December 13, 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 toxic contaminants in the nearfield of the Massachusetts Bay outfall. Reporting on some of these contaminants is part of the Contingency Plan.[1] MWRA has received results of the mussel bioaccumulation testing carried out in the summer of 2002. For two of the contaminants, polynuclear aromatic hydrocarbons (PAHs) and total chlordane, 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.

These contaminants are the same two that exceeded the Contingency Plan threshold in 2001, and their levels are similar to those found last year (Table 1). At the time MWRA learned of the previous threshold exceedance, it prepared a detailed evaluation and report of the potential causes of the higher-than-anticipated results. That report[2] concluded that the observed increases in PAH and chlordane in caged mussels at the outfall site were in keeping with present scientific understanding of bioaccumulation processes, and that the threshold itself may be unrealistic. The similar findings in 2002 underscore that conclusion. 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.

MWRA believes that the increased levels of chlordane 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 low, there is no indication that there are adverse impacts from this Caution Level exceedance. By way of comparison, the FDA limit for chlordane in fish is 100 parts per billion (ppb) wet weight while the chlordane 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 total PAHs (and chlordanes) in MWRA effluent are low, measuring in the low parts per million and parts per billion respectively.

[1] *Massachusetts Water Resources Authority Contingency Plan Revision 1*. 2001. Report ENQUAD ms-071, on line at http://www.mwra.state.ma.us/harbor/enquad/trlist.htm

[2] Hunt *et al*. 2002. *Evaluation of 2001 Mussel tissue contaminant threshold exceedance.* Boston: Massachusetts Water Resources Authority. Report ENQUAD 2002-05, on-line at http://www.mwra.state.ma.us/harbor/enquad/pdf/2002-05.pdf

Table 1. Baseline, Caution and Warning levels, 2001 and 2002 results for MWRA mussel bioaccumulation tests.

Parameter	Baseline	Caution Level	Warning Level	Outfall site 2001	**Outfall site 2002**	Exceedance
PCB (ppm wet weight)	0.0110	1	1.6	0.0096	**0.0084**	No
Lead (ppm wet weight)	0.415	2	3	0.240	**0.332**	No
Mercury (ppm wet weight)	0.019	0.5	0.8	0.018	**0.0228**	No
Chlordane* (ppb lipid)	102	205	None	250	**210**	**Yes Caution Level**
Dieldrin (ppb lipid)	25	50	None	25	**25.6**	No
DDT (ppb lipid)	241	483	None	205	**223**	No
PAH (ppb lipid)	1,080	2,160	None	3,024	**3,140**	**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 210 ppb translates to 2.2 ppb wet weight. The FDA limit is 100 ppb wet weight.

For PCBs, mercury, and lead, the thresholds were based on FDA limits. 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 will be reported in MWRA's 2002 Annual Fish and Shellfish Report. Baseline data from the outfall site were collected from 1992-2000 (except 1995). Measurements in 2002 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.

Below is a discussion of the mussel bioaccumulation test, the likely sources of the elevated contaminants, and Deer Island Treatment Plant effluent quality.

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 collected mussels from a clean site at Stover's Point, Maine. These mussels were 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 2002, the mussels were deployed June 25th and retrieved on August 26th. The mussels were suspended 36 feet above the sea floor, within the trapped effluent plume. After 62 days the mussels were retrieved and concentrations of total PCBs, DDTs, chlordanes, PAHs, dieldrin, hexachlorobenzene, lindane, aldrin, endrin, mirex, lead, and mercury measured. A portion of the

mussel deployments is retrieved after 40 days, as "insurance" against loss of the mussels during the study. The contaminants were also measured in the Maine (control) mussels.[3]

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 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 fourteen effluent samples analyzed for chlordanes and PAHs during the time period of the mussel deployments showed concentrations of total chlordane in the low parts per billion and total PAHs in the very low parts per million, both 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. Generally, the average level of these contaminants in MWRA effluent is near or below the EPA ambient water quality criteria—without dilution (ambient criteria are for concentrations in the receiving water; effluent limitations are higher than ambient criteria because they take dilution into account).

Effect of August treatment plant upset during mussel deployment

The mussel study data help us learn whether a treatment plant upset in the secondary treatment process that occurred in August, 2002 affected levels of toxic contaminants in the outfall nearfield. A report on this upset is on the web at http://www.mwra.com/harbor/pdf/20020831mtpx.pdf. Because of the upset, TSS in MWRA effluent was elevated for 10 days and there were slightly elevated concentrations of contaminants in the effluent compared to normal operations. The mussels were in place at the outfall site during this entire period. For effluent samples taken during the upset, one sample slightly exceeded the ambient criterion for the PAH, chrysene, and several samples were two-to three-fold higher than the ambient criterion for another PAH, pyrene, and chlordane was slightly higher than the ambient criterion. While these higher concentrations may have led to slightly higher ambient water concentrations, concentrations in the mussels were not significantly different from last year. Also, contaminant levels in the 40-day mussel deployments, which were retrieved before the TSS upset, were not significantly different from the 62-day deployment, which was exposed to effluent for 10 days during the upset. Thus, the data give no indication that the upset either contributed to the Contingency Plan exceedances, or that there were violations of water quality criteria for toxic contaminants.

Comparison of bioaccumulation results at different sites

Table 2 summarizes the results of the 2002 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.

[3] More technical details of how the mussel studies are done are in: Lefkovitz, L. et al., 2002. *2001 annual fish and shellfish report.* Boston: Massachusetts Water Resources Authority. Report ENQUAD 2002-14, and on line at: http://www.mwra.state.ma.us/harbor/enquad/pdf/2002-14.pdf

As in 2001, some contaminants (mercury and PCBs) have remained low at both the outfall site and Cape Cod Bay. The test detected an increase in other contaminants (chlordane, DDTs, dieldrin, and PAHs) at the outfall site only, indicating that the effluent is the probable source.

Table 2. Results of mussel bioaccumulation testing in 2002 at sites routinely monitored by MWRA.

Parameter	Outfall Site	Cape Cod Bay	Boston Harbor Deer Island	Boston Inner Harbor	Maine Control
PCB (ppm wet weight)	0.0084	0.0055	0.0161	0.024	0.0022
Lead (ppm wet weight)	0.33	0.21	0.50	0.65	0.25
Mercury (ppm wet weight)	0.02	0.02	0.02	0.02	0.02
Chlordane (ppb lipid)	210	56	106	164	31
Dieldrin (ppb lipid)	25.6	23.1	33.4	58.1	21.0
DDT (ppb lipid)	223	134	287	621	102
PAH (ppb lipid)	3,140	249	2,700	12,100	1,185

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 low levels. The Contingency Plan threshold was set at "double the baseline" and the baseline itself is 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 undiluted effluent itself are at worst only slightly higher than the ambient water quality criteria.

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

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