

November 21, 2003

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, the Massachusetts Water Resources Authority ("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 2003. For one group of contaminants, polynuclear aromatic hydrocarbons ("PAHs"), the concentrations in the mussels exceeded the Caution Level threshold, triggering a notification requirement under the Contingency Plan. This letter constitutes that notification.

This result is not unexpected, as PAHs also exceeded the thresholds in 2001 and 2002 (Table 1). (For chlordane, which exceeded the caution threshold in both 2001 and 2002, the level this year was elevated over baseline but below the threshold.) The increased concentrations of PAHs that have been detected by the very sensitive mussel bioaccumulation test likely reflect a signature of the outfall. However, there is no indication of an adverse impact on the environment nor 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 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.

In 2003, MWRA collected mussels from a clean site (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, and when water at the outfall site is stratified, trapping the effluent in the lower layer of water. At the outfall site, caged mussels were suspended 36 feet above the sea floor within the

¹ *Massachusetts Water Resources Authority Contingency Plan Revision 1*. 2001. Report ENQUAD ms-071, on line at <http://www.mwra.com/harbor/enquad/pdf/ms-071.pdf>

effluent plume, were deployed June 25 and retrieved after 63 days on August 26 for measurement of total PCBs, DDTs, chlordanes, PAHs, dieldrin, hexachlorobenzene, lindane, aldrin, endrin, mirex, lead, and mercury. The contaminants were also measured in the Maine (control) mussels.²

Table 1. Baseline, caution, and warning threshold levels, and 2001-2003 results for MWRA mussel bioaccumulation tests at the outfall site.

Parameter	Baseline	Caution Level	Warning Level	Outfall site 2001	Outfall site 2002	Outfall site 2003	Exceedance
PCB (ppm wet weight)	0.0110	1	1.6	0.0096	0.0084	.0085	No
Lead (ppm wet weight)	0.415	2	3	0.240	0.332	0.226	No
Mercury (ppm wet weight)	0.019	0.5	0.8	0.018	0.0228	.017	No
Chlordane* (ppb lipid)	102	205	None	250	210	191	No
Dieldrin (ppb lipid)	25	50	None	25	25.6	21.6	No
DDT (ppb lipid)	241	483	None	205	223	179	No
PAH (ppb lipid)	1,080	2,160	None	3,024	3,140	3,690	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 191 ppb translates to 2.2 ppm 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.

PAHs in the MWRA waste-stream

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. Lipid-normalized PAH concentrations in outfall site mussels were approximately 20% higher in 2003 than was observed in 2002. This may reflect the much wetter conditions during summer 2003—rainfall increases street runoff which is a major source of PAHs to rivers, the ocean, and MWRA's waste stream. Illegal dumping of petroleum products into the sewer system is another potential source. The levels of 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. By using more sophisticated low-detection methods MWRA routinely detects PAHs

² More technical details of how the mussel studies are done are in: Pala, S. et al., 2003. *2002 annual fish and shellfish report*. Boston: Massachusetts Water Resources Authority. Report ENQUAD 2003-05, and on line at: <http://www.mwra.state.ma.us/harbor/enquad/pdf/2003-05.pdf>

at extremely low levels in the effluent;³ secondary treatment removes 75-95% of the PAHs entering the system. Generally, the average level of these contaminants in MWRA effluent is near or below the EPA ambient water quality criteria even without dilution (ambient criteria are for concentrations in the receiving water; effluent limitations are higher than ambient criteria because they take dilution into account).

Comparison of bioaccumulation results at different sites

Table 2 summarizes the results of the 2003 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.⁴ Overall, the Inner Harbor site still shows the greatest degree of bioaccumulation. As in 2001 and 2002, some contaminants (mercury and PCBs) have remained low at both the outfall site and Cape Cod Bay.

Table 2. Results of mussel bioaccumulation testing in 2003 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)	0.0085	0.0066	0.022	0.038	0.0019
Lead (ppm wet weight)	0.23	0.26	0.30	0.73	0.22
Mercury (ppm wet weight)	0.02	0.02	0.02	0.01	0.02
Chlordane (ppb lipid)	191	40	133	398	17
Dieldrin (ppb lipid)	21.6	13.0	32.6	104.4	12.0
DDT (ppb lipid)	179	115	350	1,731	73
PAH (ppb lipid)	3,690	427	2,205	28,855	686

Review of bioaccumulation results

After the 2001 threshold exceedances, MWRA prepared a detailed evaluation and report of the potential causes of the higher-than-anticipated results.⁵ That report concluded that the increases in PAH (and chlordane) in caged mussels at the outfall site were in keeping with present scientific understanding of bioaccumulation processes, do not represent concentrations of environmental concern, and that the threshold itself may be unrealistically low. As anticipated, threshold exceedances for PAH and chlordane occurred again in 2002. In March 2003, an Outfall Monitoring Science Advisory Panel focus group convened by the Environmental Protection Agency and the Massachusetts Department of Environmental Protection reviewed the mussel results. That group concurred with the findings of MWRA's report and concluded that the levels of PAH and chlordane are very low, do not indicate an environmental risk,⁶ and that higher thresholds may be appropriate. However, the focus group recommended that for the present the thresholds remain the same but that notifications be made with appropriate caveats.

³ Data from the weekly effluent samples analyzed for PAHs during the time period of the mussel deployments are still under review; typical concentrations of total PAHs are in the very low parts per million.

⁴ Pala S, Lefkovitz LF, Moore MJ and Schaub E. 2003. *2002 annual fish and shellfish report*. Boston: Massachusetts Water Resources Authority. Report 2003-05. 176 p.

⁵ 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>

⁶ OMSAP. 2003. Draft summary, OMSAP mussel tissue contaminant focus group meeting, Wednesday, March 5, 2003, MADEP Boston.

Summary

Although the mussel bioaccumulation test at the outfall site exceeded the Contingency Plan Caution Level threshold for PAH, the level was very low. The Contingency Plan threshold was set at “double the baseline” and the baseline itself is extremely low. Because the actual levels of contamination remain low, there is no indication that there are adverse impacts from this Caution Level exceedance. There is no indication of an adverse impact on the environment nor risk to human health. The concentrations of all contaminants were far below relevant FDA limits. The levels of total PAHs in MWRA effluent are low, measuring in the low parts per million.

MWRA continues to enforce its industrial discharge limits for PAHs. MWRA reminds householders and businesses to dispose of all 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

Environmental Protection Agency, Region I (EPA)

Matthew Liebman
Janet Labonte-Deshais
Eric Hall
Roger Janson

Massachusetts Department of Environmental Protection (DEP)

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