed location(s) on which the SCA(s) will be constructed will be determined during the remedial design and be based on an evaluation of the potential impacts on the local community, geotechnical stability of the wastebeds, SCA construction requirements, wastebed size, the means for transporting dredged materials to the SCA, costs, etc. This ROD assumes that preloading and stabilization of the wastebed materials will be required prior to construction of the SCA, but the extent to which preloading and stabilization will be required, if any, will be determined during the remedial design. The remedial design of the SCA will be undertaken in accordance with state and federal requirements and guidance and will include, at a minimum, the installation of an impermeable liner, leachate collection and treatment, and a cap.

- Treatment of water generated by the dredging/sediment handling processes as a result of dewatering of the sediments at the SCA. During the remedial design, NYSDEC will issue discharge limits (that will be protective of Onondaga Lake) that will need to be met by the treated water prior to its discharge (end of pipe) back to the lake. It is assumed that the water will require "advanced treatment" (which includes enhanced primary treatment, multimedia filtration, air stripping, and granular activated carbon treatment for additional VOC removal, and pH adjustment as defined in the FS report) in order to meet discharge limits. However, the actual treatment technologies needed to ensure compliance with discharge limits will be determined during the remedial design and might vary depending on the levels and types of contaminants present in lake sediments in various areas (or SMUs) of Onondaga Lake.

- Implementation of institutional controls including notification of appropriate government agencies with authority for permitting potential future activities which could impact the implementation and effectiveness of the remedy.

- Implementation of a long-term OM&M program to monitor and maintain the effectiveness of the remedy. The long-term monitoring will be performed to assess the effectiveness of the remedy in achieving the RAOs and PRGs and to ensure that the remedial technologies are performing as specified in the remedial design. The program will be designed to monitor and evaluate the effectiveness of the various remedy components including containment at the SCA, isolation capping, thin-layer capping, effectiveness of the groundwater control structures, oxygenation, MNR, and habitat reestablishment and enhancement. Types of monitoring which will likely be employed include sampling within the lake before, during, and following remediation, including sampling of biological tissue (e.g., fish, invertebrates), measurements of the effects on the environment (e.g., toxicity testing, community analysis), and sampling of surface water and sediments; sampling of the aquatic cap to determine its integrity (chemically and structurally), and sampling of the SCA to determine its integrity (chemically and structurally).

It will be certified on an annual basis that the institutional controls are in place and that remedy-related OM&M is being performed.

The selected remedy also includes habitat enhancement, an improvement of habitat conditions in areas where CERCLA contaminants do not occur at levels that warrant active remediation, but where habitat impairment due to stressors has been identified as a concern. Habitat enhancement will be utilized along an estimated 1.5 mi (2.4 km) of shoreline (SMU 3) and over approximately 23 acres (SMU 5) to stabilize calcite deposits and oncolites and promote submerged macrophyte growth. The habitat enhancement will be performed consistent with the lakewide habitat restoration plan. This component of the remedy is not intended to satisfy the requirements of CERCLA or the National Oil and Hazardous Substances Pollution Contingency Plan, but is included in order to address requirements of state law.

As part of the remedy, the BSQV of 0.8 mg/kg for mercury will be applied on an area-wide basis. The BSQV is a means to assess areas of the lake that may be contributing to exceedances of the fish tissue PRGs, which range from 0.14 to 0.3 mg/kg mercury. An additional investigation will be conducted during the remedial design to determine the appropriate areas within the lake for applying the BSQV and to determine whether the SWACs of mercury predicted to remain in the sediments following remediation of SMUs 1 through 7 and at the end of the 10-year MNR period will meet the BSQV. If this investigation indicates that mercury in surficial sediments in the applicable areas will exceed 0.8 mg/kg, then additional remedial measures (e.g., additional thin-layer capping in SMU 8 beyond the estimated 154 acres) will be implemented, as needed, during construction so that (after remediation in SMUs 1 through 7, and at the end of the 10-year MNR period in SMU 8) surficial sediment concentrations of mercury are predicted to meet 0.8 mg/kg on an area-wide basis.

The remedy will include MNR in SMU 8 to achieve the mercury PEC of 2.2 mg/kg in the profundal zone and to achieve the BSQV of 0.8 mg/kg on an area-wide basis within 10 years following the remediation of upland sources, littoral sediments, and initial thin-layer capping in the profundal zone. An investigation will be conducted during the remedial design to refine the application of an MNR model and determine any additional remedial measures (e.g., additional thin-layer capping) needed in the profundal zone.

The remedial design will include the collection of additional site data (e.g., sediment cores) to delineate in detail the various areas in which remedial activities will be performed, dredging areas and volumes, capping areas, etc. While hydraulic dredging was assumed for the purpose of the detailed evaluation in the FS report and this ROD, the actual dredging method(s) will be determined during the design.

During the remedial design, treatability studies (e.g., water treatment) will be performed if necessary.

The remediation of the Onondaga Lake subsite will need to be coordinated with upland remedial activities. The control of contamination migrating to the lake from the various upland sites (e.g., Willis Avenue, Semet Residue Ponds, Wastebed B/Harbor Brook, LCP Bridge Street, and Geddes Brook/Ninemile Creek) is an integral part of the overall cleanup of Onondaga Lake. To prevent the recontamination of lake sediments, active sources of contamination to a given portion of the lake will need to be shut off prior to performing cleanup activities in that area of the lake. For example, the hydraulic control systems which will be installed/operated as part of the Wastebed B/Harbor Brook and Willis/Semet Barrier IRMs will address the ongoing releases of contaminants from these upland areas to SMUs 1 and 2, respectively. These systems will need to be constructed and operating prior to cleanup activities commencing in this part of the lake.

Furthermore, the effectiveness of the capping of SMUs 1 and 2 will rely upon the proper functioning of these hydraulic control systems. Likewise, the effectiveness of capping in SMU 7 will rely upon the proper functioning of the hydraulic control system which will be installed along the lakeshore as part of the remedy for this portion of the lake. Therefore, the timing of remedial activities in Onondaga Lake will need to be coordinated with the remedial work which will be performed as part of the interim and final remedies at these upland sites.

Cultural resource investigations conducted pursuant to the NHPA are ongoing. A draft Phase 1A Cultural Resource Assessment for the project area was produced in October 2004; this report noted the likelihood that the proposed project might encounter both recorded and unrecorded prehistoric and historic resources. Consequently, it is likely that once the area of remedial impact becomes established, additional cultural resource investigations will be required before the remedy is implemented.

A draft wetlands & floodplains assessment for this project was completed in October 2004, the first step towards a comprehensive wetlands and floodplains assessment as described under EPA's Policy on "Floodplains & Wetlands Assessments for CERCLA Actions" (1985). Since various project elements had not been designed and other wetlands and floodplains impacts were still being assessed at that time, the report will need to be updated as appropriate during the remedial design.

The updated assessment will be included as an appendix to the final remedial design document in its entirety.

Because this remedy would result in contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure to site media, CERCLA requires that the site be reviewed at least once every five years. The five-year review will evaluate the results from monitoring programs established as part of this remedy to ensure that the remedy remains protective of human health and the environment.

Summary of the Estimated Remedy Costs

The cost for the selected remedy is $451,000,000. This total cost estimate is comprised of capital costs of $414,000,000 and annual O&M costs of $3,000,000 (or $37,000,000 in O&M present-worth costs).

The cost estimates presented in this ROD are based upon capital (construction) costs and the present-worth of the annual O&M costs calculated using a discount rate of 7 percent and a 30-year time interval. The actual costs will vary depending on the specifications contained in the detailed remedial design. Further, the actual costs will also vary because the cost estimates provided are developed conservatively and have an accuracy of +50 percent to -30 percent, in compliance with the 1988 EPA guidance document, "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA."

In addition to the preceding information, see Tables 15 and 16 entitled "Cost Estimate Input Data for Selected Remedy" and "Cost Summary for Selected Remedy," respectively.

Expected Outcomes of the Selected Remedy

The results of the HHRA indicate that the site, if left unremediated, presents an unacceptable noncancer hazard and an increased cancer risk to recreational users of the lake due to consumption of contaminated fish and may present unacceptable cancer risks for some recreational visitors exposed to nearshore sediment in the lake. The results of the BERA indicate that comparisons of measured tissue concentrations and modeled doses of chemicals to toxicity reference values show exceedances of hazard quotients for site-related chemicals throughout the range of the point estimates of risk. Site-specific sediment toxicity data indicate sediments are toxic to benthic macroinvertebrates on both an acute and chronic basis.

The State of New York, Onondaga County, and the City of Syracuse have jointly sponsored the preparation of a land-use master plan to guide future development of the Onondaga Lake area (Reimann-Buechner Partnership, 1991). The primary objective of land-use planning efforts is to enhance the quality of the lake and lakeshore for recreational and commercial uses. Implementation of the remedy will aid this long-term planning effort by reducing or eliminating concerns related to human exposure to contaminated sediments and surface water.

Under the selected remedy, it is estimated that concentrations of contaminants in fish will be reduced within ten years following completion of remedial activities. Potential risks to humans who consume fish and existing and potential future adverse ecological effects on fish and wildlife resources will be eliminated or reduced as contaminant levels fall. Fish tissue data from post-remedial monitoring can be used to document improvements in the lake, and to support reevaluation of the NYSDOH fish consumption advisory.

STATUTORY DETERMINATIONS

Under CERCLA Section 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, or contaminants at a site.

For the reasons discussed below, NYSDEC and EPA have determined that the selected remedy meets these statutory requirements.

Protection of Human Health and the Environment

The selected remedy will be protective of human health and the environment in that all RAOs and PRGs will be met through the implementation of this remedy in combination with the remediation of the upland subsites and impacted tributaries both directly and indirectly by reducing the external inputs to the lake, reducing and isolating the contaminant inventories in the lake, and by eliminating or reducing internal processes (e.g., methylation in the anoxic waters, resuspension of contaminated wastes/sediments) in the lake. While a mechanistic model does not exist to predict the behavior of mercury and other CPOIs in the lake after remediation, the predicted reductions (on the order of 90 percent) in inputs and inventories are expected to reduce the exposures and uptake of contaminants in humans and wildlife. BSQVs were developed for Onondaga Lake to provide a conservative total mercury concentration in sediments below which bioaccumulation is expected to be low enough to result in mercury concentrations in fish that are protective for human and wildlife consumption. These values are based on the average littoral zone and lakewide mercury sediment concentrations, since fish are mobile and may be exposed to various locations in the lake. A BSQV of 0.8 mg/kg for mercury based on the most sensitive receptor, the river otter, is considered protective of all adult human and ecological receptors modeled in the Onondaga Lake risk assessments.

Following implementation of the selected remedy, the average mercury concentration in the littoral zone, the primary foraging area for birds and mammals, is predicted to be about 0.5 mg/kg, a reduction of 86 percent from the current average mercury concentration in the littoral zone (3.5 mg/kg). On a lakewide basis, the average mercury concentration is predicted to be about 1 mg/kg, a reduction of 67 percent from the current average mercury concentration for the entire lake (2.9 mg/kg). While this concentration is higher than the BSQV of 0.8 mg/kg, it should be noted that virtually all data on mercury surface sediment concentrations used to establish baseline conditions for the profundal zone are from 1992 and therefore would not account for reductions in mercury concentrations attributable to natural recovery from 1992 to the present. Therefore, following implementation of the selected remedy, the average lakewide mercury concentration may be less than 1 mg/kg. Additional data will be collected as a part of the remedial design process, and these data will be used in future predictions of natural recovery. Additional remedial measures (e.g., additional thin-layer capping) will be implemented in profundal areas that do not achieve acceptable goals (e.g., achieving the mercury BSQV of 0.8 mg/kg, achieving PRGs for fish ranging from 0.14 to 0.3 mg/kg) during the 10-year MNR period or sooner if data indicate this goal will not be achieved as anticipated.

The implementation of the selected remedy will not pose unacceptable short-term risks or cross-media impacts that cannot possibly be mitigated.

Compliance with ARARs and Other Environmental Criteria

Since there are currently no federal or state promulgated standards for contaminant levels in sediments, the ER-Ls, mean PECQ of 1, and mercury PEC were used as “To-Be-Considered” criteria. A summary of action-specific, chemical-specific, and location-specific ARARs, as well as TBCs, which will be complied with during implementation of the selected remedy, is presented below.

Action-Specific ARARs:

- National Emissions Standards for Hazardous Air Pollutants (40 CFR Parts 51, 52, and 60)
- 6 NYCRR Part 257, Air Quality Standards
- 6 NYCRR Part 200, New York State Regulations for Prevention and Control of Air Contamination and Air Pollution
- 6 NYCRR Part 376, Land Disposal Restrictions
- Resource Conservation and Recovery Act (42 U.S.C. § 6901, *et seq.*)
- Clean Water Act Sections 301-304 and 307
- Clean Water Act Section 404
- Rivers and Harbors Act Section 10
- Fish and Wildlife Coordination Act, 16 USC § 662

Chemical-Specific ARARs:

- Safe Drinking Water Act (SDWA) MCLs and nonzero MCL Goals (40 CFR Part 141)
- 6 NYCRR Parts 700-705 Groundwater and Surface Water Quality Regulations
- 6 NYCRR Part 703, New York State Surface Water Quality Standards

Location-Specific ARARs:

- Fish and Wildlife Coordination Act, 16 U.S.C. 661
- New York State Environmental Conservation Law, Article 24, Freshwater Wetlands
- 6 NYCRR Part 663, Freshwater Wetlands Permit Requirements Regulations
- New York State Environmental Conservation Law, Article 15, Use and Protection of Waters
- 6 NYCRR Part 608, Use and Protection of Waters
- EPA’s 1985 Policy on Floodplains and Wetland Assessments for CERCLA Actions
- EPA’s Protection of Wetlands Executive Order 11990
- EPA’s Floodplain Management Executive Order 11988
- National Historic Preservation Act

Other Criteria, Advisories, or Guidance TBCs:

- New York Guidelines for Soil Erosion and Sediment Control
- New York State Air Cleanup Criteria, January 1990
- SDWA Proposed MCLs and nonzero MCL Goals
- NYSDEC Technical and Operational Guidance Series 1.1.1, November 1991
- NYSDEC Guidelines for the Control of Toxic Ambient Air Contaminants, DAR-1, November 12, 1997
- NYSDEC Technical Guidance for Screening Contaminated Sediments, January 1999

A summary of the action-specific, chemical-specific, and location-specific ARARs, as well as TBCs, is also presented in Tables 17 through 22.

Cost-Effectiveness

A cost-effective remedy is one whose costs are proportional to its overall effectiveness (NCP §300.430(f)(1)(ii)(D)). Overall effectiveness is based on the evaluations of: long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness. Based on the comparison of overall effectiveness (discussed above) to cost, the selected remedy meets the statutory requirement that Superfund remedies be cost-effective in that for a reasonable increase in cost, it affords a greater degree of permanence and reliability than does the lower-cost action alternatives, and it will achieve the remediation goals in a reasonable time frame.

Each of the alternatives has undergone a detailed cost analysis. In that analysis, capital and annual O&M costs have been estimated and used to develop present-worth costs. The cost estimates presented in this ROD are based upon capital (construction) costs and the present-worth of the annual O&M costs calculated using a discount rate of 7 percent and a 30-year time interval.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

NYSDEC and EPA have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the site. Of the alternatives that are protective of human health and the environment and comply with ARARs, NYSDEC and EPA have determined that the selected remedy provides the best balance of trade-offs in terms of the five balancing criteria set forth in NCP §300.430(f)(1)(i)(B), while also considering the statutory preference for treatment as a principal element and the bias against off-site disposal without treatment and further considering support agency and community acceptance.

Implementation of the selected remedy will greatly reduce the mass of mercury and other CPOIs in the sediments and lower the average contaminant concentrations in surface sediments, which in turn will reduce contaminant levels in the water column and fish and other biota, thereby reducing the level of risk to humans and ecological receptors.

Preference for Treatment as a Principal Element

EPA's statutory preference for treatment of principal threat materials has been considered as part of this remedy. Given the extraordinary volume of materials being evaluated (e.g., greater than

4,000,000 cy [3,060,000 m^3] of sediments and wastes within the ILWD, some of which contain NAPLs), treatment of all principal threat wastes (which are present in various portions of the ILWD) is impracticable. However, the off-site treatment and/or disposal of all NAPLs that will be segregated during the dredging/handling process (The appropriate means for collecting and handling these materials will be determined during the remedial design), and oxygenation in the hypolimnion to address mercury methylation in the lake, are critical components of the selected remedy which meet EPA's treatment preference.

Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure to site media, a statutory review will be conducted within five years after initiation of remedial action. The five-year review will evaluate the results from monitoring programs established as part of this remedy to ensure that the remedy remains protective of human health and the environment.

DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan, released for public comment on November 29, 2004, identified Alternative 4 (Dredging the In-Lake Waste Deposit to an average 2 m [6.5 ft] depth with Additional Removal in Areas of Hot Spots [to an additional 1 m [3.3 ft] in depth] in the In-Lake Waste Deposit, Isolation Capping of the In-Lake Waste Deposit; /Dredging for No Loss of Lake Surface Area and for Erosion Protection and to Reestablish Habitat, Isolation Capping in SMUs 2-7; Targeted Dredging to 9 m (30 ft) depth for NAPL removal in SMU 2; Targeted Dredging in SMUs 3 and 6; and Phased Thin Layer Capping, Oxygenation, Monitored Natural Recovery in SMU 8) as the preferred remedy. Based upon review of the written and oral comments submitted during the public comment period, NYSDEC and EPA determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

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APPENDIX I

FIGURES

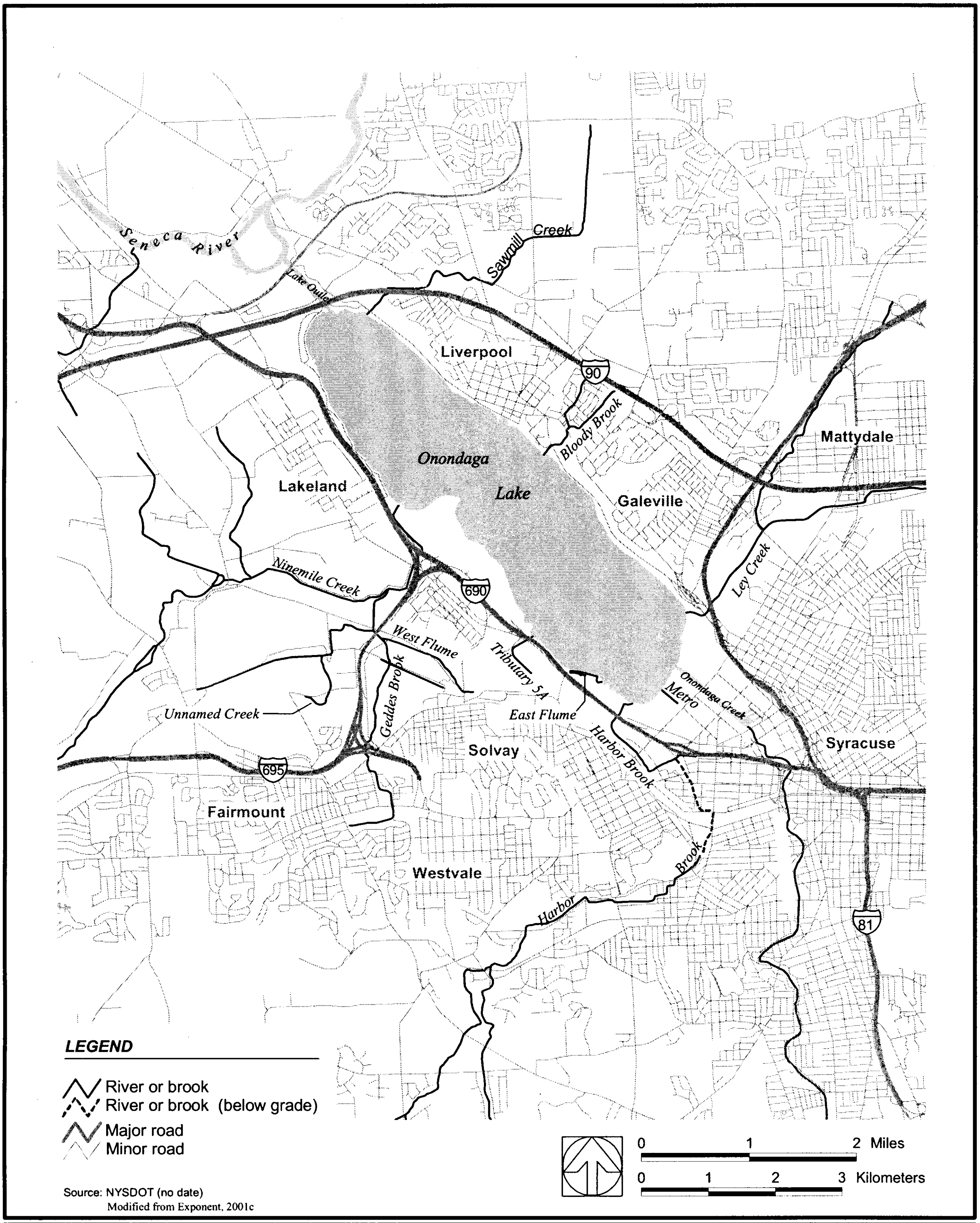


Figure 1 Onondaga Lake Area Tributaries and Roads

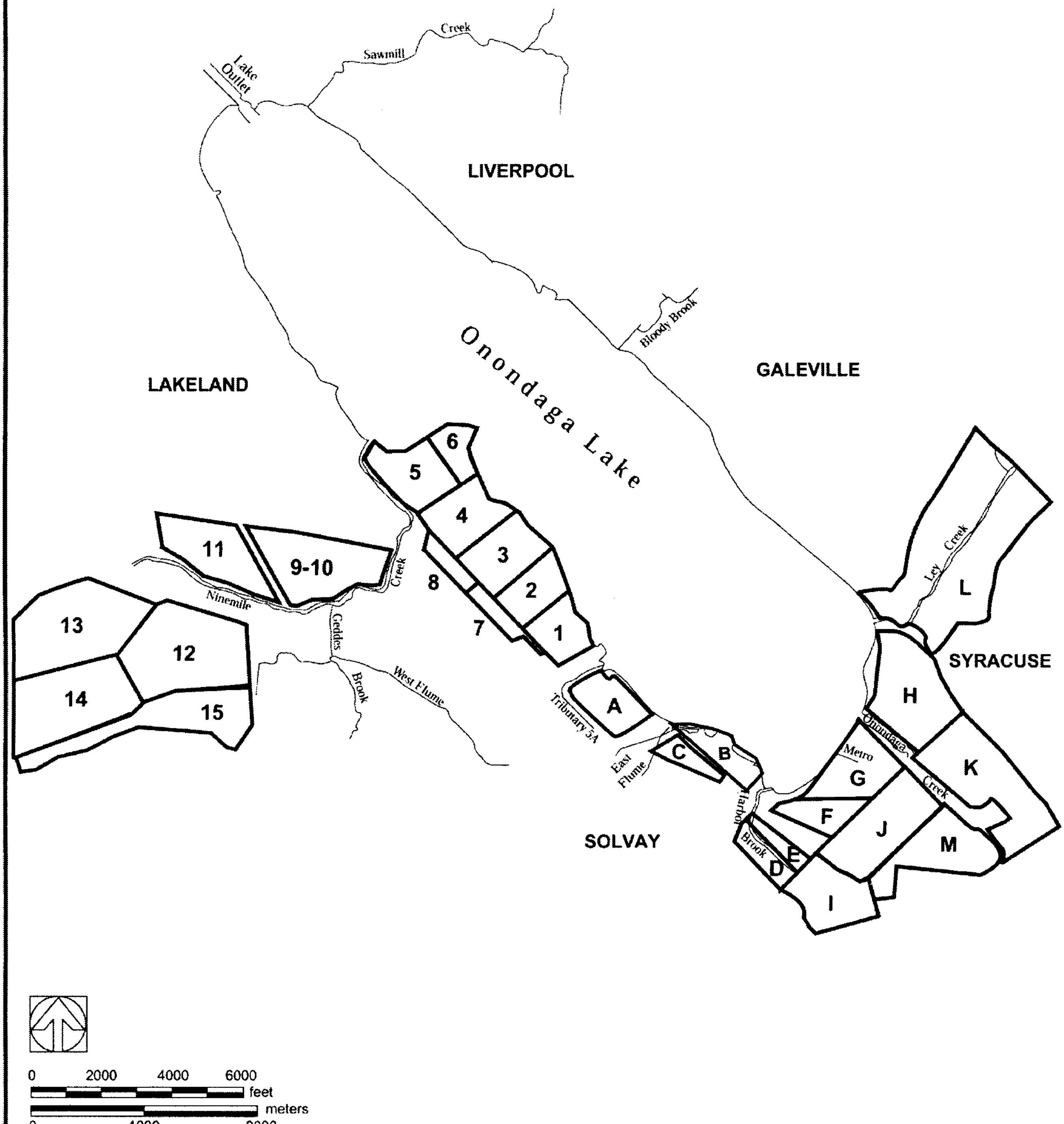
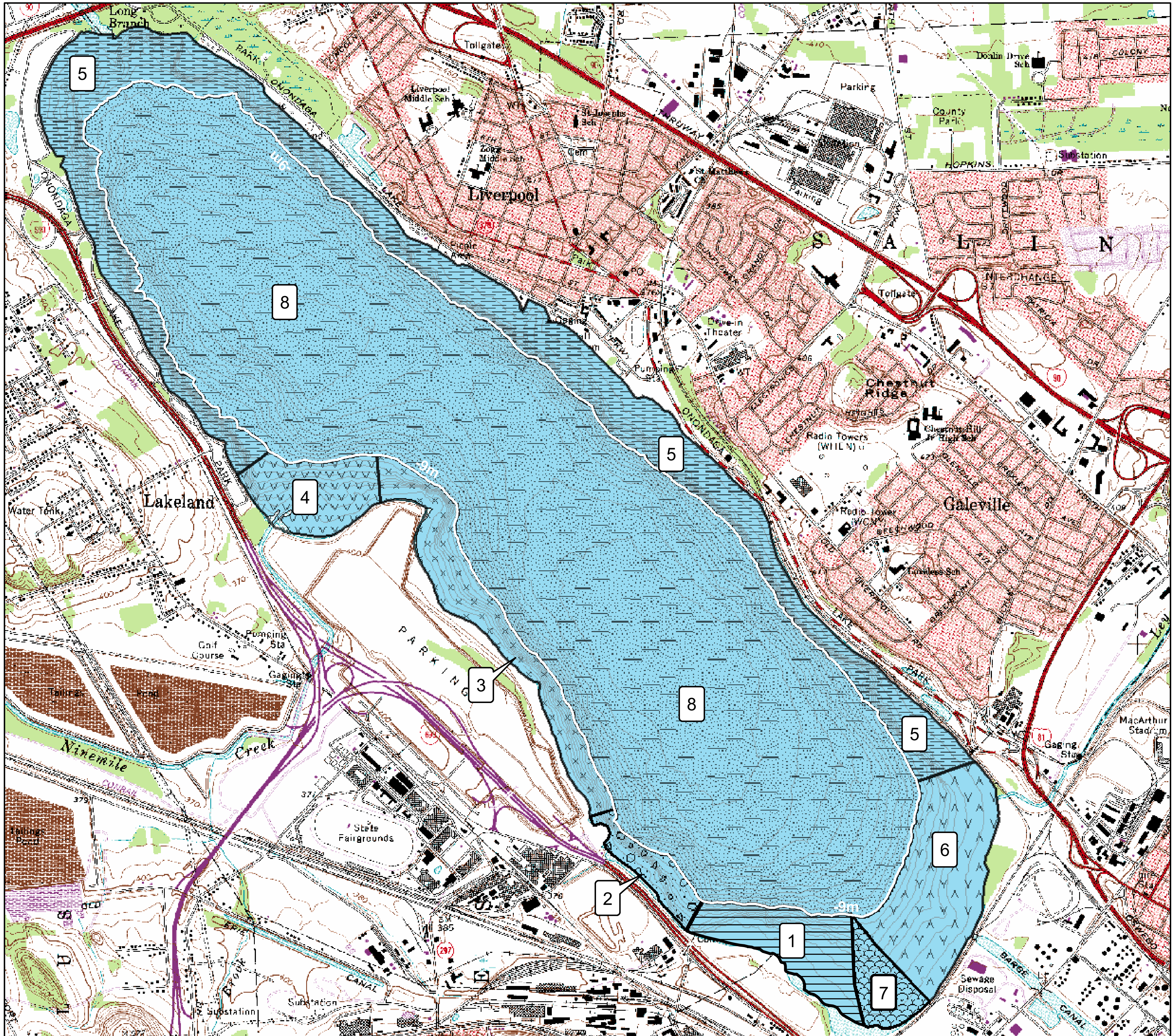


