

## Contingency Plan Report Fourth Quarter 2005

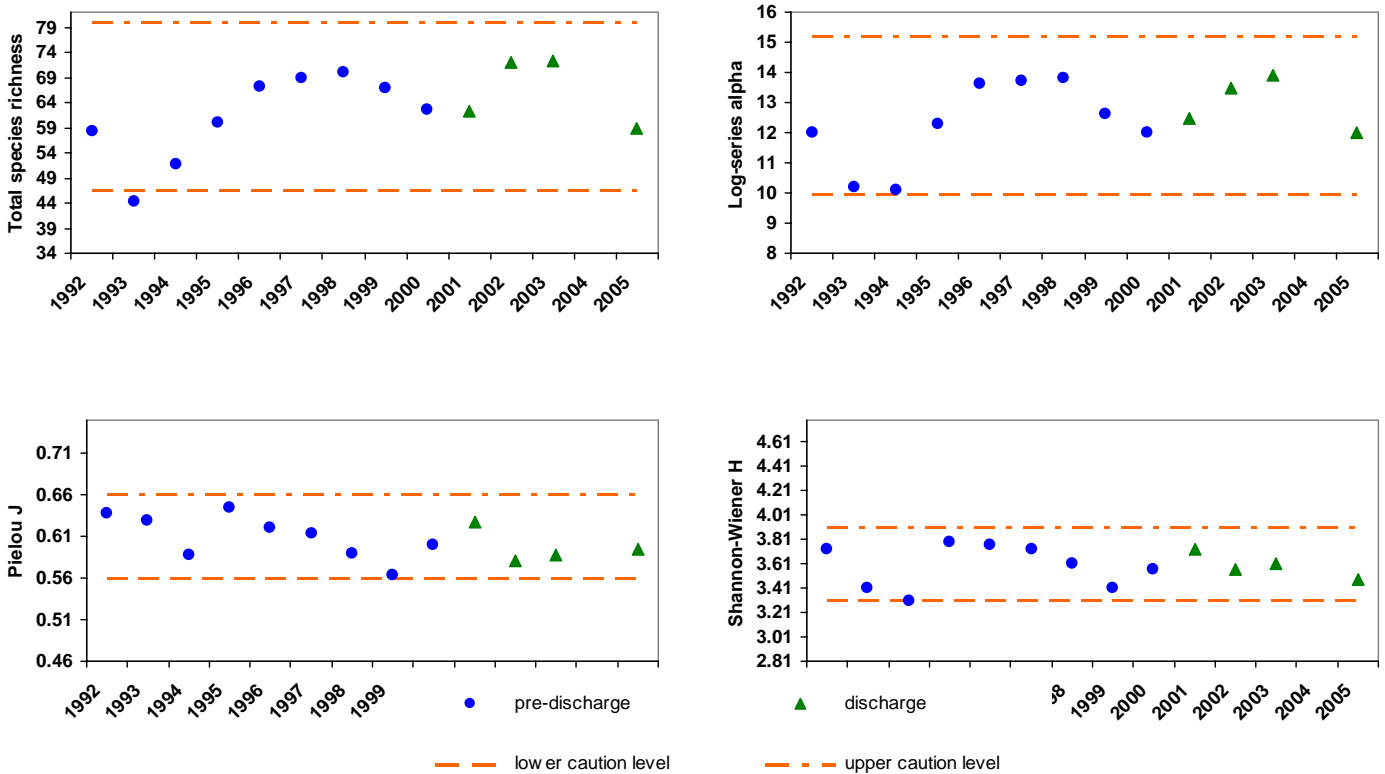
### Ambient Monitoring

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 October-December 2005 time period. There was one exceedance of a Contingency Plan threshold, for the nuisance algae *Phaeocystis*.

