

2009 ANNUAL LIST OF PROPOSED CHANGES TO MWRA'S EFFLUENT OUTFALL AMBIENT MONITORING PLAN

OCTOBER 23, 2009

Proposed changes to the plan are based on data collected and technical reports written since the monitoring began, including sixteen years of environmental monitoring (eight years of baseline and eight years of discharge monitoring). The proposed monitoring plan revisions reflect that the original monitoring questions have been answered. The focus of the monitoring program now appropriately shifts to a less intensive, less geographically dispersed, but more synoptic and consistent program. This water column monitoring is complemented by similar monitoring in Cape Cod Bay and Stellwagen National Marine Sanctuary. MWRA requests the following changes to its ambient monitoring plan:

1 EFFLUENT

- 1.1 **Discontinue effluent floatables monitoring.** Monitoring results show only low (parts per billion) levels of floatables.
- 1.2 **Change special study contaminant sampling frequency "weekly" to "4 times per month."**

2 WATER COLUMN

- 2.1 **Reduce the total number of stations sampled from 33 to 14.** This change focuses the monitoring on the geographic area now known to have a possibility of being affected by the discharge. Reference stations are included, but most of the furthest stations are removed.
 - 2.1.1 **Delete the following stations: F03, F05, F07, F12, F14, F16, F17, F18, F19, F24, F25, F26, F27, F28, F30, F31, N10, N16, N20.**
 - 2.1.2 **Include the following stations: F06, F10, F13, F15, F22, F23, N01, N04, N07, N18, N21 (Figure 1, Table 1).** Measure dissolved nutrients at nearfield station N21 at the edge of the zone of initial dilution, 60 meters from midline of diffuser line.
 - 2.1.3 **Sample three stations in Cape Cod Bay-Stellwagen Bank National Marine Sanctuary: F01, F02, F29 (Figure 1, Table 2).** Parameters will include *in situ* water quality, water column chemistry, and plankton, sampled 9 times annually at two depths. As much as logistically feasible, sample synoptically with outfall monitoring stations.

