APPENDIX TO

WATER QUALITY MONITORING IN MASSACHUSETTS AND CAPE COD BAYS: ANNUAL REPORT FOR 1992

for

MASSACHUSETTS WATER RESOURCES AUTHORITY
Charlestown Navy Yard
100 First Avenue
Boston, MA 02129

Prepared by

John R. Kelly
Carl S. Albro

Battelle Ocean Sciences
397 Washington Street
Duxbury, MA 02332

May 14, 1993

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This Appendix contains graphs of selected stations from the nearfield and farfield sampling regions including:

F01P  (given as F01 in graph headings)
F02P  (given as F02 in graph headings)
F04
F08
F12
F13P  (given as F13 in graph headings)
F17P
F19
F20
F21
F22
F23P  (given as F23 in graph headings)
F24
F25
N01P  (given as N01 in graph headings)
N04P  (given as N04 in graph headings)
N07P  (given as N07 in graph headings)
N08
N09
N10P  (given as N10 in graph headings)
N11
N12
N16P  (given as N16 in graph headings)
N20P  (given as N20 in graph headings)
The parameters shown in contoured time plots are given for the set of stations in the following sequence:

- Chlorophyll
- Dissolved oxygen
- Dissolved inorganic nitrogen
- Phosphate
- Silicate
- Temperature
- Salinity
- Density

Note that any of the stations/parameters shown in the associated text report are not repeated here.

The data for chlorophyll, dissolved oxygen, temperature, and salinity, are 0.5-m averages derived from vertical profiles performed during the surveys. A string of vertical dots shows the depth positions for these data at each survey.

For farfield stations, 6 surveys were conducted. For nearfield stations, the graphs use data from 14 nearfield surveys, six of which immediately followed the farfield surveys. Some stations were not sampled during each of these surveys and the dissolved oxygen sensor malfunctioned during March, so there are only 5 farfield surveys available for dissolved oxygen.

The data for nutrients includes data where vertical profile/Niskin-bottle sampling was performed at a station; the depth of samples are shown by the string of 5 (usually) vertical dots over depth at each survey. Data for nutrients includes repeated sampling at nearfield “P” stations during combined farfield-nearfield surveys, so there are more than 14 points in time for some stations.

Contouring was done by proprietary software developed at Battelle Ocean Sciences. Contours are based on a two-pass interpolation scheme. The first pass interpolates vertically at each survey, using linear interpolation between points to fill each pixel. The second pass interpolates horizontally (across surveys) at each vertical pixel level, again filling pixels by linear interpolation between points. The contouring is performed to the shallowest and deepest depth of the actual data collected across all surveys at a station, then the data are blocked to the actual depth range sampled at each survey.

Concentration intervals were spread across the available 8 grey-tones, after inspection of the ranges of each parameter observed for the entire year.
Chlorophyll
Station F04 during 1992

Water Depth (m)

Chlorophyll a (ug/L)

1 2 3 4 5 6 7
Station F12 during 1992
Station F13 during 1992
Station F20 during 1992
Station F22 during 1992

Chlorophyll a (μg/L)
Station N08 during 1992
Station N11 during 1992

Chlorophyll a (μg/L)

Water Depth (m)
Dissolved oxygen
Station F01 during 1992
Station F08 during 1992

Percent Saturation of Dissolved Oxygen

60  70  80  90  100  110  120
Station F13 during 1992

Diagram showing water depth (m) from February to December, with percent saturation of dissolved oxygen ranging from 60 to 120.
Station F21 during 1992
Station F25 during 1992

Percent Saturation of Dissolved Oxygen

60 70 80 90 100 110 120
Station N01 during 1992

Water Depth (m)

Percent Saturation of Dissolved Oxygen

60 70 80 90 100 110 120
Station N69 during 1992

Percent Saturation of Dissolved Oxygen

Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec

Water Depth (m)

-10  0  10  20  30
Dissolved inorganic nitrogen
Station F08 during 1992

Dissolved Inorganic Nitrogen

Water Depth (m)

Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec
Station F12 during 1992

Dissolved Inorganic Nitrogen (mg/L)

Water Depth (m)
Station F21 during 1992
Station F25 during 1992
Station M11 during 1992

Water Depth (m)

Dissolved Inorganic Nitrogen

0.5  2.0  3.5  5.0  6.5  8.0  9.5
Station N12 during 1992
Phosphate
Station F04 during 1992
Station F13 during 1992

