prepared by W. Leo, S.Y. Liang, and S. Carroll, MWRA

Contingency Plan Report
Second Quarter 2004

Ambient Monitoring

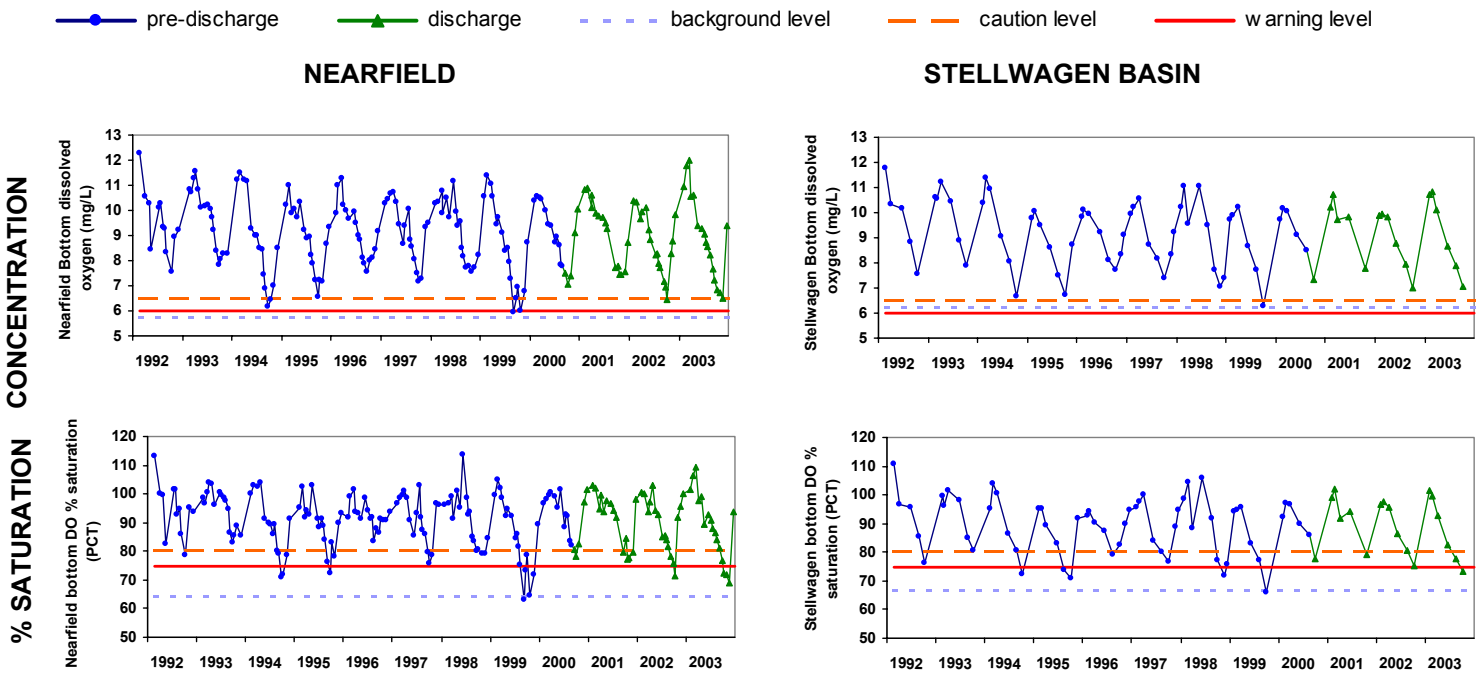
MWRA gathers data from the outfall location in Massachusetts Bay on various thresholds outlined in its Deer Island outfall discharge permit. This report shows relevant ambient monitoring results that became available in January-March 2004. No relevant ambient monitoring results became available in April-June 2004 thus this report is the same as last quarter. There were no exceedances of Contingency Plan thresholds.

DISSOLVED OXYGEN – September-October 2003

The concentration of dissolved oxygen (DO) in the water indicates the balance between production by algae and consumption by aquatic organisms and the decomposition of organic matter. Excessive organic matter may result in oxygen depletion, which may in turn adversely affect the aquatic ecosystem. The amount of oxygen that the water can hold is related to water temperature, salinity, and pressure; thus, the percent saturation of dissolved oxygen is a measure that takes these factors into account. Monitoring locations for which there are DO thresholds include the "nearfield," the group of stations within about three miles from the outfall, and "Stellwagen Basin," a deep area nine miles east of the outfall. DO thresholds apply to the part of the year when the water column is stratified, *i.e.* from June - October. During September-October 2003 there were one farfield survey and four nearfield surveys.