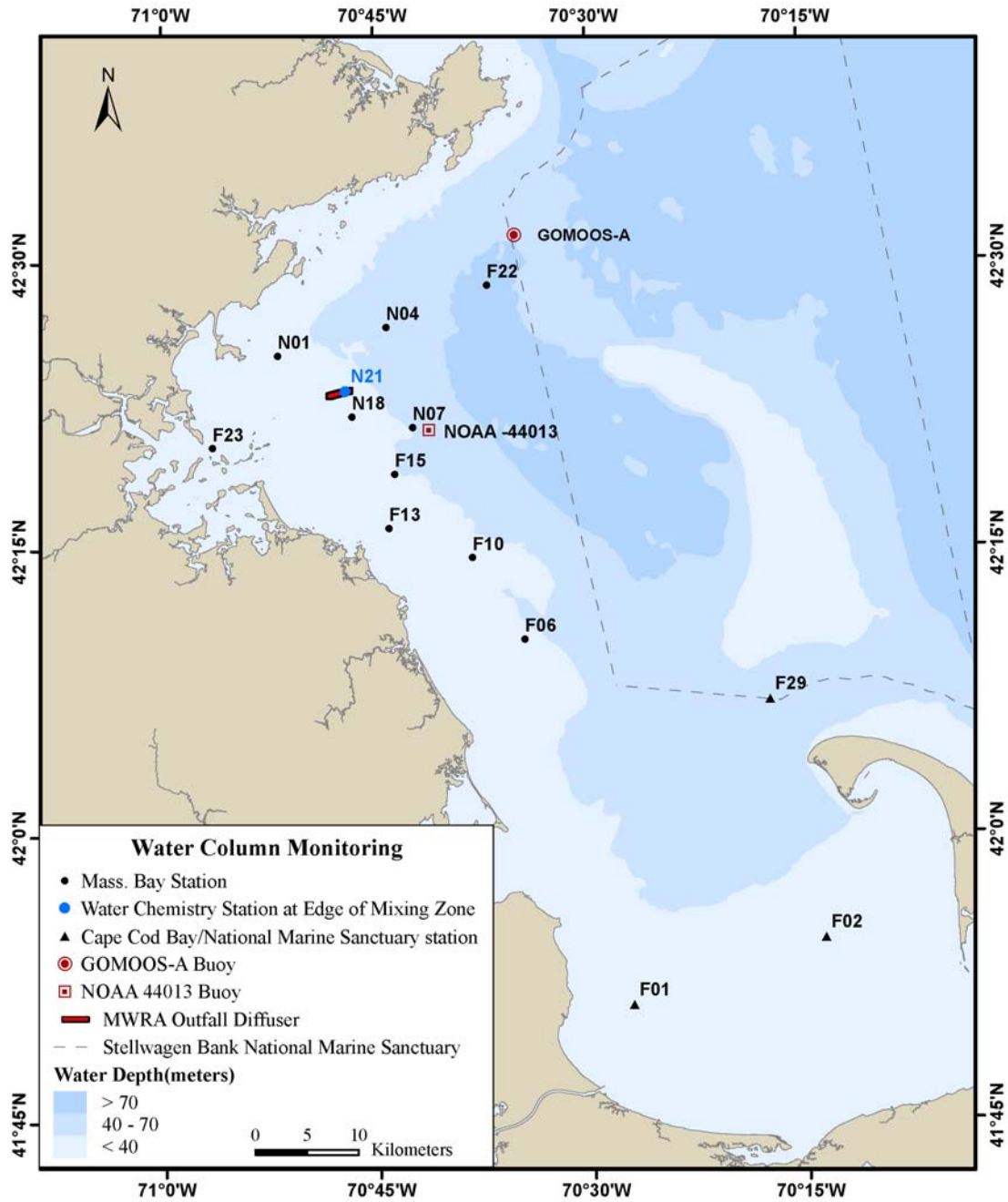


Figure 1 Map of proposed water column monitoring stations.

Table 1 List of proposed water column monitoring stations and purpose for monitoring

STATION ID	WATER DEPTH (M)	LOCATION DESCRIPTION RELATIVE TO OUTFALL	PURPOSE
F22	80	17 km NE	Northern reference station Gulf of Maine influence Regional physical forcing relates to nearfield DO Link between buoy and sampling data "Upstream" sentinel station in winter-spring
N04	50	7.1 km NE	Evaluate extent of plume northeast
N01	31	6.3 km NW	Evaluate extent of plume northwest
N21	35	60 m	Evaluate dissolved nutrients at ZID
N18	27	2.5 km S	Close to outfall Ammonium signature Primary "impact" station for comparison to other stations
N07	50	7 km SE	Near NOAA buoy MWRA instruments-data comparison
F23	25	12 km E	Boston Harbor
F15	38	9 km S	Evaluate extent of plume southeast
F13	25	14 km S	Near coastal (model, <i>Alexandrium</i>)
F10	33	20 km S	Furthest expected southern expression of effluent plume
F06	33	29 km SE	Southern reference station

Table 2 Proposed Cape Cod Bay-Stellwagen Bank NMS monitoring stations

STATION ID	WATER DEPTH (M)	LOCATION DESCRIPTION RELATIVE TO OUTFALL	PURPOSE
F29	65	50 km SE	Evaluate nutrients and plankton in Stellwagen Bank National Marine Sanctuary
F02	32	70 km SE	Evaluate nutrients and plankton in Cape Cod Bay
F01	26	66 km SE	

2.2 Change survey schedule from 12 nearfield and 6 farfield annually to 9 surveys annually that include the five nearfield and six reference stations. Unlike the existing design where different stations are sampled at different frequencies and for different parameters, all stations will be sampled during every survey, and all parameters measured at all stations (except N21), including reference stations. This will provide a synoptic picture of a broader area than was previously possible, facilitating data interpretation and enabling scientists to better discriminate between regional changes and potential outfall-related changes (Table 3). As much as logistically feasible, monitor the Cape Cod Bay-Stellwagen Bank NMS stations synoptically with the outfall monitoring stations.

