

January 25, 2002

Mr. Glenn Haas, Director  
Division of Watershed Management  
Department of Environmental Protection  
1 Winter Street  
Boston, MA 02108

Ms. Linda Murphy, Director  
Office of Ecosystem Protection  
U.S. Environmental Protection Agency  
Water Technical Unit "SEW"  
P.O. Box 8127  
Boston, MA 02114

Re: Massachusetts Water Resources Authority, Permit Number MA0103284  
Notification Pursuant to Part I.8. Contingency Plan

Dear Mr. Haas and Ms. Murphy:

In its outfall ambient monitoring program, MWRA uses mussels to monitor bioaccumulation of 12 toxic contaminants in the nearfield of the Massachusetts Bay outfall. Reporting on seven of these contaminants is part of the Contingency Plan.<sup>1</sup> MWRA has received results of the mussel bioaccumulation testing carried out in the summer of 2001. For two of the contaminants, polynuclear aromatic hydrocarbons (PAHs) and total chlordanes, the concentrations in the mussels exceeded the Caution Level threshold (Table 1), triggering a notification requirement under the Contingency Plan. This letter constitutes that notification.

MWRA believes that the increased levels of chlordanes and PAHs that have been detected by the very sensitive bioaccumulation test reflect a signature of the outfall. However, because the actual levels of contamination remain very low, there is no indication that there are adverse impacts from this Caution Level exceedance. By way of comparison, the FDA limit for chlordanes in fish is 100 parts per billion (ppb) wet weight while the chlordanes in mussels at the outfall site was 2.2 ppb wet weight. There are no FDA limits for PAHs in food, but on average, the levels of PAHs (and chlordanes) in MWRA effluent are extremely low, measuring in the low parts per billion, within EPA ambient water quality criteria.

Below is a discussion of the mussel bioaccumulation test, the likely sources of the elevated contaminants, Deer Island Treatment Plant effluent quality, and environmental conditions in Massachusetts Bay that could have affected the results.

<sup>1</sup> Massachusetts Water Resources Authority Contingency Plan Revision 1. 2001. Report ENQUAD ms-071, on the web at <http://www.mwra.state.ma.us/harbor/enquad/trlist.htm>

#### MWRA mussel bioaccumulation testing

Blue mussels (*Mytilus edulis*) actively filter large volumes of the water around them during feeding. Because mussels bioaccumulate contaminants from the water, these shellfish are useful for assessing local concentrations of many contaminants, and have been used widely for two decades as a sensitive water quality monitoring tool.

MWRA collects mussels from a clean site in Rockport, Massachusetts. These mussels are put in cages and placed at sites in Boston's Inner Harbor, near Deer Island, in Cape Cod Bay, and in the plume of MWRA's offshore outfall discharge. The mussel testing is done in summer after the mussels' spawning season and when the mussels are biologically more active. Also, the study coincides with the period when water at the outfall site is stratified, trapping the effluent in the lower layer of water. In 2001, the mussels were deployed on June 26 and retrieved on August 27. The mussels were suspended 36 feet above the sea floor, within the trapped effluent plume. After 60 days the mussels were retrieved and concentrations of total PCBs, DDTs, chlordanes, PAHs, dieldrin, hexachlorobenzene, lindane, aldrin, endrin, mirex, lead, and mercury measured. These contaminants were also measured in the Rockport (control) mussels.<sup>2</sup>

Table 1. Baseline, Caution and Warning levels and 2001 results for MWRA mussel bioaccumulation tests.

--	--	--	--	--	--

Parameter	Baseline	Caution Level	Warning Level	Outfall site 2001	Exceedance
PCB (ppm wet weight)	0.0110	1	1.6	0.0096	No
Lead (ppm wet weight)	0.415	2	3	0.240	No
Mercury (ppm wet weight)	0.019	0.5	0.8	0.018	No
Chlordane* (ppb lipid)	102	205	None	250	Yes, Caution Level
Dieldrin (ppb lipid)	25	50	None	25	No
DDT (ppb lipid)	241	483	None	205	No
PAH (ppb lipid)	1,080	2,160	None	3,024	Yes, Caution Level

\* Since organic pollutants concentrate more readily in the lipids of animal tissue, the Outfall Monitoring Task Force (OMTF) agreed that organic compounds should be normalized to lipid content. This is not the same as FDA limits, which are in terms of wet weight; the lipid-normalized chlordane value of 250 ppb translates to 2.2 ppb wet weight. The FDA limit is 100 ppb wet weight.

Thresholds were based on FDA limits for PCBs, mercury, and lead. The Caution Levels are 50% of the FDA limit and the Warning Levels are 80% of the FDA limit. For other constituents the OMTF established Caution Level thresholds at twice baseline average for total chlordanes, total DDTs, total PAHs, and dieldrin. Threshold levels for PAHs were determined using the 24 PAH compounds which have been measured in the Outfall Monitoring Program since 1992. MWRA currently measures a total of 48 PAH compounds. Complete results for all constituents are reported in MWRA's Annual Fish and Shellfish Report.<sup>3</sup> Baseline data from the outfall site were collected from 1992-2000 (except 1995). Measurements in 2001 of other contaminants not part of the Contingency Plan--lindane, hexachlorobenzene, aldrin, endrin, and mirex--were at very low levels at all locations sampled, similar to levels found in previous years.

<sup>2</sup> More technical details of how the mussel studies are done are in: Lefkovitz, L. et al., 2001. *2000 annual fish and shellfish report*. Boston: Massachusetts Water Resources Authority. Report ENQUAD 2000-20, and on the web at:

<http://www.mwra.state.ma.us/harbor/enquad/trlist.htm#ms>.