Figure 2: Historical Locations of Solvay Wastebeds



SMU 1 - In-Lake Waste Deposit (ILWD)

SMU 2 - Causeway

SMU 3 - Wastebeds 1 through 8

SMU 4 - Mouth of Ninemile Creek

SMU 5 - Northern Shore

SMU 6 - Ley Creek to 700 ft south of Onondaga Creek

SMU 7 - 700 ft south of Onondaga Creek to the ILWD

SMU 8 - Profundal Area

NOTES

1. Bathymetric contour (9 meter) highlighted in white

2. Boundary between littoral and profundal zone is the 9 meter contour.

0 1,500 3,000
Feet

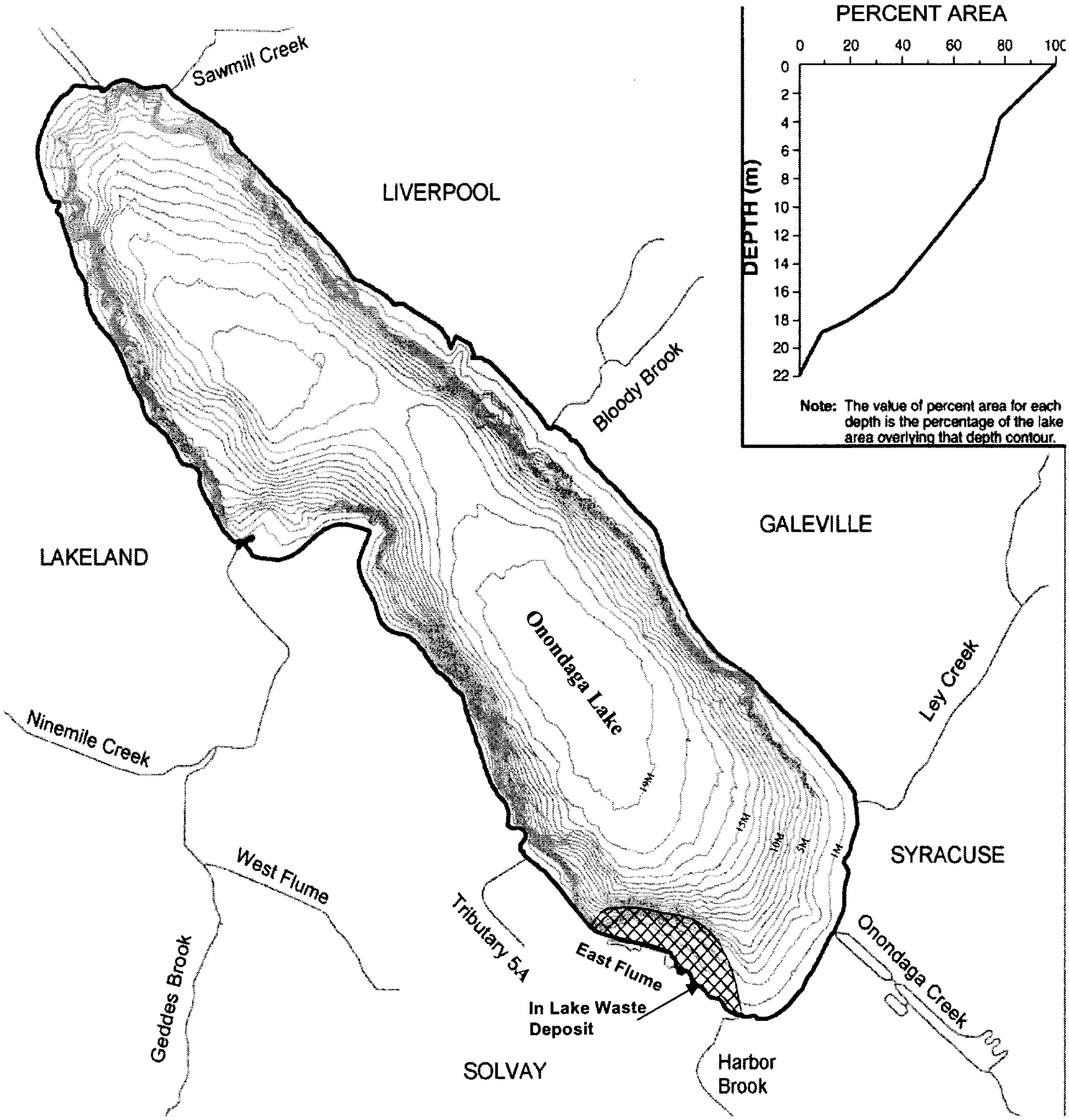
1:25,000

N

Figure 3

Sediment Management Units (SMUs)

C:\Projects\Onondaga Lake_SMUS\Figures\Fig 2-1 All SMU (10-1-04).mxd - 10/1/2004 @ 3:10:11 PM



Bathymetry is in 1 meter intervals.

Water surface elevation is 363.39 Feet (110.76 Meters) above mean sea level

Figure 4

ONONDAGA LAKE
SYRACUSE, NEW YORK

Approximate Location of the In-Lake Waste Deposit

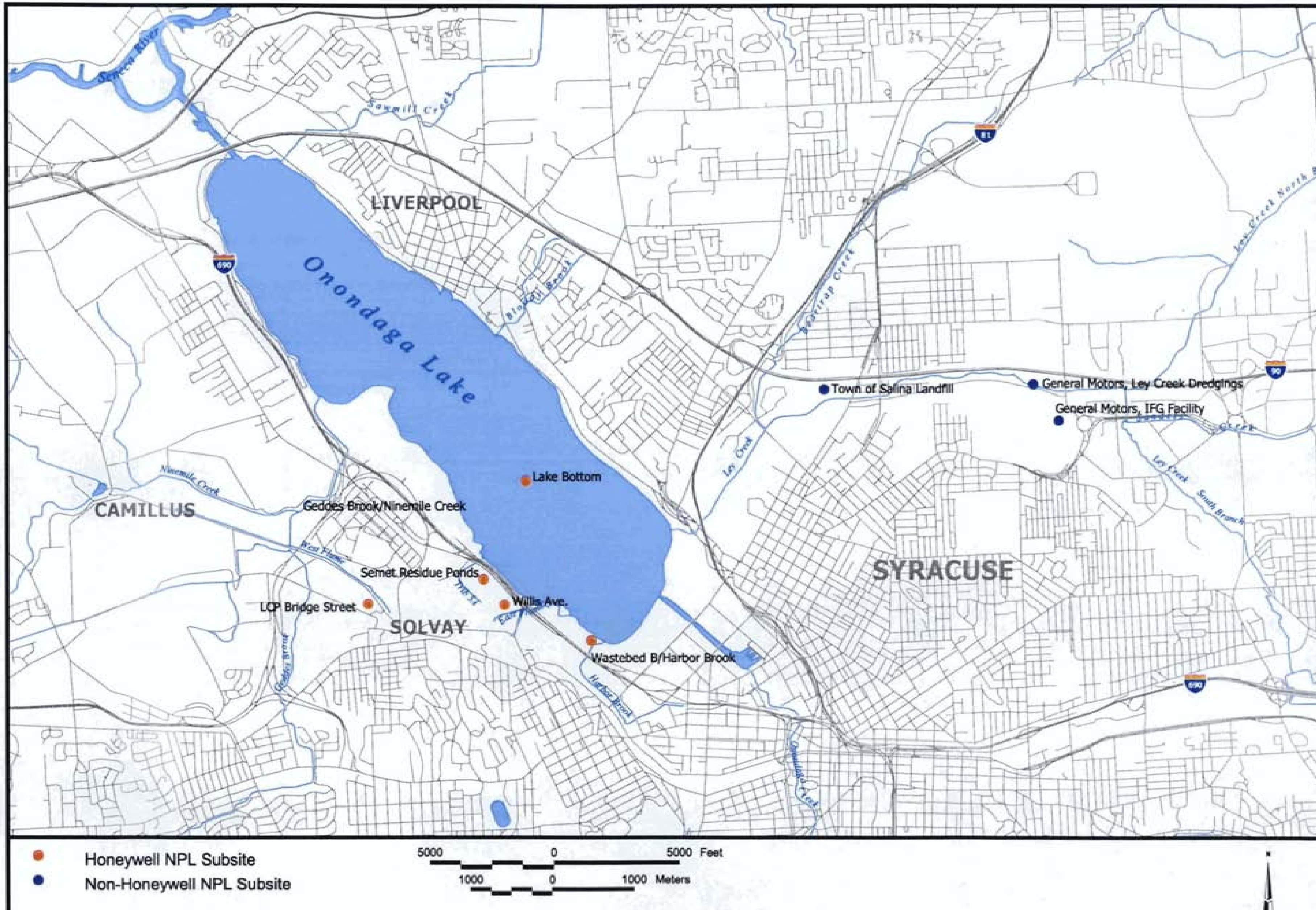


Figure 5: Location of Onondaga Lake NPL Subsites

Figure 6: Aerial View of Onondaga Lake

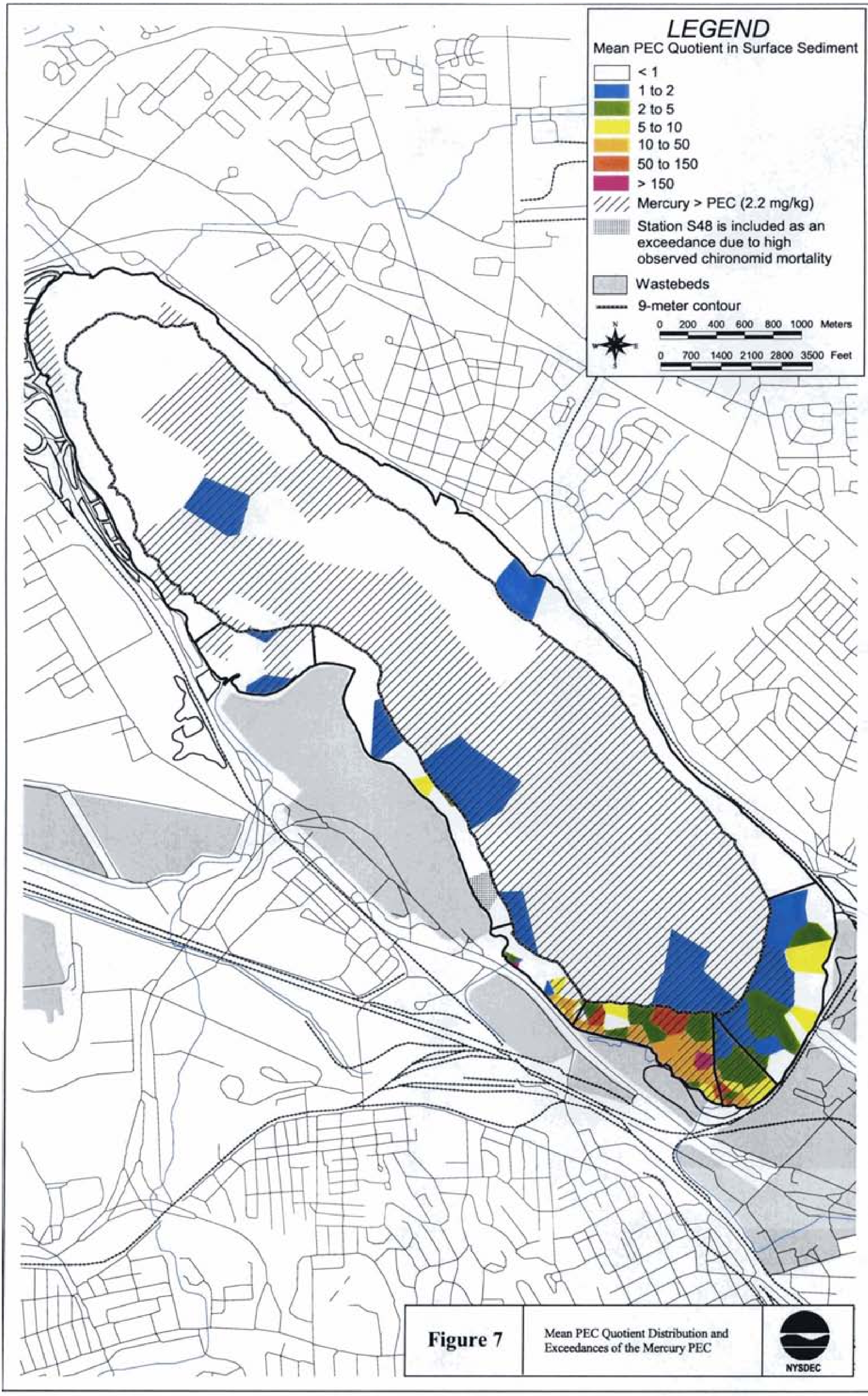


Figure 7 Mean PEC Quotient Distribution and Exceedances of the Mercury PEC

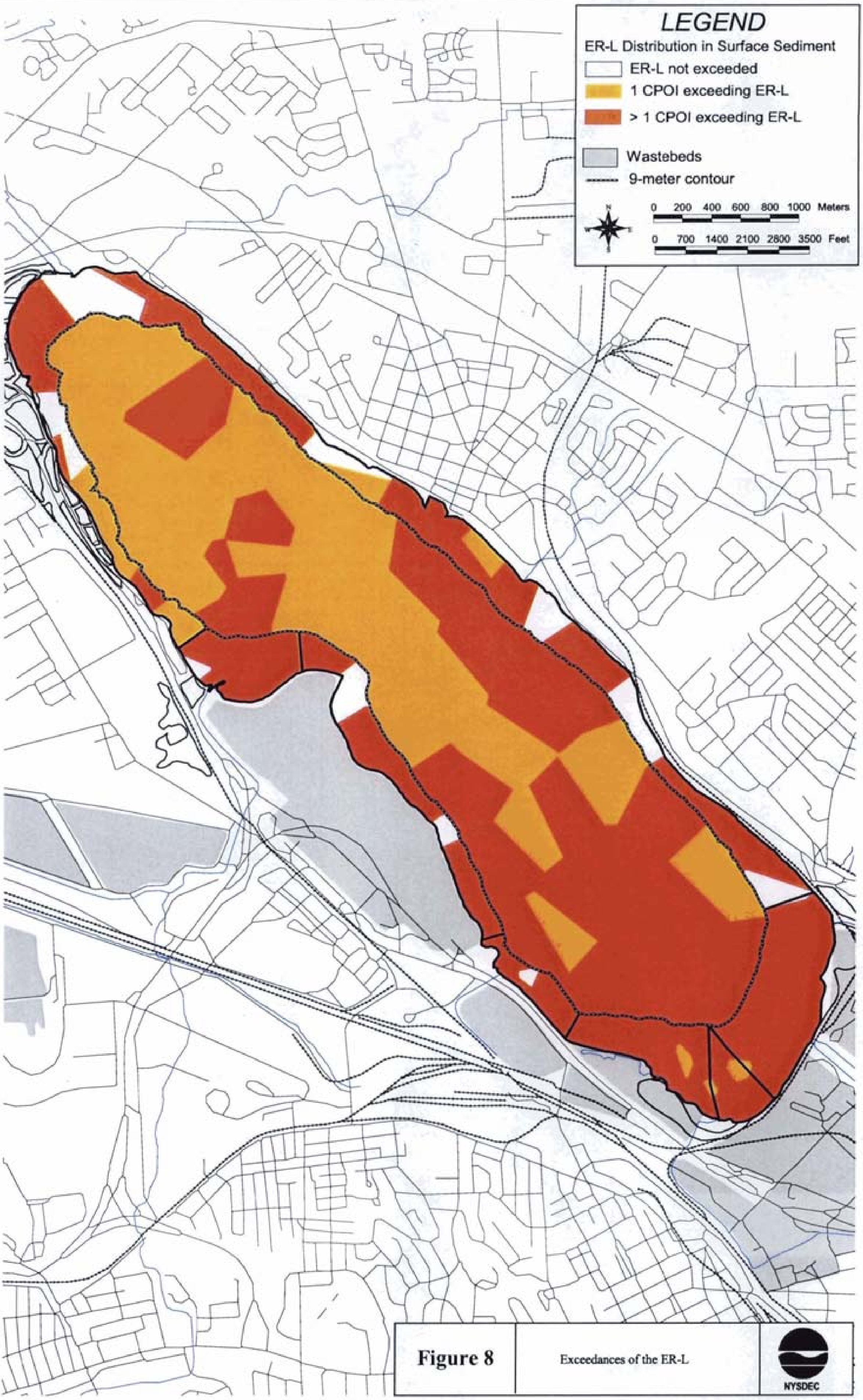
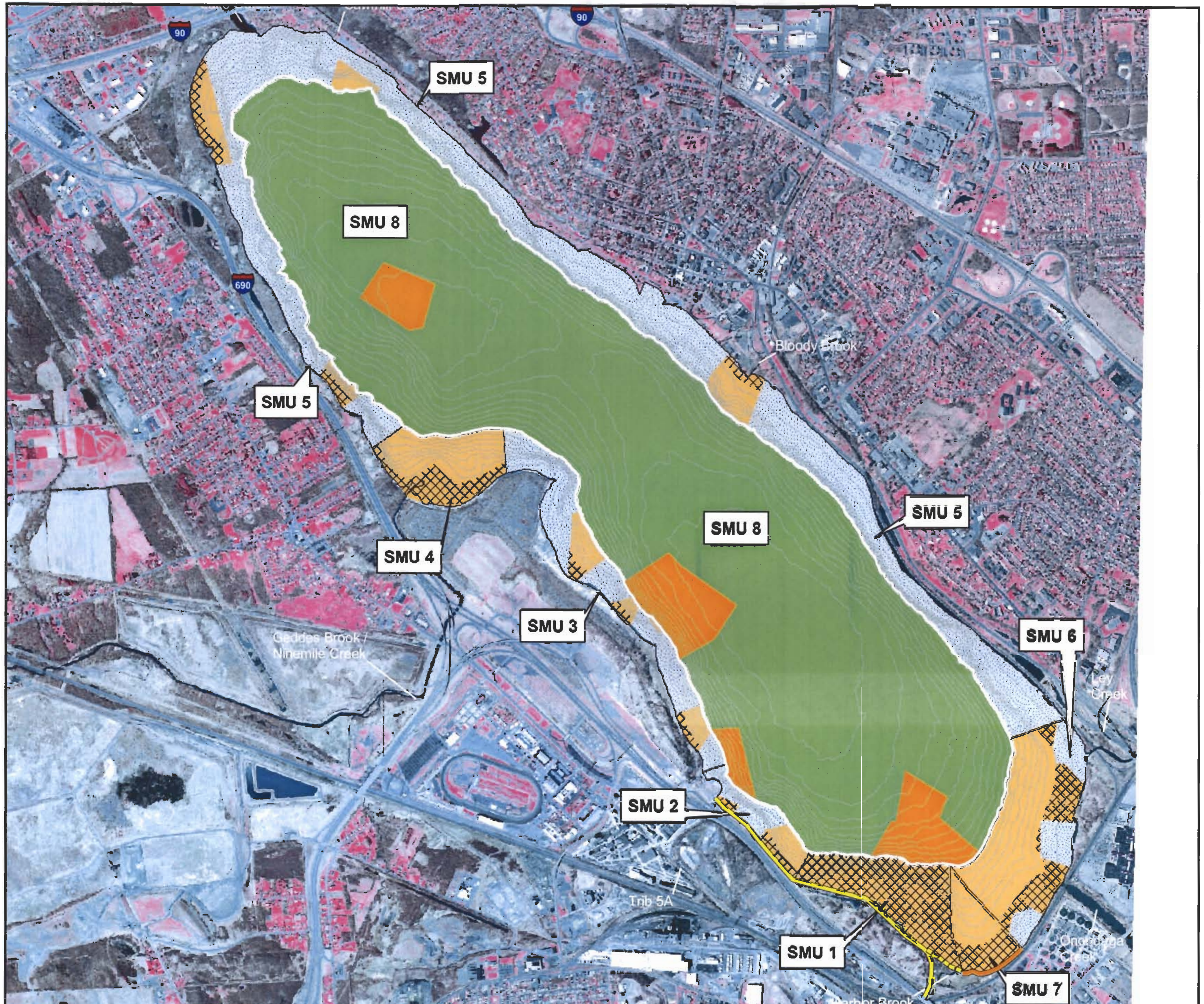


Figure 8 Exceedances of the ER-L



Littoral Areas Not Requiring Remediation

Conceptual Isolation Capping Areas

Conceptual Thin Layer Capping Areas

Conceptual Areas to be Dredged

Profundal Area Monitored Natural Recovery and Oxygenation

SMU 7 Barrier Wall (Location is Conceptual)

Willis/Semet-Wastebed B/Harbor Brook Barrier Wall (Part of Interim Remedial Measure, Location is Conceptual. Dashed Section to be determined as part of design.)

NOTES

1. Profundal bathymetric boundary at 30 ft (9m) highlighted in white

2. Boundary between SMUs shown as black line

3. Bathymetric contours are at 1-meter intervals based on current bathymetry

4. SMU = Sediment Management Unit

5. Actual areas of capping and dredging will be determined as part of the Remedial Design.

N

0 750 1,500 3,000 4,500 6,000 Feet

Figure 9
Onondaga Lake Selected Remedy

Onondaga Lake
Syracuse, New York

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APPENDIX II

TABLES

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

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

Table 1 (cont.)

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

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

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

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

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

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

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

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

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

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

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

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

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

Table 5 (cont.)

