

## Contingency Plan Report First Quarter 2002

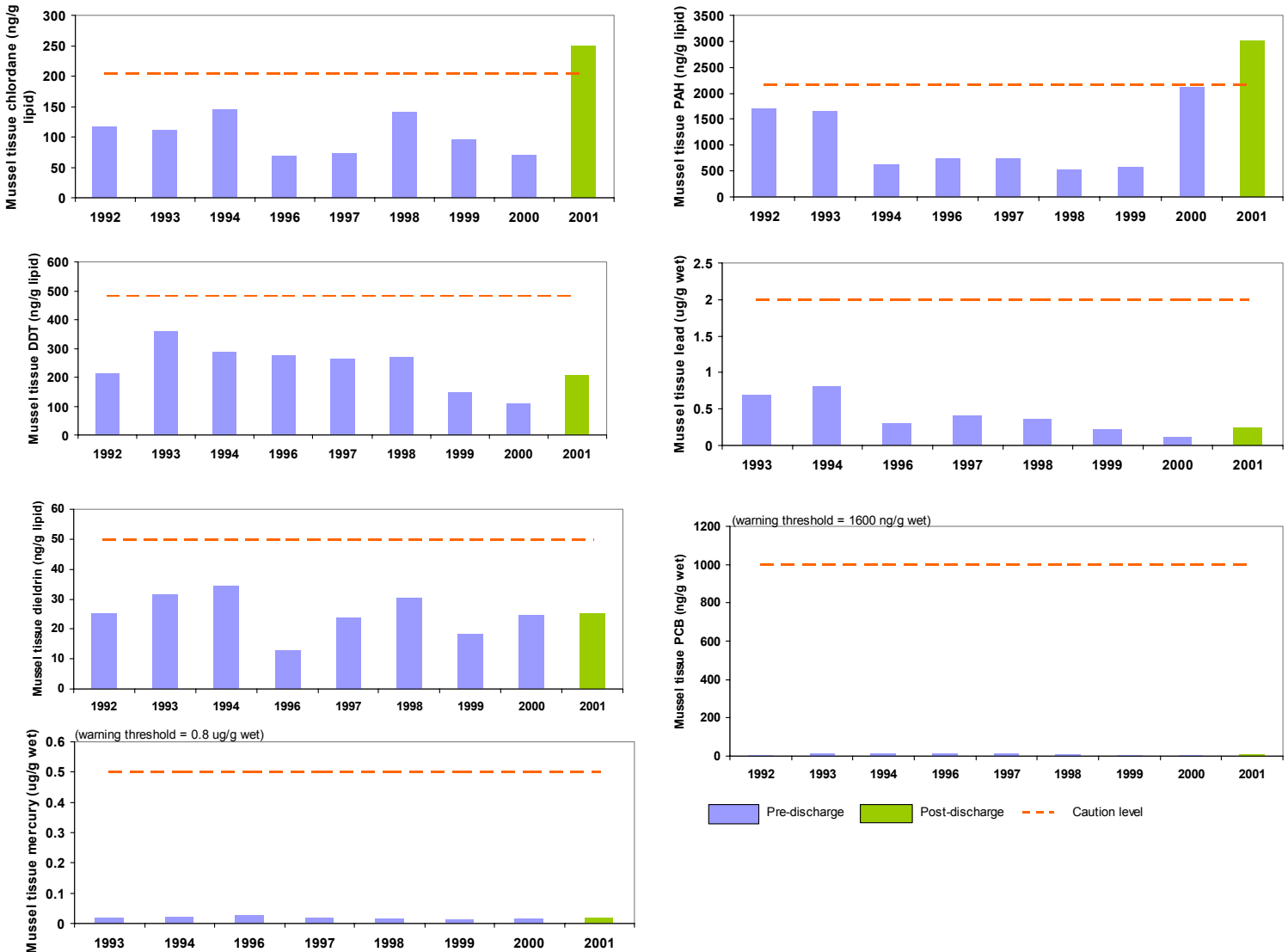
### Ambient Monitoring

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 the previous quarter.

