



MASSACHUSETTS WATER RESOURCES AUTHORITY

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June 23, 2009

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Re: Massachusetts Water Resources Authority, Permit Number MA0103284
Submission Pursuant to Part I.7.c.iii. - Ambient Monitoring Plan Modifications
Response to EPA initial comments

Dear Mr. Haas and Mr. Perkins:

Thank you for your initial comments on MWRA's proposed modifications to the *Ambient Monitoring Plan for the Massachusetts Water Resources Effluent Outfall, Revision 1, March 2004*. This letter summarizes MWRA's understanding of our discussion during a telephone conference with EPA on June 18, 2009, and offers some general responses to your initial comments. We look forward to a detailed technical discussion of the issues at the OMSAP meeting June 29.

Before responding to EPA's comments, I would like to clarify that the proposed revisions to the monitoring plan are not intended to be a basis for monitoring requirements in MWRA's next permit. MWRA's position is that it is no longer appropriate to require ambient monitoring in its permit: the monitoring questions have been answered and nearly a decade of ambient monitoring results have determined that the outfall is working as designed and no adverse effects have been found.

MWRA hopes the response below can clarify some issues in advance of the OMSAP meeting and spur effective discussion. (EPA's general comments are abbreviated.)

Summary of EPA Comments and Questions on 2009 Proposed Modifications and MWRA responses

A. ...[ensure] sufficient monitoring parameters and stations have been maintained to support MWRA's modeling and responsive strategy and to track regional changes in water quality for comparison with changes in the nearfield.

MWRA response: The modified design, proposed for implementation only until MWRA's renewed permit is in effect, would improve the ability to compare

regional changes to the nearfield data by collecting samples synoptically over the entire monitoring area, and by increasing the frequency of monitoring in the farfield.

B. ...discuss re-focusing the nearfield sampling to confirm that water quality standards are being achieved at the edge of the ZID. (See specific comments Nos. 2, 3, and 4 regarding monitoring near the boundary of the ZID.)

MWRA response: There is considerable spatial redundancy within the near field and therefore it is reasonable to decrease the number of stations sampled. MWRA's data show that all existing water quality standards are being met, including state narrative standards for cultural eutrophication (nutrient effects) and numerical standards for dissolved oxygen. However, if EPA wants one of the four nearfield stations moved to the inner nearfield, MWRA will do so. (With regard to nearfield sampling locations, none of the sampling stations in the near field that were dropped beginning in 2004 as part of the first revision to the monitoring plan included sampling for total nitrogen, but only for dissolved inorganic nitrogen.)

Our understanding is that an issue for EPA is whether a future numerical standard for total nitrogen would be met at the boundary of the ZID (defined as 60 m from the outfall for purposes of calculating permit limitations). MWRA is carrying out some additional plots and analyses for discussion at the OMSAP meeting.

Also, MWRA notes that it (together with EPA) carried out a major dye-dilution study that verified that the outfall was functioning as designed, and that EPA certified that study.

C. ...Evaluate whether the proposed sampling reductions will ensure that its proposed monitoring program (including the number and location of stations, and the parameters sampled) is sufficient to meet the information requirements of the Contingency Plan.

MWRA response: A number of correlation analyses were provided in the proposed revised monitoring plan; MWRA is carrying out some additional analyses including recalculating the values of threshold parameters and the thresholds themselves for presentation at the meeting.

D.Marine environmental parameters should be monitored at areas expected, based on previous modeling and monitoring, to have impacts from the outfall discharge...

MWRA response: MWRA believes that its proposed plan does do this, MWRA will discuss these issues in further detail at the OMSAP meeting. Additional data plots are being prepared. MWRA's intention is to be able to discriminate between regional and potential outfall effects, which is why we want to change to synoptic

sampling for the water column. Continuous monitoring from buoys and satellite data help discriminate between outfall and regional phenomena.

E. The monitoring plan should include measures of living resources, such as winter flounder.

MWRA response: no changes to the fish and shellfish monitoring have been proposed.

F. Some adjustments to the presentation of material that would facilitate review of the proposed modification by the public and other reviewers not familiar with all of the underlying reports include:

- Map(s) showing the overall changes in sampling locations from the baseline program to the present proposal....
...the location of the ZID as defined in the 1998 Fact Sheet, and the nearfield as defined by MWRA in their technical reports, for both water column and benthic sampling.

MWRA response: The requested maps will be available at the OMSAP meeting (they are complicated and need to be printed in large format).

