

**Contingency Plan Report**  
 Second Quarter 2012

**Ambient Monitoring**

MWRA gathers data from the outfall location in Massachusetts Bay on various thresholds in its Deer Island outfall discharge permit. This contingency plan quarterly report shows ambient monitoring results relevant to contingency plan thresholds, that became available in the April-June 2012 time period.

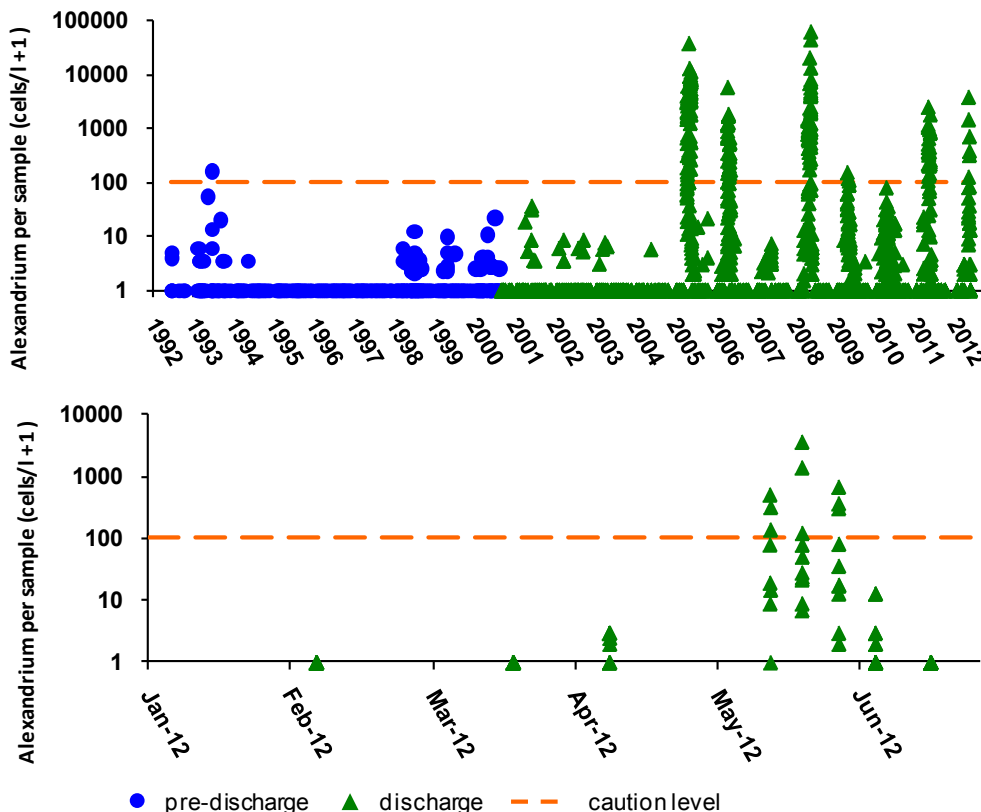
There was one exceedance of a Contingency Plan threshold, for the red tide nuisance alga *Alexandrium*.

**NUISANCE ALGAE – February-June 2012**

**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.

In 2012 there was an *Alexandrium* bloom along the coast of Maine, New Hampshire, and Massachusetts. Preliminary data from a routine MWRA survey on May 15 showed that the abundance of *Alexandrium* in the outfall nearfield exceeded the Caution Level threshold of 100 cells/L, triggering notification under the Contingency Plan (see notice [http://www.mwra.state.ma.us/harbor/pdf/20120522amx\\_alexandrium.pdf](http://www.mwra.state.ma.us/harbor/pdf/20120522amx_alexandrium.pdf)). By the time of preparation of this report (early July 2012), the bloom had subsided in Massachusetts Bay. The bottom figure shows *Alexandrium* results from February through June 2012; there were five routine surveys and three special surveys. (Note logarithmic scale for graph. May 15 and June 19 2012 data are preliminary.)



