Semiannual water column monitoring report

August – December 1999

Massachusetts Water Resources Authority

Environmental Quality Department
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SEMIANNUAL WATER COLUMN MONITORING REPORT

August – December 1999

Submitted to

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EXECUTIVE SUMMARY

The Massachusetts Water Resources Authority (MWRA) has collected water quality data in Massachusetts and Cape Cod Bays for the Harbor and Outfall Monitoring (HOM) Program since 1992. This monitoring is in support of the HOM Program mission to assess the potential environmental effects of the relocation of effluent discharge from Boston Harbor to Massachusetts Bay. The data are being collected to establish baseline water quality conditions and ultimately to provide the means to detect significant departure from that baseline. The surveys have been designed to evaluate water quality on both a high-frequency basis for a limited area in the vicinity of the Outfall Site (nearfield) and a low-frequency basis over an extended area throughout Boston Harbor, Massachusetts Bay, and Cape Cod Bay (farfield). This semi-annual report summarizes water column monitoring results for the eight surveys conducted from August through December 1999.

The summer/fall period is usually characterized by the overturn of the stratified water column and the return to winter physical, chemical, and biological conditions. In 1999, seasonal stratification had deteriorated at the coastal stations and had begun to weaken at the offshore stations by the October survey (WF99E). The nearfield survey data indicated the pycnocline broke down in the eastern nearfield by early October (WF99E), but the water column at the outer nearfield stations was not mixed until late November (WN99G). Intermittent upwelling in August brought cooler, nutrient-replete waters into the surface layer at coastal and western nearfield stations.

The general trend in nutrient concentrations during the 1999 August to December period was similar to previous baseline monitoring years. Nutrients were depleted in the surface waters during the summer and increased in concentration with the change from a stratified to a well-mixed water column. The most noteworthy observation for this time period was the continued presence of elevated concentrations of ammonium in the western nearfield. This had also been observed during the fall/winter period of 1998 and the source of the ammonium was determined to be an increase in the discharge of ammonium from the Deer Island facility. This increase resulted from a combination of a change to secondary treatment and increased sewage flows through the system as sewage from Nut Island is now transferred to the Deer Island facility for treatment (summer of 1998). Secondary treatment, which is now fully on-line, leads to the breakdown of organic wastes, but one of the consequences or byproducts of the secondary treatment process is higher ammonium concentrations in the effluent. Unlike the winter of 1998, however, the elevated NH_4 concentrations did not translate into unusually high chlorophyll concentrations in November or December 1999.

Maximum chlorophyll values (>25 μgL^{-1}) were measured in the nearfield during the early September survey (WN99C). These levels were not coincident with maximum phytoplankton abundance, which peaked in early August, or maximum production, which peaked in late August. In early August, nearfield phytoplankton abundance was at a maximum for this period (2.8 million cells L^{-1}). The high phytoplankton abundance did not result in elevated chlorophyll concentrations, but was coincident with very high zooplankton counts (>200,000 individuals m^{-3}) dominated by copepodites and females of *Oithona similis* and *Pseudocalanus* sp. and copepod nauplii. By mid August, phytoplankton abundance had decreased in the nearfield perhaps due to intense grazing pressure. Although total phytoplankton abundance had decreased, the numbers and relative contribution of the centric diatom, *Leptocylindrus danicus*, had increased at station N18. This diatom was also numerous at stations along the south shore (F06 and F13) where total phytoplankton counts reached a maximum of 3 million cells L^{-1}.

Areal production in August reached a period maximum at nearfield station N18 (~3500 mg C m^{-3} d^{-1}). These high production values in the nearfield in late August may have continued and contributed to the elevated chlorophyll concentrations seen in early September. The atypical late summer increase in production and chlorophyll concentrations overshadowed the increase observed in these parameters during a weak fall bloom in late October (WN99F). Although a substantial fall bloom did not develop in the nearfield in 1999, farfield chlorophyll and phytoplankton data suggest that there may have been a more significant fall bloom off the coast of southwestern Massachusetts Bay.

Mean nearfield bottom water DO concentrations in early September and late October were lower than any previous baseline survey means and were equivalent to the proposed warning threshold of 6 mgL^{-1}. The low bottom water DO concentrations resulted from a combination of factors. Relatively low bottom water DO concentrations (mean of 9 $mg\ L^{-1}$) were observed in June of 1999 when stratified conditions had been established in Massachusetts Bay. The atypical late summer phytoplankton bloom and associated input of organic material into the bottom waters in late August probably served to accelerate DO decline along the inner nearfield. Water column mixing events in September (Hurricane Floyd) prevented even more extreme DO concentrations from being reached in late September and October.

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1.0 INTRODUCTION

1.1 Program Overview

The Massachusetts Water Resources Authority (MWRA) has implemented a long-term Harbor and Outfall Monitoring (HOM) Program for Massachusetts and Cape Cod Bays. The objective of the HOM Program is to (1) test for compliance with NPDES permit requirements; (2) test whether the impact of the discharge on the environment is within the bounds projected by the SEIS; and (3) test whether change within the system exceeds the Contingency Plan thresholds. A detailed description of the monitoring and its rationale is provided in the Effluent Outfall Monitoring Plan developed for the baseline period and the post discharge monitoring plan (MWRA, 1997a).

To help establish the present water quality conditions with respect to nutrients, water properties, phytoplankton and zooplankton, and water-column respiration and productivity, the MWRA conducts baseline water quality surveys in Massachusetts and Cape Cod Bays. The surveys have been designed to evaluate water quality on both a high-frequency basis for a limited area (nearfield) and a low-frequency basis for an extended area (farfield). The nearfield stations are located in the vicinity of the Outfall Site (Figure 1-1) and the farfield stations are located throughout Boston Harbor, Massachusetts Bay, and Cape Cod Bay (Figure 1-2). The stations for the farfield surveys have been further separated into regional groupings according to geographic location to simplify regional data comparisons. This semi-annual report summarizes water column monitoring results for the nine surveys conducted from August through December 1999 (Table 1-1).

Table 1-1. Water Quality Surveys for WN99A-WN99H August to December 1999

Survey #	Type of Survey	Survey Dates
WN99A	Nearfield	August 2
WF99B	Nearfield/Farfield	August 16 - 19
WN99C	Nearfield	September 8
WN99D	Nearfield	September 24
WF99E	Nearfield/Farfield	October 6, 8, 22, 28 [a]
WN99F	Nearfield	October 27
WN99G	Nearfield	November 23
WN99H	Nearfield	December 20

[a] Due to severe weather, the WF99E survey was completed over the course of three weeks in October – nearfield samples were collected October 8th and farfield samples were collected October 6, 22, and 28.

Initial data summaries, along with specific field information, are available in individual survey reports submitted immediately following each survey. In addition, nutrient data reports (including calibration information, sensor and water chemistry data), plankton data reports, and productivity and respiration data reports are each submitted five times annually. Raw data summarized within this or any of the other reports are available from MWRA in hard copy and electronic formats.

1.2 Organization of the Semi-Annual Report

The scope of the semi-annual report is focused primarily towards providing an initial compilation of the water column data collected during the reporting period. Secondarily, integrated physical and biological results are discussed for key water column events and potential areas for expanded discussion in the annual water column report are recommended. The report first provides a summary of the survey and laboratory methods (Section 2). The bulk of the report, as discussed in further detail below, presents results of water column data from the last eight surveys of 1999 (Sections 3-5). Finally, the major findings of the semi-annual period are summarized in Section 6.

Section 3 data are provided in data summary tables. The summary tables include the major numeric results of water column surveys in the semi-annual period by survey. A description of data selection, integration information, and summary statistics are included with that section.

Sections 4 (Results of Water Column Measurements) and 5 (Productivity, Respiration, and Plankton Results) include preliminary interpretation of the data with selected graphic representations of the horizontal and vertical distribution of water column parameters in both the farfield and nearfield. The horizontal distribution of physical parameters is presented through regional contour plots. The vertical distribution of water column parameters is presented using time-series plots of averaged surface and bottom water column parameters and along vertical transects in the survey area (Figure 1-3). The time-series plots utilize average values of the surface water sample (the “A” depth, as described in Section 3), and the bottom water collection depth (the “E” depth). Examining data trends along four farfield transects (Boston-Nearfield, Cohassett, Marshfield and Nearfield-Marshfield), and one nearfield transect, allows three-dimensional analysis of water column conditions during each survey. One offshore transect (Boundary) enables analysis of results in the outer most boundary of the survey area during farfield surveys.

Results of water column physical, nutrient, chlorophyll, and dissolved oxygen data, are provided in Section 4. Survey results were organized according to the physical characteristics of the water column during the semi-annual period. The timing of water column vertical stratification, and the physical and biological status of the water column during stratification, significantly affects the temporal response of the water quality parameters, which provide a major focus for assessing effects of the Outfall Site. This report describes the horizontal and vertical characterization of the water column during the summer stratification period (WN99A – WN99D) and the subsequent deterioration of stratification and return to winter conditions (WF99E – WN99H). Time-series data are commonly provided for the entire semi-annual period for clarity and context of the data presentation.

Productivity, respiration, and plankton measurements, along with corresponding discussion of chlorophyll and dissolved oxygen results, are provided in Section 5. Discussion of the biological processes and trends during the semi-annual period is included in this section. A summary of the major water column events and unusual features of the semi-annual period is presented in Section 6. References are provided in Section 7.

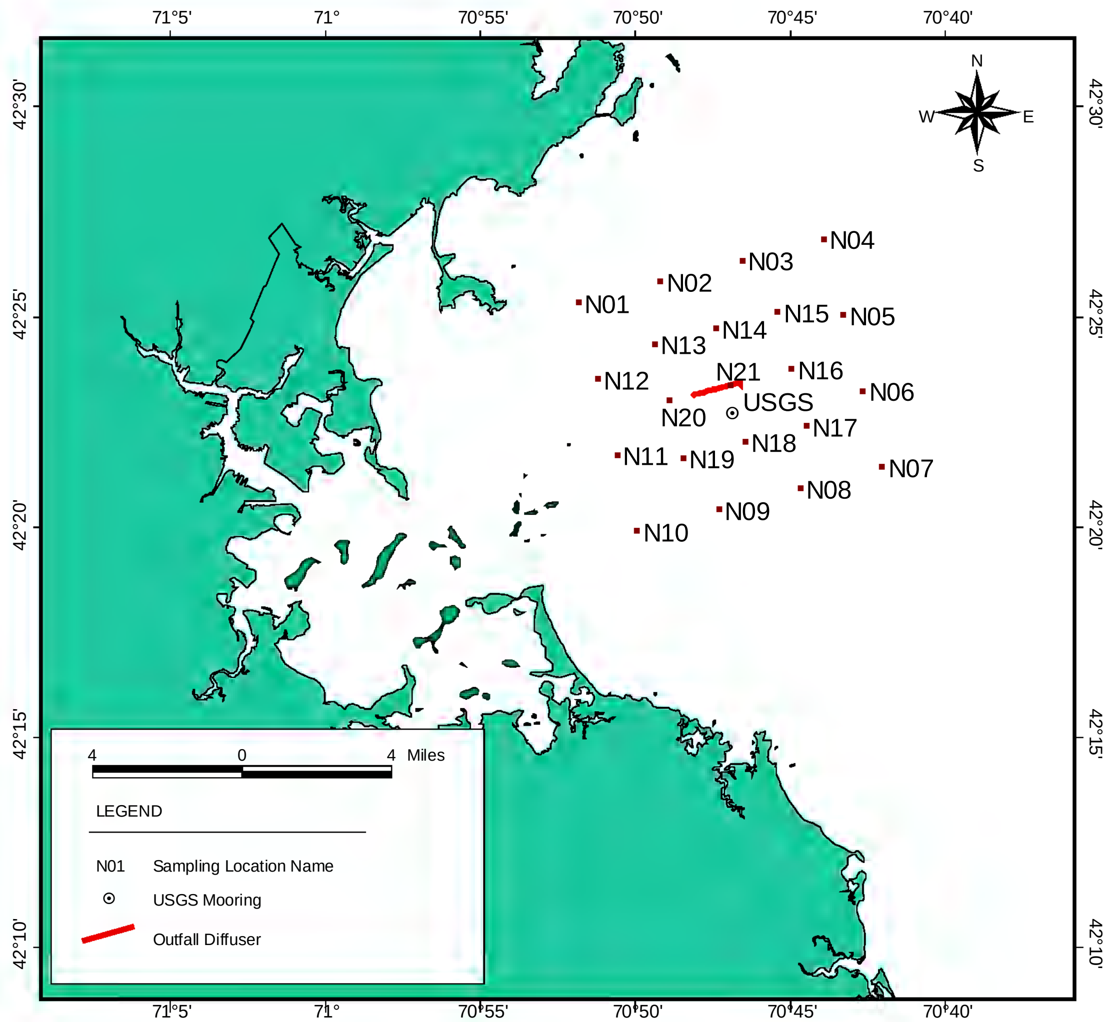


Figure 1-1. Locations of MWRA Outfall Site, Nearfield Stations and USGS Mooring

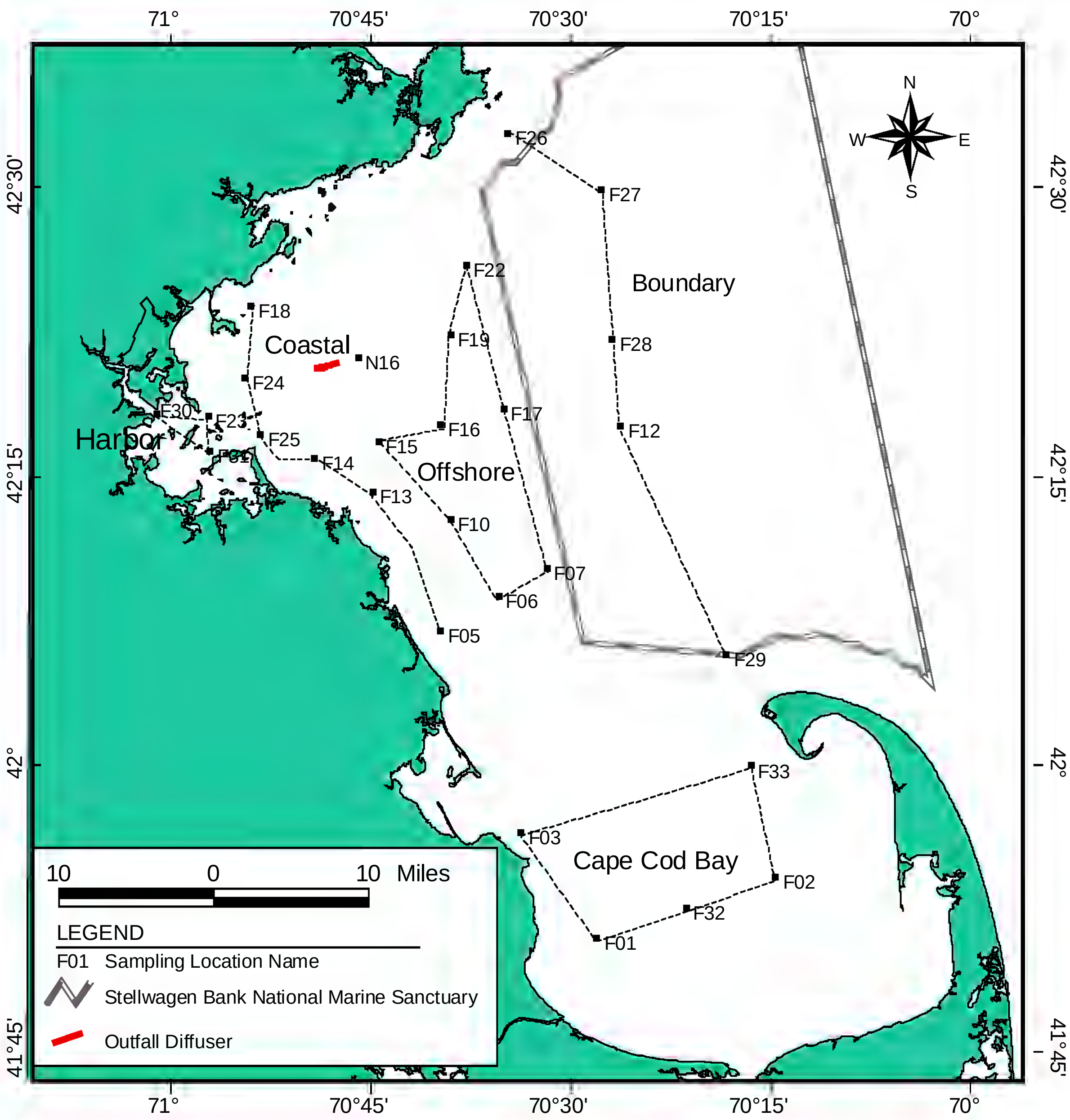


Figure 1-2. Locations of Farfield Stations and Regional Area Groupings

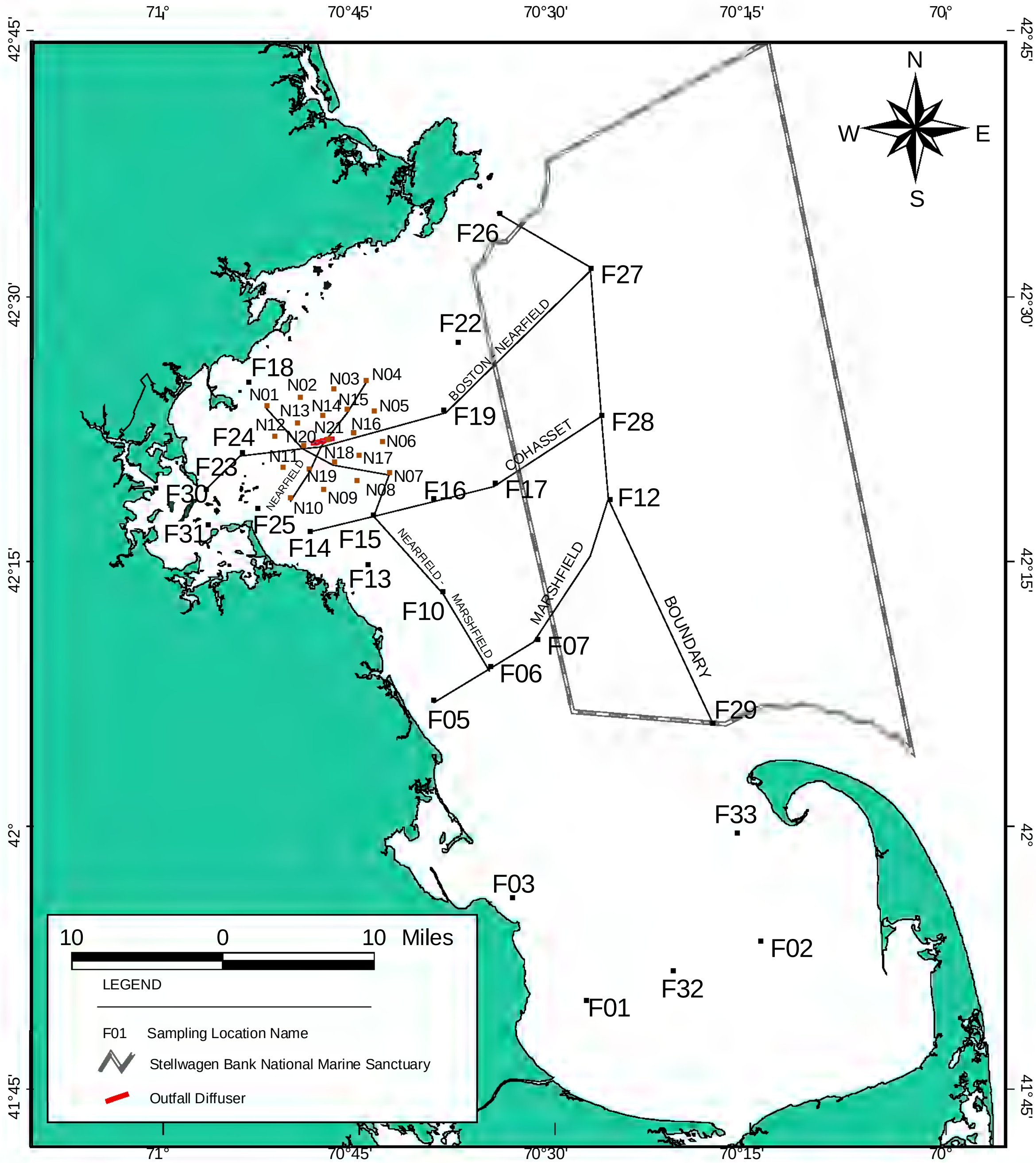


Figure 1-3. Location of Stations Selected for Vertical Transect Graphics Showing Transect Name

2.0 METHODS

This section describes general methods of data collection and sampling for the last eight water column monitoring surveys of 1999. Section 2.1 describes data collection methods, including survey dates, sampling platforms, and analyses performed. Section 2.2 describes the sampling schema undertaken, and Section 2.3 details specific operations for the second 1999 semi-annual period. Specific details of field sampling and analytical procedures, laboratory sample processing and analysis, sample handling and custody, calibration and preventative maintenance, documentation, data evaluation, and data quality procedures are discussed in the Water Quality Monitoring CW/QAPP (Albro *et al*. 1998). Details on productivity sampling procedures and analytical methods are also available in Appendix A.

2.1 Data Collection

The farfield and nearfield water quality surveys for 1999 represent a continuation of the baseline water quality monitoring conducted from 1992 – 1998. The monitoring program has been improved over the years as more data have been collected and evaluated. In 1998, two Cape Cod Bay stations (F32 and F33) were added to better capture the winter/spring variability in zooplankton abundance and species in these Right whale feeding grounds. During the first three farfield surveys of 1999, these two stations were again sampled for zooplankton and hydrographic (CTD) properties.

Water quality data for this report were collected from the sampling platform *R/V Aquamonitor*. Continuous vertical profiles of the water column and discrete water samples were collected using a CTD/Go-Flo Bottle Rosette system. This system includes a deck unit to control the system, display *in situ* data, and store the data, and an underwater unit comprised of several environmental sensors, including conductivity, temperature, depth, dissolved oxygen, transmissometry, irradiance, and fluorescence. These measurements were obtained at each station by deploying the CTD; in general, one cast was made at each station. Water column profile data were collected during the downcast, and water samples were collected during the upcast by closing the Go-Flo bottles at selected depths, as discussed below.