#### SEDIMENT BIODIVERSITY - 2005

##### DIVERSITY

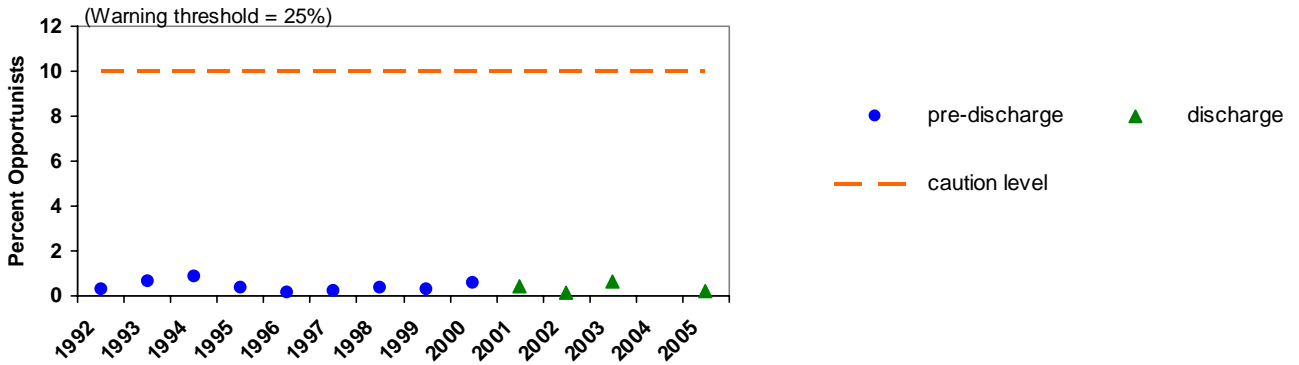
The annual survey of post-discharge monitoring in 2005 showed that the benthic diversity was normal at the outfall site, and did not exceed any of the [benthic diversity thresholds](#).



For each diversity measure, the graphs show the annual average for sediment samples collected within seven kilometers of the outfall discharge since 1992.

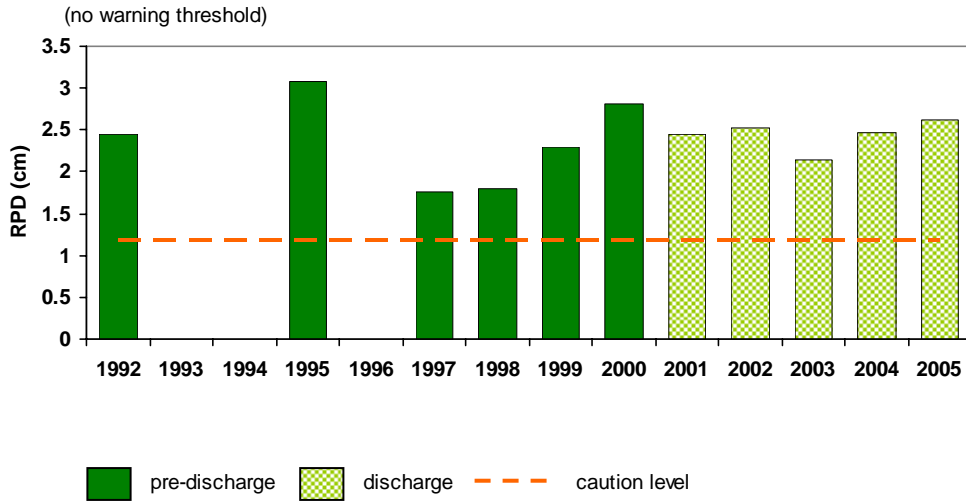
**OPPORTUNISTS**

The annual sampling in 2005 showed that the numbers of [opportunistic benthic organisms](#) remain normal at the outfall site and did not exceed the caution threshold of 10% of the total population.



**SEDIMENT ENRICHMENT - 2005**

The 2005 annual post-discharge monitoring showed that the RPD depth was normal at the outfall site and did not exceed the threshold (did not fall below the minimum RPD threshold.)