- A summary evaluation for each sampling location to be eliminated...

MWRA response: In general, many sites were originally selected for monitoring to confirm predictions made during planning. Now the monitoring questions have been answered; MWRA has proposed eliminating stations that are not affected by the outfall such as in Cape Cod Bay, and has kept some stations from most of the station groups for comparison with the near field and for boundary conditions for the model. The documented spatial redundancy within the nearfield supports less intensive spatial sampling in the nearfield.

Specific Comments

Effluent

1. MWRA proposes to eliminate effluent floatables monitoring. EPA recognizes that the sampling requirement is unusual. However, given that visible fat particles have been reported in the ambient net tows, and SA water quality standards require that these waters "...shall be free from oil and grease and petrochemicals," EPA believes that further investigation into the process by which oil and grease particles are released into the receiving water may be necessary. This may require further effluent data collection and/or ambient tows (also see comment 7 below).

MWRA response: It is important to note that the small fat particles described are not petroleum-derived hydrocarbons, and that no grease is observable in the outfall area. The fat particles are observable after being collected in a very fine (0.5 mm) mesh net. No sewage-derived plastics of concern have been seen in the outfall area or collected in the net tows. MWRA still tests for petroleum hydrocarbons in the effluent, results are very low and well below the Contingency Plan threshold.

Water Column

2. We are particularly concerned that the nearfield stations that MWRA is proposing to eliminate are N10, N16, and N20. Stations N16 and N20 are two of only three stations inside the boundary of the nearfield, and data from N10 appears to show values higher than from the stations at the other corners of the nearfield. All of these stations have, to varying degrees, indicated effects from the outfall discharge plume, including relatively high total nitrogen concentrations at N16 (see comment 4). Retaining these specific stations, where changes have been observed, is also important for purposes of having a continuous record of changes over time.

MWRA response: Except for ammonium, which, as expected, has been very thoroughly documented as being an outfall signature usually detectable in the inner near field, water quality parameters in the nearfield have spatial redundancy. The objective both in the 2004 revision and in this redesign is to focus on monitoring for indicators of eutrophication such as chlorophyll, dissolved oxygen, and plankton. Water column total nitrogen measurements have never been a major focus of this program, rather a comprehensive suite of nitrogenous chemistry parameters is measured. The purpose of the monitoring has been to document whether ecosystem effects have occurred as a result of the discharge. The program has focused on the ecological indicators such as algal growth (chlorophyll), dissolved oxygen, nuisance algae, and the plankton community. MWRA is preparing additional analyses of the spatial pattern of water column chemistry for review at the OMSAP meeting, and looks forward to further discussion of which nearfield stations are appropriate to include for the purpose of the monitoring.

3. In the current monitoring plan, the nearfield water column monitoring station (N20) closest to the outfall is located approximately 3,600 feet west of the diffuser, and approximately 3,400 feet west of the ZID. The next closest nearfield location is more than twice that distance from the outfall. EPA believes that MWRA should evaluate establishing at least one new monitoring location at the boundary of the ZID to monitor the effect of plume constituents on water quality. Such a station would help to provide a confirmation of plume dilution, especially the extent to which pollutants build up near the outfall, which was not a component of the dye studies done in 2001. The specific location of the station(s) should be based on the best understanding of the movement of the plume.

MWRA response: the movement of water at the outfall site is complex, making an attempt to sample at the edge of the true hydraulic mixing zone a very challenging task. The original 21 stations in the nearfield included sampling for DIN in order to characterize the location and the movement of the discharge. The EPA-certified dye dilution study, and the past and proposed near field and farfield monitoring document that the outfall diffuser system is successful in accomplishing effective dilution of effluent nutrients to oceanic background conditions. The monitoring data show that background conditions are quickly achieved for nitrogen. Most other effluent constituents such as metals meet water quality criteria at the treatment plant even before dilution, and the remaining ones such as copper require less dilution than the minimum the outfall provides. MWRA will be prepared to discuss the movement of the plume and the location of near field sampling stations in more detail at the upcoming OMSAP meeting, but believes that 4 nearfield stations are enough to well-characterize the nearfield conditions.