Water samples were collected at five depths at each station, except at stations F30, F31, F32, and F33. Stations F30 and F31 are shallow and require only three depths while only zooplankton samples are collected at F32 and F33 (winter/spring surveys). These depths were selected during CTD deployment based on positions relative to the pycnocline or subsurface chlorophyll maximum. The bottom depth (within 5 meters of the sea floor) and the surface depth (within 3 meters of the water surface) of each cast remained constant and the mid-bottom, middle and mid-surface depths were selected to represent any variability in the water column. In general, the selected middle depth corresponded with the chlorophyll maximum and or pycnocline. When the chlorophyll maximum occurred significantly below or above the middle depth, the mid-bottom or mid-surface sampling event was substituted with the mid-depth sampling event and the "mid-depth" sample was collected within the maximum. In essence, the "mid-depth" sample in these instances was not collected from the middle depth, but shallower or deeper in the water column in order to capture the chlorophyll maximum layer. These nomenclature semantics result from a combination of field logistics and scientific relevance. In the field, the switching of the "mid-depth" sample with the mid-surface or mid-bottom was transparent to everyone except the NAVSAM operator who observed the subsurface chlorophyll structure and marked the events. The samples were processed in a consistent manner and a more comprehensive set of analyses were conducted for the surface, mid-depth/chlorophyll maximum, and bottom samples.

Samples from each depth at each station were collected by subsampling from the Go-Flo bottles into the appropriate sample container. Analyses performed on the water samples are summarized in Table 2-1. Samples for dissolved inorganic nutrients (DIN), dissolved organic carbon (DOC), total dissolved nitrogen (TDN) and phosphorus (TDP), particulate organic carbon (POC) and nitrogen (PON), biogenic silica, particulate phosphorus (PP), chlorophyll *a* and phaeopigments, total suspended solids (TSS), urea, and phytoplankton (screened and rapid assessment) were filtered and preserved immediately after obtaining water from the appropriate Go-Flo bottles. Whole water phytoplankton samples (unfiltered) were obtained directly from the Go-Flo bottles and immediately preserved. Zooplankton samples were obtained by deploying a zooplankton net overboard and making an oblique tow of the upper two-thirds of the water column but with a maximum tow depth of 30 meters. Productivity samples were collected from the Go-Flo bottles, stored on ice and transferred to University of Rhode Island (URI) employees. Incubation was started no more than six hours after initial water collection at URI's laboratory. Respiration samples were collected from the Go-Flo bottles at four stations (F19, F23, N04, and N18). Incubations of the dark bottles were started within 30 minutes of sample collection. The dark bottle samples were maintained at a temperature within 2°C of the collection temperature for five to seven days until analysis.

2.2 Sampling Schema

A synopsis of the sampling schema for the analyses described above is outlined in Tables 2-1, 2-2, and 2-3. Station designations were assigned according to the type of analyses performed at that station (see Table 2-1). Productivity and respiration analyses were also conducted at certain stations and represented by the letters P and R, respectively. Table 2-1 lists the different analyses performed at each station. Tables 2-2 (nearfield stations) and 2-3 (farfield stations) provide the station name and type, and show the analyses performed at each depth. Station N16 is considered both a nearfield station (where it is designated as type A) and a farfield station (where it is designated a type D). Stations F32 and F33 are occupied during the first three farfield surveys of each year and collect zooplankton samples and hydrocast data only (designated as type Z).

Table 2-1. Station Types and Numbers (Five Depths Collected Unless Otherwise Noted)

Station Type	**A**	**D**	**E**	**F**	**G[1]**	**P**	**R**	**Z**
Number of Stations	**5**	**8**	**26**	**3**	**2**	**3**	**4**	**2**
Analysis Type								
Dissolved inorganic nutrients (NH_4, NO_3, NO_2, PO_4, and SiO_4)	•	•	•	•	•	•		
Other nutrients (DOC, TDN, TDP, PC, PN, PP, Biogenic Si)[1]	•	•			•	•		
Chlorophyll [1]	•	•			•	•		
Total suspended solids [1]	•	•			•	•		
Dissolved oxygen	•	•		•	•	•		
Phytoplankton, urea [2]		•			•	•		
Zooplankton[3]		•			•	•		•
Respiration [1]						•	•	
Productivity, DIN						•		

[1]Samples collected at three depths (bottom, mid-depth, and surface)
[2]Samples collected at two depths (mid-depth and surface)
[3]Samples collected at the surface

2.3 Operations Summary

Field operations for water column sampling and analysis during the second semi-annual period were conducted as described above. Deviations from the CW/QAPP for nearfield surveys WN99A, WF99B, WN99C, WN99D, WN99F, WN99G, and WN99H had no effect on the data. The principal deviation for survey WF99E was that due to weather and electronic equipment problems, it took 22 days to complete the farfield/nearfield survey in October (WF99E). Nearfield samples were collected on October 8, 1999 and farfield samples were collected on October 6, 22, and 28 1999. Due to the delay, the survey was conducted well beyond the normal 4-day time frame for a farfield survey. Data will be evaluated within this context in this report. For additional information about a specific survey, the individual survey reports may be consulted.

Table 2-2. Nearfield Water Column Sampling Plan (3 Pages)

Nearfield Water Column Sampling Plan

StationID	Depth (m)	Station Type	Depths	Total Volume at Depth (L)	Number of 9-L GoFlos	Dissolved Inorganic Nutrients	Dissolved Organic Carbon	Total Dissolved Nitrogen and Phosphorus	Particulate Organic Carbon and Nitrogen	Particulate Phosphorus	Biogenic silica	Chlorophyll a	Total Suspended Solids	Dissolved Oxygen	Rapid Analysis Phytoplankton	Whole Water Phytoplankton	Screened Water Phytoplankton	Zooplankton	Urea	Respiration	Photosynthesis by carbon-14	Dissolved Inorganic Carbon
			Protocol Code			IN	OC	NP	PC	PP	BS	CH	TS	DO	RP	WW	SW	ZO	UR	RE	AP	IC
			Volume (L)			1	0.1	0.1	1	0.6	0.3	0.5	1	1	4	1	4	1	0.1	1	1	1
			1_Bottom	8.5	2	1	1	1	2	2	2	1	2	1								
			2_Mid-Bottom	2.5	1	1						1		1								
N01	30	A	3_Mid-Depth	10	2	2	1	1	2	2	2	2	2	1								
			4_Mid-Surface	2.5	1	1						1		1								
			5_Surface	8.5	2	1	1	1	2	2	2	1	2	1								
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
N02	40	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1																
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
N03	44	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1																
			1_Bottom	15.5	2	1	1	1	2	2	2	1	2							6	1	1
			2_Mid-Bottom	4.5	1	1						1		1							1	1
N04	50	D+	3_Mid-Depth	22.1	2	2	1	1	2	2	2	2	2			1	1		1	6	1	1
		R+	4_Mid-Surface	4.5	1	1						1		1							1	1
		P	5_Surface	20.6	2	1	1	1	2	2	2	1	2			1	1		1	6	1	1
			6_Net Tow															1				
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
N05	55	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1																
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
N06	52	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1																
			1_Bottom	10.5	2	1	1	1	2	2	2	1	2	3								
			2_Mid-Bottom	2.5	1	1						1		1								
N07	52	A	3_Mid-Depth	10	2	2	1	1	2	2	2	2	2	1								
			4_Mid-Surface	2.5	1	1						1		1								
			5_Surface	10.5	2	1	1	1	2	2	2	1	2	3								
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
N08	35	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																

Nearfield Water Column Sampling Plan

StationID	Depth (m)	Station Type	Depths	Total Volume at Depth (L)	Number of 9-L GoFlos	Dissolved Inorganic Nutrients	Dissolved Organic Carbon	Total Dissolved Nitrogen and Phosphorous	Particulate Organic Carbon and Nitrogen	Particulate Phosphorous	Biogenic silica	Chlorophyll a	Total Suspended Solids	Dissolved Oxygen	Rapid Analysis Phytoplankton	Whole Water Phytoplankton	Screened Water Phytoplankton	Zooplankton	Urea	Respiration	Photosynthesis by carbon-14	Dissolved Inorganic Carbon
			Protocol Code			IN	OC	NP	PC	PP	BS	CH	TS	DO	RP	WW	SW	ZO	UR	RE	AP	IC
			5_Surface	1	1	1																
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
N09	32	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1																
			1_Bottom	8.5	2	1	1	1	2	2	2	1	2	1								
			2_Mid-Bottom	2.5	1	1						1		1								
N10	25	A	3_Mid-Depth	10	2	2	1	1	2	2	2	2	2	1								
			4_Mid-Surface	2.5	1	1						1		1								
			5_Surface	8.5	2	1	1	1	2	2	2	1	2	1								
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
N11	32	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1																
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
N12	26	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1																
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
N13	32	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1																
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
N14	34	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1																
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
N15	42	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1																
			1_Bottom	8.5	2	1	1	1	2	2	2	1	2	1								
			2_Mid-Bottom	2.5	1	1						1		1								
N16	40	A	3_Mid-Depth	10.2	2	2	2	2	2	2	2	2	2	1								
			4_Mid-Surface	2.5	1	1						1		1								
			5_Surface	8.5	2	1	1	1	2	2	2	1	2	1								
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
N17	36	E	3_Mid-Depth	1	1	1																

Nearfield Water Column Sampling Plan

StationID	Depth (m)	Station Type	Depths	Total Volume at Depth (L)	Number of 9-L GoFlos	Dissolved Inorganic Nutrients	Dissolved Organic Carbon	Total Dissolved Nitrogen and Phosphorous	Particulate Organic Carbon and Nitrogen	Particulate Phosphorous	Biogenic silica	Chlorophyll a	Total Suspended Solids	Dissolved Oxygen	Rapid Analysis Phytoplankton	Whole Water Phytoplankton	Screened Water Phytoplankton	Zooplankton	Urea	Respiration	Photosynthesis by carbon-14	Dissolved Inorganic Carbon
			Protocol Code			IN	OC	NP	PC	PP	BS	CH	TS	DO	RP	WW	SW	ZO	UR	RE	AP	IC
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1																
			1_Bottom	15.5	2	1	1	1	2	2	2	1	2							6	1	1
		D+	2_Mid-Bottom	4.5	1	1						1		1							1	1
N18	30	R+	3_Mid-Depth	26.1	3	1	1	1	2	2	2	2	2		1	1	1		1	6	1	2
		P	4_Mid-Surface	4.5	1	1						1		1							1	1
			5_Surface	20.6	2	1	1	1	2	2	2	1	2			1	1		1	6	1	1
			6_Net Tow															1				
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
N19	24	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1																
			1_Bottom	8.5	2	1	1	1	2	2	2	1	2	1								
			2_Mid-Bottom	2.5	1	1						1		1								
N20	32	A	3_Mid-Depth	10	2	2	1	1	2	2	2	2	2	1								
			4_Mid-Surface	2.5	1	1						1		1								
			5_Surface	8.5	2	1	1	1	2	2	2	1	2	1								
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
N21	34	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1																
				Totals		111	22	22	42	42	42	42	42	33	1	4	4	2	4	36	10	11
Blanks A									1	1	1	1	1									

Table 2-3. Farfield Water Column Sampling Plan (3 Pages)

Farfield Water Column Sampling Plan

StationID	Depth (m)	Station Type	Depths	Total Volume at Depth (L)	Number of 9-L GoFlos	Dissolved Inorganic Nutrients	Dissolved Organic Carbon	Total Dissolved Nitrogen and	Particulate Organic Carbon	Particulate Phosphorous	Biogenic silica	Chlorophyll a	Total Suspended Solids	Dissolved Oxygen	Secchi Disk Reading	Whole Water Phytoplankton	Screened Water Phytoplankton	Zooplankton	Urea	Respiration	Photosynthesis by carbon-14	Dissolved Inorganic Carbon
			Protocol Code			IN	OC	NP	PC	PP	BS	CH	TS	DO	SE	WW	SW	ZO	UR	RE	AP	IC
			Volume (L)			1	0.1	0.1	1	0.3	0.3	0.5	1	1	0	1	4	1	0.1	1	1	1
			1_Bottom	7.9	2	1	1	1	2	2	2	1	2	3								
			2_Mid-Bottom	2.5	1	1						1		1								
F01	27	D	3_Mid-Depth	14	2	1	1	1	2	2	2	2	2	1		1	1		1			
			4_Mid-Surface	2.5	1	1						1		1								
			5_Surface	13	2	1	1	1	2	2	2	1	2	3	1	1	1		1			
			6_Net Tow															1				
			1_Bottom	7.9	2	1	1	1	2	2	2	1	2	1								
			2_Mid-Bottom	2.5	1	1						1		1								
F02	33	D	3_Mid-Depth	15	2	2	1	1	2	2	2	2	2	1		1	1		1			
			4_Mid-Surface	2.5	1	1						1		1								
			5_Surface	13	2	1	1	1	2	2	2	1	2	1	1	1	1		1			
			6_Net Tow															1				
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
F03	17	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1									1							
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
F05	18	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1									1							
			1_Bottom	7.9	2	1	1	1	2	2	2	1	2	3								
			2_Mid-Bottom	2.5	1	1						1		1								
F06	35	D	3_Mid-Depth	15	2	2	1	1	2	2	2	2	2	1		1	1		1			
			4_Mid-Surface	2.5	1	1						1		1								
			5_Surface	13	2	1	1	1	2	2	2	1	2	3	1	1	1		1			
			6_Net Tow															1				
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
F07	54	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1									1							
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
F10	30	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1									1							
			1_Bottom	4	1	1								1								
			2_Mid-Bottom	2	1	1								1								
F12	90	F	3_Mid-Depth	2	1	1								1								
			4_Mid-Surface	2	1	1								1								
			5_Surface	4	1	1								1	1							
			1_Bottom	7.9	2	1	1	1	2	2	2	1	2	1								
			2_Mid-Bottom	2.5	1	1						1		1								
F13	25	D	3_Mid-Depth	15	2	2	1	1	2	2	2	2	2	1		1	1		1			
			4_Mid-Surface	2.5	1	1						1		1								

Farfield Water Column Sampling Plan

StationID	Depth (m)	Station Type	Depths	Total Volume at Depth (L)	Number of 9-L GoFlos	Dissolved Inorganic Nutrients	Dissolved Organic Carbon	Total Dissolved Nitrogen and	Particulate Organic Carbon	Particulate Phosphorous	Biogenic silica	Chlorophyll a	Total Suspended Solids	Dissolved Oxygen	Secchi Disk Reading	Whole Water Phytoplankton	Screened Water Phytoplankton	Zooplankton	Urea	Respiration	Photosynthesis by carbon-14	Dissolved Inorganic Carbon
			Protocol Code			IN	OC	NP	PC	PP	BS	CH	TS	DO	SE	WW	SW	ZO	UR	RE	AP	IC
			5_Surface	13	2	1	1	1	2	2	2	1	2	1	1	1	1		1			
			6_Net Tow															1				
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
F14	20	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1									1							
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
F15	39	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1									1							
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
F16	60	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1									1							
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
F17	78	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1									1							
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
F18	24	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1									1							
			1_Bottom	7	2	1														6		
			2_Mid-Bottom	2	1	1								1								
F19	81	F+R	3_Mid-Depth	7	2	1														6		
			4_Mid-Surface	2	1	1								1								
			5_Surface	7	2	1									1					6		
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
F22	80	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1									1							
			1_Bottom	18	3	1	1	1	2	2	2	1	2							6	1	1
			2_Mid-Bottom	8.5	1	1						1		1							1	2
F23	25	D+R+P	3_Mid-Depth	24	3	1	1	1	2	2	2	2	2			1	1		1	6	1	1
			4_Mid-Surface	7.5	1	1						1		1							1	1
			5_Surface	23	3	1	1	1	2	2	2	1	2		1	1	1		1	6	1	1
			6_Net Tow															1				
			1_Bottom	7.9	2	1	1	1	2	2	2	1	2	3								
			2_Mid-Bottom	2.5	1	1						1		1								
F24	20	D	3_Mid-Depth	14	2	1	1	1	2	2	2	2	2	1		1	1		1			
			4_Mid-Surface	2.5	1	1						1		1								
			5_Surface	13	2	1	1	1	2	2	2	1	2	3	1	1	1		1			
			6_Net Tow															1				
			1_Bottom	9.9	2	1	1	1	2	2	2	1	2	1								
			2_Mid-Bottom	2.5	1	1						1		1								

Farfield Water Column Sampling Plan

StationID	Depth (m)	Station Type	Depths	Total Volume at Depth (L)	Number of 9-L GoFlos	Dissolved Inorganic Nutrients	Dissolved Organic Carbon	Total Dissolved Nitrogen and	Particulate Organic Carbon	Particulate Phosphorous	Biogenic silica	Chlorophyll a	Total Suspended Solids	Dissolved Oxygen	Secchi Disk Reading	Whole Water Phytoplankton	Screened Water Phytoplankton	Zooplankton	Urea	Respiration	Photosynthesis by carbon-14	Dissolved Inorganic Carbon
					Protocol Code	IN	OC	NP	PC	PP	BS	CH	TS	DO	SE	WW	SW	ZO	UR	RE	AP	IC
F25	15	D	3_Mid-Depth	15	2	2	1	1	2	2	2	2	2	1		1	1		1			
			4_Mid-Surface	2.5	1	1						1		1								
			5_Surface	15	2	1	1	1	2	2	2	1	2	3	1	1	1		1			
			6_Net Tow															1				
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
F26	56	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1									1							
			1_Bottom	7.9	2	1	1	1	2	2	2	1	2	1								
			2_Mid-Bottom	2.5	1	1						1		1								
F27	108	D	3_Mid-Depth	15	2	2	1	1	2	2	2	2	2	1		1	1		1			
			4_Mid-Surface	2.5	1	1						1		1								
			5_Surface	13	2	1	1	1	2	2	2	1	2	1	1	1	1		1			
			6_Net Tow															1				
			1_Bottom	1	1	1																
			2_Mid-Bottom	1	1	1																
F28	33	E	3_Mid-Depth	1	1	1																
			4_Mid-Surface	1	1	1																
			5_Surface	1	1	1									1							
			1_Bottom	2	1	1								1								
			2_Mid-Bottom	2	1	1								1								
F29	66	F	3_Mid-Depth	2	1	1								1								
			4_Mid-Surface	2	1	1								1								
			5_Surface	2	1	1								1	1							
			1_Bottom	9.9	2	1	1	1	2	2	2	1	2	3								
			3_Mid-Depth	14	2	1	1	1	2	2	2	2	2	1		1	1		1			
F30	115	G	5_Surface	15	2	1	1	1	2	2	2	1	2	3	1	1	1		1			
			6_Net Tow															1				
			1_Bottom	9.9	2	1	1	1	2	2	2	1	2	3								
			3_Mid-Depth	14	2	1	1	1	2	2	2	2	2	1		1	1		1			
F31	115	G	5_Surface	15	2	1	1	1	2	2	2	1	2	3	1	1	1		1			
			6_Net Tow															1				
F32	30	Z	5_Surface												1							
			6_Net Tow															1				
F33	30	Z	5_Surface												1							
			6_Net Tow															1				
			1_Bottom	8.1	2	1	2	2	2	2	2	1	2	1								
			2_Mid-Bottom	2.5	1	1						1		1								
N16	40	D	3_Mid-Depth	15	2	2	2	2	2	2	2	2	2	1		1	1		1			
			4_Mid-Surface	2.5	1	1						1		1								
			5_Surface	13	2	1	1	1	2	2	2	1	2	1	1	1	1		1			
			6_Net Tow															1				
					Totals	132	35	35	66	66	66	62	66	76	28	22	22	13	22	36	5	6
			Blanks B						1	1	1	1	1									
			Blanks C						1	1	1	1	1									
			Blanks D						1	1	1	1	1									

3.0 DATA SUMMARY PRESENTATION

Data from each survey were compiled from the final HOM Program 1999 database and organized to facilitate regional comparisons between surveys, and to allow a quick evaluation of results for evaluating monitoring thresholds (Table 3-1 Method Detection Limits, Survey Data Tables 3-2 through 3-10). Each table provides summary data from one survey. A discussion of which parameters were selected, how the data were grouped and integrated, and the assumptions behind the calculation of statistical values (average, minimum, and maximum), is provided below. Individual data summarized in this report are available from MWRA either in hard copy or electronic format.

The spatial pattern of data summary follows the sample design over major geographic areas of interest in Massachusetts Bay, Cape Cod Bay, and Boston Harbor (Section 3.1). Compilation of data both horizontally by region and vertically over the entire water column was conducted to provide an efficient way of assessing the status of the regions during a particular survey. Maximum and minimum values are provided because of the need to assess extremes of pre-outfall conditions relative to criteria being developed for contingency planning purposes (MWRA, 1997b).

Regional compilations of nutrient and biological water column data were conducted first by averaging individual laboratory replicates, followed by field duplicates, and then by station visit within a survey. Prior to regional compilation of the sensor data, the results were averaged by station visit. Significant figures for average values were selected based on precision of the specific data set. Detailed considerations for individual data sets are provided in the sections below.

3.1 Defined Geographic Areas

The primary partitioning of data is between the nearfield and farfield stations (Figures 1-1 and 1-2). Farfield data were additionally segmented into five geographic areas: stations in Boston Harbor (F23, F30, and F31), coastal stations (F05, F13, F14, F18, F24, F25), offshore stations (F06, F07, F10, F15, F16, F17, F19, and F22), boundary region stations (F12, F26, F27, F28, F29), and Cape Cod Bay stations (F01, F02, and F03; and F32 and F33 as appropriate). These regions are shown in Figure 1-2.

The data summary tables include data derived from all of the station data collected in each region. Average, maximum, and minimum values are reported from the cumulative horizontal and vertical dataset as described for each data type below.

3.2 Sensor Data

Six CTD profile parameters provided in the data summary tables include temperature, salinity, density (σ_t), fluorescence (chlorophyll a), transmissivity, and dissolved oxygen (DO) concentration. Statistical parameters (maximum, minimum, and average) were calculated from the sensor readings collected at five depths through the water column (defined as A-E). These depths were sampled on the upcast of the hydrographic profile. The five depth values, rather than the entire set of profile data, were selected to reduce the statistical weighting of deep-water data at the offshore and boundary stations. Generally, the samples were collected in an even depth-distributed pattern. The mid-depth sample (C) was typically located at the subsurface fluorescence (chlorophyll) peak in the water column, depending on the relative depth of the chlorophyll maximum. Details of the collection, calibration, and processing of CTD data are available in the Water Column Monitoring CW/QAPP (Albro *et al*. 1998), and are summarized in Section 2.

Following standard oceanographic practice, patterns of variability in water density are described using the derived parameter sigma-t ($\sigma_{t,}$), which is calculated by subtracting 1,000 kg/m^3 from the recorded density. During this semi-annual period, density varied from 1021.5 to 1025.5, meaning σ_t varied from 21.5 to 25.5.

Fluorescence data were calibrated using concomitant extracted chlorophyll *a* data from discrete water samples collected at a subset of the stations (see CW/QAPP or Tables 2-1, 2-2, 2-3). The calibrated fluorescence sensor values were used for all discussions of chlorophyll in this report. The concentrations of phaeopigments are included in the summary data tables as part of the nutrient parameters.

In addition to DO concentration, the derived percent saturation was also provided. Percent saturation was calculated prior to averaging station visits from the potential saturation value of the water (a function of the physical properties of the water) and the calibrated DO concentration (see CW/QAPP).