Table 3 Proposed list of water column survey dates

WHEN	TARGET WEEK	ORIGINAL SURVEY NUMBER	PURPOSE
Early February	6	1	Nutrient conditions near start of spring bloom
March	12	3	Spring bloom
Early April	15	4	Capture <i>Phaeocystis</i> bloom. Late winter/spring bloom nutrients
Mid-May	20	6	Nutrient/water column conditions at end of winter-spring, <i>Alexandrium</i>
Mid-June	25	7	Early summer stratification and nutrients. Mid-late red tide season.
Mid-July	30	9	Mid-summer stratification and nutrients
Mid-August	34	11	Mid-summer stratification and nutrients
Late September	40	13	Nutrients, etc. prior to overturn.
Late October	43	14	Mid-fall bloom nutrients, DO minima, etc.

2.3 Change certain water quality parameters. Some measurements have been used in data interpretation only infrequently if ever, therefore: **MWRA proposes to drop measurements of dissolved organic carbon, particulate biogenic silica, and total suspended solids.** MWRA would **add gene probe measurements for *Alexandrium*** which is the fastest and most accurate method to measure red tide. Table 4 shows the proposed list of tests to be conducted at each station.

Table 4 Proposed water column parameters¹

ANALYTE	DEPTH	PARAMETER ²
Hydro profile	No change. Downcast data continuous, with upcast data at any sampled depths	Temperature Salinity Dissolved oxygen Chlorophyll fluorescence Transmissometry Irradiance Depth of sensors
Water chemistry	Five depths. Surface, bottom, and three intermediate depths which includes the chlorophyll maximum	Ammonium Nitrate Nitrite Total dissolved nitrogen Particulate nitrogen Phosphate Total dissolved phosphorus Particulate phosphorus Silicate Particulate carbon
<i>Alexandrium</i>	Two depths.	Gene probe
Phytoplankton and Zooplankton	No change, net tow	Identification, enumeration
Parameters measured at zone of initial dilution station N21: Salinity, temperature, depth, dissolved nutrients		

¹ The suite of parameters measured at Cape Cod Bay and Stellwagen Bank NMS will differ somewhat and include *in situ* water quality, nutrients, and plankton.

² Some measurements have been used in data interpretation only infrequently if ever, therefore this revised plan drops measurements of dissolved organic carbon, particulate biogenic silica, and total suspended solids.

- 2.4 Discontinue productivity measurements.**³ After eight years, these measurements have not found a substantial increase in outfall-related productivity. MWRA will compile and report on available Bays Eutrophication Model-data comparisons, and will evaluate and report on the BZ_pl₀ model and comparisons to measured productivity data.
- 2.5 Discontinue the special study net tows for floatables monitoring.** No floatables of concern have been detected in eight years of monitoring.
- 2.6 Discontinue the special study marine mammal observations.** The surveys would no longer be occurring in the areas most frequented by whales. MWRA will continue to follow guidelines to avoid collisions with whales during surveys.

3 SEAFLOOR

- 3.1 Reduce the benthic community monitoring from the current 31 stations (23 stations in western Massachusetts Bay and eight reference stations more distant from the outfall) to 13 stations (ten nearfield (Figure 2) and three farfield stations (Figure 3)).** In a change from current monitoring, in which half of the stations are sampled in odd years and the other half sampled in even years, all 13 stations will be sampled each survey. (No change to the rapid benthic assessments-sediment profile imaging which will continue at the 23 original nearfield stations.)
- 3.1.1 Delete the following 18 benthic stations: NF02, NF05, NF07, NF08, NF09, NF15, NF16, NF18, NF19, NF23, NF24, FF05, FF06, FF07, FF10, FF11, FF13, FF14.**
- 3.1.2 Community analyses at the following 13 benthic stations: NF04, NF10, NF12, NF13, NF14, NF17, NF20, NF21, NF22, FF12, FF01A, FF04, FF09**
- 3.2 Modify the sampling frequency for the hard bottom study from once per year to every third year, to be sampled the same year as sediment chemistry.**
- 3.3 End the nutrient flux study.**
- 3.4 End the annual chemistry sampling at stations NF12 and NF17.**
- 3.5 Modify the chemistry sampling so that it is done at the remaining soft-bottom benthic stations:**
- 3.5.1 Delete the following 18 chemistry stations: NF02, NF05, NF07, NF08, NF09, NF15, NF16, NF18, NF19, NF23, NF24, FF05, FF06, FF07, FF10, FF11, FF13, FF14.**

³ Since the inception of the monitoring, measurements of productivity and respiration, which is done at only a few stations, have cost more than \$2 million, one of the more costly studies done by MWRA.