The depth of the oxygenated layer in marine sediment is a measure of ecosystem health. A diverse bottom-dwelling community includes organisms that mix water and oxygen down into the sediment. In an over-enriched environment, organic material deposited on the sediment surface can use up the available oxygen and smother the bottom-dwelling community. Such areas, including some areas of Boston Harbor, have a thin or nonexistent oxygenated layer. The thickness of the oxygenated layer is called the redox potential discontinuity (RPD) depth. In MWRA’s monitoring program, the RPD depth is estimated from sediment-profile images, cross-sections of the upper several centimeters of the sediment taken with a special mud-penetrating prism and camera. The threshold for RPD is half the mean measured in the baseline period (that is, if the thickness of the oxygenated layer fell to less than half the thickness measured pre-discharge, a caution threshold would be exceeded.)

## SEDIMENT CONTAMINATION

Sediment contamination levels at the outfall site in 2005 were well below the thresholds.

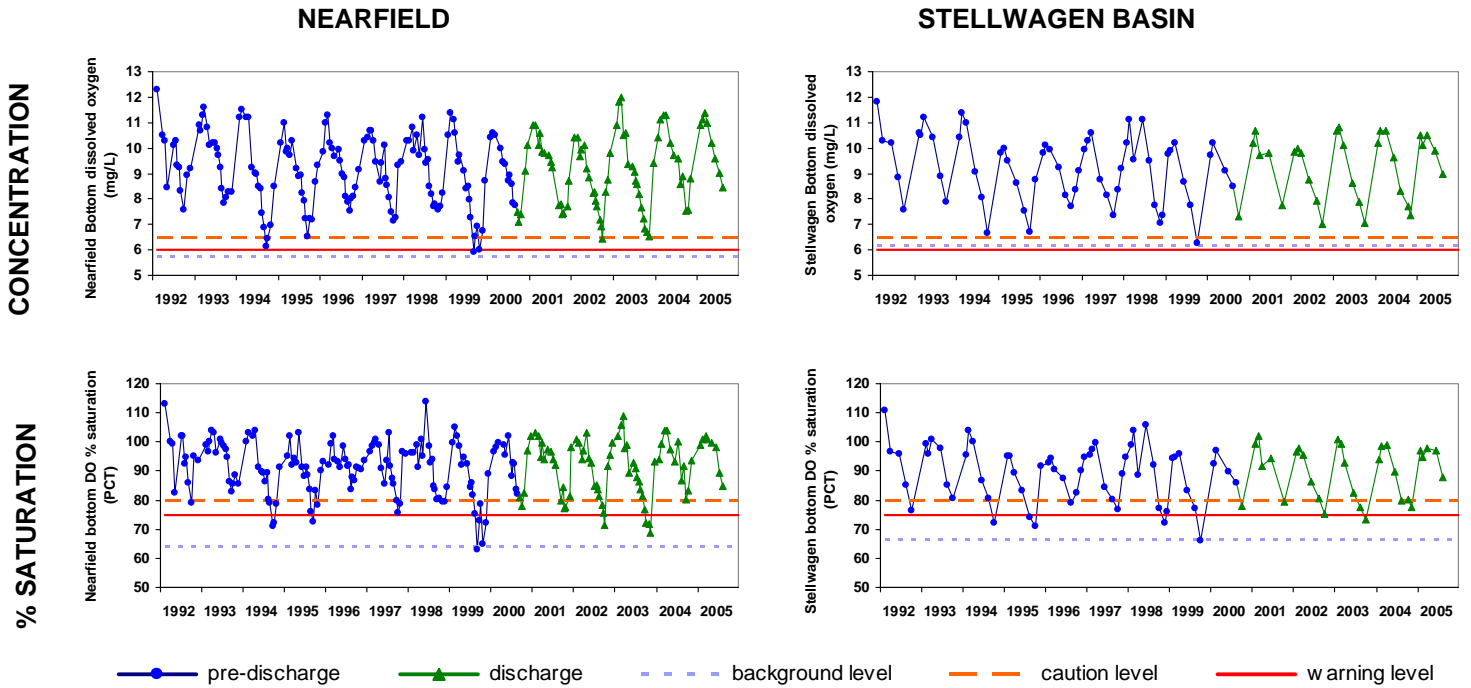
The sediment contamination thresholds would indicate any unexpected accumulation of toxic contaminants in soft sediments near the outfall. Contaminant levels are compared to sediment guidelines issued by the National Oceanic and Atmospheric Administration (NOAA). These NOAA "ER-M" levels indicate toxic contaminant concentrations above which adverse effects on marine life are often detected. Baseline sediment contamination levels are all well below the ER-M levels for all contaminants, with only low molecular weight polycyclic aromatic hydrocarbons (LMWPAH) reaching to more than half the threshold value.