![Graph showing water depth and phosphate levels over time for Station F13 during 1992. The x-axis represents months from February to December, and the y-axis represents water depth in meters from 0 to -20. The z-axis represents phosphate levels from 0.15 to 1.05.]
Station FZ0 during 1992
Station F21 during 1992
Station FZ3 during 1992
Station F24 during 1992
Station F25 during 1992

Water Depth (m)

Phosphate

<table>
<thead>
<tr>
<th>0.15</th>
<th>0.30</th>
<th>0.45</th>
<th>0.60</th>
<th>0.75</th>
<th>0.90</th>
<th>1.05</th>
</tr>
</thead>
</table>
Station M08 during 1992

- Water Depth (m)
- Phosphate

Legend:
- 0.15
- 0.30
- 0.45
- 0.60
- 0.75
- 0.90
- 1.05
Station N09 during 1992
Station M16 during 1992

Water Depth (m)

Phosphate

0.15 0.30 0.45 0.60 0.75 0.90 1.05
Silicate
Station F08 during 1992
Station F12 during 1992
Station F13 during 1992
Station F19 during 1992

Water Depth (m)

Silicate

0.5 2.0 3.5 5.0 6.5 8.0 9.5
Station F20 during 1992
Station F21 during 1992
Station N07 during 1992
Station N88 during 1992
Station M10 during 1992

Water Depth (m)

Silicate

0.5  2.0  3.5  5.0  6.5  8.0  9.5
Station M12 during 1992

Water Depth (m)

Silicate

0.5 2.0 3.5 5.0 6.5 8.0 9.5
Station M20 during 1992

Water Depth (m)

Silicate

0.5 2.0 3.5 5.0 6.5 8.0 9.5
Temperature
Station F04 during 1992

[Diagram showing temperature variations at different water depths and months from February to December, with temperature ranges from 5°C to 17°C.]
Station F08 during 1992
Station F12 during 1992
Station F13 during 1992

Temperature (°C)
Station F19 during 1992
Station F21 during 1992
Station F24 during 1992

[Diagram showing temperature distribution over time and water depth]
Station F25 during 1992
Station N01 during 1992

Temperature (°C)

Water Depth (m)
Station N09 during 1992
Station N10 during 1992

Temperature (°C)

Water Depth (m)
Station N11 during 1992
Station M12 during 1992
Salinity
Station F02 during 1992

Water Depth (m)

Salinity (PSU)

30.7 31.0 31.3 31.6 31.9 32.2 32.5
Station F04 during 1992

Salinity (PSU)

| 30.7 | 31.0 | 31.3 | 31.6 | 31.9 | 32.2 | 32.5 |

Water Depth (m)

Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Station F08 during 1992
Station F13 during 1992
Station F19 during 1992
Station F20 during 1992

Water Depth (m)

Salinity (PSU)

30.7 31.0 31.3 31.6 31.9 32.2 32.5
Station F21 during 1992

Water Depth (m)

Salinity (PSU)

30.7 31.0 31.3 31.6 31.9 32.2 32.5
Station F22 during 1992

Salinity (PSU)

<table>
<thead>
<tr>
<th>Salinity (PSU)</th>
<th>30.7</th>
<th>31.0</th>
<th>31.3</th>
<th>31.6</th>
<th>31.9</th>
<th>32.2</th>
<th>32.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Depth (m)</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
</tr>
</tbody>
</table>

Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec
Station F24 during 1992

Vertical section of salinity (PSU) for the year 1992, showing variations with depth and time.
Station F25 during 1992

Water Depth (m)
Station N01 during 1992

Salinity (PSU)

30.7 31.0 31.3 31.6 31.9 32.2 32.5

Water Depth (m)

Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Station M04 during 1992

Water Depth (m)

Salinity (PSU)

0  30.7  31.0  31.3  31.6  31.9  32.2  32.5
Station N09 during 1992
Station M12 during 1992
Density
Station F01 during 1992
Station F04 during 1992
Station F12 during 1992
Station F17 during 1992
Station F19 during 1992
Station F21 during 1992

Water Depth (m)

Sigma-T

Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec

0  -10  -20  -30  -40  -50  -60

22  23  23  24  24  25  25
Station N11 during 1992

[Graphical representation showing water depth (m) over time from February to December, with a Sigma-T scale ranging from 22 to 25.]
Station N12 during 1992