3.5.2 Continue to sample the following 13 chemistry stations every third year: NF04, NF10, NF12, NF13, NF14, NF17, NF20, NF21, NF22, FF12, FF01A, FF04, FF09

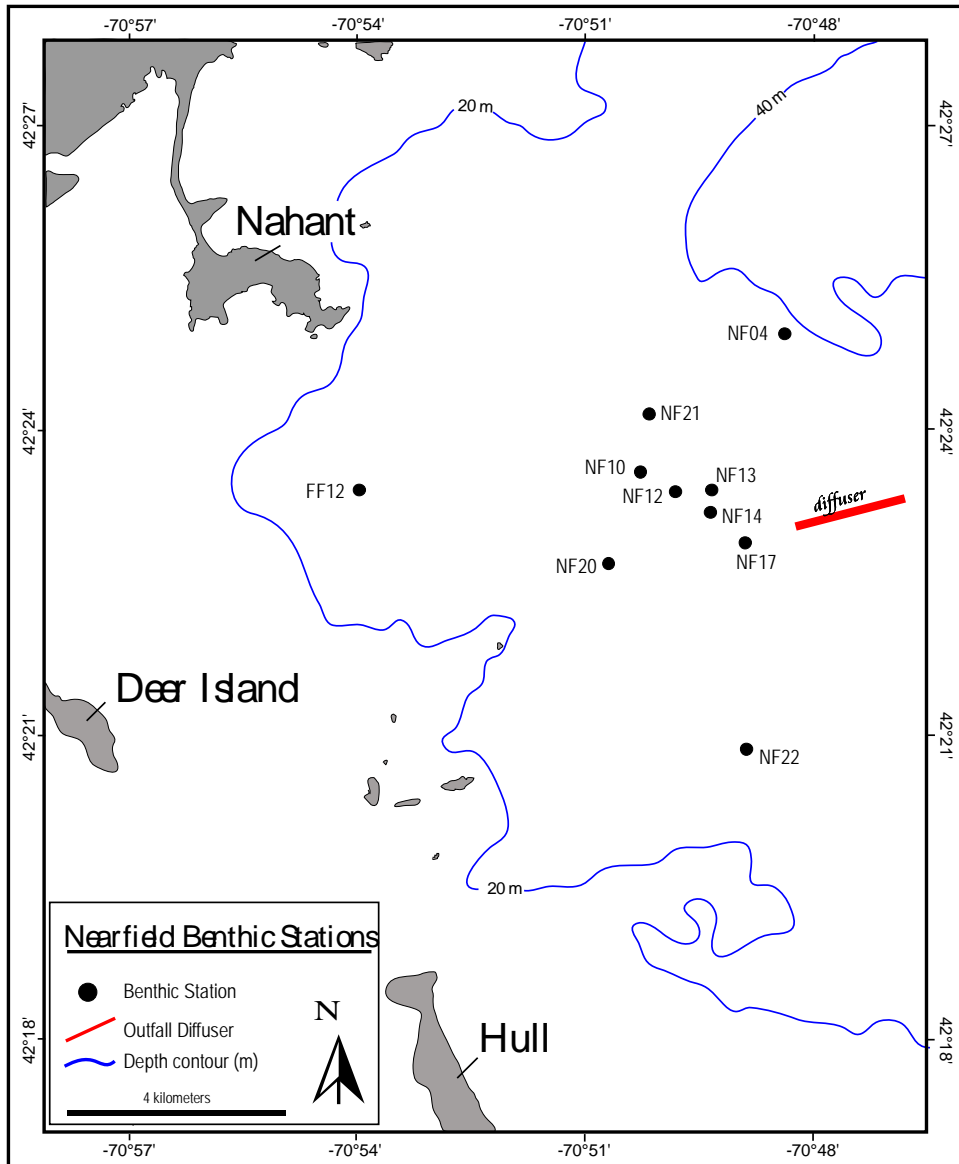


Figure 2 Proposed nearfield benthic sampling stations.