Finally, the derived beam attenuation coefficient from the transmissometer ("transmittance") was provided on the summary tables. Beam attenuation is calculated from the natural logarithm of the ratio of light transmission relative to the initial light incidence, over the transmissometer path length, and is provided in units of m^{-1}.

3.3 Nutrients

Analytical results for dissolved and particulate nutrient concentrations were extracted from the HOM database, and include: ammonia (NH_4), nitrite (NO_2), nitrate + nitrite (NO_3+NO_2), phosphate (PO_4), silicate (SiO_4), biogenic silica (BSI), dissolved and particulate organic carbon (DOC and POC), total dissolved and particulate organic nitrogen (TDN and PON), total dissolved and particulate phosphorous (TDP and PP), and urea. Total suspended solids (TSS) data are provided as a baseline for total particulate matter in the water column. Dissolved inorganic nutrients (NH_4, NO_2, NO_3+NO_2, PO_4, and SiO_4) were measured from water samples collected from each of the five (A-E) depths during CTD casts. The dissolved organic and particulate constituents were measured from water samples collected from the surface (A), mid-depth (C), and bottom (E) sampling depths (see Tables 2-1, 2-2, and 2-3 for specific sampling depths and stations).

3.4 Biological Water Column Parameters

Four productivity parameters have been presented in the data summary tables. Areal production, which is determined by integrating the measured productivity over the photic zone, and chlorophyll-specific areal production is included for the productivity stations (F23 representing the Harbor, and N04 and N18, representing the nearfield). Because areal production is already depth-integrated, averages were calculated only among productivity stations for the two regions sampled. The derived parameters α ($gC[gChla]^{-1}h^{-1}[\mu Em^{-2}s^{-1}]^{-1}$) and Pmax ($gC[gChla]^{-1}h^{-1}$) are also included. The productivity parameters are discussed in detail in Appendix A.

Respiration rates were averaged over the respiration stations (the same Harbor and nearfield stations as productivity, and additionally one offshore station [F19]), and over the three water column depths sampled (surface, mid- and bottom). The respiration samples were collected concurrently with the productivity samples. Detailed methods of sample collection, processing, and analysis are available in the CW/QAPP (Albro *et al*. 1998).

3.5 Plankton

Plankton results were extracted from the HOM database and include whole water phytoplankton, screened phytoplankton, and zooplankton. Phytoplankton samples were collected for whole-water and screened measurements during the water column CTD casts at the surface (A) and mid-depth (C) sampling events. As discussed in Section 2.1, when a subsurface chlorophyll maximum is observed, the mid-depth sampling event is associated with this layer. The screened phytoplankton samples were filtered through 20-µm Nitrex mesh to retain and concentrate larger dinoflagellate species. Zooplankton samples were collected by oblique tows using a 102-µm mesh at all plankton stations. Detailed methods of sample collection, processing, and analysis are available in the CW/QAPP (Albro *et al*. 1998).

Final plankton values were derived from each station by first averaging analytical replicates, then averaging station visits. Regional results were summarized for total phytoplankton, total centric diatoms, nuisance algae (*Alexandrium tamarense, Phaeocystis pouchetii,* and *Pseudo-nitzschia pungens*), and total zooplankton (Tables 3-2 through 3-10).

Results for total phytoplankton and centric diatoms reported in Tables 3-1 through 3-10 are restricted to whole water surface samples. Results of the nuisance species *Phaeocystis pouchetii* and *Pseudo-nitzschia pungens* include the maximum of both whole water and screened analyses, at both the surface and mid-depth. Although the size and shape of both taxa might allow them to pass through the Nitex screen, both have colonial forms that in low densities might be overlooked in the whole-water samples. For *Alexandrium tamarense*, only the screened samples were reported.

3.6 Additional Data

Two additional data sources were utilized during interpretation of HOM Program semi-annual water column data. Temperature and chlorophyll a satellite images collected near survey dates were preliminarily interpreted for evidence of surface water events, including intrusions of surface water masses from the Gulf of Maine and upwelling (Appendix I). U.S. Geological Service continuous temperature and salinity data were collected from a mooring located between nearfield stations N21 and N18 (Figure 1-1). Daily temperature and salinity data from ~20 m below surface and ~1 m above bottom are plotted in Figure 3-1. Chlorophyll *a* data (as measured by *in situ* fluorescence) from the MWRA Wetlab sensor mounted at mid-depth (~13 m below surface) on the nearfield USGS mooring are plotted in Figure 3-2.

Table 3-1. Method Detection Limits

Analysis	MDL
Dissolved ammonia (NH_4)	0.02 µM
Dissolved inorganic nitrate (NO_3)	0.01 µM
Dissolved inorganic nitrite (NO_2)	0.01 µM
Dissolved inorganic phosphorus (PO_4)	0.01 µM
Dissolved inorganic silicate (SIO_4)	0.02 µM
Dissolved organic carbon (DOC)	20 µM
Total dissolved nitrogen (TDN)	1.43 µM
Total dissolved phosphorus (TDP)	0.04 µM
Particulate carbon (POC)	5.27 µM
Particulate nitrogen (PON)	0.75 µM
Particulate phosphorus (PARTP)	0.04 µM
Biogenic silica (BIOSI)	0.32 µM
Urea	0.2 µM
Chlorophyll *a* and phaeophytin (EDL)	0.036 µg L^{-1}
Total suspended solids (TSS)	0.1 mg L^{-1}

Table 3-2. Nearfield Survey WN99A (Aug 99) Data Summary

Region		Nearfield		
Parameter		**Min**	**Max**	**Avg**
In Situ				
Temperature	C	6.5	21.7	12.6
Salinity	PSU	30.8	32.2	31.7
Sigma _T		21.5	25.2	23.8
Beam Attenuation	m-1	0.53	2.67	1.12
DO Concentration	mg/L	7.4	10.8	9.0
DO Saturation	PCT	75.5	138.5	103.8
Fluorescence	ug/L	0.06	16.30	2.90
Chlorophyll a	ug/L	NA	NA	NA
Phaeopigment	ug/L	NA	NA	NA
Nutrients				
NH4	uM	0.05	3.83	0.97
NO2	uM	0.01	0.44	0.15
NO2+NO3	uM	0.01	7.66	1.92
PO4	uM	0.05	1.01	0.55
SIO4	uM	0.53	9.83	4.54
BIOSI	uM	0.1	3.5	0.9
DOC	uM	173.9	600.8	301.7
PARTP	uM	0.12	0.69	0.31
POC	uM	1.2	9.7	4.3
PON	uM	0.26	1.22	0.76
TDN	uM	12.1	25.7	16.0
TDP	uM	0.29	1.20	0.70
TSS	ug/L-1	NA	NA	NA
Urea	uM	0.3	0.8	0.5
Productivity				
Alpha	ALPHA	0.02	0.15	0.08
Pmax	mgCm-3h-1	0.76	23.20	9.29
Areal Production	mgCm-2d-1	1415.1	1989.4	1702.2
Chlorophyll Specific Areal Production	mgC(mg Chla)-1m-2d-1	608.0	1030.6	819.3
Respiration	uM/hr	0.01	0.27	0.15
Plankton				
Total Phytoplankton	E6CELLS/L	0.78	4.63	
Centric diatoms	E6CELLS/L	0.02	0.29	
Alexandrium tamarense	CELLS/L	ND	ND	
Phaeocystis pouchettii	CELLS/L	ND	ND	
Psuedo-nitzschia pungens	E6CELLS/L	ND	ND	
Total Zooplankton	ind/m3	185832.12	233072.05	

NA = Data not available due to samples loss
ND = Not detected in the sample.

Table 3-3. Combined Farfield/Nearfield Survey WF99B (Aug 99) Data Summary

		Farfield								
Region		**Boundary**			**Cape Cod Bay**			**Coastal**		
Parameter	**Unit**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**
In Situ										
Temperature	C	5.03	18.67	11.06	7.55	19.24	13.62	8.85	17.31	13.68
Salinity	PSU	31.6	32.4	32.0	31.5	32.1	31.7	31.3	32.0	31.7
Sigma _T		22.5	25.5	24.3	22.3	24.9	23.7	22.8	24.7	23.6
Beam Attenuation	m-1	0.51	1.36	0.87	0.70	1.60	1.09	0.73	1.83	1.12
DO Concentration	mg/L	7.43	9.61	8.24	6.11	10.17	7.88	6.51	9.49	7.78
DO Saturation	PCT	74.1	120.3	92.2	62.8	115.5	92.6	69.6	119.7	91.7
Fluorescence	ug/L	0.09	8.68	3.83	0.05	8.83	3.40	0.04	19.32	4.69
Chlorophyll a	ug/L	0.09	5.78	2.44	0.33	6.54	2.77	3.62	3.62	3.62
Phaeopigment	ug/L	0.16	0.89	0.46	0.06	0.61	0.30	1.26	1.26	1.26
Nutrients										
NH4	uM	0.06	1.79	0.42	0.21	4.97	1.79	0.14	13.52	3.47
NO2	uM	0.01	0.19	0.08	0.01	0.35	0.13	0.02	0.48	0.24
NO2+NO3	uM	0.06	12.24	5.64	0.10	3.38	1.16	0.11	6.22	2.27
PO4	uM	0.20	1.40	0.80	0.31	1.26	0.68	0.27	1.39	0.87
SIO4	uM	1.03	15.51	6.65	1.86	22.23	7.59	0.32	11.96	6.55
BIOSI	uM	1.1	1.7	1.3	0.1	3.4	1.5	1.0	3.4	2.40
DOC	uM	158.5	230.5	194.4	143.0	276.2	203.3	153.0	249.6	188.8
PARTP	uM	0.08	0.36	0.25	0.17	0.54	0.28	0.13	0.42	0.32
POC	uM	19.0	52.9	38.7	23.1	56.0	39.0	26.1	113.3	44.5
PON	uM	2.44	6.79	4.76	3.24	6.55	5.10	4.66	12.50	6.23
TDN	uM	12.3	21.51	16.74	11.36	17.95	14.16	13.65	29.20	21.49
TDP	uM	0.45	1.20	0.81	0.66	1.37	0.95	0.61	1.84	1.32
TSS	ug L-1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Urea	uM	0.3	0.3	0.3	0.1	0.3	0.2	0.3	0.7	0.4
Productivity										
Alpha	ALPHA									
Pmax	mgCm-3h-1									
Areal Production	mgCm-2d-1									
Chlorophyll Specific Areal Production	mgC(mg Chla)-1m-2d-1									
Respiration	uM/hr									
Plankton										
Total Phytoplankton	E6CELLS/L	2.087	2.521		0.687	1.216		0.784	3.056	
Centric diatoms	E6CELLS/L	1.168	1.219		0.025	0.176		0.280	2.170	
Alexandrum tamarense	CELLS/L	ND	ND		ND	ND		ND	ND	
Phaeocystis pouchettii	CELLS/L	ND	ND		ND	ND		ND	ND	
Psuedo-nitzschia pungens	E6CELLS/L	ND	ND		ND	ND		ND	ND	
Total Zooplankton	ind/m3	78236.30	78236.30		70892.31	83241.29		15151.02	57828.96	

NA = Data not available due to sample loss.
ND = Not detected in the sample.

Table 3-3. Combined Farfield/Nearfield Survey WF99B (Aug 99) Data Summary (continued)

		Farfield								
Region		**Harbor**			**Offshore**			**Nearfield**		
Parameter	**Unit**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**
In Situ										
Temperature	C	12.30	18.00	15.80	6.36	18.20	11.41	6.96	18.50	11.90
Salinity	PSU	31.1	31.8	31.4	31.5	32.3	31.9	31.0	32.2	31.8
Sigma _T		22.3	24.0	23.1	22.7	25.4	24.2	22.3	25.2	24.0
Beam Attenuation	m-1	1.00	2.09	1.53	0.47	2.00	0.88	0.51	2.01	0.93
DO Concentration	mg/L	6.79	8.54	7.34	6.87	10.09	8.23	6.94	10.93	8.15
DO Saturation	PCT	80.3	104.6	89.7	73.1	127.0	92.8	72.7	129.5	92.5
Fluorescence	ug/L	0.60	12.16	4.68	0.34	16.90	4.99	0.08	20.96	5.54
Chlorophyll a	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phaeopigment	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nutrients										
NH4	uM	1.32	17.33	10.27	0.06	2.18	0.57	0.21	3.81	1.26
NO2	uM	0.15	0.48	0.37	0.01	0.44	0.15	0.01	0.47	0.23
NO2+NO3	uM	1.26	4.02	3.07	0.02	11.50	4.44	0.01	9.70	3.70
PO4	uM	0.59	1.66	1.25	0.19	1.28	0.78	0.16	1.32	0.79
SIO4	uM	4.14	10.52	8.55	0.41	12.83	5.77	0.52	11.40	5.91
BIOSI	uM	1.2	4.5	3.2	1.3	1.9	1.6	0.7	4.3	2.0
DOC	uM	175.7	416.2	268.8	155.9	301.6	238.8	11.2	546.4	228.8
PARTP	uM	0.32	0.73	0.54	0.17	0.25	0.21	0.08	0.59	0.31
POC	uM	19.4	56.7	41.9	19.6	43.3	34.5	8.8	189.2	52.4
PON	uM	3.64	9.57	7.04	3.37	6.49	5.07	1.90	11.00	5.99
TDN	uM	14.1	36.3	26.9	11.7	16.1	14.5	11.0	22.4	16.2
TDP	uM	0.70	1.88	1.38	0.43	1.18	0.88	0.43	1.28	0.89
TSS	ug L-1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Urea	uM	0.32	0.72	0.55	0.22	0.45	0.34	0.12	0.32	0.16
Productivity										
Alpha	ALPHA	0.04	0.11	0.08				0.02	0.36	0.13
Pmax	mgCm-3h-1	8.43	21.10	15.10				0.39	47.70	17.90
Areal Production	mgCm-2d-1	1410.9	1410.9	1410.9				939.8	984.1	962.0
Chlorophyll Specific Areal Production	mgC(mg Chla)-1m-2d-1	377.6	377.6	377.6				358.9	368.2	363.6
Respiration	uM/hr	0.11	0.19	0.15	0.03	0.18	0.10	0.02	0.32	0.16
Plankton										
Total Phytoplankton	E6CELLS/L	1.385	3.250		1.089	2.105		1.155	2.507	
Centric diatoms	E6CELLS/L	0.322	1.884		0.543	1.316		0.062	1.179	
Alexandrum tamarense	CELLS/L	ND	ND		ND	ND		ND	ND	
Phaeocystis pouchettii	CELLS/L	ND	ND		ND	ND		ND	ND	
Psuedo-nitzschia pungens	E6CELLS/L	ND	ND		ND	ND		ND	ND	
Total Zooplankton	ind/m3	18526.32	49078.45		67486.82	67486.82		41441.88	79529.68	

NA = Data not available due to sample loss.
ND = Not detected in the sample.

Table 3-4. Nearfield Survey WN99C (Sep 99) Data Summary

Region		**Nearfield**		
Parameter		**Min**	**Max**	**Avg**
In Situ				
Temperature	C	7.87	20.6	14.3
Salinity	PSU	31.3	32.3	31.9
Sigma _T		22.0	25.1	23.6
Beam Attenuation	m-1	0.54	1.95	0.93
DO Concentration	mg/L	4.94	10.22	7.04
DO Saturation	PCT	54.9	123.5	83.2
Fluorescence	ug/L	0.01	58.23	12.05
Chlorophyll a	ug/L	0.44	53.77	16.28
Phaeopigment	ug/L	0.07	4.26	1.84
Nutrients				
NH4	uM	0.12	4.80	1.51
NO2	uM	0.01	0.50	0.20
NO2+NO3	uM	0.04	11.60	3.87
PO4	uM	0.22	1.49	0.85
SIO4	uM	0.20	16.53	6.94
BIOSI	uM	0.2	2.6	1.4
DOC	uM	145.8	270.8	190.0
PARTP	uM	0.09	0.54	0.26
POC	uM	7.26	172.0	50.0
PON	uM	1.16	24.64	6.96
TDN	uM	10.7	26.9	17.5
TDP	uM	0.50	1.57	1.052
TSS	ug L-1	NA	NA	NA
Urea	uM	0.2	0.8	0.46
Productivity				
Alpha	ALPHA	0.017	0.11	0.055
Pmax	mgCm-3h-1	0.39	20.19	6.42
Areal Production	mgCm-2d-1	600.8	1256.2	928.5
Chlorophyll Specific Areal Production	mgC(mg Chla)-1m-2d-1	94.1	98.8	96.4
Respiration	uM/hr	0.00	0.13	0.09
Plankton				
Total Phytoplankton	E6CELLS/L	1.018	1.242	
Centric diatoms	E6CELLS/L	0.046	0.321	
Alexandrium tamarense	CELLS/L	ND	ND	
Phaeocystis pouchettii	CELLS/L	ND	ND	
Psuedo-nitzschia pungens	E6CELLS/L	ND	ND	
Total Zooplankton	ind/m3	32751.42	66309.98	

NA = Data not available due to sample loss.
ND = Not detected in the sample.

Table 3-5. Nearfield Survey WN99D (Sep 99) Data Summary

Region		**Nearfield**		
Parameter		**Min**	**Max**	**Avg**
In Situ				
Temperature	C	9.3	15.8	14.3
Salinity	PSU	31.3	32.5	31.9
Sigma _T		23.0	25.1	23.7
Beam Attenuation	m-1	0.69	1.75	0.95
DO Concentration	mg/L	5.90	8.5	7.67
DO Saturation	PCT	64.4	103.2	91.6
Fluorescence	ug/L	1.58	35.46	11.16
Chlorophyll a	ug/L	0.48	44.81	13.53
Phaeopigment	ug/L	0.01	3.29	1.28
Nutrients				
NH4	uM	0.03	7.22	1.13
NO2	uM	0.010	0.33	0.12
NO2+NO3	uM	0.02	9	1.78
PO4	uM	0.230	1.35	0.60
SIO4	uM	1.97	15.07	5.70
BIOSI	uM	0.3	5.3	2.3
DOC	uM	162.7	1005.7	398.7
PARTP	uM	0.08	0.48	0.24
POC	uM	9.6	100.0	38.7
PON	uM	1.45	9.00	4.72
TDN	uM	8.4	29.4	15.2
TDP	uM	0.54	1.31	0.82
TSS	ug L-1	0.25	2.50	1.06
Urea	uM	0.1	0.3	0.2
Productivity				
Alpha	ALPHA	0.01	0.10	0.05
Pmax	mgCm-3h-1	0.19	5.5	3.13
Areal Production	mgCm-2d-1	455.8	743.1	599.5
Chlorophyll Specific Areal Production	mgC(mg Chla)-1m-2d-1	30.4	49.3	39.8
Respiration	uM/hr	0.04	0.21	0.14
Plankton				
Total Phytoplankton	E6CELLS/L	0.900	1.220	
Centric diatoms	E6CELLS/L	0.050	0.130	
Alexandriium tamarense	CELLS/L	ND	ND	
Phaeocystis pouchettii	CELLS/L	ND	ND	
Psuedo-nitzschia pungens	E6CELLS/L	ND	ND	
Total Zooplankton	ind/m3	19536.84	20424.80	

ND = Not detected in the sample.

Table 3-6. Combined Farfield/Nearfield Survey WF99E (Oct 99) Data Summary

		Farfield								
Region		**Boundary**			**Cape Cod Bay**			**Coastal**		
Parameter	**Unit**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**
In Situ										
Temperature	C	7.87	14.4	12.3	11.13	14.58	14.0	10.85	12.1	11.5
Salinity	PSU	31.6	32.7	32.0	31.8	32.13	31.8	31.4	32.1	31.8
Sigma _T		23.6	25.5	24.2	23.6	24.52	23.8	23.8	24.5	24.2
Beam Attenuation	m-1	0.79	1.47	1.03	1.01	1.61	1.23	1.02	1.75	1.26
DO Concentration	mg/L	6.43	8.5	7.61	6.03	8.39	7.95	6.95	8.37	7.71
DO Saturation	PCT	67.0	100.4	87.3	67.2	100.32	94.1	76.73	95.20	86.2
Fluorescence	ug/L	2.10	13.51	6.66	0.28	13.67	9.55	0.02	16.70	7.17
Chlorophyll a	ug/L	0.32	6.13	3.46	5.15	15.59	11.01	1.35	6.25	2.86
Phaeopigment	ug/L	0.34	1.16	0.76	0.31	1.16	0.65	0.31	1.36	0.88
Nutrients										
NH4	uM	0.30	4.02	0.92	0.28	2.66	0.91	0.23	14.61	4.63
NO2	uM	0.01	0.15	0.07	0.01	0.13	0.05	0.18	0.74	0.49
NO2+NO3	uM	0.02	11.0	3.08	0.015	1.05	0.26	1.44	8.3	4.98
PO4	uM	0.34	1.33	0.66	0.28	0.73	0.45	0.56	1.69	1.03
SIO4	uM	2.54	14.0	6.06	3.56	9.70	6.08	5.01	15.09	10.24
BIOSI	uM	0.6	0.7	0.7	1.0	3.6	1.7	2	3.50	2.7
DOC	uM	156.8	345.3	279.0	150.8	388.7	231.8	163.7	369.1	264.1
PARTP	uM	0.16	0.34	0.27	0.37	0.55	0.47	0.20	0.36	0.30
POC	uM	13.4	43.7	32.9	49.5	93.3	66.5	10.3	39.30	26.9
PON	uM	1.86	5.27	4.12	6.03	10.40	7.51	1.86	5.18	3.89
TDN	uM	9.0	18.9	13.4	10.4	21.1	14.1	15.2	34.5	24.6
TDP	uM	0.62	1.34	0.86	0.64	1.07	0.79	1.12	1.87	1.46
TSS	ug L-1	2.56	5.62	4.18	2.90	6.03	3.96	2.26	8.05	4.83
Urea	uM	0.62	0.76	0.70	0.30	0.59	0.42	0.16	0.62	0.47
Productivity										
Alpha	ALPHA									
Pmax	mgCm-3h-1									
Areal Production	mgCm-2d-1									
Chlorophyll Specific Areal Production	mgC(mg Chla)-1m-2d-1									
Respiration	uM/hr									
Plankton										
Total Phytoplankton	E6CELLS/L	1.520	1.576		0.721	1.01		0.471	1.290	
Centric diatoms	E6CELLS/L	0.039	0.052		0.027	0.07		0.063	0.290	
Alexandrium tamarense	CELLS/L	ND	ND		ND	ND		ND	ND	
Phaeocystis pouchettii	CELLS/L	ND	ND		ND	ND		ND	ND	
Psuedo-nitzschia pungens	E6CELLS/L	ND	ND		ND	ND		ND	ND	
Total Zooplankton	ind/m3	29257.14	29257.14		37213.25	38869.54		3549.09	17098.51	

ND = Not detected in the sample.