2005 contaminant levels were somewhat lower than those observed in recent years, possibly due to sediment transport or mixing from vigorous winter/spring storms in 2004-05.

	contaminant	range over baseline	threshold	2005 value
<b>PAHs (ng/g dry weight)</b>				
	acenaphthene	23-41.3	500	17.7
	acenaphthylene	38.3-58.4	640	26.9
	anthracene	114.1-171	1100	92.2
	benz(a)anthracene	221.4-302	1600	250
	benzo(a)pyrene	223.6-287	1600	245
	chrysene	217.3-288	2800	221
	dibenzo(a,h)anthracene	30.5-42	260	29.4
	fluoranthene	465-592	5100	424
	fluorene	37.9-60.9	540	28.3
	naphthalene	53.5-83.2	2100	31.3
	phenanthrene	296.4-405	1500	239
	pyrene	440.3-540	2600	384
	sum HMWPAH	2986.4-3754	9600	3224
	sum LMWPAH	1420.1-2004	3160	961
	total PAH	4482.5-5726	44792	4185
<b>Other organic contam. (ng/g)</b>				
	p,p'-DDE	0.28-1.25	27	0.5
	total DDT	2.59-5.27	46.1	1
	total PCB	10.4-28.6	180	6.9
<b>Metals (ug/g dry weight)</b>				
	cadmium	0.09-0.23	9.6	0.1
	chromium	61.9-86.8	370	49.1
	copper	19.2-27.6	270	18.4
	lead	42.9-47.2	218	42.2
	mercury	0.2-0.29	0.71	0.2
	nickel	15.5-18.5	51.6	7.1
	silver	0.47-0.71	3.7	0.2
	zinc	56.6-69.7	410	59.3

## DISSOLVED OXYGEN – July-August 2005

Measurements of dissolved oxygen (DO) concentration and percent saturation in late summer 2005 did not fall below background levels and thus did not exceed thresholds.

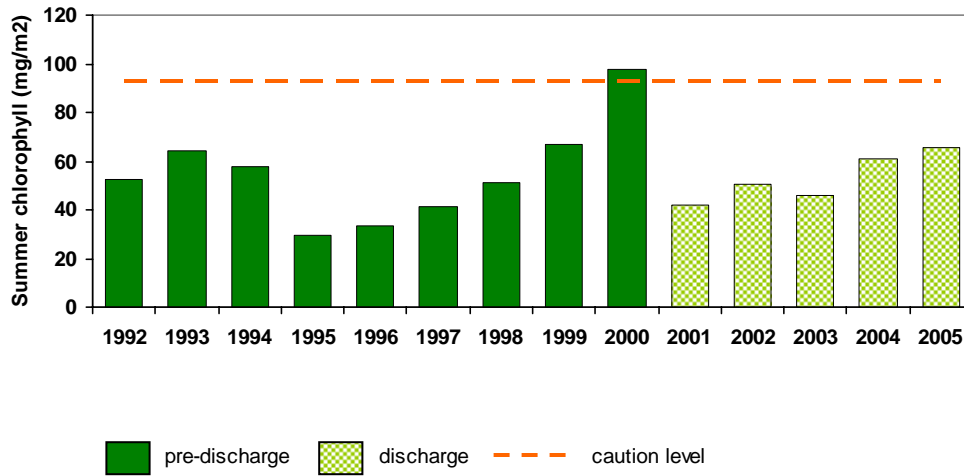


The current reporting period for [dissolved oxygen thresholds](#) is July-August 2005. During this period there was one nearfield survey and one farfield survey. Oxygen levels were similar to those seen in most baseline years. The graphs above include data since the start of the monitoring program in 1992, and reflect the natural fluctuation of DO and percent saturation, which is typically lowest in early autumn.