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

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

ND=not detected
NA=not analyzed

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

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

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

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

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

Table 7: Concentrations of Select Contaminants in Onondaga Lake Fish

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

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

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

Table 8

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

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

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

Key

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

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

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

Table 9

Non-Cancer Toxicity Data Summary

Ingestion

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

Key

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

Summary of Toxicity Assessment

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

Table 10

Cancer Toxicity Data Summary

Ingestion

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

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

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

Summary of Toxicity Assessment

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

Table 11

Page 1

Risk Characterization Summary - Carcinogens (Reasonable Maximum Exposure)

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

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

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

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

Table 11

Page 2

Risk Characterization Summary - Carcinogens (Reasonable Maximum Exposure)

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

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

Key

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

Risk Characterization

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

Table 12

Page 1

Risk Characterization Summary - Noncarcinogens (Reasonable Maximum Exposure)

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

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

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

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

Table 12

Page 2

Risk Characterization Summary - Noncarcinogens (Reasonable Maximum Exposure)

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

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

Risk Characterization

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

Table 13

Contaminants Used in Mean PEC Quotient for Onondaga Lake

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

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

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

TABLE 15
COST ESTIMATE INPUT DATA FOR SELECTED REMEDY

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

SCA Size	232	AC
SCA Dike Height	14	FT

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

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

TABLE 16
COST SUMMARY FOR SELECTED REMEDY

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

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

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

TABLE 17

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

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

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

TABLE 18

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

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

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

TABLE 19

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

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

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

TABLE 20

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

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

TABLE 21

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

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

Medium/Authority	Citation	Status	Requirement Synopsis
Resource Conservation and Recovery Act 42 USC s/s 6901 et seq. (1976) Subtitle C – Wastes	40 CFR Part 261	ARAR	Identification and listing of hazardous waste
Resource Conservation and Recovery Act 42 USC s/s 6901 et seq. (1976)	40 CFR Part 262	ARAR	Standards applicable to generators of hazardous waste
Resource Conservation and Recovery Act 42 USC s/s 6901 et seq. (1976)	40 CFR § 262.11	ARAR	Hazardous waste determination
Resource Conservation and Recovery Act, 42 USC s/s 6901 et seq. (1976)	40 CFR Part 262.34	ARAR	Standards for Hazardous Waste Generators, 90-Day Accumulation Rule

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

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

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

TABLE 22

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

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

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

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

APPENDIX III

ADMINISTRATIVE RECORD INDEX

Administrative Record Index
Onondaga Lake Site

APPENDIX III

(New York State Inactive Hazardous Waste Disposal Site #7-34-030)

RI/FS Activities	Document*
Remedial Investigation / Feasibility Study Work Plans	Onondaga Lake RI/FS Sampling and Analysis Plan. Volume 1: Field Sampling Plan. PTI Environmental Services (1991) Onondaga Lake RI/FS Sampling and Analysis Plan. Volume 2: Quality Assurance Project Plan. PTI Environmental Services (1991) Onondaga Lake RI/FS Work Plan. PTI Environmental Services (1991) Onondaga Lake RI/FS Sediment Processes Study Work Plan and Sampling and Analysis Plan. PTI Environmental Services (1992) Onondaga Lake Site Health Assessment, ATSDR (July 24, 1995) Citizen Participation Plan for the Onondaga Lake National Priority List Site (1996) Supplemental Mercury Methylation and Remineralization Studies Work Plan. PTI Environmental Services (1996) Onondaga Lake RI/FS Supplemental Lake Water Sampling Work Plan. Exponent (1999) Onondaga Lake RI/FS Supplemental Data Phase 2A Work Plan and Dredge Material Disposal Area Addendum. Exponent (2000) Work Plan for Supplemental Sampling in Onondaga Lake – 2001. Onondaga Lake RI/FS. TAMS (2001)

Remedial Investigation Reports	Onondaga Lake RI/FS Site History Report. PTI Environmental Services (1992) Onondaga Lake RI/FS Geophysical Survey Report. PTI Environmental Services (1992) Onondaga Lake RI/FS Bioaccumulation Investigation Data Report. PTI Environmental Services (1993) Onondaga Lake RI/FS Ecological Effects Investigation Data Report. PTI Environmental Services (1993) Onondaga Lake RI/FS Mercury and Calcite Mass Balance Investigation Data Report. PTI Environmental Services (1993) Onondaga Lake RI/FS Substance Distribution Investigation Data Report. PTI Environmental Services (1993) Onondaga Lake RI/FS Reference Lake Selection Report (1993) Onondaga Lake RI/FS Supplemental Mercury Methylation and Remineralization Studies Data Report. PTI Environmental Services (1997) New York State's Revision of the Onondaga Lake Calcite Modeling Report. NYSDEC/TAMS (1998) New York State's Revision of the Onondaga Lake Mercury Modeling Report. NYSDEC/TAMS (1998)
Remedial Investigation Reports (cont.)	Onondaga Lake Baseline Ecological Risk Assessment. Prepared by TAMS and YEC for New York State Department of Environmental Conservation (December 2002) Volume 1: Text, Tables, and Figures Volume 2: Appendices Onondaga Lake Human Health Risk Assessment Report. Prepared by TAMS and YEC for New York State Department of Environmental Conservation (December 2002) Volume 1: Text, Tables, Figures and Appendices A-D Volume 2: Appendix E Onondaga Lake Remedial Investigation Report. Prepared by TAMS and YEC for New York State Department of Environmental Conservation (December 2002) Volume 1: Text, Tables, and Figures Volume 2: Appendices A-D Volume 3: Appendices E-I

Feasibility Study	Onondaga Lake RI/FS Preliminary Overview of Sediment Remediation Alternatives (1992) Letter from Timothy J. Larson and Andrew J. Gershon regarding the May 2003 draft Feasibility Study Report (November 28, 2003) Draft Feasibility Study Report for Onondaga Lake. Parsons (May 2004) Volume 1: Executive Summary and Sections 1-6 Volume 2: Appendices A-G Volume 3: Appendices H-N Responses to NYSDEC Comments on Onondaga Lake Draft Feasibility Study Report (May 2004) E-mail from Jim Nicotri regarding Action Item #10, SMU Boundaries (May 27, 2004) E-mail from Timothy J. Larson regarding Action Item #10, SMU Boundaries (June 1, 2004) Memo from Tom Drachenberg regarding Action Item #23, ECL Article 15 and NYCRR Part 608 (June 8, 2004) E-mail from Ed Glaza regarding Backup Info on SMU 1 Hotspots Table (October 25, 2004). Letter from Donald J. Hesler regarding responses to Tom Drachenberg's June 8, 2004 memo regarding Action Item #23, ECL Article 15 and NYCRR Part 608 and Ed Glaza's October 25, 2004 email regarding Backup Information on SMU 1 Hotspots Table (June 30, 2005) E-mail from Don Hesler regarding NYSDEC comments on Appendix H (August 12, 2004). E-mail from Timothy J. Larson regarding NYSDEC comments on Appendices J and K (August 12, 2004). E-mail from Timothy J. Larson regarding NYSDEC comments on Section 5 and Appendix I (August 27, 2004). E-mail from Timothy J. Larson regarding NYSDEC comments on Sections 1 -4, Appendices A, B, G, and M (August 30, 2004). E-mail/Letter from Timothy J. Larson regarding NYSDEC comments on Draft Final Appendices E and F, and on Narrative Summaries Associated with Section 4 and Appendices D, H, I, J, and N (September 8, 2004). E-mail/Letter from Donald J. Hesler regarding NYSDEC comments on Narrative Summaries Associated with Section 5 and Appendices K and L (September 15, 2004). E-mail/Letter from Timothy J. Larson regarding NYSDEC comments on Appendix D (September 30, 2004). E-mail/Letter from Timothy J. Larson regarding NYSDEC comments on Appendix N (October 7, 2004).

Feasibility Study (Cont.)	E-mail/Letter from Timothy J. Larson regarding NYSDEC comments on Draft Final Appendix I (October 22, 2004). E-mail/Letter from Timothy J. Larson regarding NYSDEC comments on Draft Final Appendices J, K, L, and M (October 25, 2004). E-mail/Letter from Timothy J. Larson regarding NYSDEC comments on Draft Final Section 4 (November 8, 2004). E-mail/Letter from Timothy J. Larson regarding NYSDEC comments on Draft Final Section 5 (November 11, 2004). Draft Feasibility Study Report for Onondaga Lake. Parsons (November 2004)** Volume 1: Executive Summary and Sections 1-6 Volume 2: Appendices A-G Volume 3: Appendices H-N
National Remedy Review Board	NRRB Presentation Package (January 2005) National Remedy Review Board Recommendations for the Onondaga Lake Superfund Site (February 18, 2005) Response to National Remedy Review Board Recommendations for the Lake Bottom Sub-Site of the Onondaga Lake Superfund Site (March 25, 2005)
Proposed Plan Released Start of Public Comment Period	Proposed Plan (November 2004) Onondaga Lake Subsite Proposed Plan Basis for Development of Alternative 4 (Bridging Document) (November 2004) Notices of Public Meetings and Opportunity to Comment EPA Proposed Plan Concurrence Letter (March 25, 2005)
Public Meetings Held	Documentation and Transcripts of Meetings (Attached to the Record of Decision) Written Comments on Selected Remedy (Attached to the Record of Decision)
Record of Decision Issued	Record of Decision and Responses to Comments (Responsiveness Summary) - July 1, 2005 Public Notice of Administrative Record Availability

Enforcement Documents	RI/FS Consent Decree for the Onondaga Lake Sediments (March 16, 1992) United States Environmental Protection Agency. Joint Request for Information. Mailing No. 1 (June 13, 1996) AlliedSignal, Inc. Response to Joint Request for Information. Mailing No. 1. Prepared by Whiteman Osterman & Hanna (August 19, 1996) New York State Department of Environmental Conservation. Supplemental Joint Request for Information. Mailing No. 2 (March 10, 1997) AlliedSignal, Inc. Supplemental Response to Joint Request for Information. Mailing No. 2. Prepared by Whiteman Osterman & Hanna (May 14, 1997) Letter from NYSDEC and EPA to Honeywell regarding Notice of Liability, June 23, 1997 Stipulation and Order Amending Consent Decree (January 22, 1998) New York State Attorney General. Supplemental Joint Request for Information. Mailing No. 3 (March 2, 1999) AlliedSignal, Inc. Supplemental Response to Joint Request for Information. Mailing No. 3. Prepared by Hunton & Williams (April 22, 1999) New York State Department of Environmental Conservation. Supplemental Joint Request for Information. Mailing No. 4 (December 22, 1999) Honeywell International Inc. Supplemental Response to Joint Request for Information. Mailing No. 4. Prepared by Hunton & Williams (February 29, 2000) New York State Department of Environmental Conservation. Supplemental Joint Request for Information. Mailing No. 5 (June 30, 2000) Stipulation and Order Amending Consent Decree (July 12, 2000) Honeywell International Inc. Supplemental Response to Joint Request for Information. Mailing No. 5. Prepared by Hunton & Williams (August 4, 2000) Stipulation and Order Amending Consent Decree (March 16, 2001) Stipulation and Order Amending Consent Decree (May 30, 2002) Stipulation and Order Amending Consent Decree (January 29, 2004) Stipulation and Order Amending Consent Decree (May 28, 2004)

* Data are summarized in several of these documents. The actual data, QA/QC, chain of custody, etc. are compiled at various NYSDEC office locations and can be made available at the NYSDEC Region 7 office upon request. Bibliographies in these documents and in the references cited in this Record of Decision are incorporated by reference in the Administrative Record. Many of the documents referenced in the bibliographies are publicly available and readily accessible. Most of the guidance documents referenced in

the bibliographies are available on EPA or NYSDEC websites. If copies of the referenced documents cannot be located, contact the NYSDEC Project Manager (Timothy J. Larson, 518-402-9767). Copies of administrative record documents that are not available in the administrative record files in the NYSDEC Region 7 office or at Atlantic States Legal Foundation can be made available at one of those locations upon request.

**This November 2004 “Draft” of the Feasibility Study (FS) was the primary source utilized by the NYSDEC in drafting the Record of Decision (ROD) The document is designated as “Draft” since a feasibility study is never deemed to be complete until a ROD is issued for a site, due to the fact that there may be a need to supplement or correct information contained in the FS up until the time that the ROD is issued. Accordingly, the November 2004 FS document represents the final version of the FS even though it carries a “Draft” designation. Earlier FS documents and comment letters are included in the record since the final version of the FS was prepared by Honeywell and its consultants and there were certain earlier comments which NYSDEC and EPA had submitted which were not adequately addressed to NYSDEC and EPA’s satisfaction in the November 2004 FS document or certain statements in the document with which NYSDEC and/or EPA did not agree. Notwithstanding any continued disagreements with respect to such comments or statements, NYSDEC determined that the information contained in the final FS was sufficient for it to develop the ROD. Earlier FS documents are included in the Administrative Record for the purpose of clarifying NYSDEC and EPA findings with respect to specific issues that may not be adequately expressed in the November 2004 FS. The ROD is based upon all documents which are included in the Administrative Record.

APPENDIX IV

NYSDOH LETTER OF CONCURRENCE

STATE OF NEW YORK
DEPARTMENT OF HEALTH

Flanigan Square, 547 River Street, Troy, New York 12180-2216

Antonia C. Novello, M.D., M.P.H., Dr.P.H.
Commissioner

Dennis P. Whalen
Executive Deputy Commissioner

June 24, 2005

Mr. Dale Desnoyers, Director
Division of Environmental Remediation
NYS Dept. of Environmental Conservation
625 Broadway - 12th Floor
Albany, NY 12233-7011

Re: Record of Decision
Onondaga Lake Bottom Sediments
Site ID# 734030
Syracuse, Onondaga County

Dear Mr. Desnoyers,

My staff has reviewed the Record of Decision for the Onondaga Lake Bottom Sediments site north of Syracuse in Onondaga County. Based upon that review I understand that the selected remedy addresses contamination in the Lake with the ultimate goal of reducing contamination in fish to levels that will no longer present an unacceptable health risk to the public via consumption. The remedy, which should result in a long-term reduction in toxicity, mobility, and volume of the key contaminants in Onondaga Lake, includes:

- Removal of approximately 2.6 million cubic yards of contaminated sediments and NAPLs by dredging;
- Isolation capping of about 425 acres of the littoral zone;
- Thin-layer capping of about 154 acres of contaminated sediments in the profundal zone, along with aeration of the deep water column, and monitored natural recovery;
- Construction of a sediment consolidation area on one or more of Honeywell's waste beds in the Town of Camillus (or another site, if preferred);
- Control of upland sources of contaminated groundwater or runoff; and
- Improvements to aquatic habitat throughout the Lake.

I concur with the selected remedy as it will prevent human exposure to contaminated sediments and support an eventual recreational fishery unhindered by fish consumption concerns.

If you have any questions, please call Geoff Laccetti at (518) 402 7871.

Sincerely,

Steven M. Bates, Assistant Director
Bureau of Environmental Exposure Investigation

cc: G. A. Carlson, Ph.D.
Mr. G. Litwin/ Mr. G. Laccetti/ File
Ms. H. Hamel
Dr. L Novick – OCHD.
Mr. D. Coburn – Onondaga Co. Office of the Environment
Mr. D. Hesler/ Mr. T. Larson – DEC
Mr. J. Burke – DEC Region 7

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APPENDIX V

STATEMENT OF FINDINGS:
FLOODPLAINS AND WETLANDS

Appendix V

Record of Decision

Onondaga Lake Bottom Subsite of the Onondaga Lake Superfund Site

Statement of Findings: Floodplains and Wetlands

Need to Affect Floodplains and Wetlands

Onondaga Lake sediments are currently contaminated with mercury and other contaminants. Onondaga Lake lies within the 100-year floodplain, therefore, cleanup of the contaminated sediments, which pose a risk both to human and ecological receptors, may involve extensive remedial work within the floodplain adjacent to the lake. The selected remedy addresses all areas of the lake where the surface sediments exceed a mean probable effect concentration quotient (PECQ) of 1 or a mercury PEC of 2.2 milligrams per kilogram (mg/kg).[1] The selected remedy will also attain a 0.8 mg/kg bioaccumulation-based sediment quality value (BSQV) for mercury on an area-wide basis for the lake and for other applicable areas of the lake to be determined during the remedial design. The selected remedy is also intended to achieve lakewide fish tissue mercury concentrations ranging from 0.14 mg/kg, which is for protection of ecological receptors, to 0.3 mg/kg, which is based on EPA's methylmercury National Recommended Water Quality criterion for the protection of human health for the consumption of organisms. The major components of the selected remedy include:

- Dredging of as much as an estimated 2,653,000 cubic yards (cy) of contaminated sediment/waste from the littoral zone[2] in Sediment Management Units (SMUs)[3] 1 through 7 to a depth that will prevent the loss of lake surface area, ensure cap effectiveness, remove non-aqueous-phase liquids (NAPLs), reduce contaminant mass, allow for erosion protection, and reestablish the littoral zone habitat. Most of the dredging will be performed in the in-lake waste deposit (ILWD) (which largely exists in SMU 1) and in SMU 2.

- Dredging, as needed, in the ILWD to remove materials within areas of hot spots (to improve cap effectiveness) and to ensure stability of the cap.

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1 These cleanup criteria were developed to address acute toxicity to the sediment-dwelling (benthic) community in Onondaga Lake.

2 The littoral zone is the portion of the lake in which water depths range from 0 to 9 meters (m) (30 feet [ft]).

3 For investigation and remediation purposes, the site has been divided into eight SMUs based on water depth, sources of water entering the lake, physical and ecological characteristics, and chemical risk drivers. SMUs 1 through 7 cover the littoral zone and SMU 8 covers the profundal zone. (See Record of Decision Figure 3.)

- Placement of an isolation cap over an estimated 425 acres of SMUs 1 through 7.

- Construction/operation of a hydraulic control system along the SMU 7 shoreline to maintain cap effectiveness. In addition, the remedy for SMUs 1 and 2 will rely upon the proper operation of the hydraulic control system, which is being designed to control the migration of contamination to the lake via groundwater from the adjacent upland areas.

- Placement of a thin-layer cap over an estimated 154 acres of the profundal zone.[4]

- Treatment and/or off-site disposal of the most highly contaminated materials (e.g., pure phase chemicals segregated during the dredging/handling process). The balance of the dredged sediment will be placed in one or more Sediment Consolidation Areas (SCAs), which will be constructed on one or more of Honeywell's Solvay wastebeds that historically received process wastes from Honeywell's former operations. The containment area will include, at a minimum, the installation of a liner, a cap, and a leachate collection and treatment system.

- Treatment of water generated by the dredging and sediment handling processes to meet NYSDEC discharge limits.

- Completion of a comprehensive lakewide habitat restoration plan.

- Habitat reestablishment will be performed consistent with the lakewide habitat restoration plan in areas of dredging/capping.[5]

- Habitat enhancement will be performed consistent with the lakewide habitat restoration plan.

- A pilot study will be performed to evaluate the potential effectiveness of oxygenation at reducing the formation of methylmercury in the water column, while preserving the normal cycle of stratification within the lake. An additional factor which will be considered during the design of the pilot study will be the effectiveness of oxygenation at reducing fish tissue methylmercury concentrations. If supported by the pilot study results, the pilot study will be followed by full-scale implementation of oxygenation in SMU 8. Furthermore, potential impacts of oxygenation on the lake system will be evaluated during the pilot study and/or the remedial design of the full scale oxygenation system.

- Monitored natural recovery (MNR) in SMU 8 to achieve the mercury PEC of 2.2 mg/kg in the profundal zone and to achieve the BSQV of 0.8 mg/kg on an area-

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4 The profundal zone is the portion of the lake in which water depths exceed 9 m (30 ft) within SMU 8.

5 The design and construction of the remedy must meet the substantive requirements for permits associated with disturbance to state and federal regulated wetlands (e.g., 6 New York Code of Rules and Regulations [NYCRR] Part 663, Freshwater Wetlands Permit Requirements) and navigable waters (e.g., 6 NYCRR Part 608, Use and Protection of Waters).

wide basis within 10 years following the remediation of upland sources, littoral sediments, and initial thin-layer capping in the profundal zone. An investigation will be conducted to refine the application of an MNR model and determine any additional remedial measures (e.g., additional thin-layer capping) needed in the profundal zone.

- Investigation to determine the appropriate area-wide basis for the application of the BSQV of 0.8 mg/kg. During remedy implementation, additional remedial measures may be needed (e.g., thin-layer capping) to meet the BSQV on an area-wide basis.

- Implementation of institutional controls including the notification of appropriate government agencies with authority for permitting potential future activities which could impact the implementation and effectiveness of the remedy.

- Implementation of a long-term operation, maintenance, and monitoring (OM&M) program to monitor and maintain the effectiveness of the remedy.

NYSDEC and EPA have determined that there is no practicable alternative that is sufficiently protective of human health and the environment which would not result in the excavation and isolation capping of these sediments. Consequently, since remedial action is necessary, any remedial action that might be taken would necessarily affect floodplains and wetlands associated with Onondaga Lake. The following seven remedial alternatives were considered[6]:

- Alternative 1 – No Action

- Alternative 2 – Dredging for No Loss of Lake Surface Area and Erosion Protection and to Reestablish Habitat, and Isolation Capping in SMUs 1 to 7; Targeted Dredging to 4 m (13 ft) for NAPL Removal in SMU 2; Targeted Dredging in SMUs 3 and 6; and Phased Thin-Layer Capping, Oxygenation, and Monitored Natural Recovery in SMU 8.

- Alternative 3 – Dredging of the ILWD to 2 m (6.5 ft) and Isolation Capping in SMU 1; Dredging for No Loss of Lake Surface Area and Erosion Protection and to Reestablish Habitat, and Isolation Capping in SMUs 2 to 7; Targeted Dredging to 4 m (13 ft) for NAPL Removal in SMU 2; Targeted Dredging in SMUs 3 and 6; and Phased Thin-Layer Capping, Oxygenation, and Monitored Natural Recovery in SMU 8.

- Alternative 4 – Dredging of the ILWD to 2 m (6.5 ft); Removal in Areas of Hot Spots in the ILWD to a Maximum Depth of 3 m (10 ft) and Isolation Capping in SMU 1; Dredging for No Loss of Lake Surface Area and Erosion Protection and to Reestablish Habitat, and Isolation Capping in SMUs 2 to 7; Targeted Dredging to 9 m (30 ft) for NAPL Removal in SMU 2; Targeted Dredging in SMUs 3 and 6;

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6 Under Alternatives 2 through 6, all areas of the lake where the surface sediments exceed a mean PECQ of 1 or the mercury PEC (2.2 mg/kg) would be addressed. Under Alternative 7, all areas of the lake where the surface sediments exceed effects range-low (ER-L) values would be addressed.

and Phased Thin-Layer Capping, Oxygenation, and Monitored Natural Recovery in SMU 8.

- Alternative 5 – Dredging of the ILWD to 5 m (16.4 ft) and Isolation Capping in SMU 1; Dredging for No Loss of Lake Surface Area and Erosion Protection and to Reestablish Habitat, and Isolation Capping in SMUs 2 to 7; Targeted Dredging to 9 m (30 ft) for NAPL Removal in SMU 2; Targeted Dredging in SMUs 3 and 6; and Phased Thin-Layer Capping, Oxygenation, and Monitored Natural Recovery in SMU 8.

- Alternative 6 – Dredging for Full Removal (based on mean PECQ of 1 and the mercury PEC criteria) in SMUs 1 to 4, 6, and 7; Dredging for No Loss of Lake Surface Area and Erosion Protection and to Reestablish Habitat, and Isolation Capping in SMU 5; and Phased Thin-Layer Capping, Oxygenation, and Monitored Natural Recovery in SMU 8.

- Alternative 7 – Dredging for Full Removal (based on ER-L criteria) in SMUs 1 to 4, 6, and 7; Dredging for No Loss of Lake Surface Area and Erosion Protection and to Reestablish Habitat, and Isolation Capping in SMU 5; and Thin-Layer Capping and Oxygenation in SMU 8.

The No-Action alternative does not entail excavation or capping of contaminated sediments; under this alternative, no remedial actions would take place within delineated floodplains or wetlands. However, contaminated sediments in the lake would remain in place and would continue to be a potential source of contamination to the lake and its adjacent wetlands and floodplains. Consequently, the No-Action alternative would not be protective of human health and the lake environment. The implementation of any of the action alternatives would be more protective of human health and the environment than the no-action alternative (since they would, to varying degrees, meet the remedial action objectives [RAOs] and preliminary remediation goals [PRGs] for the littoral and profundal areas and would result in residual risks less than the no-action alternative), including the wetlands and floodplains adjacent to the lake; and all action alternatives would involve substantial actions within floodplains.

Effects of Proposed Action on the Natural and Beneficial Values of Floodplains and Wetlands

The RAOs for Onondaga Lake include the elimination or reduction of contaminant releases from the ILWD and other littoral areas, and from profundal sediments, all of which are located within the 100-year floodplain. Since the selected remedy will be expected to achieve the RAOs, sediments contaminated with mercury and other contaminants will no longer function as a source of contamination to wetlands and floodplains associated with Onondaga Lake. Furthermore, capping activities will not significantly alter the capacity of the floodplain, and should not result in any increase in downstream flooding events. Accordingly, it is anticipated that no long-term adverse effects to floodplain resources will result due to implementation of the selected remedy, since any short-term negative impacts to the natural or beneficial values associated with the lake bottom sediments, which are already compromised by existing contamination, will be more than compensated for by the long-term benefit to the Onondaga Lake ecosystem once these sediments are removed and/or capped. Further, the habitat reestablishment component of the selected remedy will also provide additional habitat value to the lake and shoreline through the installation of various substrate and vegetation on the cap surface. The details for habitat reestablishment (e.g., type and thickness of substrates and vegetation) will be developed during the remedial design, based upon a comprehensive lakewide habitat restoration plan. These measures will serve to enhance floodplain resources associated with the Onondaga Lake bottom, as well as wetland resources associated with Onondaga Lake. It is not anticipated that the landward extent of the floodplain will be impacted by implementation of the selected remedy.

Compliance with Applicable State or Local Floodplain Protection Standards

Four New York State regulated wetlands occur along or near the lake's shoreline near the mouths of Harbor Brook (SYW-19), Ley Creek (SYW-12), and Ninemile Creek (SYW-10), and along the northwest shoreline of the lake (SYW-6) (See Record of Decision Figure 6). These areas are now being addressed as part of investigations taking place at other upland sites (i.e., the Ninemile Creek Dredge Spoils Area for state-regulated wetland SYW-6, Geddes Brook/Ninemile Creek for state-regulated wetland SYW-10, and the Wastebed B/Harbor Brook site for state-regulated wetlands SYW-12 and SYW-19).

The primary New York State standard for protection of freshwater wetlands applicable to the remediation is Environmental Conservation Law (ECL), Article 24, Title 7. For freshwater wetlands, 6 NYCRR Parts 662 through 665 regulate activities conducted in or adjacent to regulated wetlands. The selected remedy will comply with this standard.

The selected remedy will also comply with applicable or relevant and appropriate substantive requirements relating to floodplains and wetlands, including Executive Order 11988: Floodplain Management; Executive Order 11990: Protection of Wetlands, and 40 CFR Part 6, Appendix A. Accordingly, draft floodplains and wetlands assessments have already been prepared for the preferred remedy; these assessments will be refined as necessary during the remedial design process.

Measures to Mitigate Potential Harm to the Floodplains and Wetlands

Implementation of the selected remedy will entail excavation and capping of lake sediments, resulting in temporary physical disturbances to the wetlands and floodplains. Measures to minimize potential adverse impacts that cannot be avoided will be evaluated as part of and incorporated into the remedial design. Common practices include field demarcation of wetland/floodplain areas and implementation of soil/sediment erosion and/or resuspension control measures (e.g., installation of silt fencing, hay bales, hay/straw mulch, jute matting) to minimize impacts from construction activities. Furthermore, any impacts to wetlands will be mitigated in accordance with the lakewide habitat restoration plan.

Measures will also be employed during capping and dredging activities to prevent in-lake sediments that are resuspended during remediation activities from being transported to other parts of the lake or downstream of the lake during flooding events (100-year and 500-year storms). For example, silt curtains will be used during dredging activities to minimize the transport of resuspended sediments from the areas being dredged to other parts of the lake. In addition, monitoring will occur during both dredging and capping operations. Should this monitoring indicate that elevated levels of suspended sediments are being generated by dredging or capping operations, operations will be modified so as to reduce those levels. Possible actions that could be taken in this regard include slowing down the rate of sediment removal, changes to the depth of the dredge cut, modifications to movement of the dredge equipment, and cessation of dredging/capping activities.