#### FISH AND SHELLFISH TISSUE CONTAMINATION

The fish tissue contamination thresholds are designed to identify unexpected effects on marine life. Contaminants are measured in three species of seafood: flounder, lobster, and mussels. FDA Action Limits are available for mercury and PCBs in flounder, lobster, and mussels; for these measurements, caution and warning thresholds are set at 50% and 80% of the FDA limits. The threshold for lead in mussels is based on EPA risk assessment of lead in drinking water. Other fish/shellfish tissue contamination thresholds are based on change from baseline conditions at the outfall site.

Post-discharge data available this quarter include bioaccumulation data in mussels, from cages recovered in August 2001. Mussel tissue levels of chlordane and PAH slightly exceeded thresholds (see <http://www.mwra.state.ma.us/harbor/html/20020125amx.htm>), while levels of other contaminants were similar to those measured in the baseline period.



## DISSOLVED OXYGEN

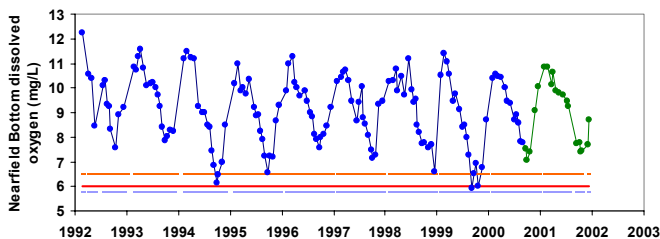
The concentration of dissolved oxygen (DO) in the water indicates the balance between production by algae and consumption by aquatic organisms and the decomposition of organic matter. Excessive organic matter may result in oxygen depletion, which may in turn adversely affect the aquatic ecosystem. The 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. Thresholds apply to the part of the year when the water column is stratified, *i.e.* from June - October. The current reporting period for dissolved oxygen thresholds is autumn 2001. During this period there were four nearfield surveys and one farfield survey.

Dissolved oxygen concentration and percent saturation naturally fall below the numerical thresholds on occasion during the baseline period. The state standard, on which the thresholds were based, allows an exception if background conditions are lower, as is the case here. The thresholds have accordingly been modified (see <http://www.mwra.state.ma.us/harbor/html/20010601cpr.pdf>) to mirror the state standard, and a threshold is not exceeded unless the value falls below the threshold and below background.

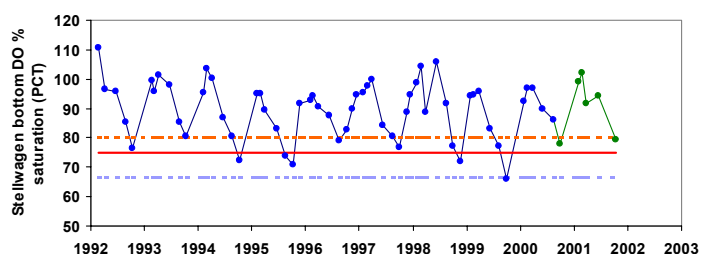
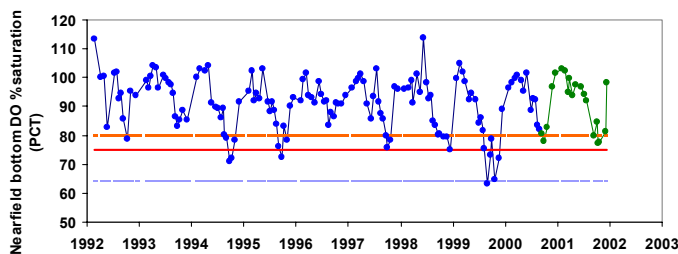
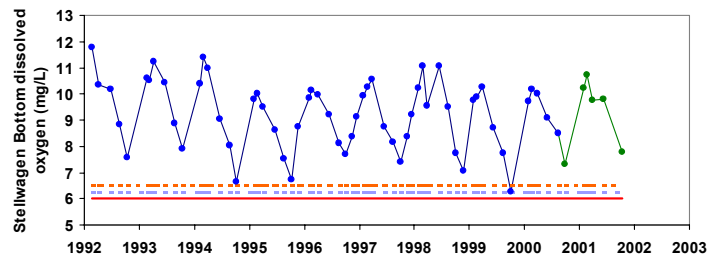
Parameter	Location	Caution	Warning	Background
Dissolved Oxygen (mg/L)	Nearfield	6.5	6.0	5.75
	Stellwagen Basin	6.5	6.0	6.2
Percent Oxygen Saturation (%)	Nearfield	80	75	64.3
	Stellwagen Basin	80	75	66.3