## CHLOROPHYLL – May-August 2005

There were no [chlorophyll threshold](#) exceedances in this period. The nearfield mean areal average chlorophyll in summer 2005 was 66 mg/m<sup>2</sup>, below the caution level threshold for summer of 93 mg/m<sup>2</sup>.

### SUMMER



The figures compare chlorophyll data for summer 2005 (May-August), which included four surveys, to the summer threshold. The graph includes data since the start of the monitoring program in 1992.

The caution level threshold for summer is 93 mg/m<sup>2</sup>. The nearfield mean areal average in summer 2005, which included two surveys, was 66 mg/m<sup>2</sup>, below the threshold and similar to the levels in the summers of baseline years 1993 and 1999.

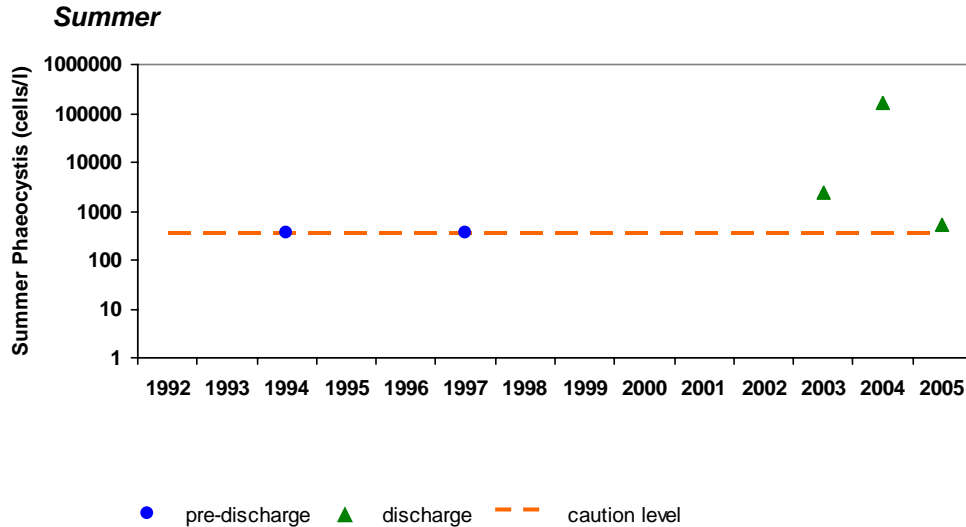
## NUISANCE ALGAE – Summer 2005

In the figures below, we compare *Phaeocystis* and *Pseudonitzschia* data to the [nuisance algae thresholds](#) for summer 2005 (May through August), which included four surveys. We also compare *Alexandrium* data to the threshold for each sample in July and August 2005 (January-June data were reported in the previous quarter's report.)

There was a threshold exceedance for *Phaeocystis* but not for *Pseudonitzschia* or *Alexandrium*.

### PHAEOCYSTIS

As in other recent years, *Phaeocystis pouchetii* exceeded the very low summer threshold in summer 2005 (See <http://www.mwra.state.ma.us/harbor/pdf/20051028amx.pdf>). This was a remnant in a single nearfield sample of a moderate spring *Phaeocystis* bloom, and is not a meaningful change from baseline observations.