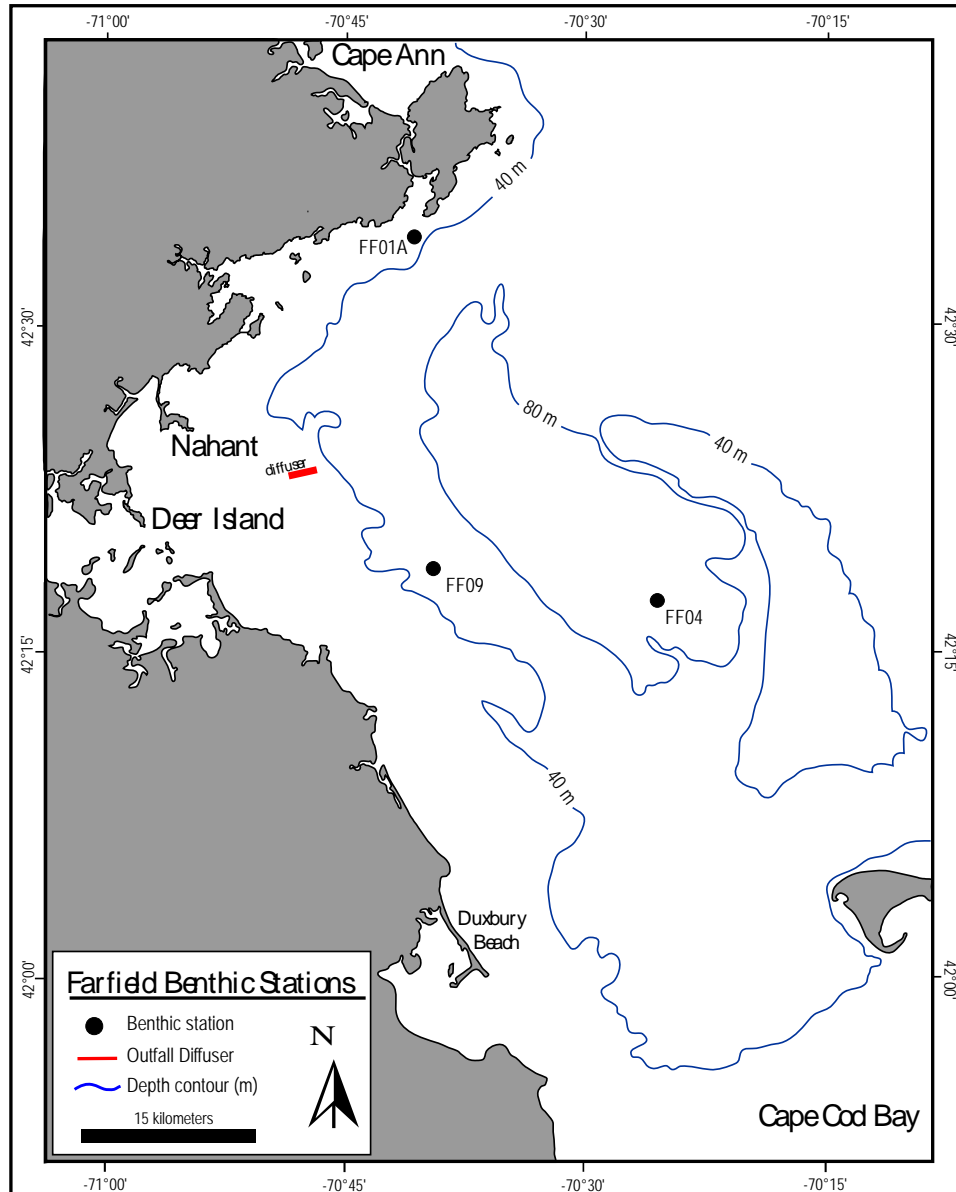


Figure 3 Proposed farfield reference benthic community stations

The proposed *Ambient Monitoring Plan for the Massachusetts Water Resources Effluent Outfall Revision 2 Draft 2 MWRA Technical Report 2009-15* summarizes the data that support these changes. The report is available at <http://www.mwra.state.ma.us/harbor/engquad/trlist.html>; and upon request from MWRA. The report is also available at the following repository libraries:

Rebecca Kenney
 MWRA
 2 Griffin Way
 Chelsea, MA

Hyannis Public Library
 401 Main St
 Hyannis, MA