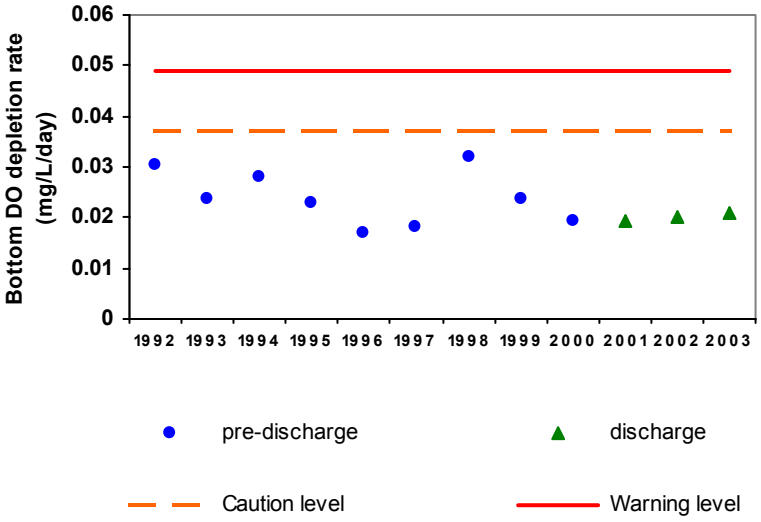
Dissolved oxygen concentration and percent saturation naturally fell below 6 mg/l on occasion during the baseline period. The state standard, on which the thresholds were based, allows an exception to numerical thresholds if background conditions are lower, as is the case here; thus, the threshold is not exceeded unless the value falls below the threshold and below background.

Measurements of dissolved oxygen (DO) concentration and percent saturation in late summer/early autumn 2003 did not fall below background levels and thus did not exceed thresholds. Levels were similar to those seen in the baseline years 1994 and 1995. The graphs below include data since the start of the monitoring program in 1992, and reflect the natural fluctuation of DO and percent saturation, which is typically lowest in early autumn.



An additional threshold measure of dissolved oxygen is the rate at which oxygen is depleted during the stratified summer period. Even if dissolved oxygen concentrations remain healthy, an excessively rapid rate of decrease could signal a future problem. A low rate indicates DO dropped only slowly. The threshold for DO depletion rate is based on a change from the baseline; the caution threshold is a rate faster than 1.5 times the baseline mean rate, while the warning threshold is twice the baseline mean rate. The DO depletion rate for the summer of 2003 was low, within the baseline range, and did not exceed the threshold.

DO Depletion Rate – summer 2003



CHLOROPHYLL – September-December 2003

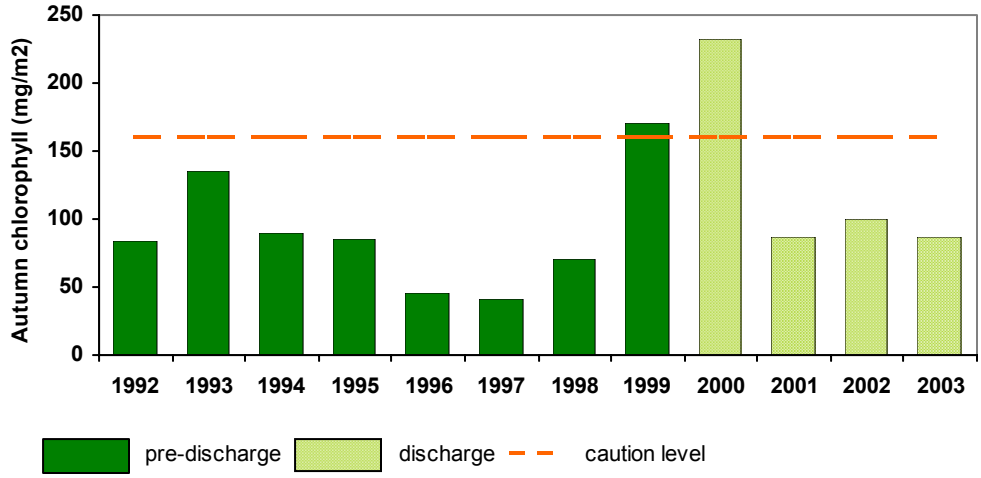
Chlorophyll is a measure of the amount of microscopic plants (phytoplankton or algae) in the water. In Massachusetts Bay, production of algae is the basis of the food web. However, excessive growth of algae can lead to undesirable consequences, such as oxygen depletion at depth due to decomposition of organic matter. Effluent from the outfall is rich in nutrients, and therefore could potentially cause excessive algal growth.