Measurements of dissolved oxygen (DO) concentration and percent saturation in autumn 2001 did not fall below background levels and thus did not exceed thresholds. Levels in summer and autumn 2001 were very similar to those in 2000. 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 fall.

### NEARFIELD

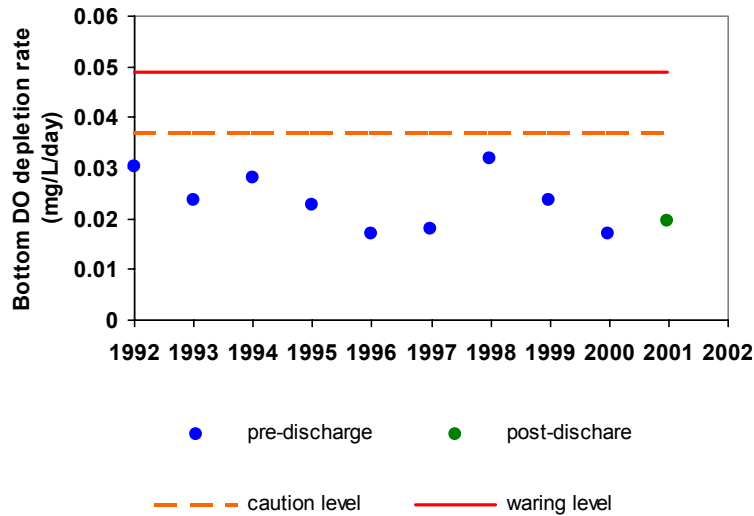


### STELLWAGEN BASIN



- pre-discharge
  - - - baseline
  - warning level
- post-discharge
  - - - caution level

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 of dissolved oxygen could indicate a future problem with dissolved oxygen. The 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 first summer after outfall discharge began was low, within the baseline range, and did not exceed the threshold.