APPENDIX VI

RESPONSIVENESS SUMMARY

(under separate cover)

APPENDIX VII

TRANSCRIPTS FOR
JANUARY 12, 2005 AND FEBRUARY 16, 2005
PUBLIC MEETINGS

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

- -

In the Matter of

ONONDAGA LAKE PROPOSED REMEDIAL PLAN

- -

PUBLIC MEETING in the above matter conducted at the New York State Fair Grounds, Art & Home Center Bldg. Martha Eddy Room, on **January 12, 2005 7:00-10:00 p.m.**

MODERATOR:

KEN LYNCH, Regional Director NYSDEC Syracuse

ALSO PRESENT:

DALE DESNOYERS	NYSDEC Albany
BOB EDWARDS	NYSDEC, Albany
DON HESLER	NYSDEC, Albany
TIM LARSON	NYSDEC, Albany
DAVID SMITH	NYSDEC, Albany
TRACY SMITH	NYSDEC, Albany
JIM BURKE	NYSDEC, Syracuse Reg Haz Waste Engr
MARY JANE PEACHEY	NYSDEC, Syracuse, Regional Engineer
HENRI HAMEL	NYS Department of Health
ALLEN BURTON	TAMS
HELEN CHERNOFF	TAMS
MARK MOESE	TAMS
BOB MONTIONE	TAMS
KELLY ROBINSON	TAMS
DAVE SCHEUING	TAMS
MICHAEL SPERA	TAMS
JOHN SZELIGOWSKI	TAMS

INDEX TO SPEAKERS

DIRECTOR LYNCH: Good afternoon everyone. Welcome to the Onondaga Lake Proposed Remedial Plan Meeting. It's certainly great to see such a strong turnout tonight in the interest that everyone has in Onondaga Lake. My name is Ken Lynch, I'm the regional director for Region 7 of the New York State Department of Environmental Conservation.

Tonight's meeting is basically going to be in three phases. We're going to start off with a brief presentation showing you what is in the Proposed Plan, real short, brief discussion about the elements of the plan itself.

Next we're going to go into a formal public comment time where people who want to make statements for the record can come up front and make your statements and we'll take those down.

After the public statements are completed we're going to go into a question and answer period. If anyone has specific questions regarding the plan we have a lot of technical staff and experts that worked on the lake here today to answer your questions.

So for those of you who know you want to speak right now we ask you to sign in in the back. Want to raise your hand Tracy. Tracy will give you a sign up card. I have some right now. As you sign up I'll take them and we'll call you in the order of signing up.

There may be many of you out there who have both a public statement to make and questions that you want answered. We ask that you make your statement at the appropriate time and then reserve your questions for the later time and we'll respond to those during the question and answer period.

We'll start with the presentation. As I stated, we're going to start with a brief overview and then go into the public comment and question period.

Cleaning up Onondaga Lake. What does that mean? I usually start my presentations on the clean up of Onondaga Lake, since it is such a complex matter and there is so many issues, with really defining the two major issues. The two major pollution issues impacting the lake are the wastewater treatment issues and the industrial pollution issues.

Many of you already know that the wastewater treatment issues are being handled by Onondaga County under an agreement signed with them back in 1998. And we're now proud to talk about the state of the art facility that we have on the lakeshore at the metro plant. We are not going to be addressing that problem tonight because we believe we're on track under the Amended Consent Judgment to address the wastewater treatment issues.

The focus of tonight's meeting is going to be on the industrial pollution. And specifically the Proposed Plan for cleaning up the lake bottom itself. There is industrial pollution impacting the lake from upland sites also. This plan does not address specifically cleaning up those

LYNCH

upland sites. It is specifically geared toward cleaning up the lake bottom and the sediments and the impact that the contaminants have had on the lake bottom itself. As we'll discuss a little later there is a tie-in between upland sites and the lake bottom, but we'll discuss that briefly later on in this presentation.

This slide, which looks a little light but you might be able to see it. In your handouts, and I did not mention that we do have handouts on this presentation so you can follow along if you can't see the screen, bring the document home and look through it yourself on some of the details.

But basically this is a map of the lake itself. And in the middle of the lake we show the lake bottom. That's what we're going to be talking about tonight. Around this lake the several dots you see there are various sub-sites of the Onondaga Lake hazardous waste site. These are sites that have already been determined to have impacted the lake through discharges of industrial waste. Again, those sites aren't specifically addressed in the plan we're going to talk about tonight. We're talking about the lake bottom.

There is a process that both the state and the federal government follow in cleaning up industrial waste or hazardous waste pollution. It starts with the remedial investigation. Basically this is an assessment of the site, a lot of testing, a lot of monitoring to determine the extent of contamination, in this case in the lake bottom.

After you know what's there you go into the next step and that's the Feasibility Study. And basically what a Feasibility Study is is an assessment of all the alternatives or range of alternatives to clean up those contaminants.

The next step is the Proposed Plan. And that's what we're talking about tonight. After all the alternatives are laid out the state, as the lead agency in this case, assesses those alternatives, looks at various options and comes up with a proposed plan to present to the public.

Once that plan is proposed we step into our public comment period, in this case for Onondaga Lake. It started on November 29th and will run until March 1st.

Onondaga Lake is somewhat of a unique site in that it is both a state and federal Superfund site. Because it is also a federal Superfund site the Environmental Protection Agency is also reviewing the Proposed Plan, and they have a process for determining or reviewing the state's proposed final remedy.

Part of that process is an internal review process within the EPA called the National Remedy Review Board. And that evaluation will be taken -- undertaken by the EPA during the month of February.

Continuing on with the Superfund process, once we finish our public comment period and get all the comments on the Proposed Plan we issue what we call a Record Of Decision or the selected remedy, the final remedy, the remedy that the state believes should be implemented to clean up the lake. And in this case for Onondaga Lake by court order that remedy is due on April 1st of 2005.

Once the remedy is determined we anticipate that the design of this proposed clean up will take approximately three years. It's a complex extensive clean up project and there is a lot of planning and design to go into this Proposed Plan.

Once the project is designed we start the construction phase. And we're anticipating four years for the entire clean up activity to be undertaken.

Back to the first step. Just want to review a little bit what we found when we did the investigation of Onondaga Lake. There is an extensive investigation undertaken in various years, some by Honeywell, some by our Department, all with the oversight of our Department and the EPA. More than 6,000 samples were taken from the lake or around the lake. We did a human

LYNCH

health risk assessment and ecological risk assessment as part of that investigation. And in real general terms what we found was that most of the contamination in Onondaga Lake is found in the southern portion or the portion located nearest to the southwest shore where most of the Allied or Honeywell activities took place, and much of other industrial activities took place.

There is mercury contamination throughout the lake. Again, most of that mercury contamination either being in the southwestern portion or at the mouth of Nine Mile Creek. We found other contaminants in the lake like benzenes, chlorinated benzenes and other contaminants. In some cases, in one area in particular, called the In-Lake Deposit Area, the deposits and contaminants reached levels up to 25 feet.

Once that investigation was completed Honeywell prepared a Feasibility Study with Department oversight. They evaluated some 14 alternatives to clean up the lake. They looked at alternatives ranging from doing

LYNCH

nothing, to spending no dollars on the clean up of the lake, to doing an awful lot of sediment removal and capping to an extent of addressing 2,300 acres in the lake at an estimated cost of $2.1 billion.

As part of that Feasibility Study Honeywell identified their preferred remedy. And that is proposed dredging of half a million cubic yards and capping of 356 acres in the lake, at a cost of $243 million.

Once the alternatives were assessed the state began its process of reviewing those alternatives and determining what they felt was the best Proposed Plan for cleaning up the lake. And that's what we're presenting tonight.

One of the steps in coming up with this plan was to establish goals. And those goals are outlined here.

Number 1 is to achieve sediment concentrations that are protective of fish and wildlife.

Number 2 is to achieve concentrations in fish tissue that are protective of humans

LYNCH

and wildlife that consume the fish.

And Number 3 is to achieve water quality standards.

Basically what we did in assessing the lake clean up, and it was also done by Honeywell in the Feasibility Study, was to break the lake into eight sections. And based on the contamination we knew of in those eight sections determine a remedial plan.

We determined that we would remediate all areas of the lake where the surface sediments exceeded our clean up levels.

That then resulted in an estimated proposed dredging of 2.7 million cubic yards and a capping of over 579 acres in the lake.

Where do those sediments go once we dredge them? The most highly contaminated sediments are proposed to be taken off-site to a permitted DEC or out of state facility. Other sediments that are less contaminated will go, are currently proposed to go to one of the Honeywell Solvay wastebeds.

LYNCH

A unique aspect of this plan is Honeywell is proposing to perform a pilot study to oxygenate the deep areas of the lake. And in an attempt to prevent mercury methylation or the mercury seeping into the water column in the lake. That will be conducted and monitored by the department. If effective we will authorize a larger scale project.

The plan also includes habitat restoration or repairing the damage you cause when you dredge. And habitat enhancement, doing more than what exists there today, adding to the habitat in and around the lake.

It's important to note that the plan also includes a long term monitoring of the water quality, the capping of the lake, fish tissue and other things related to the clean up of the lake. So once the construction activity is done the responsible party doesn't walk away, they have a long term obligation to monitor the effectiveness of this plan. And the estimated present worth of our Proposed Plan is $450 million.

LYNCH

This slide, and I'm sorry you don't have it in color in your handouts but it's a pretty good overview of how the lake is divided into eight areas and what the Proposed Plan for those eight areas is. It shows the areas to be capped and dredged. And it shows you the different units that the lake is divided up to. There is also a chart over there depicts the same thing. And is there one in the plan itself? In the plan itself that is in line, that's one of our exhibits in there. It's a good reference to get a good oversight of what areas are going to be capped and dredged.

As I mentioned there is a long term monitoring plan that I think is very important to this plan. For those of you familiar with the Amended Consent Judgment, the county has established an extensive annual monitoring program to see how their proposed clean up, their addressing of the wastewater issues that's impacting water quality, and improving water quality.

We expect that the monitoring plan for

LYNCH

this clean up project will be very similar, very extensive, reviewed by our scientists and others. We're going to monitor the effectiveness of all the remedy components. We're going to sample tissue in fish invertebrate, we're going to sample the surface water, the sediments, we're going to make sure the cap is working, we're going to make sure any containment area that's proposed in the wastebeds or other places is effectively working. And we're going to continue on an annual basis to make sure that this plan is working.

At some point during that monitoring if we find there is a problem with a cap or problem with different areas in the lake we will advise the responsible party and they will be responsible to correct those problems

Time frame. One of the most common questions I get about this plan is how long will it take? When is the lake going to be clean? As I previously stated we anticipate, if all goes well, that the state will issue a Record On Decision or final

LYNCH

remedy by April 1st.

Next is the anticipated design phase, which is estimated at this point for three years. Prior to starting construction of this remedial plan, prior to dredging, prior to cleaning up the lake bottom we have to be assured that the lake is no longer being impacted by upland sites. So that is one glitch in this schedule that we have to coordinate with the clean up of the lake bottom. Simply doesn't make sense to dredge the bottom of the lake where the lake is still being contaminated by upland sites.

So part of this proposal is to coordinate with the upland site cleanups so that those sites are no longer impacting the lake before you start dredging the material. And once the construction activity does start in the lake we anticipate a four year construction period.

And again, once the construction is done, the work is not done, there is an extensive monitoring program which will continue until we believe that the remedy

LYNCH

has satisfactorily worked and there is no longer a need to monitor.

That's my presentation, I told you it would be short. We want to reserve most of this time to hear from you, both in public comment form and also in a question and answer form. But if you want to get more information about this plan, we've had two availability sessions, and we had a great turnout for both of those and we had a lot of great questions. But if you want more information you can go to our website that's listed there or you can come to these mentioned facilities and see the plan itself, the hard copy and go through it.

You can also comment on the Proposed Plan. You don't have to speak tonight to get your comments in. You can write in until March 1st and you can do that via the web or via mail.

We're now going to move into our public comment period to allow people who have comments for the record to come forward and state their comments. I do have a couple

LYNCH

ground rules so that we can make sure that we get to everybody that wants to speak and move this in an orderly manner. First and foremost when you come to the microphone, and Dawn is going to hold the microphone and come to you, if you can come out to the aisle Dawn will meet you in the aisle for you to make your statement. State your name and spell your name for the record. We have a stenographer (court reporter) here and I know he's a good speller but he can't get all the complicated names.

Keep your statements short and concise so we can get to everyone please. If the previous speaker or previous speakers have made a similar point you don't have to reiterate that. Oral comments tonight are given equal weight to written comments that you send in, so don't feel the absolute need that you have to make a statement tonight, if you would rather write that you can do that and it's given equal weight.

We will not be responding to the comments made initially during the comment period. We're going to reserve that again for the question and answer period. So if you want to make a statement and you also have questions, please reserve those questions to the later portion of the meeting.

I'm going to start with the public speakers and as we traditionally do with DEC public meetings we'll start with our public officials. And the first one up is County Executive Nick Pirro.

COUNTY EXECUTIVE PIRRO: Good evening Director Lynch, members of the DEC team, ladies and gentlemen. This will be concise, I'm not sure that short. The county understands all too well the difficult task it is to develop and obtain agreement on expensive solutions to large scale, complex problems such as the industrial contamination in Onondaga Lake. It is always easier to be critical of such plans than to produce them. The County is aware of the level of effort that has gone into the development of the state's Proposed Clean up

PIRRO

Plan and we applaud that effort.

The ongoing effort to reclaim Onondaga Lake is substantial and widespread. The Onondaga Lake Partnership is spending millions of federal and local dollars on projects ranging from non-point pollution to habitat improvement to trail development. By the time the County is done upgrading the municipal wastewater system that discharges to the lake, the County, with substantial help from our state and federal partners, will have invested well over $450 million on lake improvement projects. A good deal of that work is already completed. It is now time to aggressively move forward with remediation of the industrial side of the lake restoration equation. The plan proposed by the state is substantial and aggressive. It's not perfect. And there are certainly many questions that will have to be answered along the way. But it is time now to move forward without delay. The County is hopeful that the technical and public review and comment process that is

PIRRO

now underway will allow this process to move in a positive and expeditious fashion.

That said, there are a number of critical issues that the County is hopeful can be addressed as the Proposed Plan becomes refined and finalized.

First, the schedule. As the County understands it, the plan recommended by Honeywell in the most recent Feasibility Study would postpone implementation of the most substantial work in the lake until 2011. That is too long to wait. The state's Proposed Plan offers no start or completion dates. Based on what is written, work could begin as soon as next year or as late as 2011. As there is no schedule things could be delayed even beyond 2011. An implementation schedule, with start and end dates needs to be spelled out as part of the plan, and work needs to be begin sooner, much sooner than 2011.

Related to the schedule is the lack of progress and coordination to date in addressing the upland sites. I am referring to sites like Willis Avenue, the Semet Tar Beds, Wastebed B and Harbor Brook, Wastebeds 1 through 8, and the Geddes Brook/Nine Mile Creek sites. It should be readily apparent to everyone that these sites, all of which are ongoing sources of contamination to the lake, have to be addressed before implementation of a remedy in the lake itself can take place.

The county has consistently pointed out that all these sites should have been addressed collectively as part of a single comprehensive lake clean up plan and not as independent hazardous waste sites.

From an ecological standpoint, all of these sites are linked to the lake. The approach of allowing the upland and lake remedial investigation to proceed on distinct legal and separate time frames has resulted in a significant impediment to proceeding immediately with the remediation of the lake itself. The County recommends that the process to clean up these upland sites proceed as quickly as possible, so

PIRRO

that the lake bottom clean up plan can begin, and can do so without having to rely solely on the installation of interim remedial measures at these upland sites.

A second issue of concern is the long-term viability and reliability of several of the measures that are proposed in the Plan. Many of the proposed measures involve containment rather than removal. All of these engineered structures will require ongoing inspection, operation and maintenance.

These include: 1) Groundwater cutoff walls coupled with pumping and treating contaminated groundwater intended to stop the migration of contamination into the lake.

2) Engineered confinement caps intended to encapsulate over 575 acres of contaminated lake bottom sediments.

3) Engineered confinement of the 2.6 million cubic yards of contaminated dredge spoils in the proposed Sediment Consolidation Area located on Wastebed 13.

PIRRO

4) Facilities to pump oxygen into the lower layers of the lake in an effort to inhibit the methylation of mercury released from lake bottom sediments.

These engineered, constructed facilities will have to work forever, and will require inspection, operation and maintenance forever. The need to monitor and maintain these sites will never go away. Can the state assure this community that Honeywell will be around forever to take care of these things? What assurance can the state and Honeywell provide to the local community that it will not inherit the financial burden of maintaining, repairing and replacing all of these facilities, 30, 40 or 50 years from now? How will the final plan address this concern? The final plan must include formal legal protections, long term financial assurances or other protections that address this concern.

Third, institutional controls. The goal of Onondaga Lake clean up efforts is to restore the lake for the use and enjoyment

PIRRO

of the community. Typically, institutional controls impose limitations on the use of the site or resource. Limitations on the future use of Onondaga Lake as a recreational resource to this community due to institutional controls should not be part of the remedy.

Fourth, there is very little information provided regarding the proposed Sediment Consolidation Area on Wastebed 13. It appears to the County, based on the limited information that has been provided, that the Sediment Consolidation Area represents a sizable ongoing challenge, and potential burden to this community in the future.

The potential issues include: 1) the unexplained procedure to identify and then separate hazardous materials in the lake bottom sediments from sediments that are simply contaminated during the dredging process.

2), the physical stability of the site.

3), the potential for odor problems.

4), management of the supernatant.

PIRRO

5), long term operation and maintenance. And by long term it appears that this containment facility will have to be maintained forever.

6) and it appears that any redevelopment potential for this site will be gone for generations.

It is not apparent that any other alternatives for handling the dredge spoil were given full consideration. The question the County has is whether the creation of the proposed Sediment Consolidation Area is justified given these uncertainties.

Finally, monitoring. The topic of monitoring, in both the Feasibility Study and the Proposed Plan, is largely deferred to the design stage. While this is not unusual or necessary inappropriate, it is too important an issue to ignore during the stage of the remedy selection process. Given the complexities of the Onondaga Lake system, and the ubiquitous extent of the contamination related to the industrial sources impacting the lake system, it could

PIRRO

be very difficult to accurately monitor change and improvements and ascribe them with confidence to the remedial measures in the Proposed Plan.

The community will want and deserves assurances that the remediation measures ultimately put in place are succeeding. Monitoring for this purpose should begin now, in order to assure the establishment of a reliable pre-construction or baseline data-base. Moreover, development of the post-construction monitoring program must involve the County and other appropriate stakeholders.

I wish to close by restating that it is not easy to develop and obtain agreement and expensive solutions to large scale, complex problems such as the industrial contamination in Onondaga Lake. The state's Proposed Clean Up Plan represents a substantial laudable effort. What we offer tonight should be viewed as constructive input to that plan.

DIRECTOR LYNCH: Thank you. Next

speaker is Dale Sweetland, Onondaga County Legislative Chairman.

LEGISLATOR SWEETLAND: Thank you. I'll be very brief, I am - since I left my office with the paper I had in my hand sitting on the desk. I am Dale Sweetland the chairman of the Onondaga County Legislature. And I'm here tonight not as an engineer, because I'm not, I'm not a scientist, I am a resident of Onondaga County. And I'm here to express to you the feelings of my constituents and my neighbors as I talked to them after this plan has unfolded and come about in the media.

Several years ago, this is my 12th year in the county legislature, I was in the legislature and chaired the drainage and sanitation committee when we signed the Amended Consent Judgment. And there is probably nothing that I am prouder of than the fact that the County is doing, with the help of the state and the federal government, doing an enormous amount of work to stop polluting Onondaga Lake.

SWEETLAND

Ever since I have been in high school or was in high school - sounded like I still am, didn't it? Ever since I was in high school I have heard about Onondaga Lake. We've all heard about Onondaga Lake. We now have a great opportunity. We are closer than we have ever been in this community to actually coming to terms with the pollution in Onondaga Lake.

I want to reiterate what the county executive said, and I applaud DEC and Honeywell for all the work they've done. It's taken an enormous amount of time and a lot of effort to get to this point. I would reserve any criticism of the Proposed Plan because again, I'll beg that I'm not an engineer and I'm not a scientist.

I would offer that people who I talked to are excited about an opportunity to see something positive happen with Onondaga Lake. It's necessary, not only for the city, the county and the Central New York region, but it's very important to have this lake come back to life and be a vital part of this community. So I want to encourage Honeywell and DEC and everyone involved to continue their hard work and really make an agreement happen and have this work come to fruition.

The one thing that strikes me as that in every type of these situations, as the County Executive said, nothing is perfect in this world, nothing will ever be perfect. And all I ask is that all the parties be logical, use common sense, and be reasonable in all this process so that we can have some good things happen to Onondaga Lake and the city of Syracuse and Onondaga County. Thank you.

DIRECTOR LYNCH: Next speaker is James Corbett, Onondaga County Legislator.

LEGISLATOR CORBETT: Thanks, Ken. C-O-R-B-E-T-T. Welcome to my area. I represent this 8th District. And I'm here to comment on one aspect of the plan, having gone over it extensively. I want to preface it saying I'm speaking as the County Legislator for this district. I have also

CORBETT

lived for 20 years right down the road here. My house and my backyard overlook right over 690 at the lake. So for 20 years I looked right at this lake every day.

The aspect that I would like to talk about is the pumping of the sediments from the pump station proposed to be built at Onondaga Lake to the Sediment Containment Area constructed at Wastebed 13. This is after the dredged materials have been processed. I understand that there would be approximately 4 miles of pipe from the pump station to the proposed containment settling area 13.

What my concern is, I've received a number of calls from constituents in this area, and if you're familiar, anyone around here, with 13, which is over off of - between Armstrong and Warners Road, there is a lot of the residential area around there. There is always a wind up there; there is always a breeze.

And the calls that I have received are two-fold. One is concern about the odor control, which has been brought up at the meeting in Camillus. And also the length of the piping to come from the proposed pump station to the Wastebed 13. It would be approximately 4 miles from what I understand, and one of the proposals is to follow Ninemile Creek.

I think there might be another option after looking at this. We've discussed, and it was up on the screen, you can see the finger right here going out into the lake, that's Wastebeds 1 through 8. Wastebeds 1 through 8 right now is part of, is Onondaga County land and it's also part of the parking.

What I have talked with some of my constituents about and I don't know if anyone from Honeywell or the DEC, what if we thought of putting that containment area right there? You have four miles less piping, you're not going through a residential area. You also have a lot less worry about odor control. You've got the lake on one side, you've got 690 down on the other side. Yes, it is now county property, and yes, we have a proposal for the trail around the lake there. But I would beg that this option maybe be looked at. And I would appreciate that if there is a scientific part of it, I just think that it's a real viable option. You're not going up Ninemile, you're not going through a residential area.

And I think in the long run it would prove to be, if it's done the way I've looked at everything, it could be turned right back into a recreational area. You could put that trail both up and down on it. And who knows, there might be a lot of uses for it down the road for maybe picnicking or a lot of other things. So I appreciate the opportunity to make this comment and I would hope you look at it. Thank you.

DIRECTOR LYNCH: Liverpool Mayor Marlene Ward.

MAYOR WARD: Thank you, Ken. Good evening. I appreciate the opportunity to be here this evening and to be able to comment

WARD

and be part of this really important undertaking because it is an important issue for the village of Liverpool. As I said before I'm Marlene Ward, the mayor of the village. My husband and I are life-long relatives -- I'm sorry, residents, of the village of Liverpool. In fact my husband was born right on First Street in the village right there on the lake. And when we were coming over this evening he was talking about being a little boy and wading in the lake and being told, you can't wade in that water.

And as we all know, Liverpool is like a lot of other communities, it was founded on a beautiful body of water, which is Onondaga Lake. And history records over time that unfortunately it became polluted to the point that it has received national attention as one of the most polluted bodies of waters in the United States.

The pollution process began many years ago, and I know that I cannot and I doubt anyone here can really remember when the lake was not polluted. There is plenty of responsibility and blame to go around. The pollution was a combined result of everyone, from individuals to municipalities, to several businesses. Everyone either believed that it was not possible to pollute a body of water such as this, or else they did not care.

The foreign material that went into this lake on a yearly basis included millions of gallons of untreated human waste, various kinds of industrial waste, including some we did not realize was hazardous or dangerous until years later.

Many times throughout my lifetime there has been various attempts and proposals regarding lake cleanup. Always they seem to go nowhere. I came to believe we would never see a clean lake. Through the efforts of many dedicated people we have seemed to reach a point where we have a plan and a proposal that would at long last seem to accomplish some of these goals.

I would like to thank everyone who

brought us to this point and to say on behalf of the village of Liverpool, please continue to move forward with the goal of a clean Onondaga Lake, we certainly would appreciate it. Thank you.

DIRECTOR LYNCH: Are there any other elected officials who would like to speak?

SUPERVISOR CZAPLICKI: Hi, I'm Bob Czaplicki, supervisor of the Town of Geddes. I just want to say I've submitted some testimony for the record but I think it really is time that we move forward. I've lived in this community my entire life and know what the lake is about and I know what my constituents talk about. And they want us to stop talking and get moving.

So I know, as that the County Executive said, no plan is perfect, and we can work through this process and reasonable people can come up with reasonable explanations. But I think the time to get this lake cleaned up and to get this community moving, there is miles of shoreline that can be developed and it can be an economically viable area. And I strongly urge that we get moving. Thank you very much.

DIRECTOR LYNCH: Any other elected officials? Okay the next speaker is Deborah Warner, Syracuse Chamber.

DEBORAH WARNER: Good evening Regional Director Lynch, thank you for holding this meeting. My name is Deborah Warner, I'm director of governmental affairs at the Greater Syracuse Chamber of Commerce. We're the largest business organization in Central New York with 2,300 organizations as members, employing over 140,000 people working in our community.

On their behalf I extend our thanks to you for this hearing and the years of dedicated work you have given to the goal of cleanup of Onondaga Lake. We're delighted and encouraged that after more than a decade we're finally at a point where we are finally talking about a remedy to implement. The goal is finally in sight. You are to be congratulated for working through this herculean task.

WARNER

I'm here tonight to tell you that we support the restoration plan you put forth. We believe and trust that all the research and study has yielded a plan worthy of implementation. We agree with Congressman James Walsh when he said, we have finally found a holistic and sterile approach to clean up this valuable community asset.