4. While the discharge of total nitrogen is within the limit established by the contingency plan, the DITP effluent concentrations (avg = 24.4 mg/l¹, range 16.0-36.2 mg/l, n=100) are relatively high compared to other secondary treatment facilities in Massachusetts, which average 19.6 mg/l total nitrogen. Sampling at current nearfield stations, which are all farther than 2 kilometers from the outfall, has shown concentrations as high as 0.36 mg/l, 2007. Suggested water quality criteria for total nitrogen in estuarine waters are about 0.4 mg/l total nitrogen². While data suggests that the stratification in the water column typically prevents the discharge from reaching the surface during the critical summer months, we believe that collection of measures of eutrophication near the ZID is appropriate. Such monitoring could consist of a combination of continuous remote monitoring stations and periodic sampling stations, both perhaps augmented by aerial surveys and intensive response monitoring should blooms be detected.

MWRA response: The nitrogen discharges are as expected and planned for. The outfall provides effective dilution, and the monitoring has found no adverse impacts. Apart from the ammonium contributed to the near field by the outfall, conditions at the outfall site and the rest of Massachusetts Bay are driven by the overwhelmingly large volumes of water, which are naturally relatively nutrient-rich, coming into the bay from offshore. MWRA's proposed monitoring plan (interim until the new permit) includes continuous monitoring and periodic sampling. The design is intended to provide data to support the currently required contingency plan thresholds, although MWRA believes that the contingency plan should not be included as a requirement in the renewed permit. Responsive monitoring has been discussed at past science panel meetings, however that monitoring approach does not support the contingency plan. Responsive monitoring is very resource-intensive and MWRA cannot afford to do both contingency plan-based monitoring and responsive monitoring (except for the red tide and indicator bacteria monitoring carried out responsively now.)

¹ Based on Discharge monitoring reports (DMRs) submitted by MWRA from September 2000-December 2008.

² See http://www.oceanscience.net/estuaries/report/WestFalmouth/WestFalmouth_Executive_Summary.pdf

MWRA has notified us that it has made arrangements to have chlorophyll and dissolved oxygen sensors installed on NOAA buoy 44013, located about 4.5 nautical miles southeast of the outfall, and that this installation is scheduled for June 2, 2009. Comparing the NOAA buoy data with data collected close to the ZID would give further insight into whether blooms are local or regional.

MWRA response: the sensors have been installed, and data are available continuously on the web. Buoy 44013 reflects local nearfield conditions—regional blooms occur over a very large area often over large portions of the Gulf of Maine—instrumentation on the GoMOOS buoys off Cape Ann and farther up the coast help MWRA determine if a bloom is regional, as does satellite data. Determining whether or not a bloom is local or regional will be improved in the proposed design because of increased sampling frequency regionally in the reference stations (formerly farfield), and synoptic sampling. MWRA will be prepared to discuss this in more detail at the science panel meeting. With respect to water quality parameters except ammonium, conditions within the ZID are the same as the rest of the nearfield. EPA has noted in its 1998 fact sheet that the regulatory ZID is drawn very tightly around the outfall. However, the rapid and relatively random mixing at the outfall location and the fact that the biological processes occur over time means that if ecological changes were to be observed as a result of the discharge they would be dispersed over a much larger area than the 60-meter ZID.

5. MWRA should evaluate shifting at least a limited number of water column and/or benthic monitoring stations. It appears that there are few, if any, stations where both water column and benthic data are collected. It would seem that aligning some of the water column and benthic stations may be useful in determining the relationship between water column and sea floor effects (also see comment 9 regarding the location of benthic stations).

*MWRA response: the outfall is located in an area that is primarily rocky with strong tidal currents, which means that there is relatively little mud corresponding to overlaying water column stations. The benthic monitoring locations are in the closest muddy areas. MWRA uses the presence of the sensitive sewage tracer, *Clostridium perfringens* spores, as an indicator of where effluent particles have settled.*

The USGS carried out a large and detailed study which documented the fate and transport of contaminated sediments from Boston Harbor and from the outfall.

6. The water quality monitoring data and the continuous measurement instrumentation should be employed to improve the water quality model to be operated in a forecast mode. For example, the MWRA should provide additional information on how results from the water quality instrumentation on the NOAA weather buoy 44013 will assist interpretation of water quality parameters between monitoring events. The location of this

buoy should also be justified in terms of its proximity to the outfall (i.e. was the use of this buoy merely convenient or is it the best location for the purposes envisioned by MWRA?).