Table 3-6. Combined Farfield/Nearfield Survey WF99E (Oct 99) Data Summary (continued)

		Farfield						Nearfield		
Region		**Harbor**			**Offshore**					
Parameter	**Unit**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**
In Situ										
Temperature	C	12.0	12.5	12.3	8.47	12.2	10.7	9.45	14.0	13.0
Salinity	PSU	29.9	31.6	31.0	31.9	32.7	32.2	31.8	32.5	32.0
Sigma _T		22.6	23.9	23.4	24.2	25.4	24.7	23.8	25.1	24.1
Beam Attenuation	m-1	1.25	2.66	1.79	0.61	1.26	0.97	0.62	1.45	0.93
DO Concentration	mg/L	7.06	7.71	7.52	5.58	8.67	7.20	5.93	8.6	7.82
DO Saturation	PCT	80.0	87.5	85.3	59.5	98.9	79.7	63.8	100.4	90.8
Fluorescence	ug/L	0.66	4.52	2.77	1.56	15.64	8.21	0.35	14.5	6.00
Chlorophyll a	ug/L	1.82	3.78	2.49	1.84	6.59	5.44	0.29	8.48	3.94
Phaeopigment	ug/L	0.76	1.40	1.07	0.53	1.33	0.97	0.33	1.55	0.93
Nutrients										
NH4	uM	12.9	20.0	15.8	NA	1.33	0.65	0.02	9.30	0.86
NO2	uM	0.51	1.01	0.74	0.070	0.39	0.23	NA	0.58	0.13
NO2+NO3	uM	4.70	8.4	6.62	0.60	12.15	6.00	NA	11	1.78
PO4	uM	1.38	1.72	1.53	0.50	1.38	0.95	0.35	1.44	0.62
SIO4	uM	10.44	16.1	13.0	3.54	17.62	10.07	2.39	14.43	4.83
BIOSI	uM	0.9	3.5	2.4	1.9	3.1	2.67	0.6	3.8	1.44
DOC	uM	187.4	387	271.2	188.7	280.3	223.7	144.5	435.3	247.0
PARTP	uM	0.28	0.43	0.37	0.21	0.41	0.32	0.10	0.41	0.24
POC	uM	21.40	30.50	26.6	15.0	46.9	31.9	9.81	56.9	30.2
PON	uM	3.59	4.64	4.17	2.28	6.04	4.36	1.79	6.69	4.4
TDN	uM	30.60	44.4	36.4	8.3	17.5	11.8	8.2	25.0	14.1
TDP	uM	1.71	2.02	1.81	0.80	0.98	0.86	0.58	1.48	0.89
TSS	ug/L-1	0.60	7.10	4.23	3.33	4.45	3.74	0.63	5.47	3.24
Urea	uM	0.29	1.55	0.71	0.1	0.16	0.13	0.16	0.43	0.34
Productivity										
Alpha	ALPHA	0.04	0.05	0.04				0.01	0.12	0.08
Pmax	mgCm-3h-1	6.97	17.17	9.904				1.06	14.4	8.4
Areal Production	mgCm-2d-1	465.7	465.7	465.7				1078.9	1091.5	1085.2
Chlorophyll Specific Areal Production	mgC(mg Chla)-1m-2d-1	157.7	157.7	157.7				221.0	251.3	236.1
Respiration	uM/hr	0.10	0.13	0.11	0.04	0.14	0.08	0.03	0.16	0.12
Plankton										
Total Phytoplankton	E6CELLS/L	0.660	1.251		1.092	1.424		0.434	1.223	
Centric diatoms	E6CELLS/L	0.074	0.189		0.243	0.265		0.020	0.256	
Alexandrium tamarense	CELLS/L	ND	ND		ND	ND		ND	ND	
Phaeocystis pouchettii	CELLS/L	ND	ND		ND	ND		ND	ND	
Psuedo-nitzschia pungens	E6CELLS/L	ND	ND		ND	ND		ND	ND	
Total Zooplankton	ind/m3	2312.81	9887.57		32419.81	32419.81		15962.35	26531.40	

ND = Not detected in the sample.

Table 3-7. Nearfield Survey WN99F (Oct 99) Data Summary

Region		Nearfield		
Parameter	**Unit**	**Min**	**Max**	**Avg**
In Situ				
Temperature	C	8.8	12.2	11.0
Salinity	PSU	31.6	32.6	32.1
Sigma _T		24.1	25.3	24.5
Beam Attenuation	m-1	0.69	5.33	1.11
DO Concentration	mg/L	5.68	8.69	7.43
DO Saturation	PCT	60.5	98.4	82.8
Fluorescence	ug/L	0.01	13.92	4.78
Chlorophyll a	ug/L	0.12	9.00	4.25
Phaeopigment	ug/L	0.21	1.57	0.75
Nutrients				
NH4	uM	0.21	6.62	1.39
NO2	uM	0.08	0.63	0.30
NO2+NO3	uM	0.86	12.30	5.63
PO4	uM	0.56	1.46	0.94
SIO4	uM	5.24	17.50	10.24
BIOSI	uM	1.3	4.6	2.8
DOC	uM	138.1	446.3	232.4
PARTP	uM	0.10	0.40	0.25
POC	uM	7.1	38.5	22.8
PON	uM	1.40	6.58	4.12
TDN	uM	11.70	31.6	19.7
TDP	uM	0.82	1.66	1.19
TSS	ug/L-1	1.23	7.00	3.68
Urea	uM	0.69	2.01	1.15
Productivity				
Alpha	ALPHA	NA	0.25	0.14
Pmax	mgCm-3h-1	0.41	26.74	16.14
Areal Production	mgCm-2d-1	1663.5	1780.7	1722.1
Chlorophyll Specific Areal Production	mgC(mg Chla)-1m-2d-1	210.9	262.3	236.6
Respiration	uM/hr	0.02	0.12	0.08
Plankton				
Total Phytoplankton	E6CELLS/L	1.192	1.729	
Centric diatoms	E6CELLS/L	0.315	0.541	
Alexandrium tamarense	CELLS/L	ND	ND	
Phaeocystis pouchettii	CELLS/L	ND	ND	
Psuedo-nitzschia pungens	E6CELLS/L	ND	ND	
Total Zooplankton	ind/m3	29749.77	29872.65	

ND = Not detected in the sample.

Table 3-8. Nearfield Survey WN99G (Nov 99) Data Summary

Region		Nearfield		
Parameter		**Min**	**Max**	**Avg**
In Situ				
Temperature	C	8.45	9.69	9.04
Salinity	PSU	31.9	32.7	32.3
Sigma _T		24.6	25.4	25.0
Beam Attenuation	m-1	0.55	1.86	0.84
DO Concentration	mg/L	5.80	9.25	8.03
DO Saturation	PCT	61.4	99.1	85.6
Fluorescence	ug/L	0.70	7.75	3.22
Chlorophyll a	ug/L	1.09	7.17	3.54
Phaeopigment	ug/L	0.26	1.99	0.65
Nutrients				
NH4	uM	0.03	8.52	1.64
NO2	uM	0.23	0.64	0.35
NO2+NO3	uM	3.26	11.98	5.97
PO4	uM	0.73	1.50	1.02
SIO4	uM	3.20	17.67	7.32
BIOSI	uM	1.00	6.40	2.57
DOC	uM	146.6	238.50	184.9
PARTP	uM	0.08	0.43	0.21
POC	uM	8.11	38.10	24.42
PON	uM	1.39	5.76	3.66
TDN	uM	12.9	23.2	18.7
TDP	uM	0.94	1.46	1.18
TSS	ug L-1	0.05	7.98	3.18
Urea	uM	0.4	0.69	0.54
Productivity				
Alpha	ALPHA	0.02	0.14	0.07
Pmax	mgCm-3h-1	1.72	9.94	5.94
Areal Production	mgCm-2d-1	498.6	614.1	556.3
Chlorophyll Specific Areal Production	mgC(mg Chla)-1m-2d-1	96.4	121.90	109.1
Respiration	uM/hr	0.01	0.08	0.05
Plankton				
Total Phytoplankton	E6CELLS/L	0.551	0.887	
Centric diatoms	E6CELLS/L	0.130	0.151	
Alexandrium tamarense	CELLS/L	ND	ND	
Phaeocystis pouchettii	CELLS/L	ND	ND	
Psuedo-nitzschia pungens	E6CELLS/L	ND	ND	
Total Zooplankton	ind/m3	30710.45	42370.71	

ND = Not detected in the sample.

Table 3-9. Nearfield Survey WN99H (Dec 99) Data Summary

Region		Nearfield		
Parameter		**Min**	**Max**	**Avg**
In Situ				
Temperature	C	5.50	7.89	7.13
Salinity	PSU	31.8	32.5	32.3
Sigma _T		25.1	25.4	25.3
Beam Attenuation	m-1	0.70	1.53	0.98
DO Concentration	mg/L	7.28	9.59	8.99
DO Saturation	PCT	74.3	96.8	91.7
Fluorescence	ug/L	NA	NA	NA
Chlorophyll a	ug/L	0.06	3.08	1.86
Phaeopigment	ug/L	0.19	1.91	0.47
Nutrients				
NH4	uM	0.05	7.89	1.90
NO2	uM	0.12	0.53	0.26
NO2+NO3	uM	5.34	9.67	6.65
PO4	uM	0.73	1.36	0.98
SIO4	uM	4.89	9.87	6.23
BIOSI	uM	1.9	4.1	2.7
DOC	uM	131.7	397.9	204.5
PARTP	uM	0.13	0.26	0.17
POC	uM	14.5	21.0	17.6
PON	uM	2.22	3.16	2.65
TDN	uM	15.4	34.7	21.5
TDP	uM	1.03	1.56	1.24
TSS	ug/L-1	1.93	8.38	3.74
Urea	uM	0.04	0.32	0.19
Productivity				
Alpha	ALPHA	0.02	0.07	0.05
Pmax	mgCm-3h-1	4.27	7.25	5.6
Areal Production	mgCm-2d-1	388.5	434.86	411.7
Chlorophyll Specific Areal Production	mgC(mg Chla)-1m-2d-1	164.3	306.1	235.2
Respiration	uM/hr	0.01	0.10	0.05
Plankton				
Total Phytoplankton	E6CELLS/L	0.297	0.918	
Centric diatoms	E6CELLS/L	0.057	0.179	
Alexandrium tamarense	CELLS/L	ND	ND	
Phaeocystis pouchettii	CELLS/L	ND	ND	
Psuedo-nitzschia pungens	E6CELLS/L	ND	ND	
Total Zooplankton	ind/m3	23543.78	27386.05	

NA = Data not available due to sample loss.
ND = Not detected in the sample.

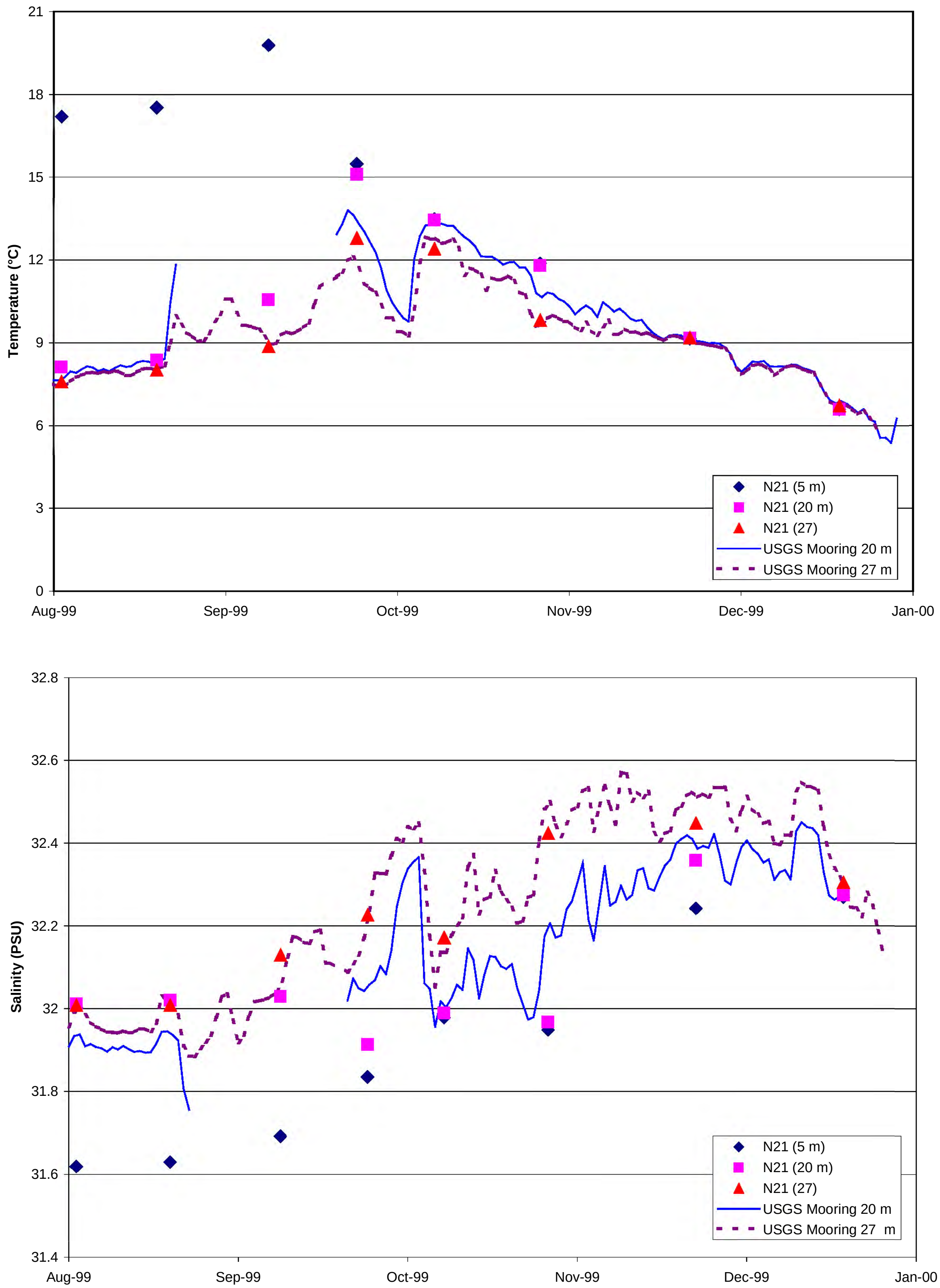


Figure 3-1. USGS Temperature and Salinity Mooring Data Compared with Station N21 Data from Comparable Depths

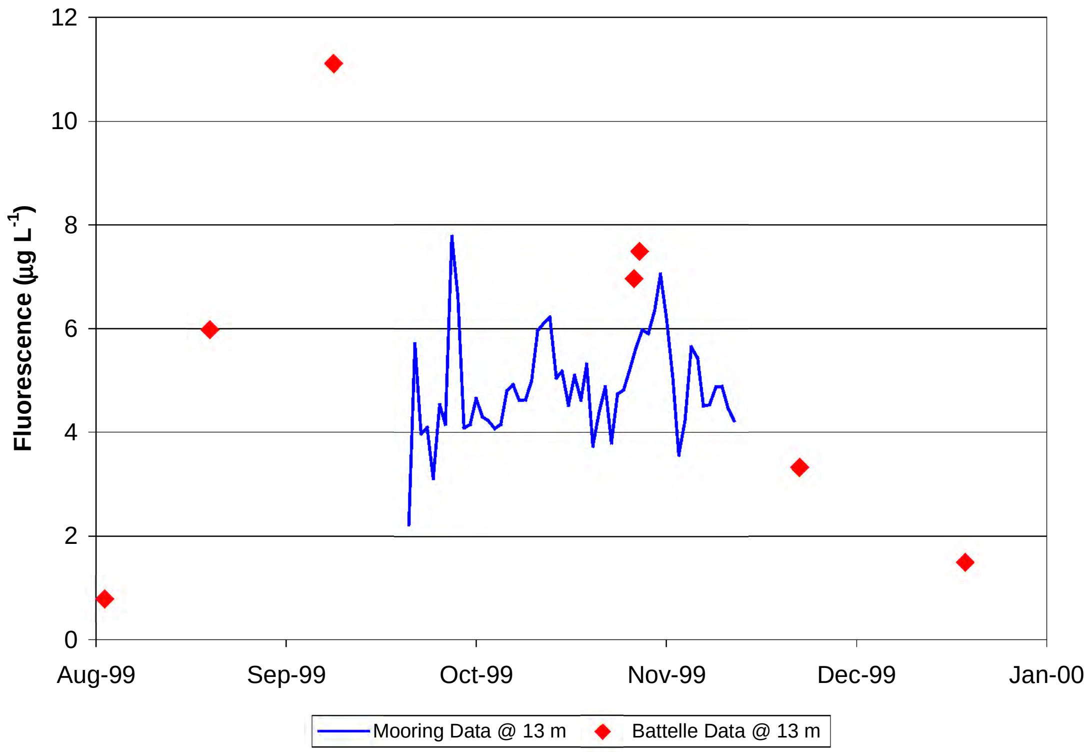


Figure 3-2. MWRA and Battelle *In Situ* Wetstar Fluorescence Data (MWRA Data Acquired at ~13 m on USGS Mooring and Battelle Data Acquired at 12.5 to 13.5 m at Station N21)

4.0 RESULTS OF WATER COLUMN MEASUREMENTS

Data presented in this section are organized by type of data and survey. Physical data, including temperature, salinity, density, and beam attenuation are presented in Section 4.1. Nutrients, chlorophyll a, and dissolved oxygen are discussed in Section 4.2. Finally, a summary of the major results for these water column measurements is provided in Section 4.3.

Two of the eight surveys conducted during this semi-annual period were combined farfield/nearfield surveys. In August during the first combined survey of this period (WF99B), seasonal stratification conditions existed throughout the bays. By October (WF99E), the density gradient was negligible at the nearshore nearfield, coastal, harbor, and Cape Cod stations while offshore stations maintained a clearly defined pycnocline. The change from stratified to well-mixed conditions in the nearfield is illustrated in Figure 4-1. At the western nearfield stations (N01, N10, and N11), the water column had become well mixed with respect to density by early October survey while a density gradient of ~1.0 still existed at the outer nearfield stations. In late October, stormy weather and inputs of freshwater had resulted in a density gradient of 0.5 to 1.0 between surface and bottom water across the nearfield. By late November, the water column had returned to well-mixed winter conditions over the entire nearfield.

The October combined survey WF99E took about three weeks to complete. The Cape Cod Bay and boundary area stations were sampled on October 6th and the nearfield stations and Boston Harbor station F23 on October 8th. The remaining farfield stations were sampled on October 22nd and 28th. For most of the data analyses in this report, time of sampling will not affect interpretation of the data (*e.g*. time series by area, all nearfield only evaluations, period plots). Transect plots and surface contour plots are affected and all interpretations of this data have accounted for temporal variations in sampling.

Data collected during the farfield surveys were evaluated for trends in regional water masses throughout Boston Harbor, Massachusetts Bay, and Cape Cod Bay. The variation of regional surface water properties is presented using contour plots of surface water parameters, derived from the surface (depth A) water sample. Classifying data by regions allows comparison of the horizontal distribution of water mass properties over the farfield area.

The vertical distribution of water column parameters is presented in the following sections along four farfield transects (Boston-Nearfield, Cohassett, Marshfield, and Nearfield-Marshfield) in the survey area, and one transect across the Nearfield (Figure 1-3). Examining data trends along transects provides a three-dimensional perspective of water column conditions during each survey. Nearfield surveys were conducted more frequently than farfield surveys, allowing better temporal resolution of the changes in water column parameters and destabilization of stratified conditions. In addition to the nearfield vertical transect (Figure 1-3), vertical variability in nearfield data is examined and presented by comparing surface and bottom water concentrations (A and E depths) and by plotting individual parameters with depth in the water column. A complete set the surface contour maps, vertical transect plots, and parameter scatter plots is provided in Appendices B, C, and D, respectively.

4.1 Physical Characteristics

4.1.1 Temperature\Salinity\Density

The breakdown of vertical stratification in the fall indicates the change from summer to winter conditions (Figure 4-2). This destabilization of the water column significantly affects a number of water quality parameters during this time period. From September through October, the water column begins to become less stratified and nutrients from the bottom waters become available to phytoplankton in the surface and mid-water depths. This often leads to the development of a fall bloom. Phytoplankton production and further mixing of the water column also serve to increase bottom water dissolved oxygen concentrations, which tend to decrease from early June through October.

The pycnocline weakens as surface water temperature declines and late fall/early winter storms increase wind-forced mixing. As mentioned above, the surface and bottom water density data collected during the combined surveys indicated that seasonal stratification had deteriorated at the coastal stations and weakened throughout the region by the October survey. Nearfield survey activities provide a more detailed evaluation of the fall/winter overturn of the water column. For the purposes of this report, vertical stratification is defined by the presence of a pycnocline with a density (σ_t) gradient of greater than 1.0 over a relatively narrow depth range (~10 m). Using this definition, the data indicate that the pycnocline began to break down in the inner nearfield region by October (WF99E), but the water column at the outer nearfield stations was not well mixed until late November (Figure 4-2).

4.1.1.1 Horizontal Distribution

In early August (WN99A), surface water temperatures exceeded 20°C over most of the nearfield and reached a maximum temperature of 21.7°C at station N19. By late August (WF99B), surface water temperatures ranged from 15.0 to 18.5°C across the nearfield with the minimum temperature observed along the eastern edge of the nearfield at station N06 (Figure 4-3). This was the coolest surface temperature recorded during the survey. Warmer surface temperatures were found in southeastern Massachusetts Bay and reached a maximum of 19.2°C at station F02 in Cape Cod Bay. Although no clear pattern was observed in the surface temperature, cooler surface water temperatures (15-17°C) were generally observed in the coastal waters.

Surface water salinity was fairly uniform throughout the bays ranging from 31.0 PSU at nearfield station N05 to 31.8 PSU at station F26 off Cape Ann (Figure 4-4). Slightly higher surface salinity was observed at the offshore and boundary stations in northeastern Massachusetts Bay (F22, F26, F27 and F28) and may be due to an incursion of more saline water from the Gulf of Maine. Unlike temperature and salinity data from August 1998, no clear upwelling signal of cooler more saline waters was observed for the surface data in the coastal waters. Local climatological data from the National Weather Service station at Logan Airport indicated wind speeds that were slightly below normal for the summer of 1999 and the direction of prevailing winds was inconsistent. Anecdotal evidence suggests that offshore winds speeds were substantially lower than normal and resulted in minimal surf in coastal Massachusetts Bay waters.

During the nearfield surveys conducted in September (WN99C and WN99D), there was little variation in surface temperature or salinity across the nearfield area. In early September, surface water temperatures were somewhat warmer to the north and ranged from 18.7°C at station N08 to 20.6°C at station N13. In late September, surface water temperatures across the nearfield were 15±0.3°C. During both surveys, the surface waters at inshore stations were slightly less saline than at the offshore stations.