Our chambers includes the Onondaga County Convention and Visitors Bureau. Although we already market the lake for a range of events we're thrilled at the potential of visitors and events after the remediation is complete. Waterways are certainly a large part of our tourism marketing efforts. Currently to the naked eye the activity along the shoreline of Onondaga Lake is a fabulous asset.

But the question remains from our out of town visitors, why is there no activity on the water? Imagine the tourism benefits and economic development impact when we can successfully hold major fishing and boating events. When Destiny is built the value of the lake to us will be nearly inestimable. We urge final approval and implementation of this program as soon as possible. Many projects in and near Onondaga Lake are moving forward, particularly the more than $200 million inner harbor redevelopment project we should see this year begin.

And the faster the lake is cleaned up the more development and jobs will occur in our community. Of course we can't ignore the economic impacts of over $400 million of over 7 years in the local economy if the project moves forward. We look forward to Honeywell being a valued member of this community for a long time.

I would also ask that as you work through the remediation plan you preserve development opportunities to the largest extent possible on the land that is being reclaimed. We believe that there will be strong interest and additional development adjacent to the lake, and don't want to lose out or limit this economic potential.

I know our members want me to give you a vote of confidence in your work. The business community does not doubt the thoroughness or scientific acumen of the DEC and the EPA. We trust that you have not overlooked any aspects in the Remedial Investigation and Feasibility Study. And we trust in the monitoring programs that are part of the plan.

So we also speak to Honeywell tonight asking them to consent and agree and move forward with the plan DEC has proposed.

One last question, we hope that you'll be able to respond to as you go forward, and it's similar to a concern that the County Executive brought up. Going forward, what assurances can taxpayers in our community be given that if there is a failure in the cap or an engineering solution who's going to be held responsible for those costs? If Honeywell no longer exists, or has merged with another company who is going to be responsible for the costs in the end?

Onondaga Lake is a jewel for our community and the city of Syracuse. The lake is a resource that any city would envy. We gained a lot of notoriety as the most polluted lake in the land. Now we'll have a new reputation as an example of state-of-the-art remediation of one of the largest Superfund sites in the nation. So we look forward to the earliest implementation possible and support for the recommended plan the DEC has put forward. Thank you.

DIRECTOR LYNCH: Sam Sage, Atlantic States Legal Foundation.

SAMUEL SAGE: Sam Sage, the president of the Atlantic States Legal Foundation. And I'm just going to make some preliminary remarks. Atlantic States will send in detailed comments to the EPA review panel and for the record here.

Before I say anything in detail we are happy to see that something is finally going to happen. We recognize the need for dredging and capping. And we hope that things can get started as soon as possible. I would just like to talk about three or four issues quickly.

SAGE

The first item is that we're concerned that there needs to be a vision for the lake, a consensus vision. This is a public policy issue: What do we in this community want the lake to be like fifty or even a hundred or more years from now? At this point there is a vision that the Onondaga Nation has presented, that this is their cultural heritage, this was their life source, and their fishery, and hunting grounds.

We need to see as a community what the end point of a rehabilitation of the lake should be. We have to recognize that there are scientific limitations in restoring the lake to what it once was but we really need to know what it is that the lake should become.

Part of that, to get there, the most important thing is a sensible and thorough monitoring plan for the lake. We need to start now doing baseline monitoring, so that by the time we have this plan implemented we know where we're going. This monitoring

SAGE

plan is going to have to be very complex in its variation, it has to dovetail with the monitoring currently being done by Onondaga County. We would recommend that there be outside scientific input into developing the monitoring plan, and hopefully be outside peer review of the monitoring plan before it takes place.

Another concern about the monitoring plan is its cost. The monitoring plan is estimated to be something like $3 million a year for a minimum of 30 years, but probably more than that. That's a large sum of money. Corporations come and go, we really would like to see some fail-safe mechanism that the money will be available to do the monitoring properly. And one idea would be to collect a sum of money up front and keep it into a fund specifically for the purpose of the monitoring. The legal possibilities of doing that are the Superfund notwithstanding, I think that's something that should be investigated.

Part of the monitoring exercise is

SAGE

needed in order to do some modeling of the different parameters in the lake. There was a meager effort to do a mercury model. That was shown that it wasn't going to work. But that effort was pretty half-hearted at best. To do a mercury model properly is going to take a long period of time. We need to start now getting the monitoring data that will allow us to do that monitoring. Without some kind of modeling exercise we have no idea at what point we can expect to see improvements in biota, a lessening of methyl mercury in fish tissue and other things like that.

We also should be modeling for other parameters other than mercury. There are various organic compounds that should be modeled. And a thorough analysis should be made of what are the most reasonable parameters to that modeling exercise.

The next point that I think is needed to emphasize is public participation. It's very gratifying to see so many people coming to this meeting tonight. For all too many

SAGE

years when some of us have been dealing with Onondaga Lake issues we sort of talked to ourselves. However, the Superfund process is partly to blame. We at Atlantic States audit the TAG grant agency for the Environmental Protection Agency. But even so with all our efforts getting people interested in the esoteric of the Superfund process has been difficult.

Also unfortunately, this hearing is the only requirement under the Superfund process. And so we are urging that a more comprehensive continuing public participation effort go hand in hand with the remediation of the lake bottom site and with the other sites. I have suggested separately to DEC that an overall matrix should be prepared for the public, showing the relationship of all the upland sites to the lake bottom sites on the dates and the conflicts and trying to hammer out, you know, what people can expect and what are the significant points at which some public comment would be desirable and necessary.

And I think there is some agreement to do something like that and I think that would go a long way in helping getting the public more involved.

Finally, the last point I would like to make is that in all the work to do the remediation we have to think of the workers who are going to be doing the work. And it's particularly important that proper hazardous management training be undertaken by all these workers and that all steps are taken to ensure their health and safety during the process. And thank you, we will submit written comments later.

DIRECTOR LYNCH: Thank you, Sam. Chuckie Holstein, FOCUS Greater Syracuse.

CHUCKIE HOLSTEIN: Good evening and thank you very much. I appreciate DEC being - giving us this opportunity. I'm with FOCUS Greater Syracuse. FOCUS stands for Forging Our Community's United Strength. And I'm speaking for the ordinary citizens who participated in our FOCUS visioning process in 1997 and 1998.

HOLSTEIN

There are over 5,000 citizens who participated in this process to share with us their dreams and their visions for our community. That was eight years ago. And that visioning process developed 15,500 ideas. That's a lot of ideas. We distilled those into goals. We ended up with 87 goals. Those goals were voted on in a Vision Fair in 1998, and that's what I want to talk to you about.

As people voted on the goals they established the preferences for what they wanted to happen first in this community. The number one goal was to build bicycle paths and hiking trails, especially along the waterways in our community, ergo Onondaga Lake.

The third highest goal out of 87 goals was to develop and clean Onondaga Lake. I went into that great big fat notebook this afternoon to take a look at what some of the people were saying about Onondaga Lake. After I had counted 150 times just the three words, "clean Onondaga Lake," I stopped counting, because I think at every single one of the over 200 visioning sessions people did say they wanted Onondaga Lake restored so they could go swimming there and fishing and so on.

The citizens have waited a long time for the clean up of Onondaga Lake. The good news is that there is good fishing in the lake. We understand the carp colony is wonderful, and even those people from the United Kingdom would like to come here and fish for carp.

We also understand that you can travel from Onondaga Lake all the way to the Mississippi river, but they can also come here, and that's I think what Warren talked about in bringing tourism to this community.

Last year in 2004, we spent the entire year on the waterways and water in our community. We held two FOCUS meetings, an annual event and a workshop with experts. Some of you here in this room were part of that. We ended up with a report to the community. There were 10 strategies for

HOLSTEIN

Onondaga Lake. I'm only going to read a few of them to you.

The first and foremost was to focus on water quality. And I think that's what the DEC, Honeywell and the other remediation projects are talking about.

They want to continue the clean up and have a long range plan to keep it clean. And that goes to what Sam Sage just talked about, the continuing monitoring.

They want the public to be informed of the current state and usability for recreation and fishing. In other words, they said, let's get people on the lake not just standing there and looking at the lake.

They want to create a positive publicity and media campaign about the lake. And I think we need to do that more and more. Of course they want the hiking trail and the bicycle path, the contiguous lake trail to be finished. And the edge lands be ready for development and public use.

The people talked about public accessibility and to provide transportation to the lake. There is some people who don't have transportation and need public transportation to get to the lake.

And last but not least, they said all around the lake should remain in the public realm. There should be public ownership of the shoreline, and create a long term plan for the use.

I think the citizens of this community would find it very good news to hear that we're finally beginning the process. And we recommend that the process begin as soon as possible. We say start now, just do it. And I do have some documentation on the citizens goals and what they had to say and I will leave them with you. Thank you very much.

DIRECTOR LYNCH: Thank you. Next is Clyde Ohl.

CLYDE OHL: My short presentation here is entitled "Build and measure - but No Final Specific Master Plan." I have two areas of concern with proposals for Onondaga Lake.

OHL

First, as background, there is a scientific way to resolve the issues involving Onondaga Lake. The lake would be studied by an independent scientist, or independent scientists with proper peer review. The remedial issues would be defined, with extensive models constructed, based upon selected variables and a final solution based upon a clearly defined master plan. We don't have a master plan as yet.

Unfortunately, all too often clearly defined scientific study has been subverted to what I call is the political process.

The result has been what we call the Build and Measure Plan established by Onondaga County, without precise goals, to grapple with the sewage discharge into Onondaga Lake. Build and measure, often done without independent monitoring, I repeat, independent monitoring is a nice sounding term. However, it is not based on long-term goals but it's more concerned with inching along, sometimes delaying the project.

OHL

It comes as no surprise that Honeywell has followed or decided to follow what I call the Metro template, and wants the same arrangement. Fifteen years after the state filed the lawsuit and after collecting hundreds - or mounds of data and studies at a cost of several hundreds of millions of dollars, detailing the industrial pollution of the lake, we are again endorsing what I call this build and measure plan, and again without a clear predetermined goal.

To be succinct, under build and measure the polluters are being allowed to build what amounts to interim or test facilities, and merely measure their efficacy rather than require actual predetermined results based upon proper scientific models.

This flies in the face of what I call environmental cleanup practices everywhere in the country. I have been -- don't get me wrong now, I've been delighted that Honeywell has come along. They're doing things differently than other interested organizations. They're reaching out to the

OHL

public. They haven't announced the final plan. The final plan, as I understand, will be about three years from now. During the meantime they'll be doing a lot of work in preparing for this.

This type of initiative involving the public is long overdue on issues involving Onondaga Lake. And I do not want to delay major positive efforts with reference to the lake. However, I continue to remain concerned with the build and measure approach proposed by Honeywell. The major shortcoming I again point to is a lack of modeling for the project, no models. We have to do what we do and then build and measure and so on. We spend hundreds of millions of dollars and we're throwing out a lot of that information we had before.

Using appropriate modeling to arrive at predetermined measurable goals is an overriding importance in this issue.

My second concern, by the way I mentioned two, rests with the Town of Camillus. And it goes like this. I'm not

OHL

speaking on behalf of Camillus officialdom, although as a former town supervisor in Camillus and a former county legislator I've been involved in the lake issues for many many years. I'm also chairman of what we call somewhat facetiously the Dead Lake Society. Dead Lake Society. The beds actually represent a long lost opportunity, the present beds, represent this lost opportunity for long term economic development as well as recreational opportunities.

We just have the wastebeds in Camillus, several hundred acres. We now have the chance to regain the opportunity of bringing these areas back into some type of economic development profitable for the town.

I think it's important for Camillus to be involved in the design process for the development of the beds and the surrounding areas and not merely as a depository for the tailings from the dredging program.

The so-called Allied beds actually have potentiality easily ignored, often ignored

OHL

and not much appreciated for future development in Camillus. It seems to me using bed 13 and maybe even expanding it to bed 14 actually overrides or creates a major barrier to future development. Camillus has a finite area, and to see Allied beds continue only as a dumping site flies in the face of economic development.

I do remember a schematic developed about twelve years ago by Allied Chemical and they depicted future uses of this whole area. I was very much impressed. Golf courses, parkland, all kinds of things, even potential parking lots for the State Fair and also maybe a ramp, another exit ramp on Horan Road that would serve Camillus a little bit better. Well, time has passed by, twelve years later, and nothing much has happened as far as that part is concerned.

There is no mention in all of this, by the way, of economic benefit to the future. Unless we start now we may well end up with another lost opportunity. It's not too early for Camillus to be involved in conjunction with Honeywell and the DEC in any design processes. I want to see a better use of the wastebeds and surrounding areas than we are contemplating at the present time. Thank you.

DIRECTOR LYNCH: Jeffrey Freedman.

JEFFREY FREEDMAN: Thank you. I am Jeffrey Freedman, F-R-E-E-D-M-A-N. It's been my privilege and pleasure to have a sailboat and a motorboat on Onondaga Lake for the last six years. It's also been my pleasure to be a member of Onondaga Yacht Club. Onondaga Yacht Club has existed on the shore of Onondaga Lake since 1883, promoting recreational boating on Onondaga Lake and enhancing the recreational boating experience.

On behalf of the members of the Club, we number about 60 families who have about 50 boats that we use on the lake. We thoroughly support these efforts of the DEC and of Honeywell to clean up what we regard as our lake.

In the course of the clean up operations

FREEDMAN

we think it would be in the interest of public safety to remove all of the under-water obstructions to navigation. The Noah charts for Onondaga Lake list at least two sunken barges and numerous underwater pilings which remain from the amusement park on the western shore. These objects present a clear and present danger to public safety and also to the safety of the Honeywell workers who will be out on the lake in their boats. So we hope that in the course of the clean up efforts that these objects will be removed.

We hope that the clean up effort will, in the habitat enhancement part of the project, that we can have a plan free zone in the Marina Harbor, that will also support navigation, and the channel between the Marina Harbor and the lake in the deep end.

We are not anxious to see anchoring restrictions over the areas that are capped. An anchor is an item of safety equipment on a boat. We have seen sudden storms come across Onondaga Lake and we have measured winds in excess of 80 miles an hour. So we need to deploy our anchors as a matter of boating safety, and we would not like to see any restrictions to anchoring in the cap areas.

Those things being said we look forward to working with the Honeywell staff as the clean up progresses. Our organization sees this as an opportunity to greatly expand recreational boating on Onondaga Lake. We have called for the creation of a day camp with sailing instruction and lake ecology instruction for children, possibly associated with our boating club. We would like to see community sailing programs for our senior citizens so that retired people could come and use boats, not necessarily have to own them themselves.

We would like to foster the relationships with our colleges and universities to bring back intercollegiate sailing on Onondaga Lake and scholastic sailing. And we also see our Club hosting Empire State Games sailing events and also national

FREEDMAN

sailing regattas on Onondaga Lake for one design sailboats.

So we see a tremendous increase in sailing activity. We would like to also see a tremendous increase in fishing activity and rowing shells. So I think the vision that we have for Onondaga Lake from the standpoint of recreational boating is that the thousands of people who already enjoy Onondaga Lake Park would look out and see the lake literally covered and populated with sailboats, fishing boats and rowing shells on every nice day of the summer.

And once again, we are tremendously appreciative and express our deep gratitude to the staff of the DEC and to the Honeywell organization for their clean up activities.

Finally, we just hope that - we understand that there is presently a disparity between the scope of the operations that are being proposed by Honeywell and by the DEC. We would not like to see these - this disparity get bogged down in the judicial system under court -- in the courts, but we would like the clean up effort to go as expeditiously as possible so that we and the public can enjoy our lake. Thank you.

DIRECTOR LYNCH: Nick Kochan.

NICK KOCHAN: K-O-C-H-A-N. Good evening and I would like to - village of Liverpool Planning Board Chairman and twenty year resident of the village of Liverpool and a life-long resident of the Syracuse area.

In Liverpool which was incorporated in 1830 as one of the older communities in the area, probably had one of the first commercial enterprises on the lake with the collection of salt. And the focus of the lake has been an economic driver for everybody in this community for a long time.

And the twenty years since Allied has closed the community has taken a new focus and a new direction with respect to the lake. We have worked with the mall, we have the extraordinary growth of the use of the park, the Onondaga Lake Park, and also we have the improvements being done by the wastewater, in the wastewater facilities.

It's very encouraging to see the effort that's being put into this project and it's great to see this is getting closer to becoming a reality. I just have several quick comments to make because many of the points have been covered already.

Assuming that the upland remediation is successful and diligently protected, I would make that one of the first conditions in looking at this lake proposal. And we also have to make sure that Honeywell will still remain involved in the long-run to maintain those facilities. I would just like to encourage Honeywell and the DEC to continue to work hard and find the best economic and scientific compromise possible for this project. Thank you.

DIRECTOR LYNCH: David Chapman.

DAVID CHAPMAN: How are you doing. I have some scientific statements I was going to make on behalf of Dr. George Putnam with our firm. My name is David Chapman, I'm with Mountain Eagle Management, we're a technology development firm.

CHAPMAN

I guess mainly I wanted to get across rather than, I can address this later for you and give this to you, but there is a lot going on in the community. First of all, I want to commend the DEC and Honeywell for moving towards action steps now as opposed to just a constant studying and remedial investigation going on seems like a lifetime.

Our firm has a patent on a reverse of the Solvay process, where they take carbon rock and turn it into natural chemicals. It's a patent, you take that natural chemicals and turn them back into carbon rock for sealing up buildings and soils.

We've run into a lot of, I don't know let's just say snags along the way in trying to get an idea of the chicken and egg theory a cross of whether it's been done before or how do we know it will work, and a lot of things like this. One of the things I see happening in this community right now is that we're really moving toward a community of technology development; what's going on down in Syracuse and various different

CHAPMAN

operations that are happening around there and what Pataki recently proposed as far as new technology development in the Central New York area.

And I just want to say I think that with Onondaga Lake we have a great opportunity to really look at some of the other technologies, and I'm not just talking about ours, I have seen some other technologies that really hold some serious merit for the true clean up of the lake.

And all I want to say for the record is just that if we can just make sure that we have a forum where these technologies can truly be listened to by people like yourselves and other scientists and not just pushed aside where it's been done before. But really looked at for a way for some potential solutions.

Again, like I said, I want to commend the DEC and Honeywell and all the fine engineering firms who worked up to this point of bringing this to fruition with this diverse action, instead of just study.

That's pretty much it. As far as the technical, I'll leave this for you. Thank you very much.

THE COURT: Howard Bragman.

HOWARD BRAGMAN: I am H-O-W-A-R-D B-R-A-G-M-A-N. This will be like really short, just about a minute. It seems that we've been this route before. Not so long ago a professor emeritus from ESF stated it would take at least half a century and then we would not know where we were. Is it emollients, PCBs, mercury, whatever? Because Onondaga County does not collect taxes anymore. Because I used to hear rumors that people who worked for Allied if they suddenly think about polluting the lake, rushed into a room with an exit sign on it and they were out the door.

Why am I not convinced? If Allied were still here we would not be here tonight. I propose damming it because that is the one true way of getting to the bottom of things. In other words, just put up big barriers and get in there and see what you have. And then cap it so well that it probably will never leak again. And I think the technology that was here could be developed. If they can with that movie Titanic develop technology for the cameras that went down there, just for a movie, which means nothing, they can surely do this with Onondaga Lake if they really and truly want to.

And they could go back year after year, maybe the first two years after, then two years, leave a space, two years after, two years, three years. They have barriers that they put on highways when they want to work on them, they can use the same type of technology on the lake. I don't believe they can't. Thank you.

DIRECTOR LYNCH: Les Monostory.

LES MONOSTORY: I am Les Monostory, M-O-N-O-S-T-O-R-Y. I'm president of the Onondaga County Federation of Sportsmen's Clubs, and I represent about 30 clubs and several thousand members of sportsmen who are some of the primary users of the lake in terms of fishing, boating and we have a fair number of duck hunters that also use the lake for hunting purposes.

And my concern is about shoreline safety issues. Many of you may not be aware that along the shorelines where Allied had the wastebeds, which really covers basically from Nine Mile Creek all the way to past Onondaga Creek to Ley Creek. There was these wastebeds that leaked calcium sediments into the lake and particularly along the shoreline by the so called white cliffs, which is the area adjacent to the, well the New York State Fair parking areas.

There are areas along the base of those cliffs where if you walk into the water you may fall through a hardened calcitic sediment which has been deposited along those shores.

On November 26th I wrote a memorandum to Honeywell and DEC Region 7 about safety concerns related to Honeywell clean up of Onondaga Lake bottom sediments. I expressed concern over safety issues along the western shoreline related to potential hazards for fishermen or boaters who might try to either wade or land a boat along the Onondaga Lake shore.

Honeywell responded with a letter dated December 17th, in which they described proposed remedial measures specifically for the white cliffs section of Onondaga Lake, which comprise portions of SMU 3 and SMU 4.

With regards to the sediments beneath the white cliffs in SMU 3, Honeywell's letter indicates that the FS, I can't think right now, what does FS stand for? Feasibility Study recommended alternative includes dredging of near-shore sediments followed by capping along much of the shoreline.

Shoreline stabilization would be completed along the remainder of the shoreline in this area. And those areas targeted for dredging and capping, calcitic sediments would be removed. And those are these sort of glass type of sediments that I'm talking about. And the area covered with capping materials comprised of stone, cobble and sand. The thickness and size of these materials will be determined during the design phase.

They continue. "Various techniques would be used for shoreline stabilization, and may include vegetative plantings and brush mattresses. Along those portions of the shoreline that are either exposed to wave energy or more steeply sloped, stone may be placed at the bottom of the slope to stabilize the substrate and prevent erosion of the shoreline treatments. Honeywell believes these techniques will address the potential safety concerns you raised related to calcitic sediments along 2,500 meters of shoreline."

Again, this would be the area roughly from the 690 turn-off to State Fair Grounds to Ninemile Creek. That's approximately about 2,500 meters of distance.

Shoreline Safety Recommendations: In reviewing both the Honeywell and DEC plans for dredging and capping of the shoreline sediments in both SMU 3 and SMU 4, it is clear that specific areas along the shore-line will be dredged and capped from the lakeshore up to depths up to 9 meters. However, the reports are unclear regarding what specific stabilization measures will be completed along the shoreline sediments not specifically targeted for dredging and capping in this area.

In order to address the issue of physical safety concerns for anglers or boaters who may try to access the shoreline along the base of the white cliffs, I am recommending that solidified calcitic sediments along the entire 2,500 meters of shoreline at the base of the cliffs be removed to a water depth of one to two meters, and that the entire shoreline be stabilized with capping material composed of stone, cobble or sand to a minimum water depth of 1.5 meters.

The purpose of this additional shoreline stabilization is to provide safe recreational access for shoreline waders, anglers and boaters, who are currently at risk when they try to walk the lake shores at the base of the white cliffs there, due to existing layers of unstable calcium carbonate sediment.

I also have a separate statement which I may present later with regards to a fishery goal statement for Onondaga Lake and tributaries.

DIRECTOR LYNCH: Dr. Kaczmar.

DR. KACZMAR: S-W-I-A-T-O-S-L-A-V K-A-C-Z-M-A-R. I'm adjunct professor at Syracuse University and I'm chief scientist for O'Brien & Gere engineers. I'm here tonight speaking as an independent scientist. I had the good fortune of a public education. I have been performing risk assessment investigations such as this for over 20 years and teaching others to do the same.

I performed an independent review of the remedial investigation in the Feasibility Study for Onondaga Lake. Having reviewed that, I place particular focus on the risk assessment itself. Basically what a risk assessment is, it evaluates the chemicals in the system and it puts together a model of hypothetical exposures, and what's known about the toxic impact.

In reviewing this model the assumptions that were incorporated were very conserva- tive, okay. Meaning that they had some very - assumptions that are unrealistic, but for the purposes of over-stating the risks. And the reason they're over-stated is for the purpose of protectiveness, not to try to put down, you know Honeywell caused the problem or whatever. But taking in the worst case, so that the uncertainties that might be inherit in the system, there are many, could be controlled.

Within that context there were some remedial actions taken to address those conservative risks. And it's my independent opinion that the remedies in the Feasibility Study adequately address those risks. And so I believe it's protective, and I believe it's for all practical purposes an appropriate remedy.

I'm particularly encouraged by the enhancements that are present. These are the kinds of things that are not required, okay, but really are going to make our community a better place, both on the ecological part in providing an integrated potential for development of the community. I'm very happy to see that and I'm happy to be here. Thank you.

DIRECTOR LYNCH: Sharon Fulmer.

SHARON FULMER: Thank you. I'm a resident of Liverpool and have been for more than three decades. My family was raised in Liverpool. I have served on two of the Onondaga Lake committees that existed back in the 19 - I don't know '80s and '90s. I see a few people here who were part of that group for the most part. We have all figured it was going to take a long time for something to happen.

And to that end I sincerely hope as others have said before me that Honeywell and the DEC can come to an agreement without requiring long drawn out processes that can see this go forth as quickly as possible.

I'd also ask one thing. The last slide you showed today talked about how people can view information about what's been going on at the Syracuse library and DEC and one other place I can't remember what it is. I'd ask that you remember the people who are affected the most by this, those being the people who live in Liverpool, the village and outside the village. And those people who live on this side of the lake as well, and that you provide all those written materials for the Liverpool library, which is open seven days a week and open until 9 o'clock every day. And for the library in Solvay or Camillus, Solvay and Camillus, which probably have some more hours. Thank you.

THE COURT: Dereth Glance.

DERETH GLANCE: My name is Dereth Glance, I'm a Central New York Program Coordinator for Citizens Campaign for the Environment. CCE is a not-for-profit, non-partisan advocacy organization with over 80,000 members across the State of New York and in coastal Connecticut. We work for the protection of public health and natural environment.

CCE understands the challenges to remediate the Onondaga Lake bottom and of the toxic, persistent and bioaccumulative chemicals and metals discharged from industrial polluters are unparalleled. CCE appreciates the efforts of the New York State Department of Environmental Conservation - I'll call you the Department from now on - Honeywell International and the host of stakeholder groups dedicated to improving Onondaga Lake.

CCE plans to submit formal detailed comments for thoughtful review by the Department. Today, because of the time constraints I'll limit my comments to the following recommendations.

First, CCE urges the Department to hold additional public hearings in a question answer and format. We're very pleased to

GLANCE

hear about the question and answer that will follow this public comments process, I don't know the time that will be. And so from the turnout tonight it looks like we can really stand to have another public hearing in February. I understand there are several folks in the community that have been very involved in the process and were unable to make it today due to a variety of different conflicts.