<sup>3</sup> Ibid.

#### Sources of contaminants

Chlordane was in common and widespread agricultural and household use as a pesticide in the United States

until 1988. (A major use was for termite control.) Residual chlordane remains in the environment, especially soil, and can potentially enter the sewage system in storm runoff and contaminated ground water. Illegal dumping of chlordane into the sewer system by householders is also a potential source.

PAHs are a group of compounds derived from petroleum. The "high molecular weight" PAHs that comprise most of the total PAH found in MWRA's mussel study typically come from the combustion of petroleum products and enter the MWRA system mainly through storm runoff. Again, illegal dumping of petroleum products into the sewer system is another potential source.

#### Chlordane and PAHs in the MWRA waste-stream

The levels of chlordane and PAHs in MWRA's waste-stream are typically very low—so low that the EPA-approved chemistry methods that MWRA is required to use for permit reporting are not sensitive enough to detect these compounds. MWRA has developed another program which uses more sophisticated but non-standard methods, and routinely detects chlordanes and PAHs at extremely low levels in the effluent. The ten effluent samples analyzed for chlordanes and PAHs during the time period of the mussel deployments showed concentrations of chlordane and PAHs in the low parts per billion, consistent with the amount of flow receiving secondary treatment. Secondary treatment has been found to effectively remove 75-80% of the chlordanes entering the system and 75-95% of the PAHs. During the two-month mussel deployment, 96% of the effluent received full secondary treatment and the Deer Island Treatment Plant was continuously in compliance with its NPDES permit. During this period the average effluent TSS was 10.4 mg/L (MWRA's permit limit is 30 mg/L). Generally, the levels of these contaminants in MWRA effluent are below EPA ambient water quality criteria.

#### Comparison of bioaccumulation results at different sites

Table 2 summarizes the results of the 2001 bioaccumulation data for Contingency Plan constituents at four locations and the control site. Historically, the Boston Inner Harbor and Deer Island sites have shown the highest levels, and the Cape Cod Bay and outfall site were the lowest (data not shown). Overall, the Inner Harbor site still shows the greatest degree of bioaccumulation.

In this first bioaccumulation test since the outfall came on-line, some contaminants (lead, mercury, PCBs, and DDT) have remained low at both the outfall site and Cape Cod Bay. The test detected an increase in other contaminants (chlordane, dieldrin, and PAHs) at the outfall site only, indicating that the effluent is the probable source.

Table 2. Results of mussel bioaccumulation testing in 2001 at sites routinely monitored by MWRA.

Parameter	Outfall Site	Cape Cod Bay	Boston Harbor Deer Island	Boston Inner Harbor	Rockport Control
PCB (ppm wet weight)	0.0096	0.0131	0.0302	0.0383	0.0017
Lead (ppm wet weight)	0.24	0.32	0.48	0.97	0.17
Mercury (ppm wet weight)	0.018	0.018	0.017	0.020	0.013
Chlordane (ppb lipid)	250	63	122	233	52
Dieldrin (ppb lipid)	25	17	22	56	11
DDT (ppb lipid)	205	203	356	907	122

PAH (ppb lipid)	3,024	1,116	3,485	26,488	1,134
-----------------	-------	-------	-------	--------	-------

Conditions in Massachusetts Bay during the mussel monitoring

The summer of 2001 was relatively dry with little storm activity, therefore it was likely that currents at the outfall site were lessened. The moderate stratification would also mean that the mussels were exposed to relatively concentrated effluent. Such characteristics in the ocean will vary from year to year.

#### Summary

Although the mussel bioaccumulation test at the outfall site exceeded the Contingency Plan Caution Level threshold for PAH and chlordane, it should be stressed that these contaminants were found at very low levels. The Contingency Plan threshold was set at "double the baseline" and the baseline itself is very low. There is no indication of an adverse impact on the environment or risk to human health. The concentrations of all contaminants were far below relevant FDA limits. Moreover, MWRA's sampling data show that average concentrations of these contaminants in the effluent itself are below the ambient water quality criteria. As MWRA's monitoring continues, scientists will better understand the complex interactions among weather conditions, effectiveness of treatment, and factors that affect the bioaccumulation of these compounds.

MWRA continues to enforce its prohibition on the sewer disposal of chlordane and its industrial discharge limits for PAHs. MWRA reminds householders and businesses to take unused chlordane to a household hazardous waste disposal site, and to dispose of all pesticides and petroleum products properly—not into sewers, storm drains, or on the ground.

Please let me know if any of MWRA's staff can give you additional assistance regarding this notification.

Sincerely,

Michael J. Hornbrook  
Chief Operating Officer

Cc:

Environmental Protection Agency, Region I  
(EPA) Matthew Liebman  
Janet Labonte-Deshais  
Eric Hall

Food and Drug Administration  
Martin Dowgert

National Marine Fisheries Service Salvatore  
Testaverde

Massachusetts Department of  
Environmental Protection (DEP)  
Steve Lipman  
Cathy Coniaris

Division of Marine Fisheries  
Jeff Kennedy  
Jack Schwartz

EOEA  
Mark Smith

Stellwagen Bank National Marine  
Sanctuary  
Craig MacDonald

Outfall Monitoring Science Advisory Panel  
Andrew Solow  
Robert Beardsley  
Norb Jaworski  
Scott Nixon  
Judy Pederson  
Michael Shiaris  
James Shine  
Juanita Urban-Rich  
Robert Kenney

Hyannis Library  
Ann-Louise Harries

MWRA Library  
Mary Lydon

Cape Cod Commission  
Steve Tucker

Go to: [What's New](#)

Go to: [Contingency Plan Exceedances](#)