The October survey (WF99E) was conducted over the course of three weeks and the change in surface water temperatures over that time are evident in Figure 4-5. The warmest surface temperatures (>14°C) were observed at Cape Cod Bay and boundary area stations, which were sampled on October 6th. Elevated surface temperatures (13-14°C) were also seen across the nearfield that was sampled on October 8th. By the time the remaining farfield stations were sampled, surface temperatures had decreased to approximately 12°C and lower. A similar pattern was not evident in surface salinity (Figure 4-6). Lower surface salinity was observed in Boston Harbor and at the near-harbor coastal stations, but no trends were observed across the rest of the bay. From October 9th to October 21st, more than three inches of rain fell in the area (Figure 4-7) and it was expected that the freshwater signal might appear in the plot of surface salinity. It did not, however, as the only freshwater signal seen was at station F26 off of Cape Ann where less saline surface water was observed on October 6th. This may have been due to increased output from the Merrimack River in late September resulting from an intense rain event associated with Hurricane Floyd that passed through the area on September 15-17 delivering 3.71" of rain over the 3 day period.

During the remaining three nearfield surveys, lower temperatures and lower salinity were observed in the surface waters along the western nearfield. The inshore to offshore gradient for each parameter increased from late October to December.

4.1.1.2 Vertical Distribution

Farfield. The water column was stratified throughout the region during the summer of 1999. By October, the stratified water column conditions had begun to deteriorate and at the shallow, nearshore stations had already become well mixed. As suggested previously, the density gradient ($\Delta\sigma_t$), representing the difference between the bottom and surface water σ_t, can be used as a relative indicator of a mixed or vertically stratified water column. During the August farfield survey (WF99B), the $\Delta\sigma_t$ between surface and bottom waters was >1 throughout the region except at the Boston Harbor stations (Figure 4-8). These stations are shallow and subject to strong tidal mixing. Surface water densities had increased by the October survey across the region and the water column was well mixed at the harbor, coastal and Cape Cod Bay stations. At the offshore area stations, stratification had weakened and $\Delta\sigma_t$ was < 1. Stratification had also weakened at the boundary stations, but the density difference between bottom and surface waters was still >1. For the stations in both the offshore and boundary areas, the density difference was driven by the continued gradient in temperature over the water column. Temperatures had decreased in the surface waters, but there was still a 3-4°C gradient at these deeper stations (Figure 4-9). During both of the combined surveys, there was little variation in salinity over the water column in each area (<0.5 PSU).

The temporal and spatial variability during the seasonal return to well-mixed winter conditions was also illustrated in the vertical contour plots of temperature, salinity, and sigma-T for the Boston-Nearfield, Cohassett, and Marshfield transects (Appendix C). In August, the water column was strongly stratified along each of the transects ($\Delta\sigma_t$ >2; Figure 4-10) and a sharp pycnocline was observed at 10-20 m. The density gradient was driven by temperature, which exhibited a 8-10°C difference between the surface and bottom layers at all but the nearshore stations along each transect (Figure 4-11). An upwelling signature, which is often observed in western Massachusetts Bay in August, was not evident in the temperature and salinity contours. By October, stratification had weakened throughout the region. As mentioned above, $\Delta\sigma_t$ between surface and bottom waters was <1 at the nearshore stations and it appeared that there was an inshore-offshore destabilization of the pycnocline (Figure 4-12). The decrease in $\Delta\sigma_t$ was driven by changes in surface and bottom water temperatures. Decreasing air temperatures cooled the surface waters, while bottom waters continued to be warmed due to mixing with warmer mid-depth waters. This difference between inshore and offshore waters was exaggerated by the extended time period between sampling of the inshore and offshore stations during the October survey.

The return to winter conditions can also be seen by examining the temperature-salinity (T-S) relationship for the region. In Figure 4-13, the T-S plots for the August and October surveys are presented. In August (WF99B), the T-S pattern is indicative of the vertical stratification that exists in the bays during the summer season. Surface water temperatures were generally 16-20°C and there was a strong thermal gradient (8-10°C) between surface and bottom water temperatures across the bays. Salinity varied over a relatively narrow range (31-32.5 PSU) and there was a negative relationship between the parameters as an increase in salinity with depth was coincident with a decrease in temperature. By late October (WF99E), the range in temperatures had decreased (8 to 14°C) as temperatures had decreased in the surface waters and increased at depth. The range in salinity remained about the same though salinity had generally increased by ~0.5 throughout the bays. The T-S pattern at the deeper stations in the Cape Cod Bay, offshore, boundary, and nearfield areas continued to exhibit the summer signature of increasing salinity corresponding to decreasing temperature from the surface to the bottom waters. In Boston Harbor, coastal areas and the western nearfield, the T-S pattern was shifting towards the characteristics of a well-mixed winter water column – minimal variation in salinity or temperature.

Nearfield. The breakdown of seasonal stratification and the return to winter conditions can be observed more clearly from the data collected in the nearfield area. The nearfield surveys are conducted on a more frequent basis and thus provide a more detailed picture of the physical characteristics of the water column. In Figure 4-1, it was evident that the breakdown of stratification proceeded from the shallow inshore stations to the deeper offshore stations. In early October, the inner nearfield and Broad Sound stations (N10, N11 and N01) had become well mixed with $\sigma_t = 24$ for both the surface and bottom waters. In late October, however, after mid October rain events, surface water salinity decreases led to an increase in $\Delta\sigma_t$ of 0.5 to >1.0 across the nearfield. By late November, the nearfield area had returned to well-mixed, winter conditions. Figure 4-14 presents σ_t along the nearfield transect (see Figure 1-3) from September to November showing the inshore to offshore progression in the destabilization of the water column during the fall of 1999. In early September (WN99C), stratified conditions were still present along the entire nearfield transect and the pycnocline was observed at ~10 m though it was not as clearly defined as during the August surveys. In early October, the water column had become well mixed in the western nearfield, but a weak gradient was still present at the eastern nearfield stations. By late November (WN99G), winter physical characteristics were present along the entire nearfield transect, though there was still a small gradient in density between the surface and deep waters at the offshore stations.

The vertical gradient in temperature was very strong (6-10°C) throughout the nearfield from early August to late September (Figure 4-15). The surface temperatures observed at the nearfield stations in mid August were lower than the temperatures observed earlier in the month and in September. Although the data presented in the previous section did not suggest strong upwelling occurred in 1999, the nearfield data suggest that intermittent upwelling events may have brought lower temperature bottom water into the surface layer. To investigate this in more detail, time series contours of temperature were plotted for stations N01, N07 and N10 (Figure 4-16). The time series contours suggest shoaling of the thermocline at each of these stations with cooler waters being observed at shallower depths in August. In Massachusetts Bay, upwelling events occur regularly during the summer due to prevailing winds that blow from the south and southwest. Prevailing winds for August 1999 may not have been as conducive to strong upwelling as they were in 1998, but for the week preceding the WF99B survey the prevailing winds were out of the south-southwest and may have led to moderate upwelling. The meteorological conditions along coastal and offshore waters and their affect on coastal upwelling and mixing will be examined in more detail in the 1999 Annual Water Column Report.

The inner nearfield was well mixed with respect to both temperature and salinity by early October. The gradient in temperature between surface and bottom waters continued to decline at the outer nearfield stations until late November when the water column throughout the region was isothermal. Following the rain in mid October, salinity in the surface waters at the inner nearfield and Broad

Sound stations decreased while bottom water salinity had started to increase. This resulted in a salinity gradient of ~1 PSU at the inner nearfield stations and one of >1.5 PSU at Broad Sound station (Figure 4-17). The gradient in salinity at the Broad Sound station continued to be seen in late November. By December, the entire nearfield had become well mixed with respect to temperature and salinity.

4.1.2 Transmissometer Results

Water column beam attenuation was measured along with the other *in situ* measurements at all nearfield and farfield stations. The transmissometer determines beam attenuation by measuring the percent transmission of light over a given path length in the water. The beam attenuation coefficient (m^{-1}) is indicative of particulate concentration in the water column. The two primary sources of particles in coastal waters are biogenic material (plankton or detritus) and suspended sediments. Beam attenuation data is often evaluated in conjunction with fluorescence data to ascertain the source of the particulate materials (phytoplankton versus detritus or suspended sediments).

In August (WF99B), surface water beam attenuation ranged from 0.70 m^{-1} at station F29 to 2.01 m^{-1} at station N10 (Figure 4-18). The high value at station N10 was coincident with elevated chlorophyll concentration. This was also the case at the other inshore nearfield and coastal stations exhibiting elevated beam attenuation values (>1.5 m^{-1}). As is usually the case, elevated beam attenuation measurements were found at the harbor stations. Generally, there was an inshore to offshore decrease in beam attenuation that was due to elevated harbor and coastal observations. A similar inshore to offshore decrease in surface water beam attenuation was observed during the October farfield survey (Figure 4-19). The highest value was seen at station F31 (1.85 m^{-1}) in Boston Harbor and the lowest value was observed at nearfield station N08 (0.90 m^{-1}). In addition to the high values seen in the harbor and near-harbor coastal waters, beam attenuation was elevated off Cape Ann (stations F26 and F27) and at coastal stations along the south shore. These elevated beam attenuation measurements corresponded to high surface chlorophyll concentrations in these waters.

In general, the vertical and horizontal trends in beam attenuation are dependent upon the input of particulate material from terrestrial sources (inshore stations) and the distribution of chlorophyll/phytoplankton (offshore stations). Figure 4-20 presents beam attenuation data along three of the farfield transects in August (WF99B). These contour plots clearly show the harbor signature of high beam attenuation (station F23) and its impact at nearfield stations. The beam attenuation signal along the Cohassett transect might also be indicative of a terrestrial source, but, upon comparison with fluorescence data along the same transect, it is clear that the elevated beam attenuation values are coincident with high chlorophyll concentrations (Appendix C).

4.2 Biological Characteristics

4.2.1 Nutrients

Nutrient data were preliminarily analyzed using scatter plots of nutrient depth distribution, nutrient/nutrient relationships, and nutrient/salinity relationships (Appendix D). As observed with the physical characteristics, surface water contour maps (Appendix B) and vertical contours of nutrient data from select transects (Appendix C) were also produced to illustrate the spatial variability of these parameters.

The general trend in nutrient concentrations during the 1999 August to December period was similar to previous baseline monitoring years. Nutrients were depleted in the surface waters during the summer and increased in concentration with the change from a stratified to a well-mixed water column. The most noteworthy observation for this time period was the continued presence of elevated concentrations of ammonium in the western nearfield and coastal stations that correlated with high concentrations observed in Boston Harbor. This had also been observed during the fall/winter period of 1998. The source of the ammonium was determined to be an increase in the discharge of ammonium from the Deer Island facility (Libby *et al*. 1999). This increase results from a combination of increased treated sewage flow from the Deer Island Outfall as all sewage from the MWRA system is now treated at the Deer Island facility and the treatment itself. Secondary treatment, which is now fully on line, leads to the breakdown of organic wastes, but one of the consequences or by-products of the secondary treatment process is higher ammonium concentrations in the effluent (Hunt *et al*. 2000).

During this semi-annual period, the highest nutrient concentrations were consistently measured at the harbor and harbor influenced coastal and nearfield stations. In August (WF99B), dissolved inorganic nutrients were generally depleted in the surface waters at the offshore stations in Massachusetts and Cape Cod Bays. By October (WF99E), surface water nutrient concentrations had increased at the harbor and inshore stations while remaining relatively depleted in the nearfield and further offshore. The inshore to offshore gradient was probably accentuated by the delay in sampling between these two areas. During the November and December surveys, very high ammonium concentrations were observed along the western nearfield area. No harbor data were collected in November or December of 1999 for HOM3, but a comparison between HOM3 data and MWRA data from their Boston Harbor monitoring program will be conducted as part of the annual report for 1999.

4.2.1.1 Horizontal Distribution

In August (WF99B), the highest surface nutrient values were found in Boston Harbor [dissolved inorganic nitrogen (DIN) = 20.64 µM, ammonium (NH_4) = 17.33 µM and phosphate (PO_4) = 1.66 µM at station F23 and silicate (SIO_4) = 10.52 µM at station F30] and the nearfield [nitrate (NO_3) = 5.05 µM at station N05]. Nutrient concentrations generally decreased outside of the harbor and away from the coast (Figure 4-21). There were a few areas that did not follow this trend as elevated DIN, NO_3 and SIO_4 concentrations were observed in the northeast corner of the nearfield and at boundary station F27 (Figures 4-22 and 4-23). Nitrate concentrations were depleted throughout much of the nearfield surface waters and at the offshore stations to the south. Silicate and phosphate were also depleted at these coastal and offshore stations along the south shore. The low nutrient concentrations coincided with elevated chlorophyll concentrations and phytoplankton abundance.

By October (WF99E), the distribution of surface nutrient concentrations was influenced by both export of nutrients from Boston Harbor and a two week delay between the first two and last two days of sampling. The highest nutrient concentrations were observed at Boston Harbor station F30 (DIN = 28.35 µM, NH_4 = 19.92 µM and SIO_4 = 16.15 µM) and coastal station F24 that is just offshore of the northern entrance to the harbor (NO_3 = 7.56 µM and PO_4 = 1.69 µM). The harbor signal continued to be observed in DIN distribution with concentrations of >20 µM being seen both within and just outside the harbor (Figure 4-24). The strong gradient from these harbor and coastal stations into the nearfield was primarily driven by very high NH_4 concentrations in the harbor and biological utilization of nearly all DIN in the nearfield surface waters. The signal may have been exacerbated by the delay in sampling between some of these stations, but Boston Harbor station F23 was sampled the same day as the nearfield area so a gradient between the harbor and nearfield did exist early in the month.

DIN concentrations were <1 µM at almost all of the Cape Cod, boundary and nearfield stations sampled on October 6th and 8th, while much higher concentrations were found at the offshore stations (1-4 µM) later in the month (Figure 4-24). This difference in DIN was primarily due to an increase in NO_3 concentrations over the course of the month (Figure 4-25). Nitrate was severely depleted in the surface water at the Cape Cod, boundary and nearfield stations, but by the end of the month concentrations of >1 µM were observed in coastal and offshore waters along the south shore. A similar geographic pattern was observed for SiO_4 and PO_4 concentrations, but these nutrients were not depleted at any of the stations (see Appendix B). The elevated nutrient concentrations along the south shore were coincident with higher surface chlorophyll concentrations. Surface chlorophyll, while not low, was lower than subsurface concentrations in the nearfield, which was likely due to the depletion of DIN in the surface waters and nutrient availability at depth. Following the rain and storm events in mid October, nutrient concentrations increased in surface waters giving rise to elevated chlorophyll concentrations.

The NH_4 concentrations observed in the harbor and coastal waters during the October farfield survey (WF99E) were very high (10-20 µM; Figure 4-26). During the November survey (WN99G), high NH_4 concentrations continued to be present in the western nearfield with an inshore to offshore decrease in concentration away from the harbor (Figure 4-27). This pattern was also evident in December. In comparison to the early winter of 1998, however, the elevated NH_4 concentrations did not translate into unusually high chlorophyll concentrations, though concentrations of ~5 µg L^{-1} were sustained in the nearfield surface waters through late November. The input of NH_4 into coastal and nearfield waters in late summer and early fall, however, may have contributed to the elevated chlorophyll, production and phytoplankton abundances that were observed in August and September 1999.

4.2.1.2 Vertical Distribution

Farfield. The vertical distribution of nutrients was evaluated using vertical contours of nutrient data collected along three transects in the farfield: Boston-Nearfield, Cohassett, and Marshfield (Figure 1-3; Appendix C). During the August combined farfield/nearfield survey (WF99B), nutrient concentrations were low in the surface waters and increased with depth. As observed for NO_3 in Figure 4-28, low concentrations were found throughout the surface layer and increased near the pycnocline and closer to shore. The vertical pattern in NO_3 was closely related to the vertical distribution of chlorophyll (see Section 4.2.2.2). At inshore stations along the Boston-Nearfield and Cohassett transects, NO_3 concentrations were >1 µM in the surface waters and the chlorophyll maximum was observed in the surface waters. At the nearfield stations and along the Marshfield transect, NO_3 was depleted in the surface waters and a subsurface chlorophyll maximum was found.

The vertical distribution of SiO4 was similar to that observed for NO_3 (Figure 4-29). Both sets of figures suggest that there was a shoaling of the pycnocline along the inshore areas of the Boston-Nearfield and Cohassett transects. As mentioned previously, upwelling events are often observed in August in Massachusetts Bay (Libby *et al*. 1999). In 1999, the combination of very high productivity in the nearfield (and perhaps other coastal waters) and less than optimal wind conditions (weak upwelling) may have lessened the strength of the upwelling signal. Time series contour plots of temperature at nearfield stations N01, N07 and N10 (see Figure 4-16) suggested that cooler waters were shoaling in the nearfield in August. Similar plots were examined to evaluate the effect upwelling had on NO_3, PO_4, and SiO_4 concentrations at station N01 (Figure 4-30). Elevated concentrations of each of these nutrients were observed at shallower depths in mid August compared to earlier in August or later in September. The data suggest that even though there may not have been a strong upwelling event during the summer of 1999, cooler more nutrient rich waters were being transported into the surface layer in the nearfield supporting elevated production. The strength and impact of upwelling during the summer of 1999 will be examined more closely in the annual water column report.

In October (WF99E), NO_3 concentrations were low and somewhat depleted in the surface waters at the offshore stations and increased with depth (Figure 4-31). The variation in nutrient concentration related to the timing of sampling events was evident along each of the transects (see Appendix C for

SiO_4 and PO_4). Low surface concentrations and a strong gradient in concentrations at the pycnocline were observed at the nearfield and the boundary stations. Higher concentrations of NO_3, PO_4 and SiO_4 were observed over the entire water column at the inshore stations along each of the transects. Along the Boston-Nearfield transect, the two-week difference in sampling between station F23 and F24 resulted in maximum NO_3, PO_4 and SiO_4 being found at the coastal station rather than in the harbor. The harbor signal of high NH_4, however, was still clearly evident along the Boston-Nearfield transect (Figure 4-32).

Nutrient-salinity plots are useful in distinguishing water mass characteristics and in examining regional linkages between water masses (Appendix D). Dissolved inorganic nitrogen plotted as a function of salinity exhibits a pattern that is often observed during this time period (Figure 4-33). There is a decrease in DIN concentration with increasing salinity at harbor and coastal stations and an increase in DIN from low or depleted surface concentrations at intermediate salinity to high concentrations in the higher salinity, bottom waters. The decreasing trend in DIN concentration at lower salinity is indicative of the dilution of harbor DIN with lower-nutrient, higher-salinity water at coastal and western nearfield stations. The depleted DIN at intermediate salinity and the increase in DIN concentrations with increasing salinity is common during stratified conditions. It results from biological utilization of nutrients in the surface waters and the combination of biological decomposition and nutrient regeneration processes at depth. During both surveys, the harbor was a source of DIN (primarily NH_4 – see Appendix D) to the coastal and western nearfield and summer/stratified conditions were observed throughout the rest of the bays.

Nearfield. The nearfield surveys are conducted more frequently and provide a higher resolution of the temporal variation in nutrient concentrations over the semi-annual period. In previous sections, the transition from summer to winter physical and nutrient characteristics has been discussed. For most of the nearfield, summer conditions of depleted nutrient concentrations in the surface waters existed until late October (WN99F). The progression from summer to winter conditions is illustrated in the series of nearfield transect plots for NO_3 presented in Figures 4-34 and 4-35. In early August (WN99A), NO_3 concentrations were depleted in the surface waters and increased gradually with depth across the nearfield transect (Figure 4-34). A few weeks later, during the August combined survey (WF99B), NO_3 levels were still depleted in surface waters at some stations along the transect, but concentrations had generally increased both at the surface and at depth, perhaps the result of coastal upwelling. By late September, biological utilization had reduced nutrient concentrations to low levels (<1 μM) in the upper 20-m layer across most of the nearfield transect and there was a strong gradient in concentration at depth. Elevated levels continued to be observed at the harbor-influenced station N10. This trend continued to be observed in early October during the second combined survey the period (nearfield stations sampled October 8^{th}). By late October (WN99F), NO_3 concentrations in the surface waters had increased to 1-3 μM across most of the transect (Figure 4-35). Higher values were observed at station N10 and lower values in the surface water at station N04. A strong gradient in NO_3 concentration below the pycnocline continued to be present in late October. By late November, NO_3 concentrations across the nearfield transect had increased to >3μM, but the inshore to offshore and vertical gradients continued to persist, though the gradients were much weaker than those observed during the summer and fall.

Ammonium concentrations were very low along the nearfield transect during the first three surveys of this period. In early August, NH_4 concentrations were <1 μM along most of the nearfield transect even in the surface waters at station N10 (Figure 4-36). In September, NH_4 concentrations continued to be low at the offshore stations, but started to increase closer to shore at stations N10 and N19. By early October (WF99E), high NH_4 concentrations (>7 μM) were observed in the surface and at depth at station N10. Ammonium concentrations further offshore were <1 μM over the entire water column. By December, high NH_4 concentrations were observed across much of the nearfield region.

An examination of the nutrient-nutrient plots showed that surface waters were generally depleted in DIN relative to PO_4 and SiO_4 in the nearfield during this semi-annual period (Appendix D).

4.2.2 Chlorophyll A

Chlorophyll concentrations (based on *in situ* fluorescence measurements) achieved very high levels during this time period. Maximum chlorophyll values were measured in the nearfield during the early September survey WN99C. These levels were not coincident with maximum phytoplankton abundance, which peaked in early August, or maximum production, which peaked in late August (see Sections 5.1 and 5.3, respectively). The high production values observed in the nearfield in late August, however, may have contributed to the elevated chlorophyll concentrations seen in early September. The atypical late summer increase in production and chlorophyll concentrations overshadowed the increased observed during a weak fall bloom in late October (WN99F). High chlorophyll concentrations were also observed in the farfield during the two combined surveys. In August, high chlorophyll concentrations were observed in surface and subsurface waters along a band from the nearfield to the south shore at coastal and western offshore stations. A similar pattern was observed in elevated chlorophyll in October. This may have been related to the storm events that ensued during the two-week delay in the survey. A substantial fall bloom did not develop in the nearfield in 1999, but the chlorophyll and phytoplankton data suggest that there may have been a more significant fall bloom off the coast of southwestern Massachusetts Bay.