Specifically we would like to have the additional public hearing to be held in the question and answer format so that we can inspire more and more questions from the community to thoroughly ask some good questions about the plan.

Secondly, we believe that CCE - we believe that the Department should provide ample opportunity for public involvement during the design phase. CCE understands that some of the most important decisions to be made regarding the Onondaga Lake bottom clean up are currently scheduled to occur during the design phase. These key

GLANCE

decisions currently include determining the appropriate Sediment Containment Area or the SCA, identifying the appropriate method of effluent treatment, in determining the long term monitoring requirements.

CCE believes these issues and others raised by this project will impact the local community and that the design phase needs to be transparent and accessible to the public. To this end, CCE recommends that the Department establish a Citizens Advisory Committee or CAC. The Citizens Advisory Committee should advise, provide guidance and support the Onondaga Lake remediation efforts.

CAC members would meet on a regular, perhaps monthly basis, to review plan implementation, provide input on design phase decisions, and receive reports on Onondaga Lake remediation progress and challenges. The CAC should consist of members representing the Onondaga Nation, scientists, environmentalists, local environmental officials and concerned citizens. Such CACs are well established throughout New York State and the nation and have been beneficial to government agencies, stakeholder organizations and the general public.

Finally, CCE believes that the Department should require public education as part of the Onondaga Lake bottom remediation efforts. CCE is concerned that the Proposed Plan, including the three preliminary remediation goals or the PRGs do not include a public education component to inform the public about the risks of our changing local waterbody.

CCE believes Onondaga Lake remediation discussions and actions need to be part of a coordinated public education effort that will inform individuals about the safety of using the lake for common recreational activities such as fishing, consuming fish, wading, swimming and boating.

Specifically, CCE is concerned about the PRG 2 or the Biological Tissue Goal, which is to achieve pollutant concentrations, to the extent practicable in fish tissue that are protective of humans and wildlife that consume fish.

The extensive mercury contamination in Onondaga Lake warrants aggressive public education efforts concerning fish consumption CCE understands that this is a long term goal, and that the public education and outreach efforts about the risks to human health from consuming Onondaga Lake fish needs to be a critical part of the remediation plan to protect public health. Thank you.

DIRECTOR LYNCH: Don Hughes.

DON HUGHES: Thank you, my name is Don Hughes, H-U-G-H-E-S. I've served as techni-cal adviser to Atlantic States Legal Founda-Tion, and I'm a resident of the city of Syracuse since 1985, I believe. I'm going to talk, going to add to Sam Sage's comments earlier, but talk more about some of the technical issues concerning the remediation.

First of all, people should know that the remediation depends very heavily on the viability of the slurry wall. This is an intermediate, interim remedial measure which is to be placed along the western shore in the corner of the lake, it's a mile and-a-half long. And it will hopefully cut off the movement of non-aqueous phase liquids from entering the lake. This has got to work for this whole plan to work. If it don't work we're going to be in trouble.

It has the cap, which is to be placed over the in-lake deposit is designed on a groundwater flow of 6 centimeters per year, the existing groundwater flow is about 200. So the slurry wall has got to reduce it, has got to cut off the groundwater, and you have to pump that groundwater into a treatment system. Okay, so that's a big concern.

Another concern I've got it has to do with what we're doing with the sediments. The sediments are going to be pumped up to the wastebeds, wastebed number 13 has been tentatively selected and I would ask why that one? It would seem that treatment has not really been considered to any extent except to the most cursory level.

The contamination in the sediment is concentrated in these tarry deposits which are a non-aqueous phase. And these things are dispersed throughout a matrix of calcium based waste which is the Solvay waste, which is the white, the same stuff that's the white cliffs. And it's probably a fairly easy task to separate those two things. This is, you can use mining technology to separate things which have different sizes and different densities, and it's cheap.

It's been demonstrated on contaminated sediments in Saginaw Harbor, Saginaw Bay. And I was part of that investigation and it does work. And I think that the Department and Honeywell should look extensively into that, because that's a way to take the toxicity out of the sediments. And that is a primary goal of Superfund is to significantly and permanently reduce toxicity.

Another big issue is once you get the sediments onto the wastebeds what about volatile emissions? The sediments contain a whole host of volatile chemicals, including benzene, toluene, chlorobenzene, dichlorobenzenes, xylenes and so forth. These things don't only smell bad, they are toxic. And we don't want to expose either residents or workers to this stuff. So we've got to have a good control system on odors, on emissions.

Another issue has to do with the deep waters of the lake. Now the plan really focuses on the littoral zone, the shallow waters of the lake, the profundal zone, which is the deep waters, is - well, it's kind of left in the lurch. It's - the plan really lacks a plan other than wait and see. That's what monitored natural recovery is.

The concentration of mercury will be monitored in surface sediments over time, over 10 years. And this is somehow going to be modeled using a program called STELA. STELA is a generic program for which any number of parameters and inputs can be specified. Right now we're kind of lacking basic inputs as to what's going to go into that.

And there is a lot of issues having to do with disturbance of the sediments and how the STELLA is going to successfully model the sediments. You've got groundwater moving upward into the sediments. There is a release of gas bubbles called ebullition, because there's been so much organic matter deposited in the bottom. And once the lake becomes more hospitable in the bottom waters, hopefully that's going to happen, now that Metro is being upgraded, we're going to see more fish and macro-invertebrates living in the bottom waters, which means more disturbance, more bioturbation of those sediments.

And based on the comments of Mr. Freedman we might see some boat anchors to worry about as well. So the profundal zone is a big big question mark. I would tend to characterize this whole remedial action as Part 1, the littoral zone. And Part 2 is the profundal zone, that will come later.

Finally I've got a generic comment

how the decision-making process goes. All three of the preliminary remediation goals and all five remedial action objectives are qualified by the phrase "to the extent practical." This type of language is typical in the Feasibility Study. But who decides what is practical and how will the public learn of and participate in these decisions?

How useful is the public -- how useful to the public is a goal that is achieved based on an undefined assessment of practicability? Is a qualified goal a real goal? Shouldn't goals and objectives be transparent, achievable and measurable?

Why not define what clean up levels are technically practicable given the very best model cutting edge remediation technologies fully justifying and documenting the determination to the public, and make those the achievable and measurable goals. Thanks.

DIRECTOR LYNCH: Sara Eckel. Sara Eckel here?

SARAH ECKEL: E-C-K-E-L, S-A-R-A-H. I have seen the proposed plan to use existing wastebeds to contain the various sediment. And my concern evolves around the fact it will not include a comprehensive clean up of these existing wastebeds. While I understand the cost-effectiveness of the already contaminated areas I do not believe the plan should ignore the future problems that could result from leaving these areas untreated. I also understand the need to move this plan forward and I believe it should be done with future generations in mind.

DIRECTOR LYNCH: Steve Effler.

STEVE EFFLER: E-F-F-L-E-R. I am director of research of the Upstate Freshwater Institute, a not-for-profit research organization, and it's involved in the research study of a number of fresh water systems throughout New York State.

I've spent the larger part of my professional life studying Onondaga Lake. Some people do Lake Tahoe, some people do Lake Erie -- well someone had to do it I guess.

EFFLER

Anyway, the Institute over the last 20 some odd years has published more than 200 articles in the peer reviewed literature, and we're quite proud of the fact that one of those articles entitled The Impact of the Chlor-alkali Plan in Onondaga Lake and Adjoining Systems was actually the primary technical basis for the provisional lawsuit that has led to this cleanup.

As I said, we're involved in the research of a number of systems and have in the last decade led the development of water quality models for the New York City reservoir system.

Let's get down to where we stand based upon our review of much of the available documents with regards to cleanup of the Honeywell site. We enthusiastically endorse the proposed rehabilitation efforts for the site that include removal of toxic sediments, capping of sediments, and improvement of degraded habitat. We endorse proceeding without undue delay. Let's get on with it, we have all waited a long time. With the

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following caveats, of course.

There is a continuing review process. EPA will be involved in continuing technical review. There are portions of these documents that frankly fall outside of our expertise. And also we understand the way this process works, if indeed we find new sources of contaminant problems in the future during clean up those items would also be addressed.

All those nice things said, and by the way all the hard work that I know has gone into this, those efforts certainly should be applauded. All that said however, we have great concern with the lack of understanding of the behavior of contaminants from the Honeywell site within the lake itself. This is - we don't fault any of the agencies or organizations involved, to our way of thinking this is largely attributable to the constraints embedded in the Superfund process. It's simply a very difficult arena to get some of the basic scientific information that I think we still need.

EFFLER

Why should the community care about this esoteric stuff? Well, because neither Honeywell or the state can really tell us how much better the lake will be following execution of these rehabilitation programs. Meaning, they cannot answer the question quantitatively at least, how much lower will fish mercury concentrations be following these programs? Think about that. And that's not just mercury, the other contaminants also.

We have every reason to expect, as they have argued, things will be better. But at this point don't you think we ought to know how much better? And basically this comes down to the what's lacking is a credible scientific mathematical model that can predict responses in the lake to these and other management actions. There was originally a mathematical modeling element in the Superfund work, particularly related to mercury. But these efforts had to be dropped.

While we support moving ahead with clean up actions without a model - I'll say that again. We do support moving ahead with clean up actions without a model, this limitation should be eliminated in the future. We need those tools, we need that level of understanding. As Charlie Driscoll from Syracuse University was recently quoted, "If you understand the system you can model it."

So where we are is, while we expect things to get better and indeed so do I, I think we want to know it a little better than that.

Further, UFI recommends that this model be developed and tested outside of the Superfund process. Simply put, the process by the way it is set up it is simply not the arena to get this level of understanding. The kinds of questions or information such a tool gives is, it allows us to evaluate the feasibility of reaching various goals, certain levels of contamination in fish flesh, it will help us establish reasonable expectations for the lake in response to rehabilitation efforts. How much better will it get? And allow and support quantitative evaluation of management alternatives. And could contribute to future parts of a management program.

Lastly, we support the comments of a number of previous speakers with regards to the monitoring program. The monitoring program is extremely important, particularly for the adopted build and measure approach that relies primarily upon monitoring information before and after implementation.

This needs to start ASAP. We really don't have, from what's been done so far, adequate monitoring data to be able to assess how much better things are going to be following implementation. This needs to be designed and implemented so that it can also support the modeling program. It needs to be flexible to allow changes in response to observations, it needs to be flexible, right.

In other words when we see certain behavior we need to make changes. And that's very difficult within the Superfund process. And we believe that this data needs to be available to the public soon after collection as well as other experts. Thank you very much for your time.

DIRECTOR LYNCH: Nancy Ciampi.

NANCY CIAMPI: Thanks, Ken. Nancy C-I-A-M-P-I. I'm a town of Geddes resident. And I just want to say thank you, express my appreciation to the DEC, to Honeywell, Earth Tech, for the sessions that were held in the Town of Geddes December 9th, and the two sessions in January, as well as tonight. And hope that they continue.

My comment is that I feel these sessions are very important to the success of the plan and that the public needs to know that there will be well publicized open and honest public meetings to get frequent status updates and share their concern.

DIRECTOR LYNCH: Peter Pedemonti.

PETER PEDEMONTI: P-E-D-E-M-O-N-T-I. I just like to say I would like to see the most thorough and complete clean up of the lake regardless of time or cost. Just because when put into the context of our responsibility to future generations, the Onondaga Nation, wildlife and the lake itself, it means a little less. So thank you for the opportunity to comment.

DIRECTOR LYNCH: David Arnold.

DAVID ARNOLD: My name is Dave Arnold, A-R-N-O-L-D. I'm a life long resident of Onondaga County, Town of Clay. And I am a farmer. My farm is located on Route 57, just north of Moyers Corners almost to Three Rivers.

Two years ago on January 15th, 2003, I stood in front of you and spoke against issuing Evergreen Recycling a permit to operate in the Town of Clay. Along with 500 others we spoke our minds and collectively convinced you this was not a good idea, even though the Clay officials did. During this meeting I spoke about illegal acts committed by our elected officials. Since that time our representatives have rewarded those acts by issuing more than $2.5 million in grants on projects involving a fraudulent contract at Three Rivers Point.

The Onondaga Lake Cleanup Project is much larger than the projects involved in Clay. The Clay Brownfield clean up project at Three Rivers could easily surpass $50 million if the land is cleaned up the way it should be.

If we can't even start a project in Clay without corruption and fraud at the $50 million level, how in the world can Onondaga Lake Cleanup Project succeed? A half a billion dollars in this town is a big chunk of change. We need someone at the county level that we can trust to take charge and appoint public committees of oversight that will independently scrutinize all phases of these projects. We must all take responsibility for neglecting Onondaga Lake and Three Rivers Point. Yes, the perpetrators will pay a large price, but we will pay an even higher one if we don't succeed.

On September 10, 2004, I contacted the Attorney General's office. It is my hope that Mr. Spitzer will investigate and prosecute all those involved in corruption and fraud in Onondaga County, so we can then proceed with confidence on these extremely important environmental projects.

We are fortunate in this country to be able to criticize those who represent us. What is unfortunate is when they refuse to listen. Thank you.

DIRECTOR LYNCH: Sherry Mossotti.

SHERRY MOSSOTTI: Thank you. Hello, Ken. Sherry M-O-S-S-O-T-T-I. I'm here to speak as a citizen and a taxpayer of Onondaga County. I am a life long resident of this county. For over 23 years I have driven by Onondaga Lake and thought what a shame. I've traveled all over the world, and it doesn't take someone to travel to know the importance of a lake on a community. This is an opportunity, folks.

In my position as executive director of the Premier Community Leadership Program in this community that trains and educates our community's leaders which include 600 adults and 300 youth leaders, we have had the opportunity to hear about the history of the lake from a historian, what's in the lake from the scientists and biologists, the engineers, the methodologies for clean up, and also the economic potential of Onondaga Lake. Onondaga Lake clean up is a topic that continually comes up among our community leaders that we train every single year.

We have met with Honeywell, we have met with the DEC, and we have reviewed all of the proposed plans. I have discussed this with Ken Lynch, Neil Murphy, who is the head of SUNY ESF, numerous scientists, engineers and residents both adult and youth. And it was great to see some young people come up and speak this evening.

On behalf of Leadership Greater Syracuse we applaud Honeywell, the DEC, the county, the city, O'Brien and Gere, and all the interested parties for coming together to the table. And we ask you, no, we implore you, on behalf of our community, our wildlife, our children and our grandchildren, to continue to come together and work at the table and move this project forward to find a resolution that we can all be proud of for years to come for our children and our grandchildren. Thank you.

DIRECTOR LYNCH: Terry Brown.

TERRY BROWN: Thank you. I have to be honest I'm a little conflicted here this evening, didn't know whether I was going to say anything. But I'll get unconflicted at the end of my comments here. My name is Terry Brown, I'm am chairman/CEO of O'Brien & Gere, it's an engineering and construction firm headquartered in Syracuse, New York. And I have lived in Syracuse all my life. I raised my family, and I've been with O'Brien & Gere nearly 30 years.

I spent my first six years of my career with O'Brien & Gere making or building the third Metro wastewater treatment facility. It's now in its fourth construction. In 1974 that was supposed to clean up the lake, if people go back and look at the newspaper

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articles.

I really have a passion for the community, a passion for this lake. And I have really more so a passion of the opportunity we have as a community in front of us.

As an organization, O'Brien & Gere, we're in our 60th year. Our founder, Earl O'Brien, graduated from Solvay high school in 1913. So we have a presence in this community. We pride ourselves in offering cost effective environmental solutions for our clients and municipalities we serve. Solutions which on sites, environmentally impacted, they protect the environment for future generations. That's kind of the background.

As I started listening to some of this thing, I've attended these information hearings and I have spent a lot of time in the last, I spent 18 months looking at the sites and what they could be, trying to develop a vision with a couple of my colleagues on our own time. And the vision that we can create as community for the sites and the lake is just unbelievable.

We really are at a crossroads in this community as to what we can do. And the thing we talk about, and I'm an engineer, which is much different from a scientist, I'm a doer. And I was trained, some of my training was in military. The one thing I was trained to get was the information, as much as you can, in your gut, you know what's ahead and there is tough times ahead of you but you manage the situation and go.

And we can talk about modeling, and all this other thing that we've talked about but there is a point in time where we have to go. And I'm sorry, we have made this so confusing for the public, modeling and the science. This is not. And I beg forgiveness from some of my scientific colleagues, this is not rocket science. We don't need to make it difficult for this community to understand.

We have enough information and to go with the information we have, to have an

BROWN

effective clean up in this community and create a vision. But we have to have a sense of urgency. That's what I want to stress, this is not necessarily the DEC but the people that are commenting and running comments in the future.

We have, I have worked on sites for 25 years. We've had numerous corporations, we'll buy out a site, different philosophy, different management team come in. We have an organization willing to invest in this community now and take action. That could change tomorrow. We can't let this slip by us.

And when I say acting, take the information that we have, I could give you a resume of hundreds and thousands of environmental sites. And we just had some information, we knew what the science was, we didn't have all the answers but we went out there and cleaned it up. And to my knowledge O'Brien & Gere was never cited for any environmental citation, our reputation is flawless in the nation. We have worked

BROWN

with DEC and some of the gentlemen sitting here on numerous occasions. We didn't have a lot of information, but we had enough science, we knew what the conditions were and we managed it.

So my comment really to this group here is we have to have a sense of urgency. We have to make the science simpler. We can do the modeling as we go along. We'll learn more by doing and addressing the issues as we take on the environmental remediation than we will ever learn in the modeling process. And we'll have better models in the future. But we have to move on.

A very wise gentleman said to me this afternoon, who we all respect in this community, he said, we have an opportunity and we've got to make it right. But we also have to move and we have to move with urgency so we don't lose this opportunity. Thank you.

DIRECTOR LYNCH: Those are all the people that signed up to speak. Is there anyone else who wants to speak for the record other than a question and answer period? Les?

LES MONOSTORY: I'm speaking now on behalf, well as a co-chair of the Fisheries Subcommittee of the Onondaga Lake Partnership, also vice-president of the Central New York Chapter of the Izaak Walton League. And I'm going to talk about a fishery goal statement for Onondaga Lake and tributaries.

"It is difficult to evaluate the restoration plan for Onondaga Lake without first reaching a community consensus on the restoration goals and objectives for Onondaga Lake and it's major tributaries." This is a memo that I wrote to the Outreach Committee on October 27th, and also addressed to the committee chairman, who is Seth Ausubel with the US EPA.

"On November 10, the Fisheries Subcommittee meetings included a discussion on fisheries goals and objectives for Onondaga Lake. Comments include the following:

MONOSTORY

Participants at the first Onondaga Lake Fisheries Roundtable agreed that we want to improve what fisheries we already have.

Onondaga Lake and it's principal tributaries can be promoted as a combination cold-water and warm-water fishery.

The Fisheries Subcommittee members agreed that as a future fisheries goal, Onondaga Lake should be clean enough to support both warm-water and cold-water fish species, including trout and Atlantic salmon.

On November 17th I received an e-mail from Dave Lemon, an aquatic biologist with DEC in Cortland. Lemon is a member of the subcommittee but was not able to attend the November 10th meeting. He had the following comments:

Reading over the November 10 meeting minutes I just wanted to provide some comments regarding the desire for creating a cold-water fishery on Onondaga Lake." We're getting a little technical here but this is - Lemon makes some interesting points.

MONOSTORY

"We in the Region 7 Fisheries Office do not feel that reestablishing a self-sustaining population of trout and Atlantic salmon in Onondaga Lake is a realistic goal. I'm not sure if this is the objective of the group or not." Referring to our fisheries subcommittee.

"I've attached a draft position statement to EPA, which provides some facts on the life histories of the Cisco," the former white fish "and Atlantic salmon as well as current and expected conditions in the lake. Based on this we don't believe that self-sustaining salmonid population are a realistic objective in the foreseeable future.

As such we feel that the realistic objective for the lake's fish community is a combination of cool-water walleye, perch, pike, and warm-water bass, bluegill, etcetera, species. We certainly would be happy if lake conditions improve enough so that year-round habitat for trout survival exists, but for the foreseeable future that

MONOSTORY

scenario is unlikely.

The Region 7 Fisheries Office has prepared a draft position statement to EPA entitled 'Coldwater Fisheries Rehabilitation and Management in the Onondaga Lake Watershed,' also known as the Fishery White Paper, which was prepared in July of last year. In addition to providing background information on lake water conditions and environmental requirements for various fish species, the White Paper recommends adoption of a fishery goal statement for Onondaga Lake."

A specific Goal Statement for the lake is presented as follows. "In the long term the Onondaga Lake Partnership supports the achievement of a suitable year-round habitat for a sustainable warm-water and cool-water fishery in the lake and conditions conducive for transient cold-water species in the lake and resident cold-water species in the lake tributaries."

As co-chairman of the Partnership's Outreach Committee's Fishery Subcommittee I endorse the fisheries goal statement contained in the DEC's Fishery White Paper and recommend adoption of this goal by the Onondaga Lake Partnership and its member agencies. This I think will help us at least in terms of what we would like to achieve as a fisheries goal and as a lifetime fisherman and, you know, as president of the Sportsmen's Federation I think - I happen to agree with the DEC's Fisheries goal for the lake.

DIRECTOR LYNCH: Anyone else like to speak? Bob?

BOB NUNES. My name is Bob Nunes, N-U-N-E-S, I'm the EPA project manager for the Onondaga Lake NPL site and I just wanted to briefly elaborate on what Ken said briefly in the presentation about EPA's role and what process it's following now with regards to this Proposed Plan.

EPA's role for the Onondaga Lake Superfund site has been to act as a support agency to DEC. In this capacity EPA has provided approximately $18.7 million to the

NUNES

State of New York under a cooperative agreement. And this funding has supported the performance of investigation activities, coordination and tracking of site-wide remediation activities, development of a comprehensive enforcement program, implementation of a site-wide citizen participation program, creation and maintenance of a site-wide database and project management activities.

EPA has also provided technical supports to DEC related to the investigation and clean up of the Onondaga Lake subsites. For the Onondaga Lake bottom subsite EPA provided technical support during the rewrite of the remedial investigation and review of the Feasibility Study report.

EPA will offer a position on the preferred remedy after the Proposed Plan and other project documents have been reviewed by EPA's National Remedy Review Board and EPA's Office of Superfund Remediation and Technology Innovation Sediments Team. (Microphone emitting noises) I thought it

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was the acronyms that were causing the problem.

The National Remedy Review Board is an EPA peer review group composed of technical and policy experts that review all proposed Superfund clean up decisions that meet certain cost-based or other review criteria to ensure that the proposed decisions are consistent with the Superfund law, regulations and guidance.

EPA Sediment Team offers consultation to assist risk managers in making scientifically sound and nationally consistent risk management decisions at contaminated sediment sites. The Board and Sediment Team will provide feedback to EPA Region 2 and a summary of the Review Boards and Sediment Teams comments and responses from the Region will be included in the responsiveness summary in the Record of Decision. Thank you.

DIRECTOR LYNCH: Anyone else? I want to thank everyone for some great comments. What we're going to do right now is take a very short five minute break, allow our stenographer (court reporter) to rest his hands and everyone to stretch a little bit. But we're going to try to start again real quickly with a question and answer period in about five minutes.

(Brief recess then Q&A period).

DIRECTOR LYNCH: Please don't be afraid to move up closer to us. Okay we're going to reconvene with the question and answer session. I apologize to all of you out there that have been sitting, dying to ask questions. As you can see we had a lot of people sign up for official public comments so we had to take those first. And hopefully we can answer all your questions tonight that you've been waiting to ask.

I will be attempting to answer some of those questions but not being an engineer or scientist myself I'm going to rely on my experts which are in the first two rows here. So please be patient with us so that we can identify the appropriate person amongst us to answer your particular question.

Q&A

I will ask a couple things. Try to ask only one or two questions at a time so I can get around the room and at least give everybody an opportunity to ask questions. We're going to try to go as long as possible. We'll also likely stick around to talk one-on-one with you if you want to ask your questions in that form.

We would also ask that if you have an especially technical question, and being a complex cleanup there are a lot of technical issues and questions, we will try to briefly respond to that. But we may ask that you stick around or talk to one of our experts outside on that particular interest so we don't consume everybody else's time and take up the opportunity for some other questions. So what I'm going to do is kind of open up to raise your hand and I'm going to ask Dawn, we'll start in the front and Dawn kind of work back with the microphone so she's not jumping all over the place.

Questions. You're going to have to start in the back Dawn. Also state your name for the record because this is also going to be recorded. This question and answer will be part of our response and summary as well as a response to all the comments that were made earlier .

BARRY RAICHLIN: Has there been any other searches all over the world with any other ways to do this than what we have, just plain on dredging like your swimming pool? Has there been any other things? With all the engineering we have in the world why haven't we looked into somewhere else that might have a better idea than we have? We're looking for Number 4, not Number 1. Get this done. Either you do it all, do it right or don't even bother because mother nature is doing a great job so far.

DIRECTOR LYNCH: The Feasibility Study that was an assessment of all the alternatives requires Honeywell to go and look at other technology out there other than just dredging. And although the Feasibility Study concentrates on dredging and capping alternatives Honeywell wasn't required to look at some other technical expertise around the country and around the world. And I'm not aware of any specific one that they looked at or one that they found would address a mercury and a sediments issue.

But they did look at, one of the things they looked at, as you said, leave it alone. They did look at the option of leaving it alone. And it was simply as a Department we didn't feel that that lake would heal itself in an acceptable time frame. It would leave open the environment, the fish, humans accessible to contaminants for a very long period of time before it was covered up.

BARRY RAICHLIN: Well, this is the fox in the hen house deal. As long as the little dinky fox is there we're going to have the same problem. I won't live long enough but the problem is going to be there unless we get everything out of there. We stop all the pollution and, you know, all the arteries going into the lake, it's never going to stop. This is just providing jobs for everybody, engineering, everything else. It's not the solution. You've got to cut the BS, you've got to get it all out of there or don't do anything.

You can damn it or whatever, you get right down to the bottom all the way around the lake, you won't have to worry about it anymore once you got them in jail, the crook, right? If you don't do that it's just going to keep going on and on.

I've been here 60 some years, if you don't straighten it out now it's never - if you don't do it completely it's never going to stop.