There are annual and seasonal chlorophyll thresholds for the "nearfield," the group of stations within about three miles from the outfall that are most likely to be affected by nutrient-rich effluent. Because the levels of chlorophyll in the water naturally vary over the year, there are separate thresholds for different seasons. In most years, Massachusetts Bay experiences a “spring bloom” characterized by high chlorophyll levels as lengthening days provide enough sunlight for algae to grow quickly. Chlorophyll typically drops in summer, as the nutrients in well-lit surface waters are used up. When the weather cools, the surface and bottom waters mix, which usually gives rise to a “fall bloom” as nutrient-rich bottom waters are mixed up into the well-lit surface layers. As the days become short, chlorophyll levels drop again since there is not enough light for algae to grow.

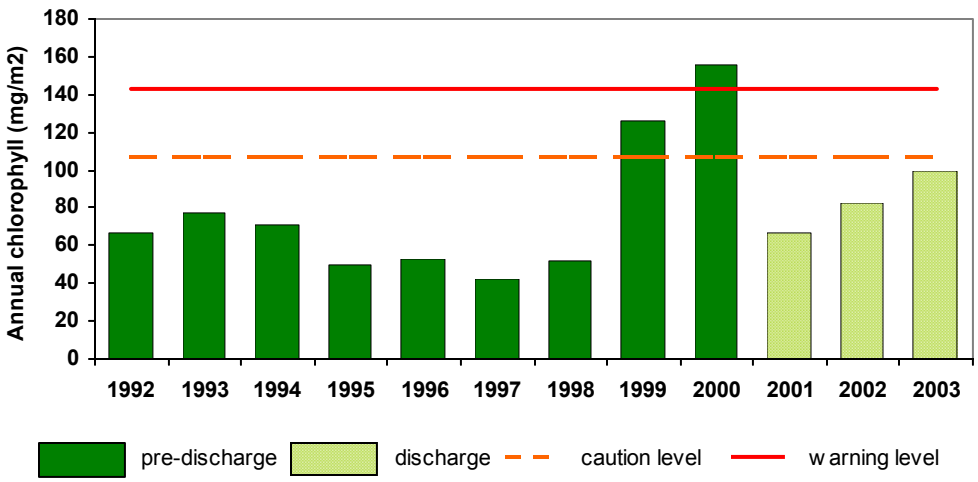
In this report, we compare the post-discharge chlorophyll data (areal average of nearfield) to the thresholds for autumn 2003 (September through December), which included six nearfield surveys, and for 2003 as a whole. The graphs include data since the start of the monitoring program in 1992.

The caution level threshold for autumn is 161 mg/m^2. The nearfield mean areal average in autumn 2003 was 87 mg/m^2, well below the threshold and similar to the last two years. The caution and warning levels for annual average chlorophyll are 107 and 143 mg/m^2, respectively. The 2003 annual average was 99 mg/m^2, below the thresholds. Because of the strong winter/spring bloom, the annual average was higher than the last two years, but lower than 1999 and 2000, which had unusually high chlorophyll levels through much of the year.

AUTUMN



ANNUAL



NUISANCE ALGAE – September-December 2003

Nuisance algal blooms are less predictable than the normal, beneficial algal blooms that produce oxygen and food for marine life; some nuisance blooms did occur during the baseline monitoring period. There is public concern that effluent nutrients could feed a red tide bloom in the vicinity of the new outfall, or otherwise increase the abundance of nuisance algae. Therefore, the Contingency Plan has thresholds for abundance of *Alexandrium*, *Phaeocystis pouchetii*, and *Pseudonitzschia*, which are triggered if the abundance of any of these becomes unusually high.

In this report, we compare post-discharge nuisance algae data to the thresholds for autumn 2003 (September-December), which included six surveys. We also compare the per-sample results for *Alexandrium* in these six surveys to the threshold.

PHAEOCYSTIS

Phaeocystis pouchetii blooms usually occur during February to April but can occur at any time. The species is not toxic, but individual cells can aggregate in gelatinous colonies that may be poor food for zooplankton. As in most previous years, *Phaeocystis* was not observed in the September-December 2003 time period.