MWRA response: although investigators (outside their contract with MWRA) are operating the hydrodynamic model experimentally in forecast mode, operation of the water quality model in forecast mode is more complex because biological processes are more difficult to model than physical processes. The water quality model is able, in a general way to replicate water column processes, but MWRA believes that the best use of the buoys is to interpolate between monitoring events. The location of the buoy is the best practicable balance we could achieve among the conflicting realities: the outfall is located in a shipping lane (ship strikes would destroy a surface buoy), but regulatory agencies and the science panel expressed a strong desire for real-time data (instrumentation located on the bottom or mid- depth could not transmit the data in real-time). These issues were reviewed in detail at a series of science panel meetings, and the consensus among the science panel and regulatory agencies was that the locating additional instrumentation buoy 44013 would be a useful addition to monitoring potential outfall effects.

7. The characterization in the proposal of effluent floatables quantities as "...only low (parts per billion) levels of floatables..." is at odds with observations and sampling results presented by MWRA in previous reports, most notably those presented in the recent reports, "*Summary of "floatables" observations in Deer Island Treatment Plant effluent and at the discharge site in Massachusetts Bay: 2000 – 2007 (ENQUAD 2008-08)*" and "*2007 outfall monitoring overview RESULTS (ENQUAD 2008-17)*". While the "concentration" of floatables calculated as a percentage of total discharge volume may be low, as reported by MWRA, the presence of visible fat particles in nearly 70% of the net tows since 2004 should be examined further as to whether MWRA's assertion that the particles "...do not have a significant aesthetic impact" (ENQUAD 2008-08) is accurate, and whether such observations are in compliance with water quality standards. MWRA's analysis should further determine whether such discharges are typical of other ocean outfalls. While the overall number of debris tows may be reduced, they should not be eliminated and MWRA must provide some form of analysis of cause and prevention.

MWRA response: the debris tows were initiated because of concern that effluent related floatables particularly plastics would either harm marine life or cause an aesthetic concern. The debris tows have documented the plastics are not present. Although the fat particles can be detected frequently, this is by means of a very fine mesh net after sampling a large volume of water. The particles are very small, a few millimeters in size at most. EPA staff recently watched a net tow and observed the outfall area and it is our understanding that he would agree that there was no significant aesthetic impact. These are not petroleum hydrocarbons. MWRA believes it is appropriate to end the floatables sampling because of these results and because the time required to conduct the sampling makes it more difficult to accomplish our proposed survey in one day.

Seafloor

8. EPA is concerned with the reduction in the frequency of hard-bottom station monitoring. MWRA should evaluate the utility of coupling a reduction in hard bottom sampling with a program to conduct some hard bottom monitoring as rapid response monitoring – in response to elevated TSS discharges from the DITP - to determine if there is a link between plant discharge and hard bottom characteristics.

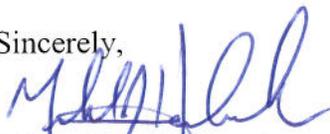
MWRA response: If an event such as a significant plant upset occurred that resulted in elevated solids discharges, MWRA would confer with the regulatory agencies to determine if it would be appropriate to schedule a hard bottom survey.

9. In General Comment F, EPA asked that MWRA provide enhanced mapping of ambient monitoring stations and summaries of monitoring data. Such enhanced mapping should include gradient diagrams of sea floor concentrations for both pre-startup and current conditions of such parameters as silver, copper, *Clostridium perfringens* spores, chlordanes, and other compounds as appropriate. This information would help provide accurate spatial understanding of the plume footprint. Such information must be presented at a scale that allows detailed understanding of the plume footprint with respect to both nearfield and farfield monitoring locations and would be very helpful in determinations of benthic and water column monitoring locations (see comment 5). The information should be presented in such a manner that is readily understood by members of the public and all other reviewers.

MWRA response: MWRA is preparing graphs of contaminant levels at the sediment stations that reflect distance from the outfall, and a map of Clostridium perfringens spores. The reasons why the water column and benthic stations have not been chosen to specifically correspond with each other was discussed previously; MWRA believes that the fate and transport of contaminants from outfall are extremely well understood because of the work of USGS.

In summary, MWRA has collected a long-term, comprehensive data set that shows that its wastewater treatment together with the dilution provided by the outfall have resulted in no adverse impacts on the marine ecosystem. The proposed changes to the effluent, water column and sediment monitoring will provide sufficient data for required modeling and threshold reporting until a renewed permit is in effect. We are looking forward to more discussions of the proposed modifications at the OMSAP meeting on June 29. Please call me at (617) 788-4359 with any questions.

Sincerely,



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Chief Operating Officer.

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