DIRECTOR LYNCH: We understand it's very important to address it now and we think we have a pretty good plan to do that.

BARRY RAICHLIN: Thank you very much.

DIRECTOR LYNCH: Thank you. In the back.

TOM RHOADS: My name is Tom Rhoads, R-H-O-A-D-S, and I was wondering about the sediment containment areas. I'm sorry I missed the first part but it seems like there is an awful lot of dredge spoils that are going to be moved in this project and I was wondering if there were going to be further public hearings or further discussion on the transport of those sediments, the dredge spoils and the containment system for the Sediment Containment Area and the capping enclosure of that so the sediments are not remobilized later on into the lake.

And I was wondering if there would be future public hearings on sort of that portion of the cleanup. This was primarily about the lake itself. Thank you.

DIRECTOR LYNCH: Excellent question. First the sediments have two options, two routes. They could go to a permitted facility or the less contaminated sediments right now are proposed to go somewhere on the wastebeds. That is a pretty general proposal in the plan. It is not defined and we admittedly will say that there is a lot of design work that needs to go into any sediment containment area on the wastebeds or anywhere else before it's built.

We do have the very basic requirements that a liner be placed for such a structure that thereby a leachate collection system and that leachate be treated. We will not permit or allow any sediment containment area unless we are convinced that it's stable and can adequately withhold the sediments that are put in that area.

We will be reviewing any proposals during the design phase. I will expect and I have had a meeting with the Town of Camillus, some of the residents that live near that area, that we will be coming back to the public to discuss any specific proposals that are made for disposal on those wastebeds. And that will likely also involve a public meeting for anyone interested in the specifics of that proposal.

Other questions?

JIM RHEA: Jim Rhea, R-H-E-A, life-long resident of Onondaga County. And I just have a clarifying question hopefully. In your presentation earlier you talked about the two different options, the one that

Honeywell had advanced and then the one that the state advanced in their plan. And there is a big difference there in terms of total volume that is going to be removed as well as total cost.

We heard some comments earlier about urgency and the need to work together and cooperatively. I wonder if you can comment, maybe clarify for everyone here what is the difference between those two in terms of actual volume and then maybe actual risk reduction. Because I assume that those differences need to be related to risk.

DIRECTOR LYNCH: You hit the major difference. Conceptually the two plans are very similar in that they both divide the lake into eight specific sections and develop a cap and dredge proposal for each of those sections.

The biggest difference in the - between the two plans is the amount to be dredged and the amount of capping that's placed. And the Department's position is, we took a very much more conservative view as the amount of material that needs to come out, the contaminated material that needs to come out, partially based on a risk assessment.

And also a little more conservative view of the depth of a cap that actually needs to be placed in the water to be protective. There are some other differences and these guys can probably add to that if you want to hear more about the differences between the two plans.

But the significant differences is the amount to be dredged. I think it was a half a million cubic yards in the Honeywell proposal and 2.7 for the DEC proposal.

DAVE ARNOLD: Dave Arnold, I spoke earlier. I guess what I'd like to do is just clarify, Mr. Lynch. In the beginning I said that I attended a hearing on Evergreen Recycling in the Town of Clay. And I would just like to I guess have some reassuring that you're not going to dump the bottom of Onondaga Lake on top of the Town of Clay on Woodward Industrial Park.

DIRECTOR LYNCH: There is no proposal to

do that, Mr. Arnold.

BARRY RAICHLIN: Why not?

DIRECTOR LYNCH: Any other questions?

RALPH MARTONE: I live over here in the city. I would like them to just expand on the toxic mercury methane and what is the possibility of, you know, health, once they start to dredge.

DIRECTOR LYNCH: During the dredging activities itself? You mean the extent to which mercury will be stirred up?

Q. (Martone) Right. I heard a new term to me, mercury methane?

A. (Lynch) Mercury methylation.

Q. Yes, what type of threat is that to the public health?

DIRECTOR LYNCH: I'm going to draw on one of my experts on this one to answer. Who can answer in very general terms. If we can explain mercury methylation and the potential impact from mercury during the dredging activities.

A. **(Bob Edwards)** I think I'm loud enough. I volunteered to answer your question. I work with the DEC and I've been involved in many or several anyway, dredging projects across the state. I was project manager of one big one up in Lake Champlain. And there are a number of controls, engineering controls that take place in the lake while we're dredging that would not expose any of the public to any mercury or any other contaminants that's in the soil or in the sediments.

Once that material is pumped up to the treatment system and the containment cell there will be controls up there to minimize odors, and there won't be any opportunity for this material to spill outside of the work zone. I mean that's one of the reasons these designs are so long is we have to cross every t and dot every i on the engineering aspects of it before we do start.

I know many people spoke to me today about how I remember they dredged down in Jamaica Bay or when they dredged the canal out and they just sprayed the stuff everywhere. That's a different type of dredging than environmental dredging. And actually the days of just spraying it up and the odors being uncontrolled are long gone. The public will not allow that to happen and we will not allow it to happen as DEC.

So I don't know if you were here for the availability section, but there is a lot of different things we can do to control odors and prevent releases of chemicals and exposures to the public and to workers.

One thing - at any of these jobs all workers are required to be trained in health and safety. There is many courses we have to take, there is many different protective clothing and respirators and stuff that we wear. So human safety, public safety, worker safety, those are paramount to any of these jobs. And all those controls and all those provisions are taken up in the design so that before any of this work starts we've addressed all these concerns.

Q. My question really is the hazard of mercury, this mercury evaporating, can that get into the atmosphere and surrounding areas or not? Is that possible or not?

A. Not during the dredging process because it will all be under water. It won't come up. How environmental dredging - or how hydraulic dredging works is a large amount of water is moved with the sediment. It's a giant pump on a boat, is essentially what it is.

Q. Slurry dredger?

A. It will slurry the material and pump it so there is no opportunity during the dredging process for that material to come to the surface, to the air. First time that material will be in the atmosphere would be at the treatment facility. And at that point there is other controls that can be taken to prevent exposure there.

RALPH MARTONE: Thank you.

HENRI HAMEL: I can probably be loud enough too. My name is Henri Hamel, I work for the State Health Department in Syracuse, and fairly familiar with the Onondaga Lake problems because I was a SUNY ESF student a

Q&A Martone - Hamel

long long time ago. I don't want to say how long.

Under current conditions the only risk or the primary risk that we've seen from the lake would be to people who are consuming fish. And as far as mercury getting into the atmosphere from the lake, that's not quite the way it works here. The mercury that we're worried about is mostly tied up in the sediments in the bottom of the lake where it was deposited. So you're not taking any hazards or any exposure from mercury just under the current conditions by living near the lake or walking around the perimeter or anything like that.

Now when we do start dredging, as Bob said, the dredging operation is under water, so we're not expecting that we're going to have any mercury exposure coming up. The sediments will be transported by pipe to the containment facility, and at that point we'll be trying to design systems then that will prevent anyone from being exposed to any volatilization of mercury or any of the other chemicals that we're going to be removing.

Now part of our operations at the lake front and also at the containment facility will be some health and safety monitoring for the workers. But we also mandate, the State Health Department requires that these projects have community monitoring programs. And we have instruments that can detect volatile organic chemicals, we also have instruments that can detect mercury.

So there will be monitoring to prevent any exposure to the public. And provisions that -- of what we would call action levels. And if we detect something with our instruments that is approaching a level that, it's a conservative level that means that somebody is going to be exposed then we have contingencies to shut down the project, do something differently, design a different system.

So we are very concerned about exposures to the public. We want to do this project to minimize that. And that's part of the design too. And we will be back talking about the design.

JEFFREY FREEDMAN: I just wonder if the folks from Honeywell would care to comment on their basis for believing that their Proposed Plan would bring the Onondaga Lake into compliance with the Clean Water Act. We've heard from the DEC and I think the public would like to hear from Honeywell if they would care to comment as well.

DIRECTOR LYNCH: This is a DEC meeting and I don't want to turn it into a Honeywell/DEC debate. I know the Honeywell people very well and if they're willing to speak they can or if they're willing to talk to you later, which I'm sure they would, outside to talk about this.

I know Honeywell has obligations and requirements under the Superfund process so I respect their position. If they want to maybe talk outside with you to explain the difference and their thoughts on their plan. And I see them shaking their head out there. So I think they would like to meet you after the meeting and talk to you.

BARRY RAICHLIN: You know, I was wondering she says they're going to develop means to process the waste. What do you mean they're going to develop it? Don't they know how to do it yet? Does all that water that's going to be pumped over there - what are they going to do with that, is that going to go back into Onondaga Lake like Skaneateles Lake water? Is it going to be sitting there and have to dry out for ten or fifteen years like the rest of that mess over there had to do? Why aren't we taking it to Wyoming or Buffalo or some other place. Why do we have to put it in our own back yard? That doesn't make any sense. Are there any other alternatives like railroads that we still have? You know, why can't we do that, why do we have to put it in our own back yard? Come on.

DIRECTOR LYNCH: Again, part of the Feasibility Study looked at those, specifically railroad, truck, transportation to facilities not only in New York State but out of state. This is one, another thing that they looked at was the feasibility of putting it nearby on the wastebeds where deposits have been placed before.

BARRY RAICHLIN: And it stunk.

DIRECTOR LYNCH: And the Department has agreed to assess that proposal. And if they can specifically design it, we know that they can dredge and place it in an area and contain the water and treat the water before it is discharged back to the lake.

They can dredge an environmentally safe manner and control the dredge spoils. It's been done before. We're very familiar with the basics of that operation. However, this is specific to Onondaga Lake. We have more contaminants, we have a lot of different contaminants, we have a unique area in the wastebeds.

So that's why we have to look at the details that Henri talked about and design something that will be safe to the environment. And if they can demonstrate that it will be safe to the environment it's

something that we will consider in this area.
Q. (Raichlin) How do they take the water out of all those sediments and not ruin the whole area? She said they have to design something. Don't they know how to do it yet? That's scary.
A. (Lynch) I think they know how to dewater sediments. But specifically up on the wastebeds for this amount of sediment and the type of water that you're going to be taking out of those sediments you have to design specific parameters to demonstrate that it will be an effective ratio.
Q. So you're going to put it on top of the pads we already have there?
A. The wastebeds you're saying?
Q. Right.
A. That is one of the proposals. And one of the most likely or the wastebed that they're looking at first is Wastebed 13. And part of that reason is because that's one that was not entirely filled up. And there is some area that needs to be filled.
But again, there is a lot of detail to

be worked out regarding stability, controlling the water and the runoff, treating the water and containing the sediments. And --

Q. Why couldn't you go over across on the Thruway across from the service area over there. There is a big area over there that they're trying to ruin right now.

A. There is a lot of different areas you can look at but there is ownership issues, there is accessibility issues and there is a whole host of other things. But they did look at a wide range of disposal of sediments from the dredging activities and this is the one that we're going to focus on first in the Proposed Plan.

Q. They ought to have more public input than they have had so far. Make a lot more people have input.

A. As that plan is developed we will.

DORIE KRAEBEL: My name is Dorie Kraebel. K-R-A-E-B-E-L. I was just wondering, I was looking at the charts earlier and it looked like you were doing the option four or around there. And I was wondering how you decided to stop there. I was looking at the other charts, it seemed maybe that wasn't quite deep enough or far enough into the lake to get everything. So I mean I was wondering if it was like financial or just physically unable to do it or what the reason was for stopping there?

DIRECTOR LYNCH: The short answer is that the number one factor that we considered in any of the remedies is that it has to be protective of human health and the environment. And there are a number of remedies that had the potential of being protective of human health and the environment. But as you went up to different levels you would see that others are much more protective and less risky.

We basically did a risk assessment and determination that our proposed remedy, which is kind of a mix of the 14 outlined in the Feasibility Study. But our proposed remedy was the adequate remedy for both a feasibility standpoint, whether it actually can and will be implemented and most importantly from an environmentally sound standpoint.

DORIE KRAEBEL: Thank you.

DAVE CHAPMAN: I was just curious in the design phase if there is going to be any room for pilot projects to look at proprietary technology that could assist. One of our lab tests showed that we were able to stop wastebed B permeability by 99.88 percent within 600 hours. And as he mentioned binding it up or making sure it doesn't release back into the environment, that they'll be looking at technologies or be a forum for discussing and looking at it and still at the same time still protecting proprietary technology and so forth.

DIRECTOR LYNCH: There is always a potential to pilot projects as part of one of the remedial projects. As a matter of fact one of the pilots in this project is the oxygenation. I would suggest that since it is likely that Honeywell will be the responsible party implementing this plan that's where you could take your interest.

And that is the potential of the state or federal government doing other work but the way we address is usually through existing state contracts as far as who we hire to do the work. But I think you really should talk to Honeywell about the potential of looking at your pilot study or technology. And certainly if it was proposed to us we do take a look at it and see if it was appropriate.

Other questions? Dave way in the back. Could you just go over to the microphone so everybody can hear your question.

DAVE ARNOLD: There is a similar project that's happening, I don't know if it's completed yet or not down in Albany that G.E. or you're probably familiar with it, could you go over some of the problems that they ran into that might be similar to the ones that we're going to run into and you know, kind of give us an idea what we're looking forward to here.

DIRECTOR LYNCH: Yep, you're probably

referring to the Hudson River dredging project for the PCBs from the G.E. facility. And they've run into many questions much like we're hearing tonight. But they are not much further along than we are in this process. They have selected a remedial design but they haven't started. They probably started specific design but they haven't started any actual dredging work at this point.

So if you're asking what problems they ran into during the dredging that hasn't been done yet so I really can't answer those. But I would suggest if you have specific questions about the G.E. project, I think we have a number of people that have been involved or very familiar with that project and you can talk off line with them after the meeting. Anymore questions? One more.

RALPH MARTONE: I'd just like to know the resources that are available to this project. Is it just the one company that's Honeywell. Are they the only resource in this to draw on basically? Just one corporation's problem? Or is it -- how does the Superfund and the resources of the US government play into, you know, the clean up?

DIRECTOR LYNCH: Any environmental clean up for hazardous waste pollution, whether at the state level or federal level is first approached by attempting to have the responsible parties, those who cause the problem clean up the problem to avoid using public monies to do so.

And in this case we have one responsible party in Honeywell who contributed to the majority of the contamination in the lake. Not all of it. We do know that there are other companies and other operations that have impacted the lake. But the Superfund does hold Honeywell responsible for addressing the entire clean up although they have certain remedies against other responsible parties.

So from a state perspective we can take the primary responsible party like Honeywell and have them do the clean up. They can then seek contribution from other responsible parties to pay their collective share towards that clean up. There are state and federal resources involved, reviewing the project and oversight of the project which is also very important.

There is also the cases where you don't have a responsible party stepping forward and doing the work that it can be done with federal or state funds. But the first resort is the responsible parties, then we go from there.

Q. (Martone) Just to extend that same point I heard two billion dollars for the wish list on this project. What about that? What type of clean up would that involve? And I don't know if Honeywell has got two billion but if we needed to go that far would that be possible if that was necessary?

A. (Lynch) I think my presentation gave the real basics and I don't remember off the top of my head but it was the $2.1 billion proposal was the most expensive alternative looked at in the Feasibility Study. And help me quick with the numbers, dredging - there you go, dredging over 2,300 acres of the land, 20 million cubic yards, which is almost seven times, probably six times what we're doing now.

Q. Wouldn't we like that?

A. It's a seventeen year process. Would involve much disruption to the lake in the area, much more challenging. The dredging plan proposed now is very challenging but this would be very challenging. And you have the practicality of that amount of money. Whether in fact you could get Honeywell or a combination of responsible parties to actually implement that plan. So it certainly was considered as part of the feasibility plan but we determined that our plan would be more suitable, practical and still be protective of the environment.

BY BARRY RAICHLIN:

Q. 240 million is a hell of a discrepancy between that and 2.1 billion. What's wrong with that picture?

A. It's six times.

Q. I think they're a little short?

A. They may be. That is not necessarily taking every piece of contaminant out of the bottom of the lake.

Q. Here's a government saying this is what we need. They're saying, okay we'll take this. We have 40 degrees, a new coach, why can't we have this too?

A. I wish it was as simple as getting a new coach.

JO ELLEN RAICHLIN: Trying to get money out of them.

DIRECTOR LYNCH: Any other questions? We will have people sticking around for a few moments if you want to come up one-on-one, we have a lot of charts that we have from our previous availability session.

I want to thank everyone for your great comments, great questions and your input on the Onondaga Lake cleanup. Have a good night.

* * * *

LYNCH

C E R T I F I C A T E

This is to certify that I am a Certified Shorthand Reporter and Notary Public in and for the State of New York, that I attended and reported the above entitled proceedings, that I have compared the foregoing with my original minutes taken therein and that it is a true and correct transcript thereof and all of the proceedings had therein.

John F. Drury, CSR, RPR

Dated: January 18, 2005

NEW YORK STATE DEPARTMENT

OF ENVIRONMENTAL CONSERVATION

- -

In the Matter of

ONONDAGA LAKE PROPOSED REMEDIAL PLAN

- -

Second PUBLIC HEARING (by this reporter) in the above matter conducted at the New York State Fair Grounds, Art & Home Center Building, Martha Eddy Room on **February 16, 2004,** 7:00-8:10 p.m.

MODERATOR:

KEN LYNCH, Regional Director NYSDEC, Region 7

ALSO PRESENT:

BOB EDWARDS	NYSDEC, Albany
DON HESLER	NYSDEC, Albany
TIM LARSON	NYSDEC, Albany
TRACY SMITH	NYSDEC, Albany
JIM BURKE	NYSDEC Syr Reg Haz Waste Engr
MARY JANE PEACHEY	NYSDEC, Syracuse Regional Engr
HENRI HAMEL	NYS Dept of Health
ALLEN BURTON	TAMS
HELEN CHERNOFF	TAMS
MARK MOESE	TAMS
BOB MONTIONE	TAMS
KELLY ROBINSON	TAMS
DAVE SCHEUING	TAMS
MICHAEL SPERA	TAMS
JOHN SZELIGOWSKI	TAMS

DIRECTOR LYNCH: Good evening everyone, welcome to our meeting on the proposed Onondaga Lake Cleanup Plan. My name is Ken Lynch, I'm the Regional Director for Region 7 of the New York State DEC. And I want to welcome everyone here tonight and thanks for coming.

Tonight's public meeting is going to have basically two parts. First of all, I'm going to provide a very general overview of the proposed Cleanup Plan, just go through a presentation, explaining real basic terms what's in the Plan and what it's all about.

After I'm completed with that presentation I'm going to open up the meeting to you for two purposes. Number 1 is to have you ask any questions of me and our DEC staff here tonight about the Plan. After making the presentation if you have any questions about details in the Plan we'll be willing to answer those questions.

We're also going to allow people to make formal public comments for the record. You do have the option of writing in your

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comments up until March 1st. But if instead you would like to make a formal public comment tonight here at the meeting we will be taking, we have a stenographer **(court reporter)** here tonight and we'll be taking your comments also.

With that said we'll get right into the presentation. Whenever we talk about cleaning up Onondaga Lake we're talking about a big challenge and a big project. And basically in real simple terms I describe the two biggest problems with Onondaga Lake is, Number 1 being the wastewater problems associated with the Onondaga County sewer treatment system and the combined sewer overflows, and the industrial waste problem, the hazardous waste that has entered the lake through many years of discharges at various industrial sites.

Most of you probably know that the domestic wastewater issues are currently being addressed via an agreement with Onondaga County which requires the county to

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implement several projects to address the wastewater issues. I'm proud to report that the county has just completed two very significant upgrades to their Metro plant, addressing most if not all of the issues related to ammonia and phosphorus being discharged from that plant.

But this meeting tonight is not to talk about the progress being made on the wastewater side, the focus of tonight's meeting is on the industrial waste problems that have impacted the lake.

The Proposed Plan that we're presenting tonight specifically addresses the lake bottom itself. The wastes that have been deposited into the lake and are currently impacting the lake in the sediments of the lake.

There are also many other wastewater or sorry, industrial contamination issues associated with upland sites. And the graph you see here and also is in your package demonstrates some of the upland sites that have impacted the lake. Although they are all tied into the impact to the lake the Plan itself actually addresses the lake bottom.

Onondaga Lake and some of its surrounding areas, both the state Superfund site and the federal Superfund site, And both the state and federal government have in place processes for reviewing and completing cleanups of these Superfund sites. And there is several steps in that cleanup process.

The first step is the remedial investigation or looking at the problem, investigating the problem, determining what are the contaminants in the lake and what has impacted the Lake. And we completed that very intense study in December of 2002.

The next step in the process is what we call the Feasibility Study. What that really is, is an assessment of a number of different alternatives to clean up the Lake. Once you lay out all the alternatives for cleaning up the Lake the state DEC is required to select a proposed remedy. And

Director

that's what we're talking about tonight.

We presented this Proposed Plan initially on November 29, 2004, and have opened it up to an extended public comment period until March 1st of 2005.

The public comment period includes meetings such as this one tonight. We held two previous meetings here in this room. We have also had several individual meetings with interest groups associated with the Lake, some of the municipalities around the Lake, a number of people who have expressed a desire to learn about this Plan and have more insight on the Plan. That's our state process for opening up the public comment.

There is also a pretty extensive process federal process led by the EPA. And one of the steps in that process is that the EPA has what they call the National Remedy Review Board. It's an independent board within their agency that looks at our Proposed Plan and assesses it. And we met with them last week and we soon will be receiving comments from that Review Board on

Director

our Proposed Plan.

Once the public comment period ends we assemble all the public comments, written and oral, and assess whether or not we need to adjust or amend the Proposed Plan. We're currently scheduled to come up with a final plan on April 1st of this year. And that April 1st date is set by an existing consent decree with the federal court.

Once we have a final decision or a final plan we begin an extended process of actually doing the clean up work. And we are anticipating for this Proposed Plan that the process will start with an extensive design period, a three year period to design the actual activity that will be undertaken to do the clean up. One of the reasons for such an extended period of time is this is not a simple clean up. There is a lot of work to be done. There is a lot of detail in our Proposed Plan, but there is also a lot of detail and engineering that needs to be worked out as we develop the construction process.

Director

Once the entire project is designed we will commence actual construction, dredging activities and other activities associated with the Lake clean up. And we're expecting that that construction activity will last for approximately four years.

As I mentioned, the first step in all this process was our Remedial Investigation. I just want to give you an example of some of the things we did in the first step of the process in looking at the Lake and assessing what has impacted the Lake.

The investigation was undertaken initially by Honeywell Corporation for an extended period of time from 1992 to the year 2000. At that point we felt that additional data was necessary, and the DEC undertook the completion of that investigation in 2001. And as I previously stated the entire investigation report was completed in 2002.

We took over 6,000 samples in and around the Lake. We did a human health risk assessment and a baseline ecological risk

Director

assessment as part of that investigation.

Real basically stated, the investigation results, we found that they're - for the most significant areas of contamination in the southern portion of the Lake; mercury contamination was found throughout the Lake, but most notably in that southern portion and also at the outlet or Nine Mile Creek Delta. We found other contaminants in the Lake like benzene, chlorinated benzenes, PCBs and others. In some areas, specifically again in that southern portion of the Lake, the contaminants were as deep as 25 feet into the sediments.

After collecting all that data we took the next step, and that's assessing a number of different alternatives. And Honeywell performed an assessment of 14 different alternatives, ranging from taking No Action or spending no dollars on the cleanup, to an extensive cleanup of removing over 20 million cubic yards of sediment and doing capping of over 23 acres of the Lake to an estimated cost of $2.1 billion.

Director

During that process where Honeywell proposed these 14 different alternatives they recommended a preferred alternative of dredging .5 million cubic yards and capping 356 acres in the Lake at a cost of $243 million.

Once we had the range of alternatives in front of us we assessed those alternatives and came up with the DEC's preferred alternative which we're talking about tonight.

The first step in that process was to establish remedial goals. What do we really want to accomplish when we do this clean up? Those goals basically stated, were to achieve sediment concentrations that are protective of fish and wildlife; to achieve concentrations in fish tissue that are protective of humans and wildlife that consume the fish; and last, to achieve water quality standards in the Lake itself.

We looked at remediation of all areas in the Lake where surface sediments exceeded our established clean up levels. What that means is after we did that assessment we are predicting that the clean up will entail dredging of an estimated 2.7 million cubic yards of sediment. It also includes capping an estimated 579 acres in the Lake.

During the dredging process as we take material out of the Lake we have to take it someplace. And we are proposing that the most highly contaminant sediments will be taken off-site to a permitted facility either within New York State or somewhere outside the state. Currently it's proposed that the remaining sediments, the less contaminated sediments that will be dredged will be taken up to the wastebed sites in the Town of Camillus.

And we will be reviewing Honeywell's proposal to construct what we call a sediment containment area up on the waste-beds where these sediments will be contained, isolated and protected from entering back into the environment. We will require at a minimum a liner in that system, a leachate collection system and a protective cap to prevent erosion from and leachate into the containment cells.

Also part of the Plan in the deep areas of the Lake is what we call Oxygenation Pilot Study. It's basically infusion of oxygen in the lower reaches of the Lake to see if that will have any impact on limiting what we call the methylation of mercury into the Lake from the sediments, eliminating the release of mercury into the water column.

Also included in the plan is habitat restoration. What we dig out we're going to replace. Also includes some habitat enhancement. We're not just going to replace in kind what was taken out but we're going to do significant improvement to the habitat in and around the Lake.

Very important to this Plan is the long term monitoring of the Plan itself. To be assured that the Plan is effective and protective of human health and the environment we will establish a very comprehensive monitoring plan of the clean up project.

Director

That includes monitoring the water column, monitoring the cap to make sure its working, if there is a sediment containment area on the wastebeds or somewhere else, monitoring that area to make sure that's protected and there is no leakage. Monitoring the fish, to see the improvements they will be making through the clean up efforts. An extensive look at how effective the remedy is and an extensive look to make sure that things like protective caps are staying protective. The estimated present worth of the DEC's Proposed Plan is $451 million.

This overview that's in your handout, I apologize it's in black-and-white in your handout but it really gives an overall example of what is proposed for each area of the Lake. Basically we split the Lake into eight different sections. And based on the quantity and quality of contamination in those sections determined a specific remedy for each of those eight sections. In many areas that includes dredging, dredging at different levels depending on the extent of contamination. And a lot of those areas include capping.