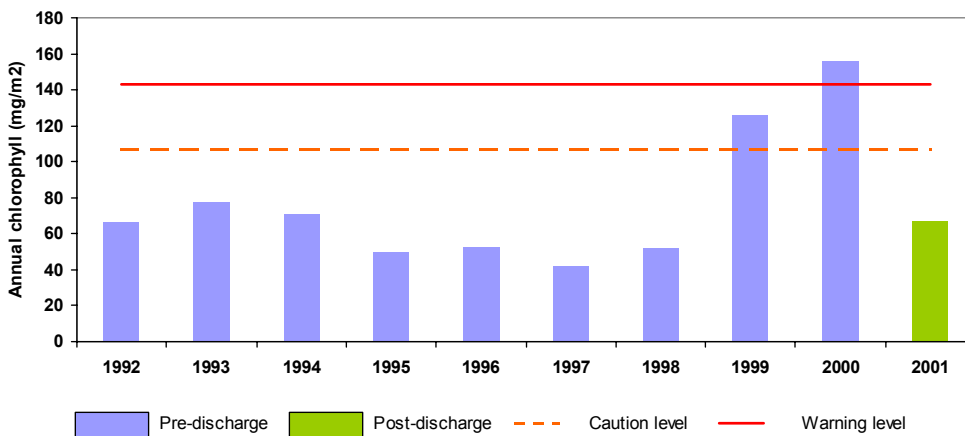
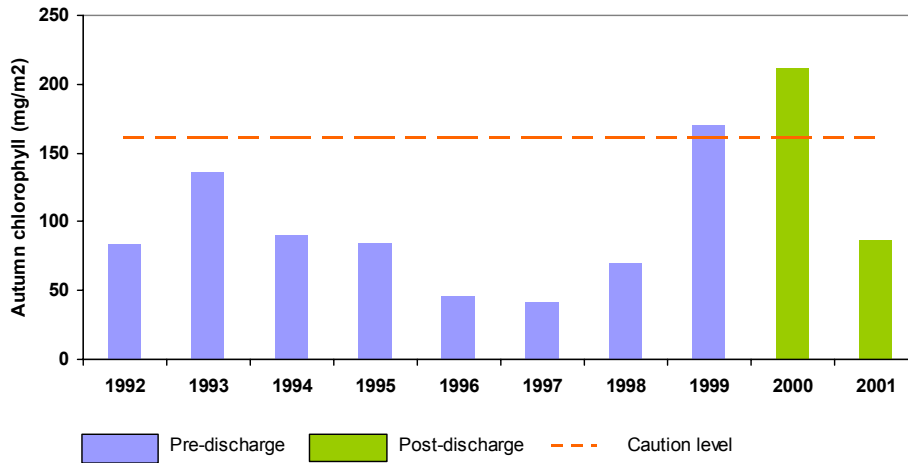
# CHLOROPHYLL

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 which 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 post-discharge chlorophyll data to the thresholds for autumn 2001 (September through December), which included six nearfield surveys, and for 2001 as a whole. The graphs include data since the start of the monitoring program in 1992, and reflect the natural fluctuation of chlorophyll described above.

The caution level threshold for autumn is 162 mg/m<sup>2</sup> (areal average of nearfield). The nearfield mean areal average in autumn 2001 was 87 mg/m<sup>2</sup>, well below the threshold. The caution and warning levels for annual average chlorophyll are 183 and 244 mg/m<sup>2</sup>, respectively. The 2001 annual average was 67 mg/m<sup>2</sup>, again well below the threshold. Unlike 1999 and 2000, which had unusually high chlorophyll levels through much of the year, 2001 had moderate levels of chlorophyll in the autumn and for the year as a whole.



## NUISANCE ALGAE

Nuisance algal blooms are less predictable than the normal, beneficial algal blooms that produce food and oxygen; 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 2001 (September through December), which included six nearfield surveys. Nuisance algae levels in these monitoring periods were well below thresholds.

### 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 are poor food for zooplankton. No *Phaeocystis pouchetii* were observed in the nearfield in autumn 2001.

Autumn <i>Phaeocystis</i> mean abundance (cells/l)	
caution threshold	2,370
Autumn 2001	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 fairly low abundances in autumn 2001, well below the threshold.

Autumn <i>Pseudonitzschia</i> mean abundance (cells/l)	
caution threshold	24,600
Autumn 2001	5,900

## ALEXANDRIUM

No samples exceeded the threshold of 100 cells/liter during the present reporting period (early summer). *Alexandrium tamarens* 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 much higher cell counts are seen in the overlying waters.

In autumn 2001, as in six of the nine baseline years, there were no observations of *Alexandrium* (*Alexandrium tamarens* plus unidentified *Alexandrium* spp.), either in the "nearfield" (the group of stations within about three miles from the outfall), nor in the remainder of Massachusetts and Cape Cod Bays (the "farfield"). During this period there were six nearfield surveys and one farfield survey.

Autumn <i>Alexandrium</i> per-sample abundance (cells/l)	
caution threshold	100
Autumn 2001*	0

\* maximum of all samples collected between September 1, 2001 and December 31, 2001.