Autumn *Phaeocystis* mean abundance (cells/liter)	
caution threshold	2,370
Autumn 2003	0

PSEUDONITZSCHIA

Pseudonitzschia multiseries blooms can occur during November to March and produce domoic acid, which can cause a condition known as amnesic shellfish poisoning. The group of algae including the toxic species *Pseudonitzschia multiseries*, the closely related *Pseudonitzschia pungens*, and any unidentified *Pseudonitzschia* species was present only at low abundances in the nearfield in autumn 2003, well below the threshold.

Autumn *Pseudonitzschia* mean abundance (cells/liter)	
caution threshold	24,600
Autumn 2003	8,900

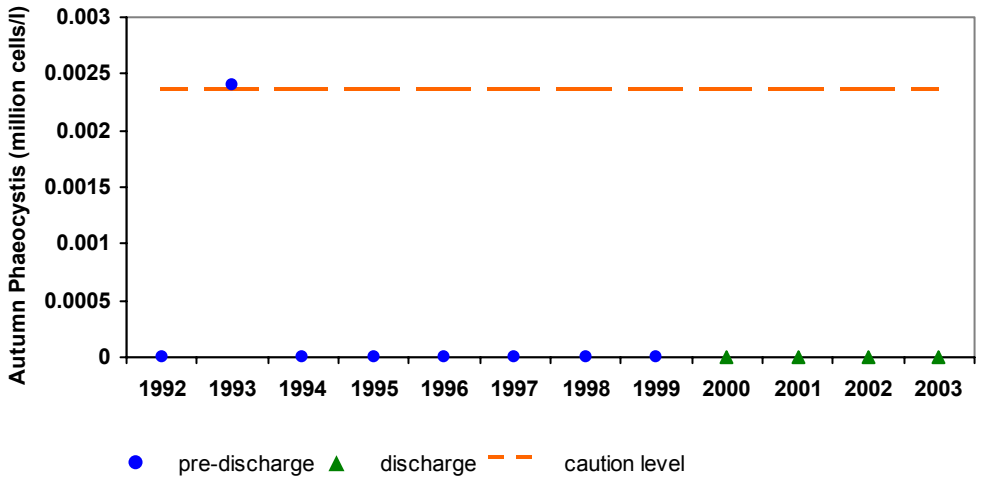
ALEXANDRIUM

Alexandrium was not observed in any samples during the present reporting period (autumn 2003), thus no samples exceeded the threshold of 100 cells/liter. *Alexandrium tamarense* typically may bloom during April to June and can cause paralytic shellfish poisoning, known as PSP or red tide; it has been periodically found in Massachusetts since the 1970s. Toxicity is generally not found in shellfish until cell counts much higher than 100/L are seen in the overlying waters.

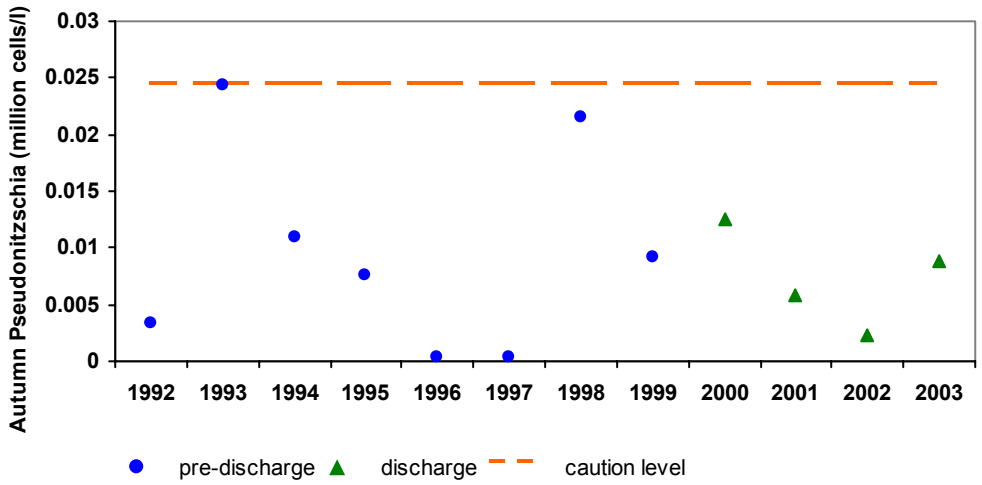
Autumn *Alexandrium* per-sample abundance (cells/liter)	
caution threshold	100
Sept.-Dec. 2003*	0

* maximum of all samples collected between September 1, 2003 and December 31, 2003.

PHAEOCYSTIS



PSEUDONITZSCHIA



ALEXANDRIUM