If you want to come up later there is a bigger depiction of this map over there on the poster board, and also if anyone has the Proposed Plan itself, it can also be obtained on our website. That is part of the Proposed Plan where you can view that section of the Lake and what the proposal is for each particular area.

Just a little more about the long term monitoring plan because this is very important to the project. We're going to monitor, like I said, the effectiveness of the various remedy components. Is it working? Is it cleaning up the Lake? We're going to monitor in a very comprehensive manner. Much of the detail will be worked out during that three year design period that I talked about.

But it most likely will include sampling of fish tissue, toxicity testing, sampling of surface water and sediments, sampling of

Director

the cap to make sure it's working, to make sure it's stable; and monitoring the sediments in the Sediment Containment Area in the wastebed or wherever else it goes.

There is a long term what we call O & M or Operation and Maintenance Plan included in any cleanup project. That assures that if fixes need to be made, if there are problems found with the proposed clean up the responsible party will correct those.

Lastly, just a little summary of the whole time frame. As I stated, once we complete this public review process we're required to come up with a final plan by April 1st, 2005. Once that Plan is completed we expect a three year design period. And after that a four year construction period.

Important to note that the actual work to be done in the Lake cannot be done until we first cut off the upland sites. This map here depicts a number of the upland sites that have impacted the Lake. Some of them still impacting the Lake today. Certainly

Director

doesn't make sense to dredge the bottom of the Lake, take out the contaminant sediments if you still have areas upland impacting the Lake.

So prior to actual dredging activity in the Lake we will make sure that the upland sites are no longer impacting the Lake itself. And there is a separate process already underway for many of those upland sites. Some of which are in the clean up phase at this point. Others are design and clean up proposals similar to what we're doing for the Lake bottom itself. But again before we actually start clean up activity in the Lake we will cut off the sources upland from the Lake.

And once again, once the clean up is done and during the clean up there is going to be an extensive long term monitoring program to make sure that everything we've done will be effective, and if not effective we can make the appropriate fixes to the clean up plan.

More information. Many of you probably

already know that you can go to our website and view the Plan itself. I think we brought some copies of the Plan with us tonight. We have staff available tonight either during the question and answer period or afterwards to talk to you about the Proposed Plan. You can send in your comments via our website. You can write in your comments to those addresses listed. You can also view the Plan itself at several depositories like the local libraries. We have also extended the places where we have the Plan available. Do we have all those listed Mary Jane?

MARY JANE PEACHY: Yes.

DIRECTOR LYNCH: Last time I think we only had it a couple places and based on the recommendation at the last meeting we have extended the area where you can view the Plan if you can't get it on the website itself.

Again, public comments will be accepted until March 1st of this year. That concludes my presentation. And we'll move

Director

right into a question and answer comment period. Before we do that I just want to outline some ground rules.

First anyone wishing to speak should first state your name, spell your name because we have a stenographer **(court reporter)** here, and state who you represent and where you're from. We'd ask that everyone limit their questions at least initially to two questions so we make sure everybody gets an opportunity to ask questions.

If you're making a public comment for the record please state that. We won't be responding officially to public comments made tonight. What we do is part of our public comment period. When that's complete, when we put together the final plan we do what we call a formal responsiveness summary, which will summarize all the comments we received and reply to all the issues brought up during the public comment period.

This is a very technical plan. There is

Director

a lot of detail. There may be some very technical questions that we may have to defer to a later point after the meeting. I want to make sure everyone gets an opportunity to ask questions. We can get into some detail and spend an awful lot of time talking about technical issues.

So if we feel that we prefer to go off line and talk to you individually one on one with our experts we'll recommend that. It's not intended to be a debate whether certain aspects of this plan are good or bad. You certainly can make those comments as official public comments. But we don't plan to engage in a debate over alternatives or other parts of the plan whether they work or not. We will explain why we think they're effective and why we selected what we did. But as far as debating alternatives we will respond to anybody's opinion or position regarding those in the formal public responsiveness summary in the final plan.

That being said we're ready to move into public comment. I'll just ask that someone raise their hand, I'll call on you. If I call on you please step up to the mike and state your name and proceed with your question or comments. Mary Ann is first.

SUPERVISOR MARY ANN COOGAN: Jim, come on up with me. I'm Mary Ann Coogan, Supervisor for the Town of Camillus. I also have with me Jim Salanger, he's one of the council people on the board at the Town of Camillus. We have a letter we are going to share reading, it's a little lengthy, so if you will indulge us, appreciate that. This will go to the DEC, Mr. Donald Hesler. "Dear Gentlemen: As the proposed host community for the dredging from the Onondaga Lake cleanup, the Town of Camillus has some concerns which need to be addressed to insure that no negative impacts will occur to our community during this cleanup.

Some of these issues relate to the details of the design and operation of the proposed SCA, on SB 13, part of what is known as the Allied Wastebeds. We make these comments now because we are unsure of

Spvsr Coogan/Council Salanger

future opportunities to do so. Camillus requests a review and advisory role as the project goes forward.

Camillus believes that the Department should revisit the entire issue of the SCA location. From some of the supporting materials accompanying the FS, it is obvious that shoreline and in-the-water locations for the SCAs have been successfully used for dredging in the past. The selection process gave no opportunity to select an in-the-water SCA because of the goals for no loss of Lake surface or volume.

An SCA location or locations, near or in the Lake would result in a relatively tiny loss of Lake surface and volume and it would eliminate the costs and environmental concerns associated with the pipeline of Nine Mile Creek and the new SCA on SB 13.

A new upscale subdivision, Golden Meadows, is being built a short distance from SB 13 to add to the large number of people already living in the area. Moving the SCA to a lakeshore or in the lake location should save money, decrease environmental risk to Town of Camillus residents, and provide a means to construct space for something useful to the general public, such as the marina/boat launch or more fairgrounds parking. If time is an issue the revisiting of the SCA location could be done as part of the design phase."

COUNCILOR SALANGER: "A. If the SCA ultimately is located in SB 13, the primary issue is the proactive prevention of odors escaping to receptors in the community. The Honeywell FS and the DEC Proposed Plan acknowledge the potential for odor releases. The details of the odor mitigation plans are to be developed during design; some of the techniques are discussed. Our suggestions are as follows:

Construct a 'Demonstration Size' SCA in the part of SB 13 farthest from the population center in Amboy. The size should be large enough so that it could run long enough to thoroughly validate the process and make corrections if necessary, at the greatest possible distance from people's homes. We understand that the odors may differ depending on the source of the dredgings, and that below SCA surface discharge and a partial floating cover would be employed at a minimum. We also suggest that odor control technologies be demonstrated in the small SCA for phase when the SCA is full and water is completely drawn off. That phase may have significant potential for odor release as the dredgings dewater, and preparations should be made in advance.

An agreed-upon protocol should be in place prior to operations relative to shut-down while corrections are being made if problems occur. Camillus does not want to be in the position of having to prod DEC or Honeywell to react to problems. A mechanism needs to be created to get feedback from odor receptors to the project team at the earliest sign of problems. We suggest an 'Odor Panel' be created of local homeowners who would monitor air quality in their neighborhoods.

B. The pumping operation to move the dredging to SB 13 and out into the SCA has a potential to generate noise which will be heard in the adjoining neighborhoods. Noise modeling should be done to predict noise impacts and appropriate mitigation should be included in the project.

C. Construction activities on-site have the potential to create noise and traffic issues. These issues should be mitigated up front in so far as possible. One very significant mitigation technique would be to use exempt construction and demolition waste for pre-loading and constructing the SCA areas. There is a large stockpile of exempt C&D in the eastern portion of the SB 15 and some in the western portion of SB 15. Utilizing these materials for construction cuts -- for construction, cuts down on impacts associated with bringing construction materials to the site but also will reclaim space in SB 15 for disposal of non-exempt C&D."

SUPERVISOR COOGAN: "D. Visual impacts of the proposed SCA in SB 13 should be an immediate priority. Viewscape modeling should be performed to develop a screening plan to shield the view of the SCA from nearby residents and passerbys. Screening techniques could include setting the SCA boundary inboard as far as possible from the current outer berms. Planting of vegetation would need to be initiated soon to be effective at the time of SCA operation.

E. The ability of the existing structure of SB 13 to carry the load for additional sediment, water and the weight of the SCA should be verified immediately. If the load carrying ability is at all suspect, after analysis, then a fresh look at where to put the SCA would be in order.

F. Our understanding at this writing is that there is no consensus between the DEC and Honeywell on the quantity of dredgings to come to the SCA, with Honeywell's proposed quantity to be significantly less. From the Camillus perspective, less is better, because of reduced environmental risks. Could the Department please provide a 'plain English' explanation why Honeywell's proposal is not sufficiently protective of the Lake and its inhabitants?

One of the speakers at the January 10th public hearing made the point that the assumptions going into the Risk Assessment are very conservative, thus overstating the risks and making the remedies in the FS even more conservative. Let's not dredge more material than we need to simply because conservative assumptions are superimposed on other conservative assumptions. If the real world risk under Honeywell's proposal is unacceptable, please explain. Perhaps a compromise quantity of dredgings would be agreeable to all.

G. Camillus suggests the Citizen's Panel to play an advisory role in evaluating final uses of the completed SCA if it is within the Town. A wide variety of potential uses are possible and public input is vital to making appropriate choices.

H. Camillus expects and demands an effective monitoring system for any SCA built in Camillus, during construction, during operation, and post-closure. This monitoring program should, at a minimum, include:

The aforementioned 'Odor Panel.'

Air quality sampling locations with sample testing and agreed upon protocol for determining results of concern.

Noise monitoring equipment to validate that activities do not violate the Camillus noise regulations.

Groundwater and surface water quality monitoring."

COUNCILOR SALANGER: "Camillus wants to be part of the review process for monitoring data, and to be reimbursed for our expenses in evaluating the monitoring of data and responding to it.

I. Security of any new facilities to guard against accidents from snowmobilers, bikers, and others is a must. Any areas with open water or other hazards must be fenced.

J. The long term financial capabilities to continue post-closure care, and monitoring must be guaranteed by some form of financial instruments. We must be assured that there is no way that local or county government is saddled with any expenses resulting from the Lake cleanup.

Depending on additional public comment, we may have additional comments prior to March 1st. We thank you for the opportunity to bring these issues to your attention. Very truly yours, Mary Ann Coogan, Camillus Supervisor, and the Camillus Town Board." Thank you.

DIRECTOR LYNCH: Next? Questions, comments? There has got to be someone out there. Yes, sir?

QUESTIONS BY BARRY RAICHLIN:

Q. Still haven't - Barry Raichlin, Syracuse, I used to live in Camillus. There is still a discrepancy of $2.1 billion and $250 million. What's up?

(ALL ANSWERS BY DIRECTOR KEN LYNCH)

A. Well, the $2.1 billion proposal was the maximum alternative that was explored. That's not being examined at this point. The difference is the state's plan which we presented tonight of 451 million versus Honeywell's Proposed Plan of 240 million.

In real simple terms the big difference between those two plans are the extent of contamination that we take out of the Lake. The state feels we need to take more of the contamination that was originally proposed from Honeywell out of the Lake to have a protective remedy. That also includes additional capping in those contaminated areas and other areas that you may not dredge.

So the big cost difference is the difference in material that you take out and the amount of capping that you perform in the Lake.

Q. So who decides after all this goes down, who decides, one person?

A. No, believe me there have been a number of people that worked on this project, from

Honeywell's assessment of all the alternatives, from the DEC's review of the project. And that doesn't only include our regional people here in DEC, we have a large staff in Albany reviewing this proposal.

We also engage the state Department of Health, they have been very heavily involved in this project. The state attorney's general office involved from a legal perspective and technical perspective. And we also have as a federal Superfund site EPA and all their experts, the Region II office, Superfund people working on this project assessing it. And as I mentioned, they have a review board internally from all their EPA regions that have looked at this proposal.

So it's a number of people that examined not only all the alternatives but the specific proposal that the state of New York is making today.

Q. Who are the people that said it would be 2.2 billion, who are they? They don't exist?

A. No, Honeywell looked at --

Q. Like having the fox in the hen house

with Honeywell?

A. They looked at the alternatives and lined them out for us to look at. We looked at the details of them, decided whether the cost estimates made sense. And more importantly selected the portions of those alternatives that made sense to implement as part of this Proposed Plan.

Q. Yeah, but all they care about is Honeywell, they don't care about us.

A. Well, the state DEC cares about the environment and the people around the environment. And that's the bottom line that we - what we assessed in coming up with all the aspects of this Proposed Plan.

Q. I would bet everyone in Syracuse thinks you're going to dredge the whole Lake.

A. We're not, that's not the proposal.

Q. Exactly.

A. That's the purpose of this meeting and a number of other outreach efforts that we have made since this Proposed Plan has been out there.

QUESTIONS BY FRED WENTHEN (Fayetteville):

Q. My question is what criteria you use to decide dredging versus capping. I mean if you cap something, isn't it as effective as dredging but you don't run the risk of having to dispose of all this material, and boil off all of the water in the process of dredging. What is the advantage of dredging over capping?

A. The number one advantage of dredging is you can get out the most significant contamination in the Lake. And regardless of how effective a cap may be under water there are a number of variables that you have to consider when you leave that material behind.

And we have through our very extensive review process determined a certain level of material that we want out of that Lake regardless of whether you cap or not. It just makes sound environmental protection and human health protection sense to take out the most highly contaminated sediments.

Realizing that it would be very difficult to take all of that contamination out, part of the plan also includes capping. And you know there was a lot of examination of alternatives that assessed the different risks associated with leaving different material behind. And that assessment ultimately resulted in our proposal to cap, to dredge 2.7 million cubic yards and cap those areas and other areas in the Lake.

We have a number of people here that worked extensively on that assessment and reviewed the alternatives. I'm sure they'll be willing to talk to you later about some of the analysis that they did to determine at what levels do we take the material out and what levels do we leave it there and cap it?

QUESTIONS BY JOE FRAGNITO:

Q. I'm just representing myself. With regards to the sediments on top of the waste-beds, after everything is complete, what is the final outcome of the wastebeds there? Are you going to do any topping of the sediments, put any gravel, or what's the final aspect of the sediments that will be

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left there?

A. Basically the sediments will be capped with a layer of soil material to protect those sediments from leachate coming from any rainwater in the Lake. It will be graded so that the runoff will, clean runoff will go off and not into the area; much like a landfill area.

But we have more opportunity in the wastebeds because of the large area to grade that sediment containment area in the way that the area can be reused. And that's some of the discussions that Honeywell has had and offered potential reuse for those wastebeds. Because they are basically long used waste areas used way before environmental regulations were in place and were not capped to today's standards.

Any sediment that goes up to those wastebeds will be capped to state-of-the-art today's standards. And the alternative of reuse of those wastebeds will be looked at as part of Honeywell's plan in conversations with the Town of Camillus or others.

Q. Has Honeywell published these reuse possibilities? I mean is there any idea of what you're talking about? What kind of reuse can you use that if you ever got up there for some reason?

A. They have talked generally to certain groups in the public about general uses there. I don't think they have identified one specific use. But some examples that have mentioned recreational uses such as trails, snowmobile trails, they have talked about possibly recreation fields like football fields, lacrosse fields. They have talked about, you know, wilderness area. There are quite a bit of trees already growing on the wastebeds right now and there is a lot of wildlife up there. They have even talked about the potential of economic development in some areas on the wastebeds.

Q. Well, along that line is there any possibility of building on top of that?

A. I think there is. That certainly would need extensive assessment. That's not part

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of the actual Lake cleanup plan.
Q. I understand that, but what's the final outcome?
A. That could be a final outcome. It could be something that could be assessed.
Q. Someone has to consider how they leave this so that someone in the future many many years from now that there may be some possibility of doing something up there. What restrictions, you know, will be available and what possible uses could be there. But something that could be able to construct something would be nice even though I won't be around to see it, but.
A. And that's something that can be considered during the design phase. A lot of the detail regarding the sediment containment area on the wastebeds will not only talk about what the actual containment will be, how do you keep things in place and protect the environment, but also what the end use may be.

And we have already met a couple of times out in the Town of Camillus to talk to town representatives and some of the residents out there. And we expect if that proposal moves forward that we will continue a dialogue with the town and its residents. And part of that dialogue will include a discussion of potential end uses on the wastebeds.

MR. FRAGNITO: Sounds good. Thank you.

DIRECTOR LYNCH: Way in the back. Sir?

QUESTIONS BY JOE McCARTHY:

Q. Joe McCarthy, Syracuse, I'm speaking for myself. My question has to do with the upland remedial activities. Basically what does that mean? And is that at that point where, you know, Onondaga County will be addressing, you know, the pollution that they personally put into the Lake?

A. Okay, a couple aspects. The Onondaga County concerns are related to the waste-water treatment issues. And at the beginning of my presentation I mentioned briefly that there is an existing agreement in place that requires the county not only to upgrade its treatment, Metro treatment plant but also to address all the CSOs, combined sewer overflows that are impacting the Lake. That is done under a separate agreement, not part of this Cleanup Plan. But very important to the cleanup of the Lake. And that work is ongoing and continuing. And as I mentioned, many of the significant improvements at the Metro plant have been completed.

The upland sites that are referred to in my presentation are industrial waste sites; sites that have discharged hazardous waste into the environment, in many case along the west shore here to the Lake. A lot of those are old Allied sites, now owned by Honeywell. And each of those sites are in various stages of the cleanup process. Some of them we're still doing investigation at, others we're actually doing cleanup work at those sites.

Q. Clarification for myself. Is that by the fair grounds then?

A. Yes, most of those sites are. But I will note that there are other upland sites that have impacted the Lake that are not Allied or Honeywell sites on the western shore. For example, General Motors up on Ley Creek. They have had historical discharges of PCBs. And GM is addressing cleanup of their site in the impact of Ley Creek.

DIRECTOR LYNCH: Mr. Pickard.

QUESTIONS BY LEGISLATOR PICKARD:

Q. Good evening, Terry Pickard, I'm with the Onondaga County Legislature. I actually have a couple of legal questions and I wondered if you might be ability to respond to them.

And the first of which is I assume that after this process is over and you hear the public comment and you sit down and talk with Honeywell that there will be some kind of settlement reached between the DEC and Honeywell, if that's possible. I mean we're urging you to do that, to move this process along as quickly as possible. I know the legislature has spoken on this same issue of trying to get, reach a consensus in the community to get this process reached and moving as quickly as possible.

But what is the legal mechanism, what happens if an agreement is not reached and the DEC moves forward with the remedy that you promulgated or whatever you do with it. How actually does that work and who would come up with the funding and then ultimately how would you collect the monies to do that?

A. Okay, as you stated, the preferred method is that once a final plan is adopted we would agree with Honeywell for the implementation and we would enter into a legal document, require them to perform that remedy.

If there isn't an agreement, a couple of things could happen. We could proceed in court to attempt to force Honeywell or other responsible parties to undertake the cleanup.

The other option and the quicker option would be for the state and/or federal government to use state Superfund or federal Superfund dollars to actually do the cleanup ourselves, hire our own contractors to do the cleanup work.

And if that happens we are required by law then to seek cost recovery, any monies we spend we can pursue responsible parties like Honeywell and other parties that have caused damage to the Lake to recoup our costs that we spent to clean up - to undertake that remedy.

Q. Thank you, can I have one more question?

A. Go ahead.

Q. The other question deals with compensation to the community. By virtue of the fact that the contamination of the Lake, the community has lost the use of this valuable resource for many years. And I understand under the Superfund legislation that there are provisions which allow for the recovery for the loss of that use through natural resource recovery damages. And that the monies that are recovered for that loss can then be used to build enhancement or improvements around the Lake.

When does that enter into the discussions and who does that and who enforces it for the community at large here?

A. That's another responsibility of the state of New York and our department. This proposed cleanup plan addresses actually cleaning up the site, getting rid of the contamination, protecting the environment.

The lawsuit that we brought to force this cleanup plan to proceed also included a claim by the state of New York for natural resource damages. The loss of the use of the Lake caused by this contamination.

We are currently undergoing an assessment of what the extent of those damages are. And once we have that assessment completed we will move further in court to collect the extent of those damages.

Now, through that whole process there is always the opportunity to negotiate with Honeywell the extent of what those damages are and how they will correct or pay the community that's been impacted. And if those discussions happen, and I'm hopeful that they will, we will include the local municipality including Onondaga County and the towns around the Lake.

LEGISLATOR PICKARD: Thank you very much.

QUESTIONS BY BARRY RAICHLIN Again:

Q. Does that also include General Motors?

A. Yes, the claim for natural resources damages could also be extended to other responsible parties.

STATEMENT BY ROBERT LONG:

My name is Robert Long, L-O-N-G, and I'm representing the Onondaga Audubon Society. Because we have some ideas about reclamation that would bring back some of the very interesting shorebirds that used to occupy the - well, the southwestern shore of the Lake beginning at the Nine Mile Creek and going all the way down to the - really the southwest corner.

Shorebirds in the 1960s, these are shorebirds that are coming back from Canada, the Arctic Circle. And they show up in early July and hang around until September. Fascinating little birds, shorebirds. If people don't know what a shorebird is, think of a killdeer, these are little birds after you've been to the ocean you see them running along the shores. And over those years, Onondaga Lake really had the reputation in the '60s and '70s of having the best fall shorebird migration variety, even better than Montezuma.

Montezuma now is the only place where you'll see them. What ruined it was the phragmites. Because once the phragmites took hold and just covered the whole area down there the birds had no place. They have to have the sand, and they're sticking their little bills in the sand and picking up small insects and things like that to build up their resources, because some of these birds fly all the way to South America.

They would come back, because they are seen periodically flying over the Lake. And mitigation there would have to be phragmites removal, it's the worst weed. Does every-body know what phragmites is? It's a huge weed with a big tuft on it. If you drive down any Interstate you can see this stuff growing. Nothing will, no birds will nest in there, no animals can get through it, it gets so thick. That's why actually we lost the birds, we couldn't even get to them too. Mitigation of that.

And the other thing, I don't know whether they allow dogs on the trail. There is going to be a trail around the Lake eventually. There would have to be control of dogs, loose dogs can be, they don't match up well with shorebirds. And many areas of Long Island now are off limits to dogs, while they're trying to save several of the species, they're nesting there actually in the summer.

It does cost much because the phragmites are not easy to get rid of. I don't know if you ever try to cut one down, but believe me it's like cutting a tree down, they grow out quickly. But there are ways to mitigate and Honeywell in their proposal has suggested mitigation. So I - just to put a pitch in for Honeywell.

It could be arranged so we can build one of these little hides or you know, little structure that you can sit in and watch the birds, because they get very flustered when they see humans. Right along the trail hopefully that will come there and perhaps fence off from each little hide, maybe two of them, one near the outlet of the Nine Mile Creek and another one farther down south there.

That would bring a lot of birders in there, and it would be something that people, if they walk along the little walkways would have something to do. Because we could provide people to be there and explain what they're looking at in the summertime. Just some thoughts. Thank you.

DIRECTOR LYNCH: Thanks for your comments. Any other questions or comments? Yes, ma'am?

QUESTIONS BY DERETH GLANCE:

Q. Dereth Glance, Citizens Campaign for the Environment. I want to thank you, Director Lynch, and everyone else, for holding a subsequent public hearing in a question and answer format; also been responsive to the initial public concerns and questions so far.

I have a couple of questions, I'll stick with my two to begin with. But first of all, when will the public know when the Lake cleanup is done?

A. Well, as I mentioned the Proposed Plan and the Final Plan is going to include an extensive monitoring program and our goals set in the Plan itself.

We will be reporting to the public the progress of the monitoring program and the results of that program, and when we are meeting the goals that we have established in the Plan itself. There will be an ongoing process of monitoring not only this cleanup but there is an existing ongoing process to monitor the county's efforts on the wastewater treatment side.

And we'll be reporting out on a regular basis, in fact the law requires for the hazardous waste site a three year assessment of the Plan to make sure it's working and to see if it is complete. I expect it will be a very extended period of time for the Lake to fully recover. But I also expect that the monitoring program in place and the assessment of that monitoring program will allow us to have established when the Lake has met the goals of our Cleanup Plan.

I can't give you a specific answer today but I'm hopeful that we're going to be able to report as the cleanup progresses the progress of the cleanup and how effective it's going to be. And again, adjustments to the Plan can be made if we're finding that certain things aren't being effective.

Q. And the second question I have is, now from my read of the plan, you know, most of the decisions are going to be made during the design phase. And so I'm just wondering if that's - what kind of an opportunity the public is going to have during the design phase and if the DEC will create a specific citizen advisory committee or citizen advisory group to advise Honeywell and the DEC on these specific matters as well as helping improve the transparency of the process?

A. No specific determinations have been made. There are no specific requirements in the law for us to go back during the design phase. I can tell you though that we will.

We have already, as I mentioned had a couple meetings in the Town of Camillus and understandably very important to the Town of Camillus is any proposed design of the sediment containment area.

We will be back in the Town of Camillus talking about that proposal if it comes to fruition. We also will be out to the public in general, whether it be with fact sheets, information on our website or additional public comment periods or establishing citizen participation groups to discuss the proposed plan.

We're fortunate in regards to Onondaga Lake to also have the Onondaga Lake Partnership whose -- one of its primary purposes is to outreach the public to inform them about the overall cleanup efforts; not just the hazardous waste, not just the county's efforts on the wastewater treatments side. But there is an ongoing effort from that group also to keep the public informed.

We have annual meetings of the progress of the Lake cleanup and the development of design plans for specific areas like the dredging of the Lake.

DERETH GLANCE: Thank you.

DIRECTOR LYNCH: Any other questions or comments? We do have a number of people available and we're willing to stick around to answer any specific one-on-one questions you may have. I'll give you one last chance for a public statement or comment.

Again, you can write in to our office up until March 1st. Those public comments will all be reviewed, given equal weight to the oral comments that were made tonight and in other public sessions. And we will prepare a Comprehensive Responsiveness Summary as part of our Final Plan.

I want to thank you all for attending

and especially thank you for your interest in cleaning up Onondaga Lake. Thanks.

(Concluded at 8:05 p.m.)

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CERTIFICATE

This is to certify that I am a Certified Shorthand Reporter and Notary Public in and for the State of New York, that I attended and reported the above entitled proceedings, that I have compared the foregoing with my original minutes taken therein and that it is a true and correct transcript thereof and all of the proceedings had therein.

John F. Drury, CSR, RPR

Dated: February 22, 2005