January-June results for <i>Alexandrium</i> per-sample abundance (cells/liter)	
Caution threshold	100
Winter-early summer 2012	3,731*

\* maximum of samples collected in nearfield between January 1, 2012 and June 30, 2012.

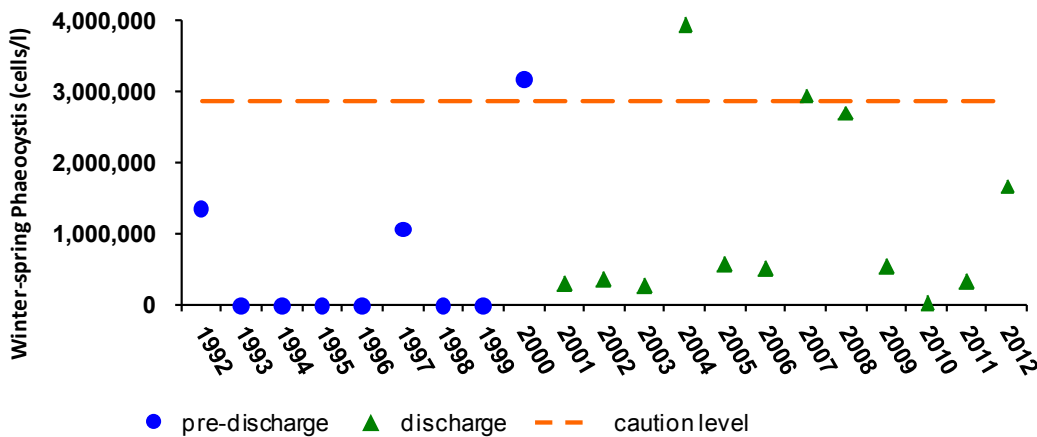
**PHAEOCYSTIS and PSEUDONITZSCHIA**

In the figures below, we compare *Phaeocystis* and *Pseudonitzschia* data to the [nuisance algae thresholds](#) for winter/spring 2012 (February through April), which included three surveys.

As in many recent years, there was a large spring bloom of *Phaeocystis pouchetii* in Massachusetts Bay but values did not exceed the threshold. *Pseudonitzschia* was observed only at very low levels in the nearfield in winter/spring 2012.

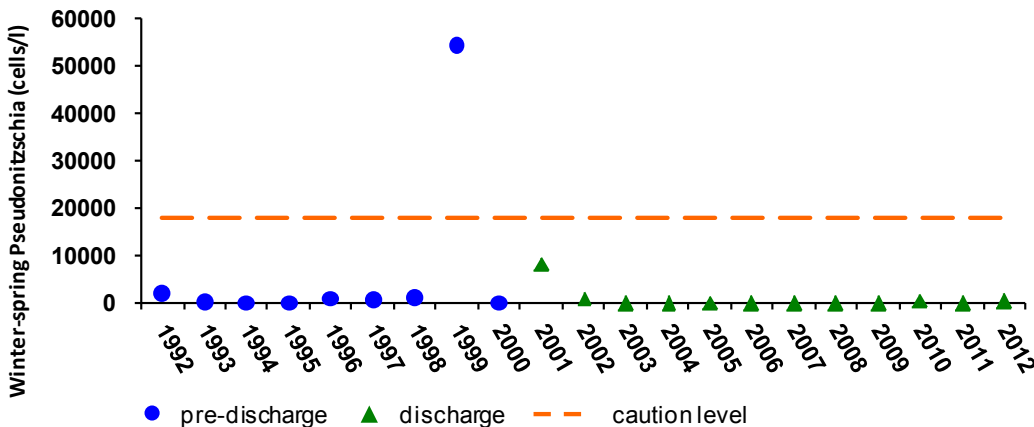
The graphs include data since the start of the monitoring program in 1992; however, the seasonal average values for 1992-2010 are calculated using a subset of all results reflecting the modified design that began in 2011, i.e. three winter/spring surveys. This enables us to compare the threshold results across years. The previous reports are at <http://www.mwra.state.ma.us/harbor/html/archive.htm#cpqamb>.