4.2.2.1 Horizontal Distribution

During the August combined survey, high surface chlorophyll concentrations were observed in the western nearfield and at inshore stations just to the south of the nearfield (F13, F14, and F15). These areas were coincident with low surface nutrient concentrations and high phytoplankton counts (dominated by centric diatoms). There was a sharp decrease in chlorophyll concentrations further offshore and into Cape Cod Bay (Figure 4-37). The survey maximum chlorophyll concentration was recorded at station N12 (18.0 $\mu g\ L^{-1}$) along the western edge of the nearfield. The lowest surface chlorophyll concentration was seen at Cape Cod station F02 (0.05 $\mu g\ L^{-1}$). Surface chlorophyll concentrations were relatively high in Boston Harbor (3.3-8.7 $\mu g\ L^{-1}$). Station F31 had both the highest harbor chlorophyll and phytoplankton abundance. Overall, the pattern of surface chlorophyll generally corresponded to spatial variations observed in phytoplankton abundance in Massachusetts Bay and the low chlorophyll concentration found in Cape Cod Bay were coincident with low phytoplankton abundance (<1 million cells L^{-1}).

In October (WF99E), surface chlorophyll concentrations ranged from 0.02 $\mu g\ L^{-1}$ at station F24 to 14.29 $\mu g\ L^{-1}$ at station F05. The range was comparable, and the spatial pattern similar, to that seen in August (Figure 4-38). High chlorophyll concentrations were observed along the south shore into Cape Cod Bay, in the western nearfield, and along the north shore extending offshore to stations F22 and F27. This pattern was very similar to that for surface NO_3 (see Figure 4-25) and SiO_4 concentrations, except that the stations in northeastern Massachusetts Bay (F22, F26, and F27) did not exhibit elevated nutrient concentrations concurrent with the higher chlorophyll measurements. The effect of the two week delay in sampling between the first two and last two survey days has been mentioned a number of times. Interestingly, there did not appear to be a substantial effect at these stations in northeastern Massachusetts Bay as they exhibited similar trends with respect to nutrients and chlorophyll, even though station F22 was sampled two weeks after the other two stations. Along the south shore, which was sampled in late October, the elevated NO_3 and SiO_4 concentrations and high surface chlorophyll were coincident with an increase in numbers and relative percentage of the centric diatom *Thalassiosira* sp. [see Figure 5-14a for stations F06, F13 and N16 (farfield day)]. It appears that the survey delay and the rain and storm events of mid October led to a change in nutrient and biological conditions in western Massachusetts Bay, but that water quality conditions further offshore were not influenced.

4.2.2.2 Vertical Distribution

Farfield. Chlorophyll concentrations over the water column were examined along the three east/west farfield transects (Figure 1-3) to compare the vertical distribution of chlorophyll across the region. In August, very high chlorophyll concentrations (>13 $\mu g\ L^{-1}$) were found in the surface waters along the Cohassett transect (Figure 4-39). The layer of high chlorophyll water appears to extend south to the inshore stations along the Marshfield transect and to the north into the nearfield area (Figure 4-40). Phytoplankton data are available for two stations along (N18 and F06) and another station (F13) near the Nearfield-Marshfield transect. At these stations, phytoplankton abundance was relatively high (1.5 to 3 million cells L^{-1}) and the assemblage was dominated by the centric diatom, *Leptoclylindrus danicus*. The lowest phytoplankton abundance for these three stations was observed at nearfield station N18, which had the highest production rate measured in 1999 (~3500 $mgCm^{-2}d^{-1}$). These data suggest the occurrence of a late summer bloom of *L. danicus* was observed in western Massachusetts Bay. Normally, diatom blooms of this magnitude do not occur during the summer, but rather later in the fall in these waters (or during the winter/spring bloom). This will be a topic that is investigated in more detail in the 1999 annual report.

By October (WF99E), production rates had decreased and phytoplankton were less abundant and dominated by microflagellates. Chlorophyll concentrations, however, remained high along each of the transects and were observed over a thick layer extending from the surface to the pycnocline at ~20 m (Figure 4-41). Along the Boston-Nearfield transect, chlorophyll concentrations were >9 $\mu g\ L^{-1}$ in the subsurface chlorophyll maximum at stations N20 and N16. Higher concentrations were observed in the subsurface and surface maxima (>13 $\mu g\ L^{-1}$) along the two transects to the south. These high concentrations along the Cohassett and Marshfield transects were coincident with somewhat elevated phytoplankton counts with a higher percentage of centric diatoms in comparison to other stations. The elevated chlorophyll concentrations along these transects may have been related to the increase in nutrient availability in late October compared to availability at the nearfield and boundary stations that were sampled earlier in the month.

Nearfield. The mean chlorophyll concentrations observed in the surface and mid-depth waters during each of the nearfield surveys conducted during this time period are presented in Figure 4-42. When a subsurface chlorophyll maximum was present, the mid-depth data was collected within the maximum. Bottom water concentrations were low over the entire period reaching a maximum of ~4 $\mu g\ L^{-1}$ in late September. In early August, the mean chlorophyll concentrations in the surface and mid-depth waters were about 2 and 5 $\mu g\ L^{-1}$, respectively. By late August, the surface and mid-depth concentrations had doubled to 5 and 10 $\mu g\ L^{-1}$. Productivity reached a maximum at station N18 during this survey and may have signaled the beginning of a late summer bloom in the nearfield as chlorophyll concentrations continued to increase into September. Maximum mean chlorophyll concentrations were reached for the surface (19 $\mu g\ L^{-1}$) and mid-depth (24 $\mu g\ L^{-1}$) waters in early September. This increase in chlorophyll from late August to early September was not coincident with an increase in phytoplankton. In fact, phytoplankton abundance at stations N04 and N18 decreased in both the surface and mid-depth waters. There was, however, an increase in abundance of the >20-µm screened phytoplankton (primarily *Ceratium* species) that was sustained from early August through November. This species may have accounted for the increased chlorophyll concentrations.

High chlorophyll concentrations (>20 $\mu g\ L^{-1}$) continued to be observed at mid-depth across the nearfield in late September. Surface concentrations, however, had decreased to <10 $\mu g\ L^{-1}$. Elevated bottom water concentrations were observed during this survey and may have been due to the senescence of the late summer bloom observed during the two previous surveys. During the October combined survey, the mean chlorophyll concentration at the subsurface chlorophyll maximum had decreased to ~7 μg L^{-1} and surface concentrations had decreased to ~4 μg L^{-1}. Both total and >20-μm screened phytoplankton had decreased since September, while production rates had increased from the summer/fall low observed in late September.

The trend of increasing production continued into late October when peak fall bloom productivity rates of ~1750 $mgCm^{-2}d^{-1}$ were observed at stations N04 and N18. The increased production was not strongly expressed in the chlorophyll or phytoplankton data. Surface water chlorophyll concentrations increased to ~7 μg L^{-1}, which was also the concentration observed in the mid-depth waters. An increase in phytoplankton abundance was observed was primarily due to an increase in microflagellates and the centric diatom *Thalassiosira* sp. By late November, chlorophyll concentrations had decreased to ≤5 μg L^{-1} over the entire water column. No fluorescence data were available for the December survey due to instrument malfunction, but extracted chlorophyll concentrations were low and had a range of 0.06 to 3.08 μg L^{-1} for the nearfield.

The vertical distribution of chlorophyll was examined in more detail along a transect extending diagonally through the nearfield from the southwest to the northeast corner (see Figure 1-3). The southwest corner, station N10, often exhibits a harbor chlorophyll signal while an offshore chlorophyll signal is more often observed at the northeast corner, station N04. In early August (WN99A), chlorophyll concentrations were relatively low in comparison to later surveys and reached a maximum in the subsurface waters at harbor-influenced station N10 (5-9 μg L^{-1}; Figure 4-43). By the middle of August (WF99B), elevated chlorophyll concentrations were observed across the entire transect with maximum concentrations (>13 μg L^{-1}) found in the subsurface waters between station N10 and N19. At these inshore nearfield stations, high chlorophyll concentrations were observed from the surface to a depth of 10 m. Chlorophyll concentrations decreased and the subsurface maximum depth increased to the northeast. The very high chlorophyll concentrations found at stations N10 and N19 were associated with the nearshore centric diatom bloom that was observed in the farfield and stretched from the nearfield to coastal and eastern offshore stations along the south shore.

By early September, chlorophyll concentrations had increased to >25 μg L^{-1} along the entire nearfield transect and there was an inshore to offshore difference in the depth of the chlorophyll maximum (Figure 4-43). A surface chlorophyll maximum was observed over the upper 10 m from station N10 to N21 reaching a maximum of >25 μg L^{-1} over the 10-m surface layer at station N19. A separate subsurface chlorophyll maximum was observed over a narrow depth range (at ~15 m) from station N21 to station N04. The distribution of chlorophyll across this transect suggests that there were two phytoplankton assemblages. Production and phytoplankton samples are only collected at stations N04 and N18, both of which exhibited strong subsurface chlorophyll maxima. Phytoplankton abundance in the subsurface chlorophyll maxima were relatively low (~1 million cells L^{-1}) and the high chlorophyll concentrations may have been a physiological response to lower light levels rather than elevated biomass. No production or phytoplankton data are available with which to assess the high surface chlorophyll layer observed at the inshore stations.

In late September, surface chlorophyll concentrations had decreased at all stations except N10 (Figure 4-44). Subsurface chlorophyll concentrations still exceeded 25 μg L^{-1} at some of the stations further offshore, but the subsurface maximum was no longer a well defined layer. Chlorophyll concentrations ranged from 5 to >25 μg L^{-1} in the upper 20 m across the entire transect. By early October, chlorophyll concentrations had decreased in the nearfield, but were still relatively high and a surface maximum of 9-13 μg L^{-1} that extended to a depth of ~10 m was observed at the inshore stations N10 and N19. A broad subsurface maximum with concentrations of 5-13 μg L^{-1} was observed further offshore.

Chlorophyll concentrations remained relatively high into late October and were coincident with elevated concentrations observed at the farfield stations further to the south on the final days of survey WF99E. The late October nearfield survey (WN99F) was conducted the day before the remaining farfield stations along the south shore were sampled (WF99E). An increase in production was observed in late October, and, although it did not result in a substantial increase in chlorophyll, there was an increase in phytoplankton abundance associated with the increased production. The increase in phytoplankton abundance observed was primarily due to an increase in microflagellates and the centric diatom *Thalassiosira* sp.. The increase in *Thalassiosira* sp. from early October to late October in the nearfield was coincident with elevated abundance of this centric diatom at the nearfield (N16), coastal (F13) and offshore (F06) stations sampled in late October during the combined survey (WF99E). A substantial fall bloom, however, did not develop in the nearfield in 1999. By late November, chlorophyll concentrations had decreased to <5 $\mu g\ L^{-1}$ across most of the nearfield transect and extracted chlorophyll concentrations indicate that low levels continued into December.

4.2.3 Dissolved Oxygen

Spatial and temporal trends in the concentration of dissolved oxygen (DO) were evaluated for the entire region (Section 4.2.3.1) and for the nearfield area (Section 4.2.3.2). Due to the importance of identifying low DO conditions, bottom water DO minima were examined for the water sampling events. The minimum DO concentration was 4.94 mg L^{-1} in the nearfield at station N11in September (WN99C). Regionally, a DO concentration minimum of 5.58 mg L^{-1} was observed at offshore station F15 (south of the nearfield) in October (WF99E). The DO minimum in the nearfield occurred relatively early in the fall and along the shallow, inshore side of the nearfield. The annual minimum usually occurs later in the fall and at the deeper offshore nearfield stations. The early DO minimum may have resulted from a combination of relatively low bottom water DO concentrations earlier in the summer and the large amount of organic material produced in the western nearfield during the late summer bloom.

The June bottom water DO concentration has been used as an indicator of DO minimum concentrations in September/October and in June of 1999 the mean bottom water concentration for the nearfield was ~9 mg L^{-1}. This was due to the high concentration of organic matter transferred to the bottom following the winter/spring bloom in 1999. Elevated production in late summer and weak probably served to accelerate DO decline along the inner nearfield. Due to the early occurrence of such low DO concentrations, there was added concern about the levels that would be found in October when minima usually are observed in the nearfield area. Mixing events in September (Hurricane Floyd) prevented DO levels from continuing to decline into late September and October. The 1999 nearfield mean bottom water DO minimum, however, was the lowest observed during the baseline monitoring program (1992-1999) and was lower than the proposed warning threshold of 6.0 mg L^{-1}.

4.2.3.1 Regional Trends of Dissolved Oxygen

Temporal trends in bottom water DO concentrations were limited for the farfield as stations were only sampled twice during this period. Area mean DO concentration and %saturation reached minimum values (7.2 mg L^{-1} and <80%, respectively) in the coastal and Cape Cod Bay areas by the August survey and remained relatively unchanged by October. At offshore and boundary stations, mean DO concentration and %saturation were comparable to the coastal and Cape Cod Bay values in August, but continued to decrease reaching minima in October (approximately 6.8 mg L^{-1} and 75% at the boundary stations and 6.2 mg L^{-1} and 65% at the offshore stations). In Boston Harbor, mean bottom water DO concentrations of 7.5 mg L^{-1} were observed during both surveys and %saturation decreased from 90% in August to 85% in October.

In August (WF99B), bottom water DO concentrations in the bays ranged from a minimum of 6.15 mg L^{-1} at station F02 in Cape Cod Bay to a maximum of 8.54 mg L^{-1} at Boston Harbor station F31 (Figure 4-45). In addition to the low bottom water DO observed in Cape Cod Bay, DO concentrations of ~6.5 mg L^{-1} were found at coastal stations F13 and F14 off Cohassett. Relatively low DO concentrations of 7-7.5 mg L^{-1} were observed throughout the nearfield and at coastal and offshore stations in the vicinity. There was a clear inshore to offshore gradient of increasing bottom water DO concentrations.

From August to October, a major change in the pattern of bottom water DO concentrations was observed (Figure 4-46). By October, bottom water DO concentrations had increased to >7.5 mg L^{-1} along the coastal and western nearfield areas were the low DO concentrations had been observed in August and decreased by 1-2 mg L^{-1} in the eastern nearfield and offshore stations. DO concentrations remained relatively unchanged in Cape Cod Bay. Bottom water DO concentrations in the bays ranged from a high of 8.11 mg L^{-1} at nearfield station N01 to a minimum of 5.58 mg L^{-1} at offshore station F15. Dissolved oxygen concentrations of <6 mg L^{-1} were also found in the bottom waters further offshore and to the south of this station. These stations were sampled (October 28th) almost three weeks after the boundary stations and nearfield (October 6th and 8th, respectively) were sampled during this survey. It is hypothesized that DO concentrations had also decreased at many of these other stations by late October. In fact, bottom water DO data collect during nearfield survey WN99F (October 27th) showed concentrations of <6 mg L^{-1} over much of the nearfield during this same time period.

4.2.3.2 Nearfield Trends of Dissolved Oxygen

Dissolved oxygen concentrations and percent saturation values for both the surface and bottom waters at the nearfield stations were averaged and plotted for each of the nearfield surveys (Figure 4-47). The gradient in DO concentration between the surface and bottom waters ranged from 0.5 to 2.5 mg L^{-1} over this time period (Figure 4-47a). Surface water DO concentrations decreased from summer maxima of >9 mg L^{-1} in August to minima of 8.3±0.2 mg L^{-1} in September and October. Decreasing temperatures resulted in increased surface DO concentrations (9 mg L^{-1}) in November and December. Nearfield mean bottom water DO concentrations reached a minimum value of 5.93 mg L^{-1} in early September. This mean value was driven by concentrations of 5-5.5 mg L^{-1} along the western nearfield (Figure 4-48). The bottom water DO minimum usually occurs later in the fall and at the deeper offshore nearfield stations. The low DO concentrations may have occurred at these inshore stations due to a combination of relatively low bottom water DO earlier in the summer and the large amount of organic material produced during the late summer bloom. The low bottom water DO concentrations observed in 1999 will be examined in more detail in the annual water column report.

By late September, mean bottom water DO concentration had increased to 6.5 mg L^{-1} in the nearfield. The increase was likely due to increased mixing caused by storm events in September (Hurricane Floyd). DO concentrations continued to increase into October when the mean nearfield bottom water concentration approached 7 mg L^{-1}. By late October, however, bottom water DO concentrations had again decreased to ~6 mg L^{-1} due to an increase in bottom water respiration rates. Relatively low DO concentrations continued to be observed in the nearfield into late November. Although the mixing events in September prevented DO levels from continuing to decline into late September and October, the 1999 nearfield mean bottom water DO minimum was the lowest observed during the baseline monitoring program (1992-1999). The mean bottom water DO concentration for the nearfield in early September (5.93 mg L^{-1}) was lower than the proposed warning threshold of 6.0 mg L^{-1} and approached that level (6.02 mg L^{-1}) again in late October. The factors that led to these low DO conditions will be examined in more detail in the 1999 annual water column report.

DO %saturation followed the same trend as DO concentration in the nearfield surface and bottom waters (Figure 4-47b). The surface waters were supersaturated from August to late September and remained somewhat undersaturated (~95% saturation) from October to December. Bottom water DO decreased from 82% saturation in August to 63% saturation in early September. DO %saturation exhibited the same trend of increasing %saturation in late September (73%) and early October (78%) and then decreasing again by late October (65%). In December, both the surface and bottom waters were about 90% saturated with respect to DO.

4.3 Summary of Water Column Results

- Regionally, seasonal stratification had deteriorated at the coastal stations and began to weaken at the offshore stations by the October survey (WF99E).
- In the nearfield area, the data indicate that the pycnocline broke down in the eastern nearfield by early October (WF99E), but the water column at the outer nearfield stations was not well mixed until late November (WN99G).
- Upwelling events in August were not as strong as in previous years (*e.g.* 1998), but data suggests that upwelling did bring cooler, nutrient replete waters into the surface layer western nearfield stations during the summer of 1999.
- The highest nutrient concentrations were consistently measured at the harbor and harbor-influenced coastal and nearfield stations.
- From October to December, high concentrations of ammonium were observed in the western nearfield that correlated with high concentrations observed in Boston Harbor. Elevated NH_4 concentrations result from a combination of increased effluent due to the transfer of south system sewage flow from Nut Island to the Deer Island facility and as a byproduct of secondary treatment.
- The input of NH_4 into coastal and nearfield waters in late summer and early fall may have contributed to the elevated chlorophyll, production and phytoplankton abundances that were observed in August and September 1999.
- In August, weak upwelling events may have supplied nutrients to surface waters at coastal and western nearfield stations also supporting the high phytoplankton abundance that was observed.
- High chlorophyll concentrations (>13 $\mu g\ L^{-1}$) were observed in the farfield on both of the combined surveys.
- Maximum chlorophyll values (>20 $\mu g\ L^{-1}$) were measured in the nearfield during the early September survey (WN99C). These levels did not coincide with maximum phytoplankton abundance, which peaked in early August, or maximum production, which peaked in late August and may have contributed to the elevated chlorophyll seen in early September.
- The atypical late summer increase in chlorophyll concentrations and production overshadowed the increases observed during a secondary bloom in late October (WN99F).
- Although a large fall bloom did not develop in the nearfield in 1999, chlorophyll and phytoplankton data suggest that there may have been a more substantial fall bloom in southwestern Massachusetts Bay.
- Mean nearfield bottom water DO concentrations in early September and late October were lower than any previous baseline survey means and were equivalent to the proposed warning threshold of 6 mgL^{-1}.

- The low bottom water DO concentrations resulted from a combination of factors – most notably:
  - The relatively low initial bottom water DO concentration (9 mg L^{-1}) that was observed in June
  - The atypical late summer phytoplankton bloom and associated input of organic material into the bottom waters in late August.
- Mixing events in September (Hurricane Floyd) prevented even more extreme DO concentrations from being reached in late September and October.

