# **Probable Effects Concentration Quotient (PECQ) for Remedial Decisions and for Allocation in Onondaga Lake**

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#### **SUMMARY**

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. EPA's National Priorities List (NPL).

The Site comprises the Lake itself, its tributaries, and the upland hazardous waste sites (sub-sites).

**Contaminants present in Onondaga Lake** sediments include mercury, benzene, toluene, ethylbenzene, and xylenes (BTEX), chlorinated benzenes, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and polychlorinated dioxins and furans (among others). These contaminants are primarily found in the southwestern portion of Onondaga Lake. High concentrations of some contaminants in certain locations in the southwestern portion of Onondaga Lake extend to a depth of at least 25 feet in lake sediments.

#### **Onondaga Lake Chemicals of Concern** and PECs

Parameter	PEC	
mercury	2.2	e mg/kg
	ug/kg	ug/kg
ethylbenzene	175.7	0.1757
xylenes	560.8	0.5608
chlorobenzenes	428.4	0.4284
dichlorobenzenes	238.6	0.2386
trichlorobenzenes	346.5	0.3465
acenaphthene	860.7	0.8607
acenaphthylene	1300.7	1.3007
anthracene	206.7	0.2067
benz(a)anthracene	191.5	0.1915
benzo(a)pyrene	146.4	0.1464
benzo(b)fluoranthene	908.4	0.9084
benzo(ghi)perylene	779.7	0.7797
benzo(k)fluoranthene	202.5	0.2025
chrysene	253.2	0.2532
dibenz(a,h)anthracene	157.2	0.1572
fluoranthene	1436.3	1.4363
fluorene	264.3	0.2643
indeno(1,2,3-cd)pyren	182.9	0.1829
naphthalene	917.4	0.9174
phenanthrene	542.7	0.5427
pyrene	343.8	0.3438
Total PCB	294.8	0.2948



#### Sampling and analyses by META helped to characterize and allocate chemicals to sources







Given the complexity of the sediment chemistry, NYSDEC, USEPA, and Honeywell developed an approach for mapping remediation areas based on mean sediment quality guideline quotients called the **Probable Effects Concentration Quotient** <u>(PECQ).</u>

**Probable Effects Concentrations (PECs) were** determined for 46 chemicals of potential interest (CPOI) using toxicity tests. Statistical analyses were used to narrow the list to 23 chemicals.

The ROD used PECQ=I as the remediation goal. Any location where the calculated PECQ exceeded I, would require a remedial response.

PAHs drove remediation in some areas of the Lake. **PAHs** were difficult to allocate given all the potential sources, mixing, and degradation that had occurred over the decades.

## **PECQ** Calculation

The COC chemicals are divided into 5 gro

The concentration of each chemical is div by its PEC to give a PECQ

The PECQs for each group are averaged

The 5 average PECQs are averaged to give the sample-specific average – the PECQ

# **META Method for Allocation**

First, calculate the % contrib **PECQ** for each COC chemic for each sample

## Next, identify and subtract background PAHs

- Historical contribution from urban rur based on Ley Creek and Barge Canal samples estimated at less than 58,800 ppm)
- Simple subtraction of background PAH concentrations from each sample

### >Last, allocate non-backgrou to each party

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The method was c with current condi sediment

#### **PECQ Allocation Example**

roups		Compound		Cono	Individual Compound and
• • •		Mercury	2.2	4.1	Group-wise PECQ 1.86
vided			475 7	Conc. (ug/kg)	0.04
		Zunyibenzene Xylenes (Total)	560.8	8.5 174	0.04
		VOCs	20010		0.18
		Chlorobenzene	428.4	1400	3.27
		Total Dichlorobenzen	238.6	330	1.38
		Chlorobenzenes	040.0		2.32
		Acenaphthene	860.7	170	0.2
		Acenaphthylene	1300.7	250	0.19
ve		Benz(a)anthracene	191.5	960	5.01
		Benzo(a)pyrene	146.4	1000	6.83
		Benzo(b)fluoranthene	908.4	1000	1.1
		Benzo(g,h,i)perylene	779.7	710	0.91
		Chrysene	202.5	1300	5.13
		Dibenz(a,h)anthracene	157.2	230	1.46
of COCs	L	Fluoranthene	1436.3	2800	1.95
		Fluorene	264.3	0	
	(	Indeno(1,2,3-cd)pyrer	182.9	600	3.28
bution to		Phenanthrene	917.4 542 7	130 1400	0.14 2 5 8
		Pyrene	343.8	2000	5.82
cal group		PAHs			2.75
cal group		Total PCBs	294.8	2123	7.2
				total PECQ	14.31066667
			No. Exceeding	% Total PECQs	Parameters requiring
out urban			PECQ		cleanup
		Mercury	1	25	Y N
		Chlorobenzenes	<u> </u>	25	N Y
		PAHs	1	25	Y
		PCBs	1	25	Y
nost estimated		Sample PECQ	2.865		
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ug/kg (58.8					
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contribution

parties to non-

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