**PHAEOCYSTIS - Winter/spring**



Winter/spring <i>Phaeocystis</i> mean abundance (cells/liter)	
Caution threshold	2,860,000
Winter/spring 2012	1,690,000

**PSEUDONITZSCHIA - Winter/spring**



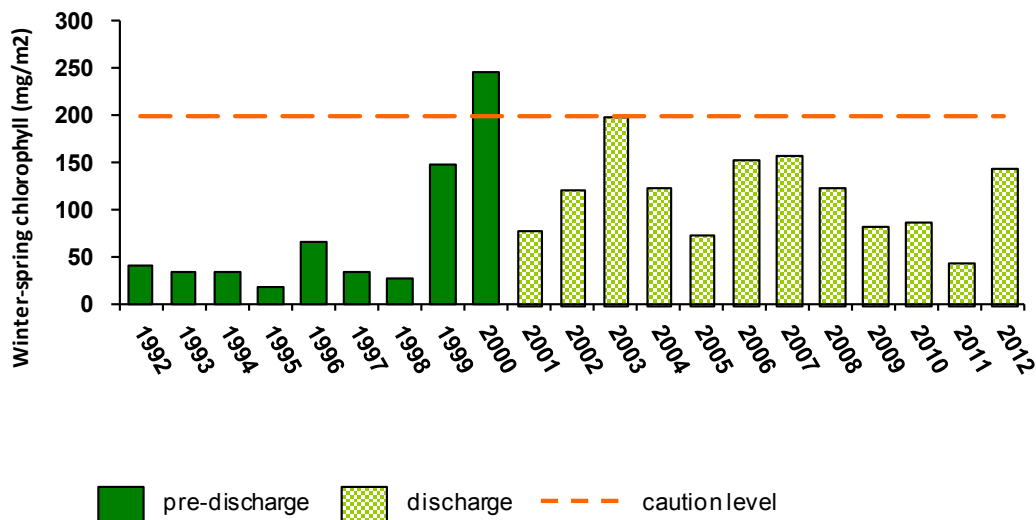
Winter/spring <i>Pseudonitzschia</i> mean abundance (cells/liter)	
Caution threshold	17,900
Winter/spring 2012	526

## CHLOROPHYLL February- April 2012

There were no [chlorophyll threshold](#) exceedances in this period. The nearfield mean areal average chlorophyll in winter/spring 2012 (February-April) was 145 mg/m<sup>2</sup>, below the caution level threshold for winter/spring of 199 mg/m<sup>2</sup>. The spring 2012 value is similar to several previous years and in the range seen during the pre-discharge period.

The figure compares chlorophyll data for winter/spring 2012 (February-April), which included three surveys, to the corresponding threshold. The graph includes data since the start of the monitoring program in 1992; however, the seasonal average values for 1992-2010 are calculated using a subset of all results reflecting the modified design that began in 2011, *i.e.* three winter/spring surveys. This enables us to better compare the threshold results across years. The previous reports are at <http://www.mwra.state.ma.us/harbor/html/archive.htm#cpqamb>.

### Winter/spring



### Recalculation of chlorophyll values and threshold values.

The chlorophyll values and associated threshold shown in this report have changed slightly compared to previous reports. Future reports on other seasons will incorporate similar changes. MWRA believes the new values are more accurate because they incorporate two improvements to the calculation of chlorophyll values: (1) correction of an error in the regression calculations in some of the early baseline surveys, and (2) recalibration of chlorophyll values to account for a phenomenon in the field called “quenching.”