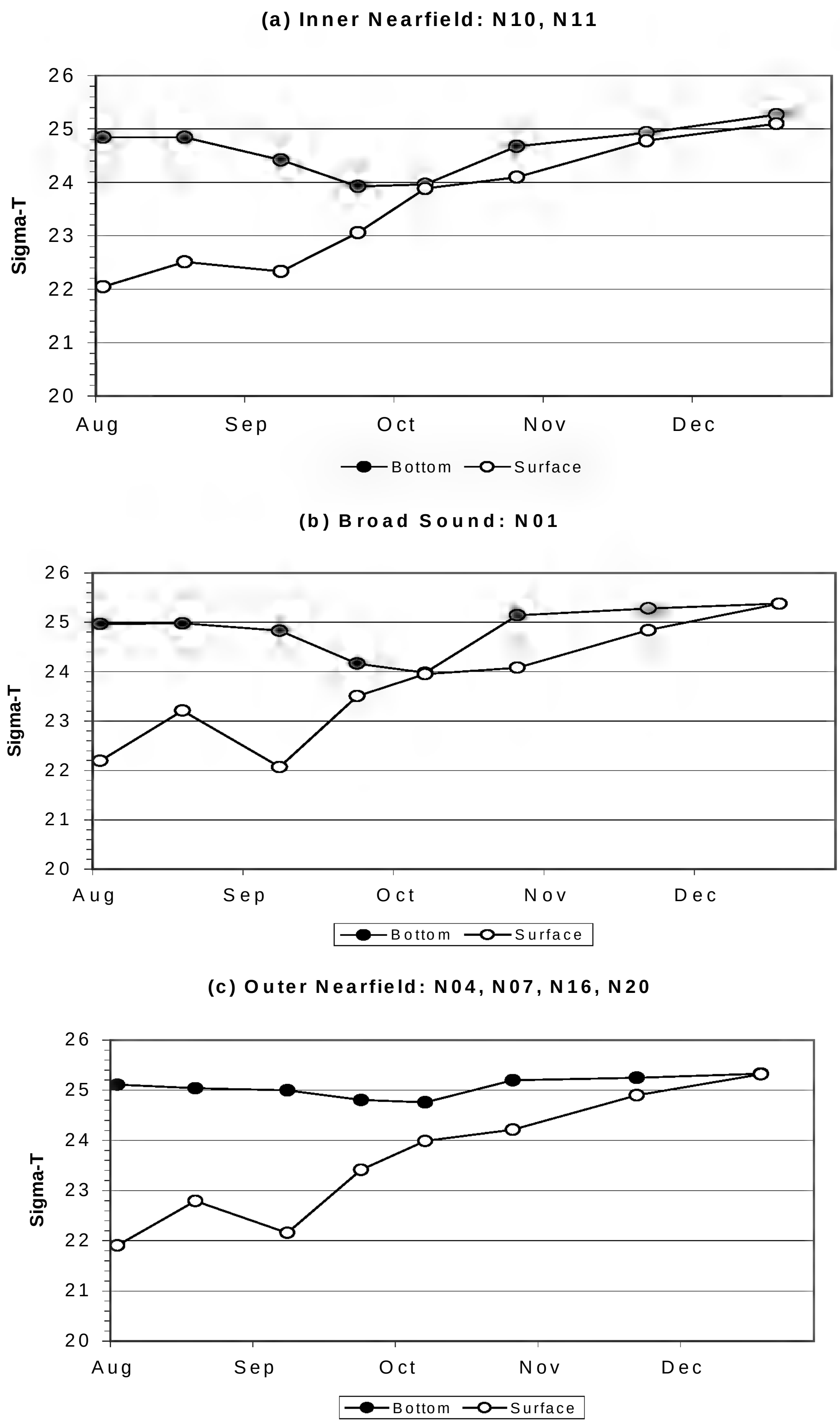


Figure 4-1. Time-Series of Average Surface and Bottom Water Density (σ_t) in the Nearfield

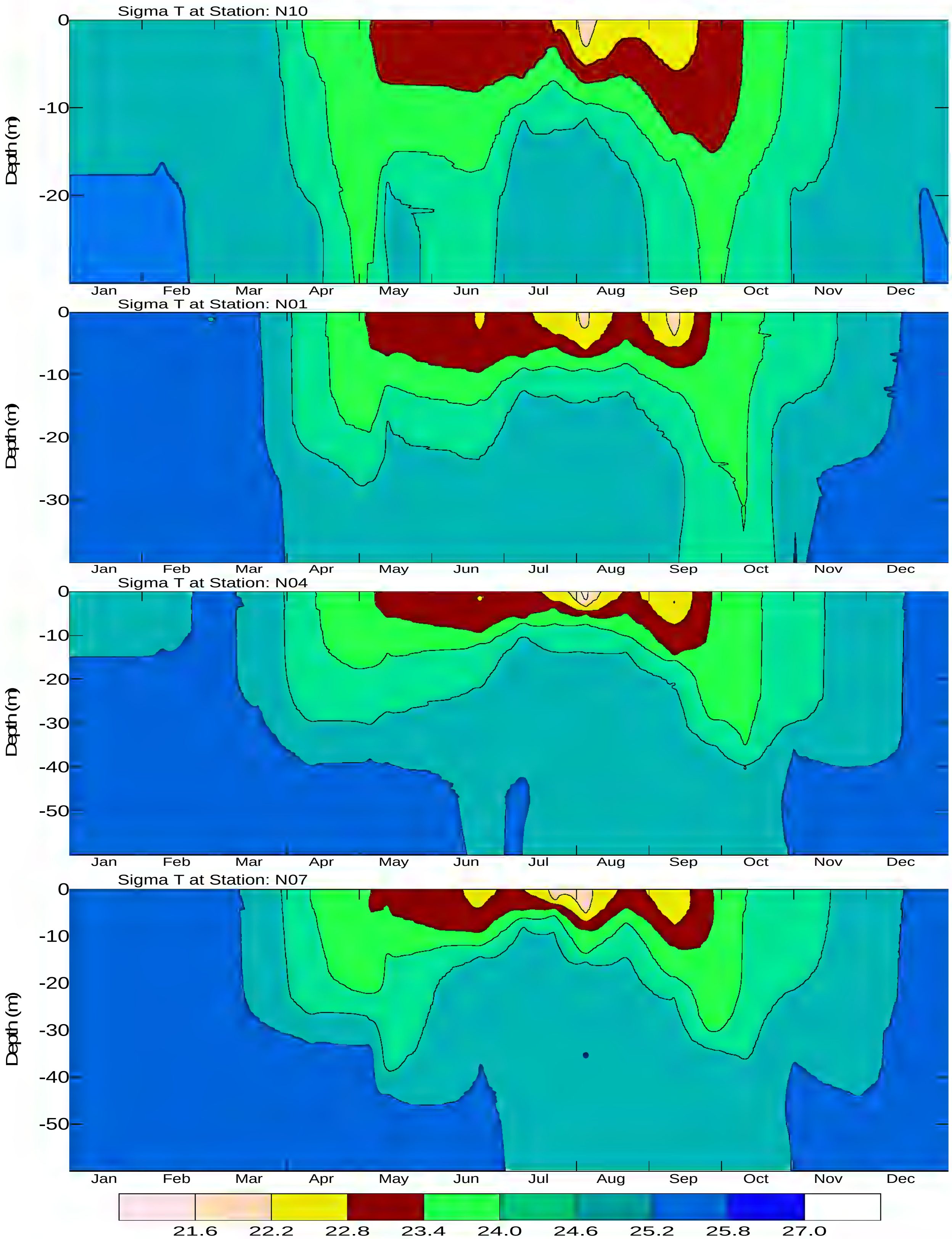


Figure 4-2. Sigma-T Depth vs. Time Contour Profiles for Stations N10, N01, N04, and N07

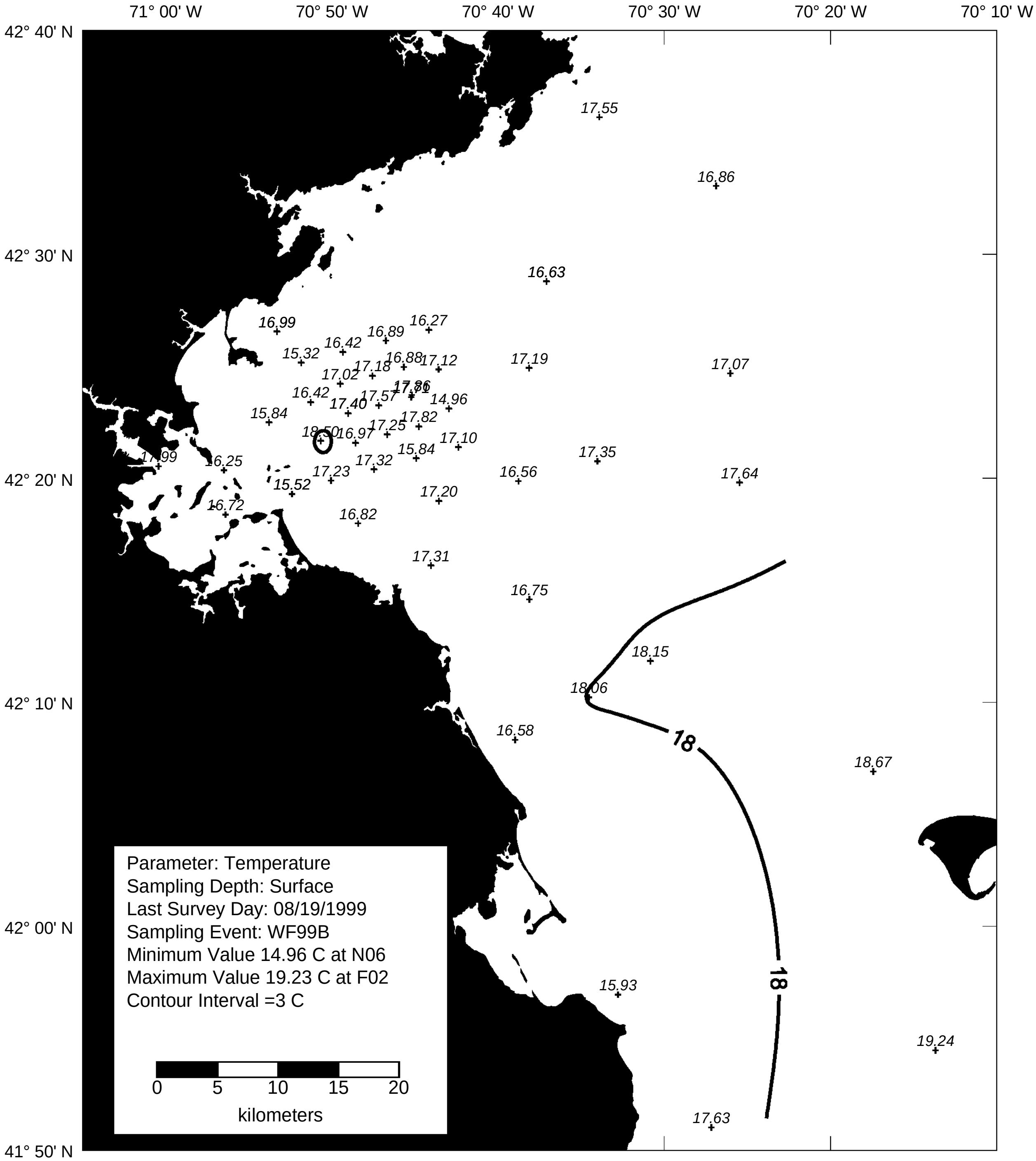


Figure 4-3. Temperature Surface Contour Plot for Farfield Survey WF99B (Aug 99)

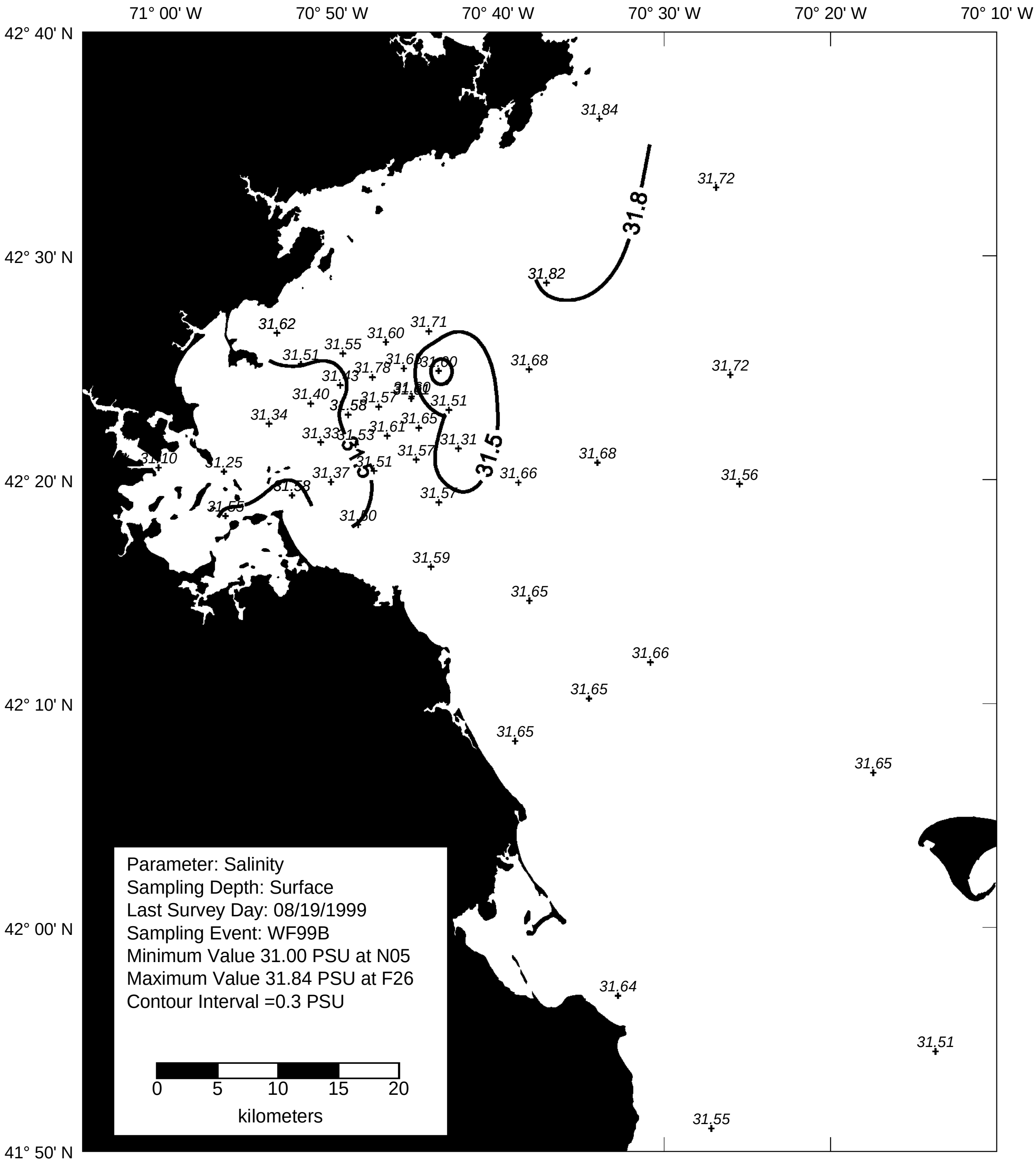


Figure 4-4. Salinity Surface Contour Plot for Farfield Survey WF99B (Aug 99)

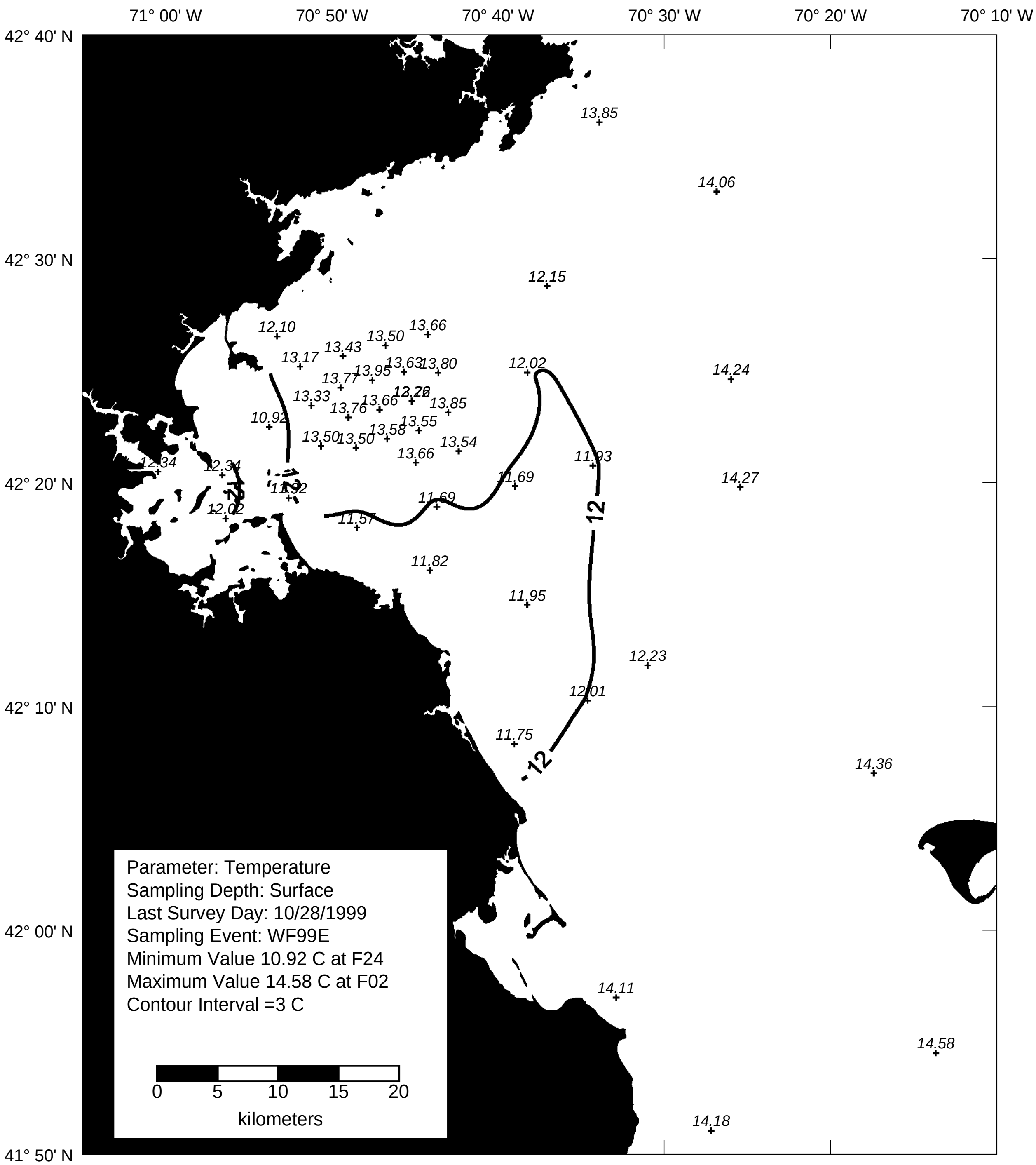


Figure 4-5. Temperature Surface Contour Plot for Farfield Survey WF99E (Oct 99)

Note: All data from the Cape Cod Bay, boundary and nearfield areas and harbor station F23 were collected October 6th and 8th. Remaining farfield stations were sampled October 22nd and 28th.

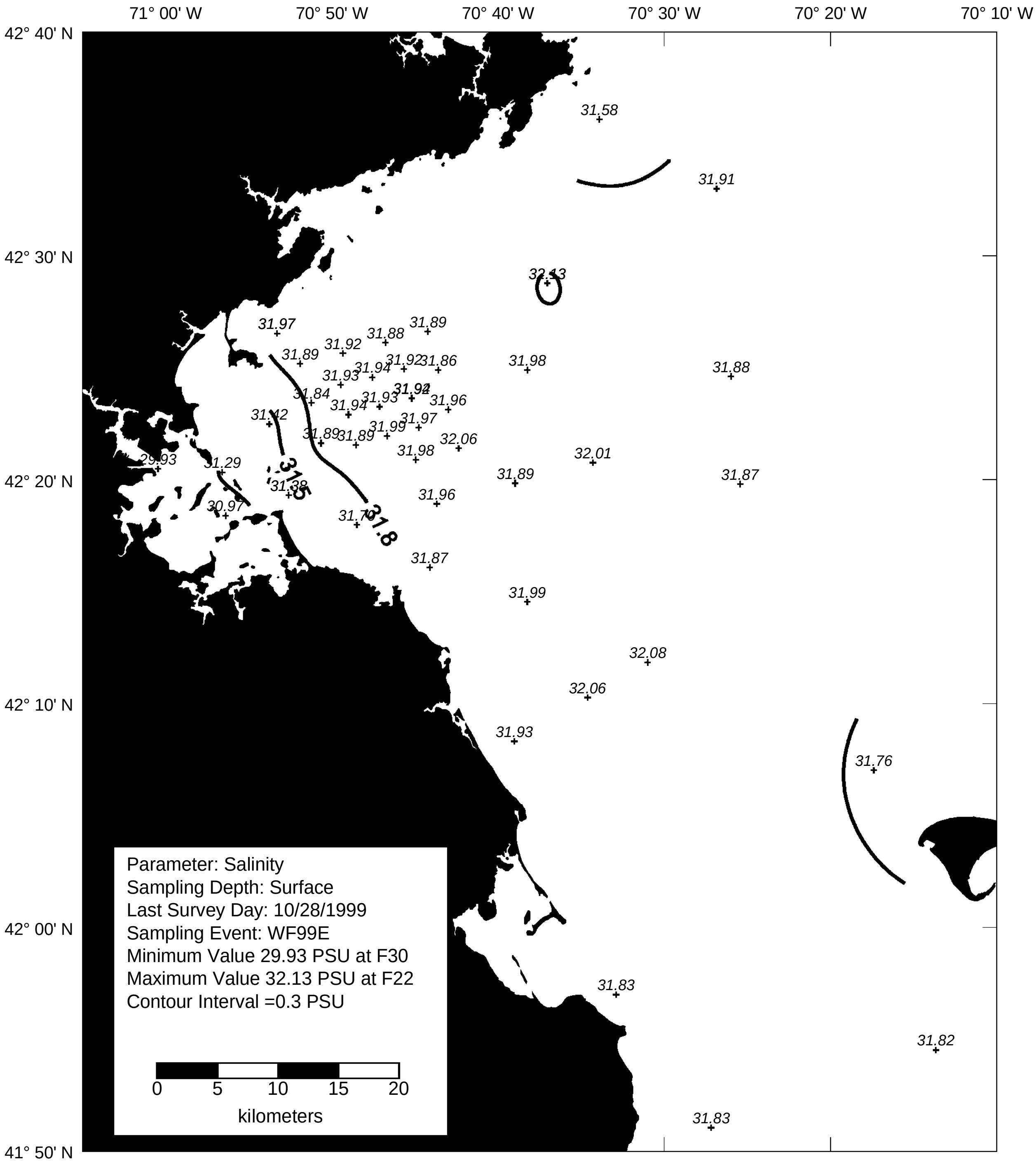


Figure 4-6. Salinity Surface Contour Plot for Farfield Survey WF99E (Oct 99)

Note: See Figure 4-5 caption for sampling dates.