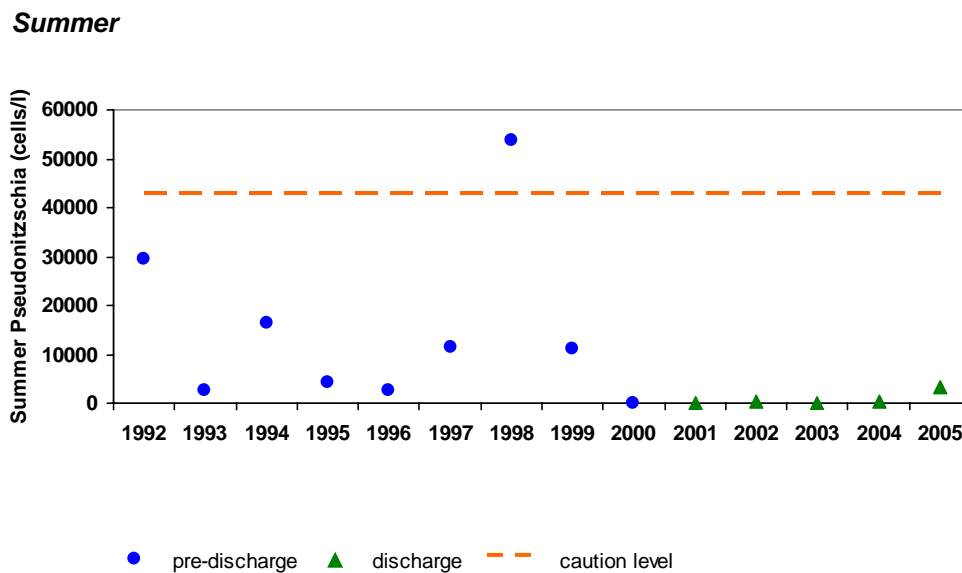


Summer <i>Phaeocystis</i> mean abundance (cells/liter)	
Caution threshold	357
Summer 2005	517

Note logarithmic scale. Years with no data point had zero average *Phaeocystis*.

### PSEUDONITZSCHIA

*Pseudonitzschia* was present only at low abundances in the nearfield in summer 2005, well below the threshold.



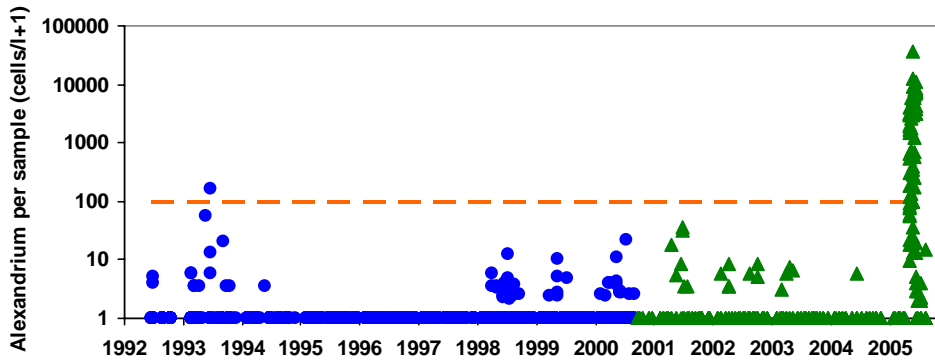
Summer <i>Pseudonitzschia</i> mean abundance (cells/liter)	
Caution threshold	43,100
Summer 2005	3,320

## ALEXANDRIUM

The nuisance algae *Alexandrium* (“red tide”) can cause paralytic shellfish poisoning (PSP) in Massachusetts Bay. MWRA measures *Alexandrium* abundance in its monitoring program, and also checks state fisheries agency observations of shellfish PSP toxicity to keep track of the course of Gulf of Maine *Alexandrium* blooms.

During the months covered by this quarter's report, (July and August) *Alexandrium* cells (*Alexandrium fundyense*) were observed in some samples, but none exceeded the threshold value.

In late spring and early summer 2005 there was an unusually robust *Alexandrium* bloom throughout the southern Gulf of Maine including Massachusetts Bay. The bloom subsided in Massachusetts Bay in early July. The figure below includes nearfield data from routine surveys through summer 2005, plus seven special surveys between May and July 2005. The second figure shows the course of the 2005 bloom.



July-August <i>Alexandrium</i> per-sample abundance (cells/liter)	
Caution threshold	100
Late summer 2005	14*

\* maximum of all samples collected between July 1, 2005 and August 31, 2005

● pre-discharge    ▲ discharge    - - - caution level