- (1) Correction of early regression calculations. MWRA calculates chlorophyll values based on depth-averaging fluorometer data collected in the field every 0.5m throughout the water column. The raw field fluorometer data are calibrated to measurements of chlorophyll extracted from grab samples using a regression equation. The calibrations are done separately for each survey. For some of the baseline surveys, the axes for the regression calculations were reversed and the regression was forced through zero. Now, all the calculations have been re-done consistently.

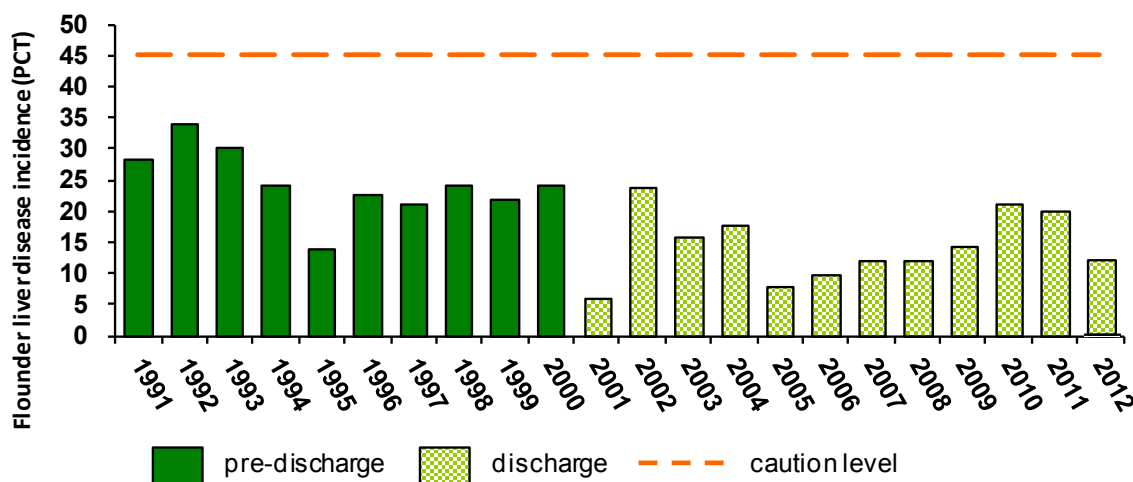
(2) Recalibration of chlorophyll values. Light can have an effect on fluorescence called “non-photochemical quenching,” which affects samples collected near the surface when daylight is strong. This effect can be quite pronounced, and it caused MWRA to exclude many surface chlorophyll measurements from previous calibrations, which were calculated by simple linear regressions. To enable it to use these excluded data, MWRA developed a multiple regression model that includes terms for light as well as extracted chlorophyll. Starting with the raw fluorescence from all surveys to date, we applied the new model to generate recalibrated fluorescence values. We then recalculated the baseline averages and determined the new 95<sup>th</sup> percentile values for each season as the new thresholds.

Although for individual hydrocasts, especially at mid-day during the darker months, the effect of light can be important, the recalibration did not change the depth-integrated, averaged seasonal values by a large amount.

MWRA has prepared a technical report with more detail on the new calibration method, which will be posted at <http://www.mwra.state.ma.us/harbor/enquad/pdf/2012-06.pdf>.

### FLOUNDER LIVER DISEASE - 2012

The prevalence of liver disease at the outfall site in 2012 was 12%, within the range of the baseline years, and did not exceed the threshold. Flounder are sampled annually in April.



One measure of the effects of pollution is the prevalence of liver disease in winter flounder. The flounder liver disease threshold value (dashed line) is based on data from Boston Harbor during the baseline monitoring period (1991-2000). In the harbor, flounder liver disease rates were historically quite high but dropped considerably during the late 1980s. Since Massachusetts Bay monitoring began, prevalence of an early-stage liver disease near the new outfall has been much lower than the threshold. If the prevalence of liver disease at the outfall site were to approach that seen in Boston Harbor in the 1990’s, a caution level threshold would be exceeded.