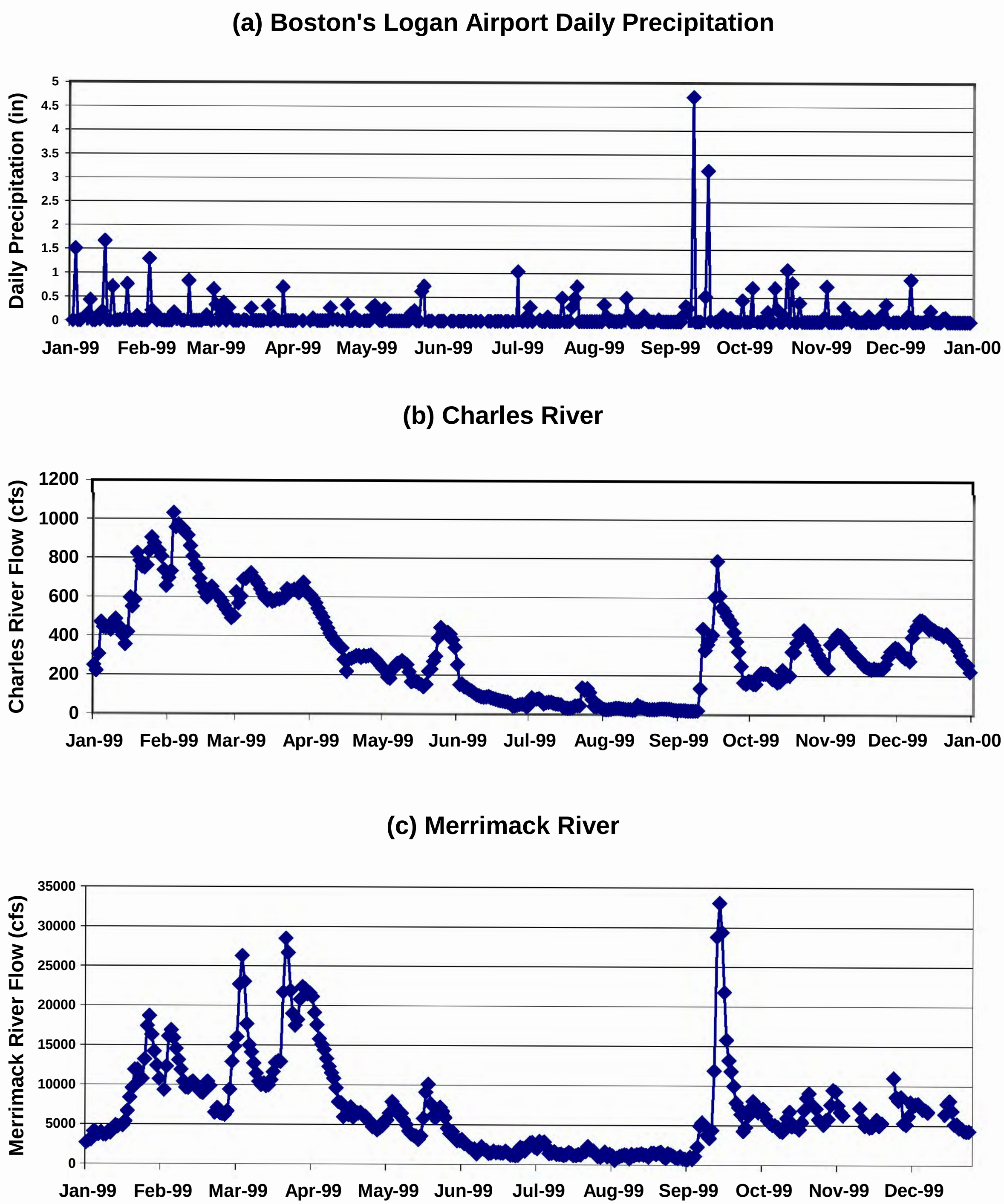


Figure 4-7. Precipitation at Logan Airport and River Discharges for the Charles and Merrimack Rivers

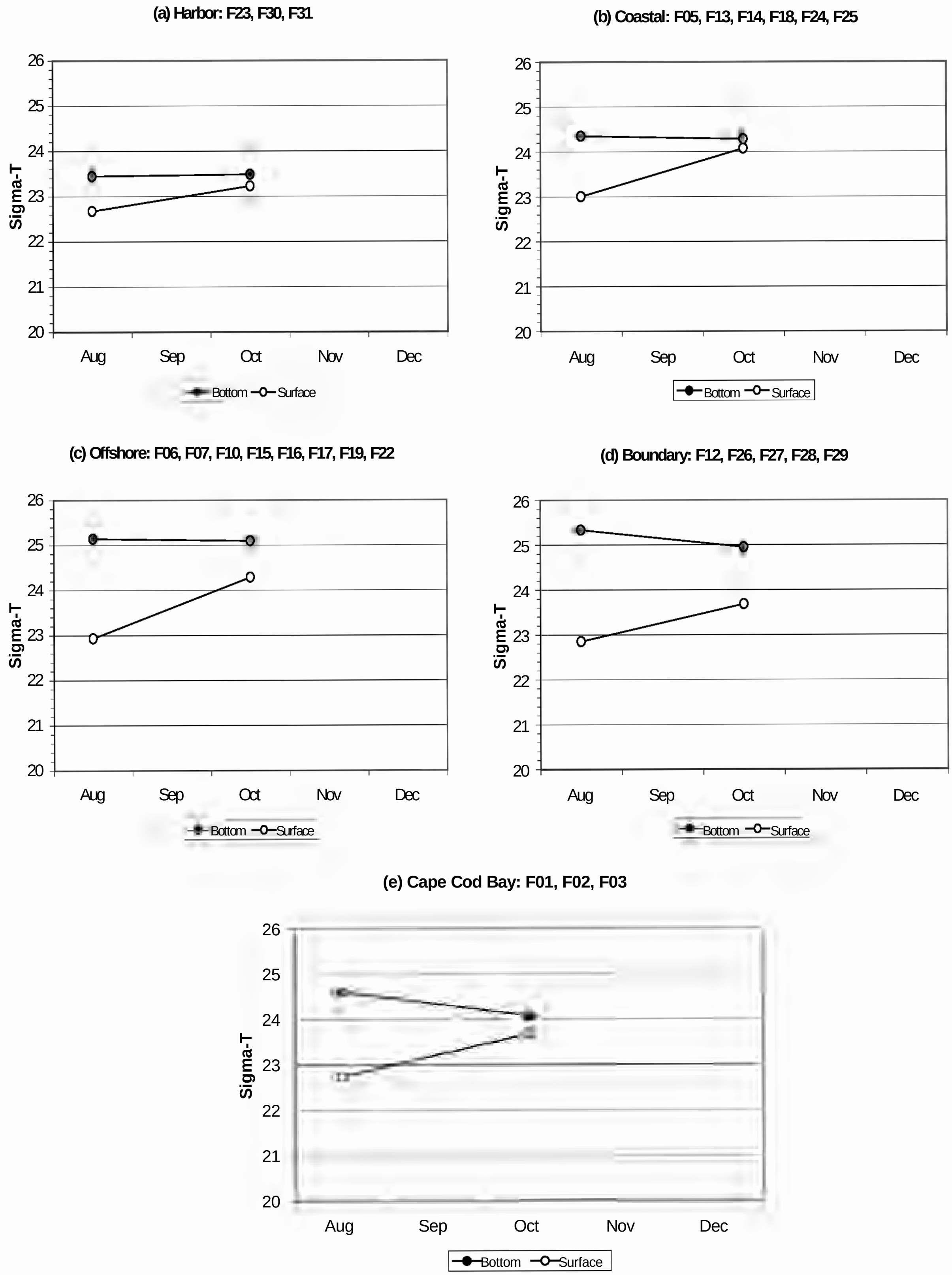


Figure 4-8. Time-Series of Average Surface and Bottom Water Density (σ_T) in the Farfield

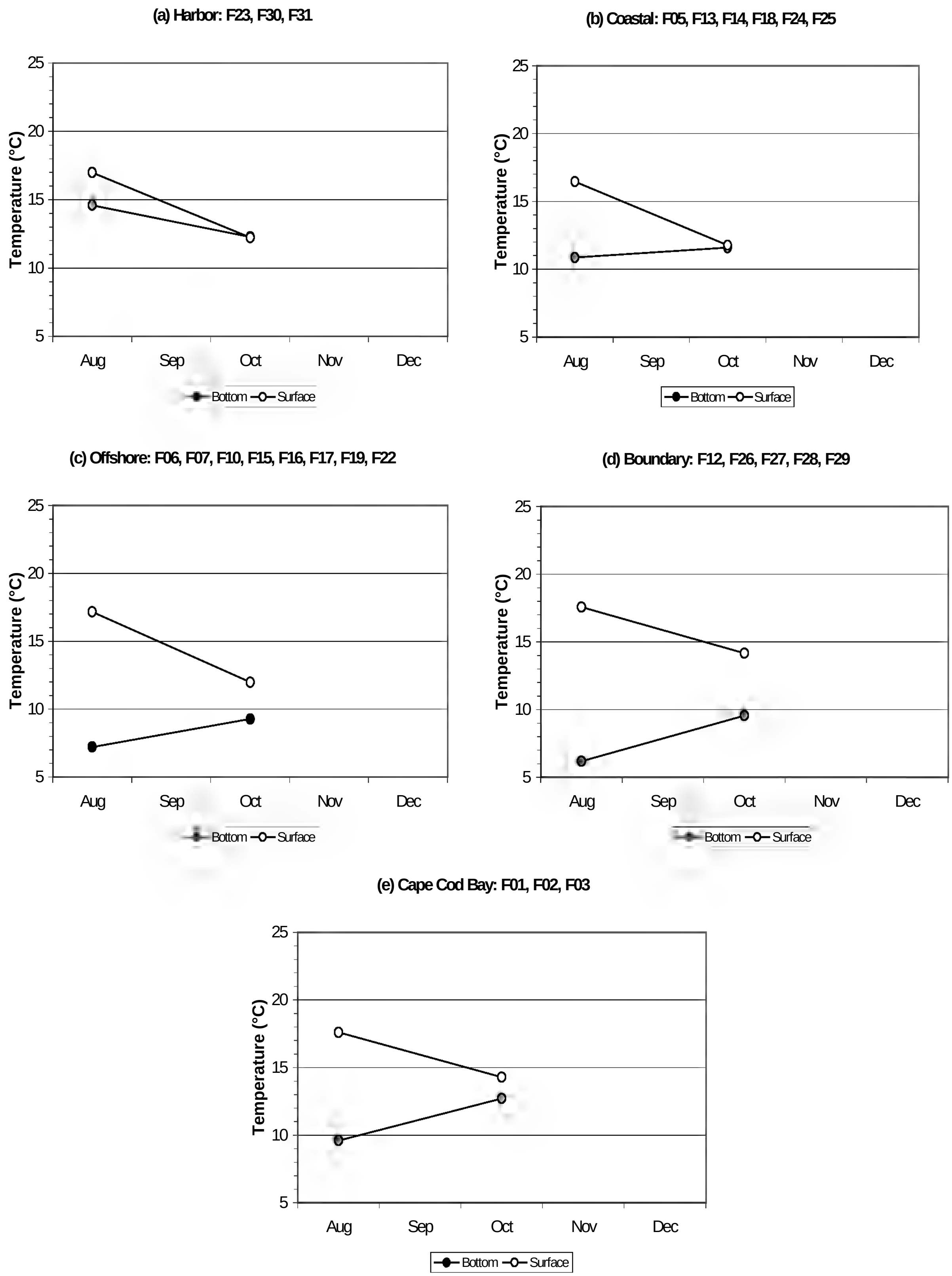


Figure 4-9. Time-Series of Average Surface and Bottom Water Temperature (°C) in the Farfield

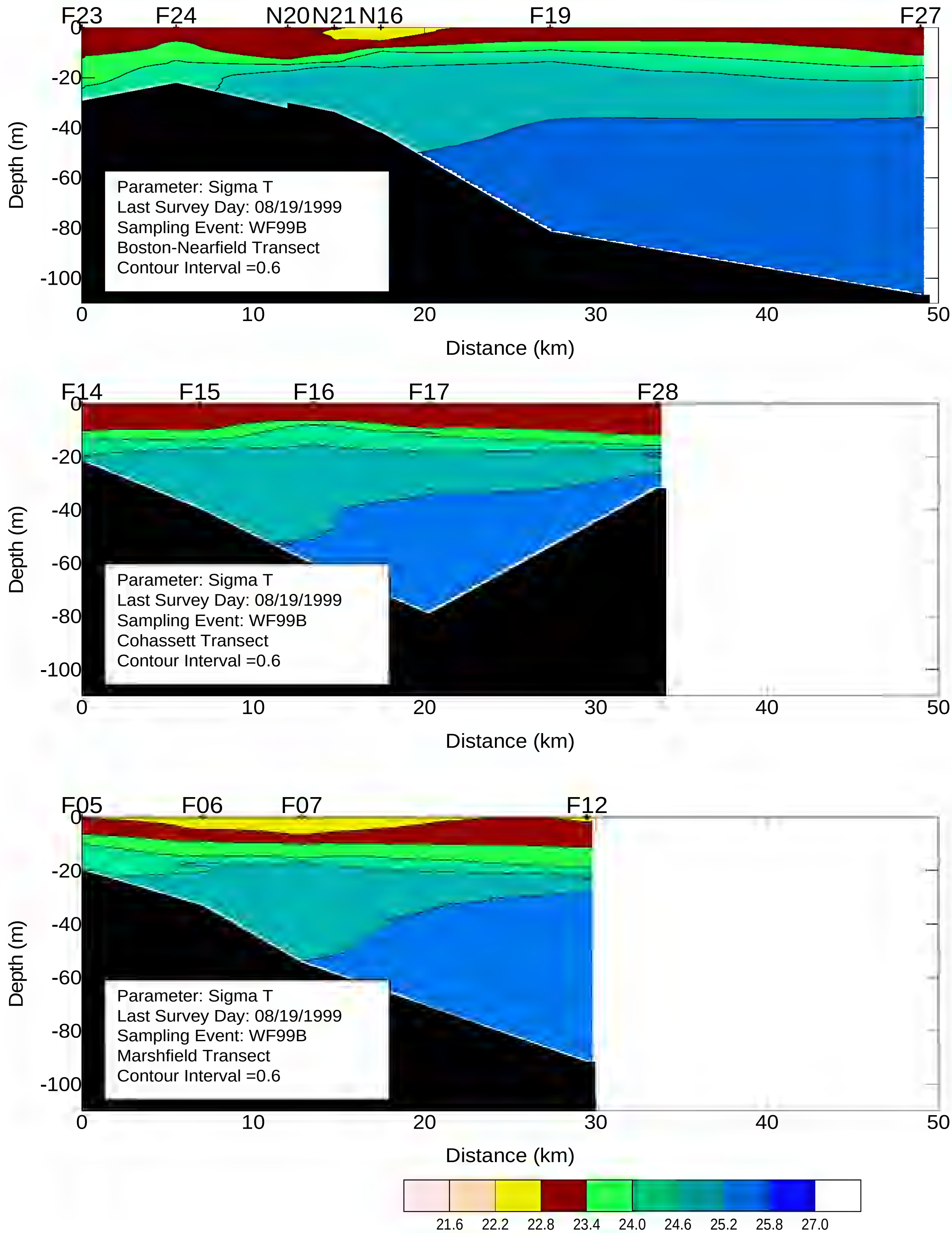


Figure 4-10. Sigma-T Vertical Transects for Farfield Survey WF99B (Aug 99)

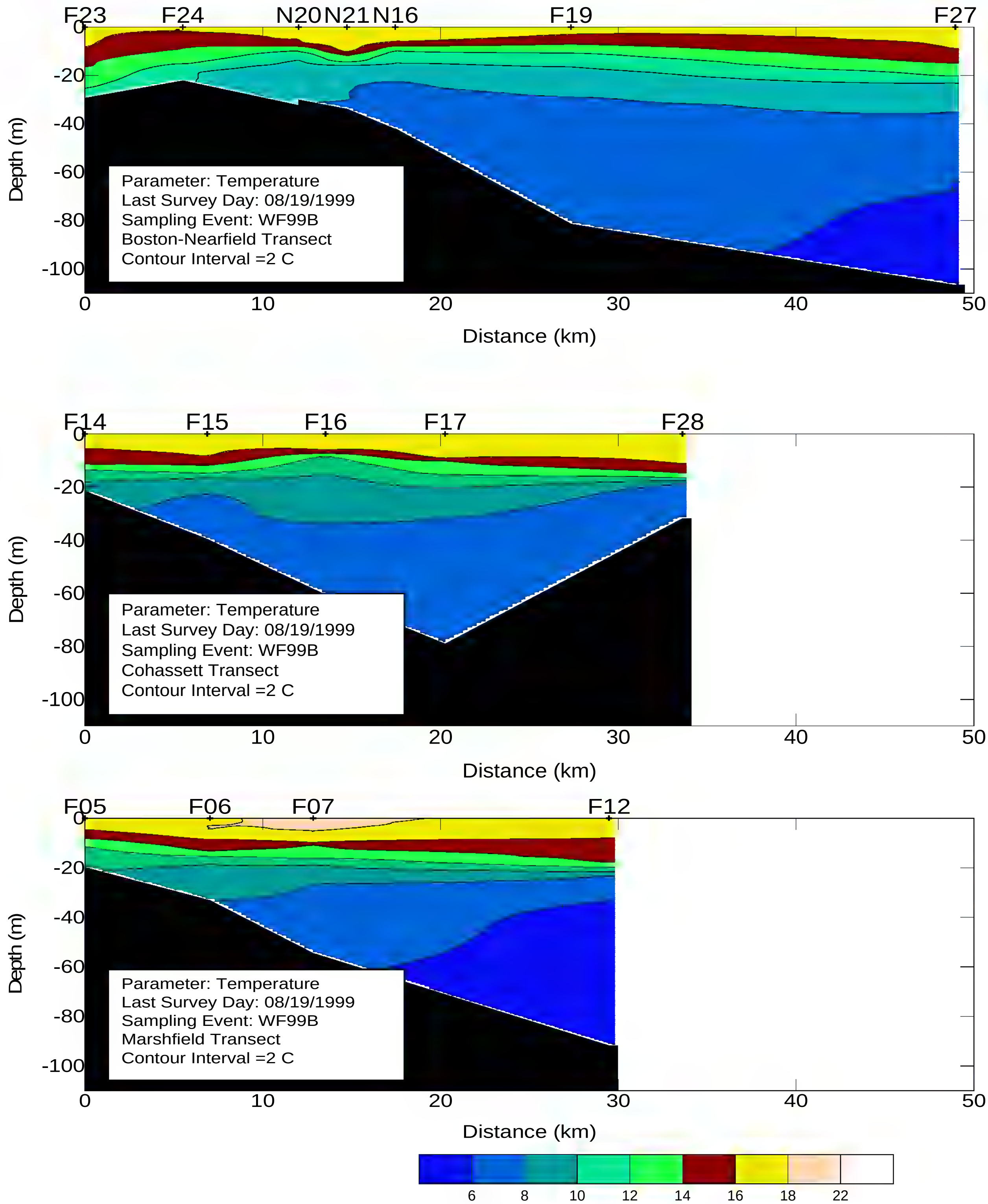


Figure 4-11. Temperature Vertical Transect for Farfield Survey WF99B (Aug 99)

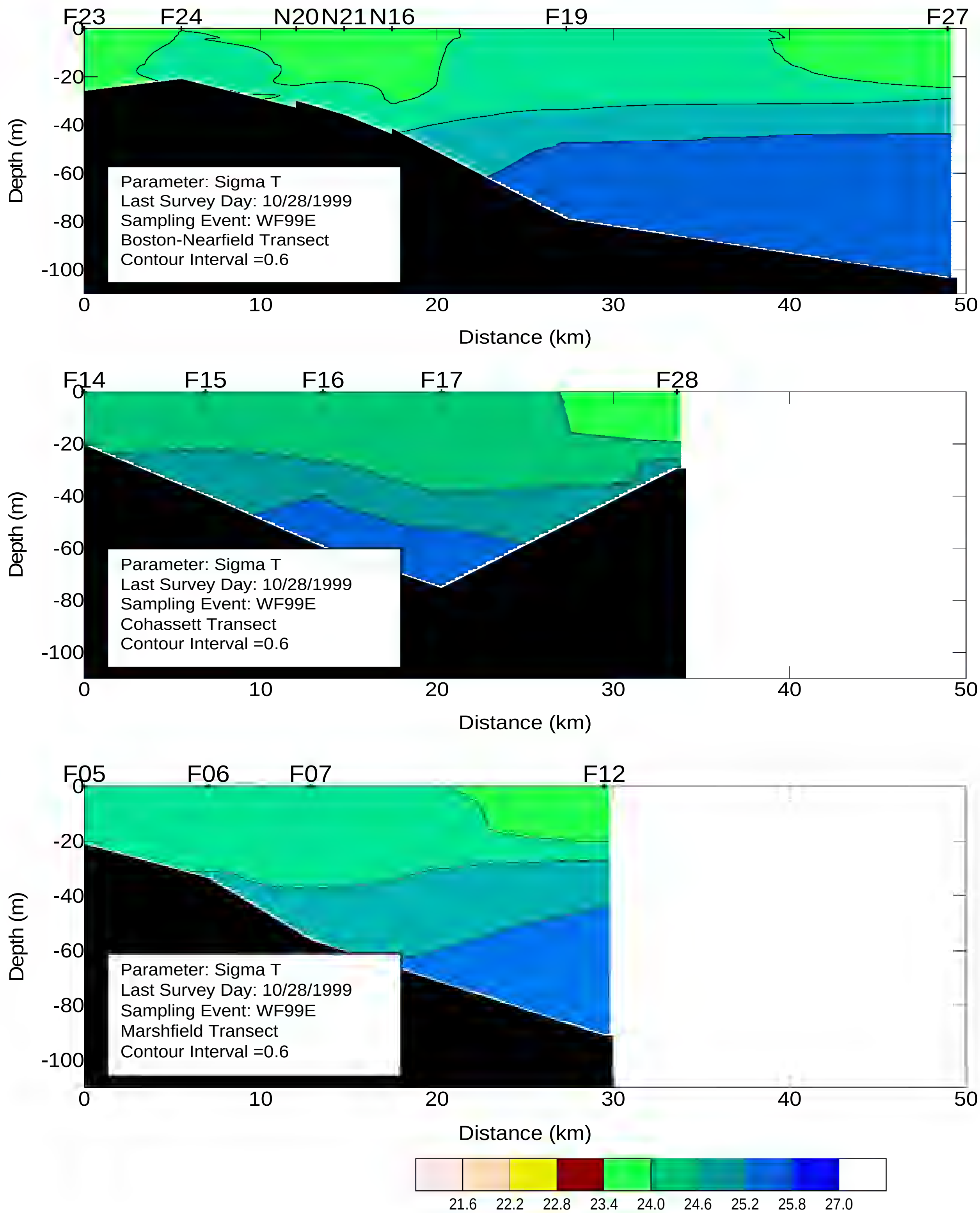
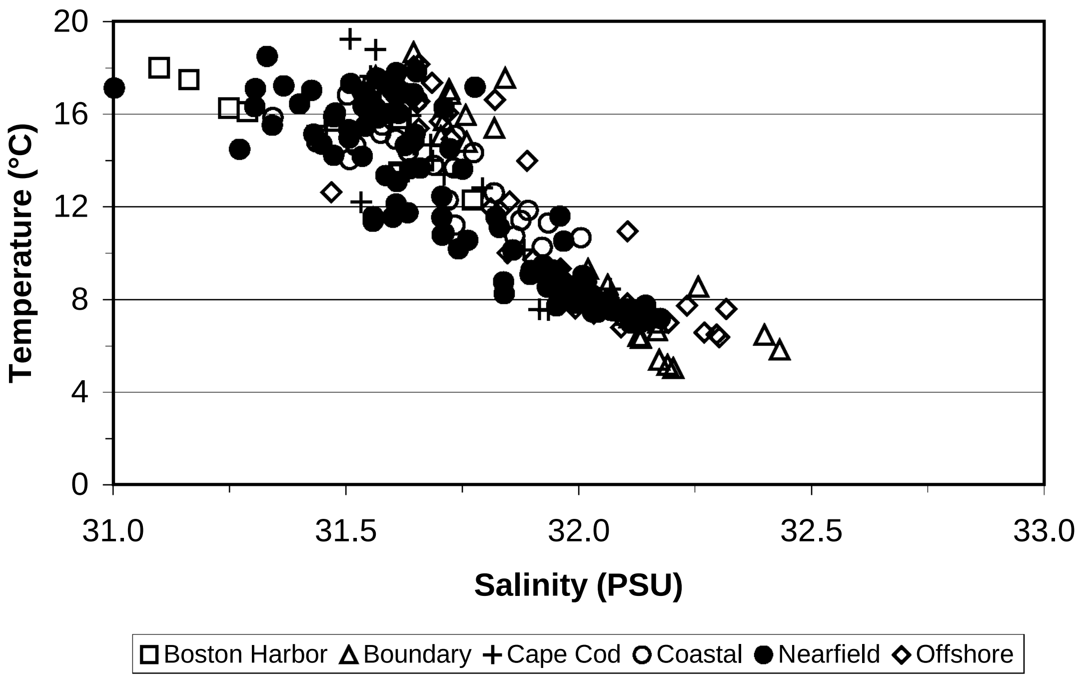


Figure 4-12. Sigma-T Vertical Transect for Farfield Survey WF99E (Oct 99)

Note: See Figure 4-5 caption for sampling dates.

(a) WF99B: August



(b) WF99E: October

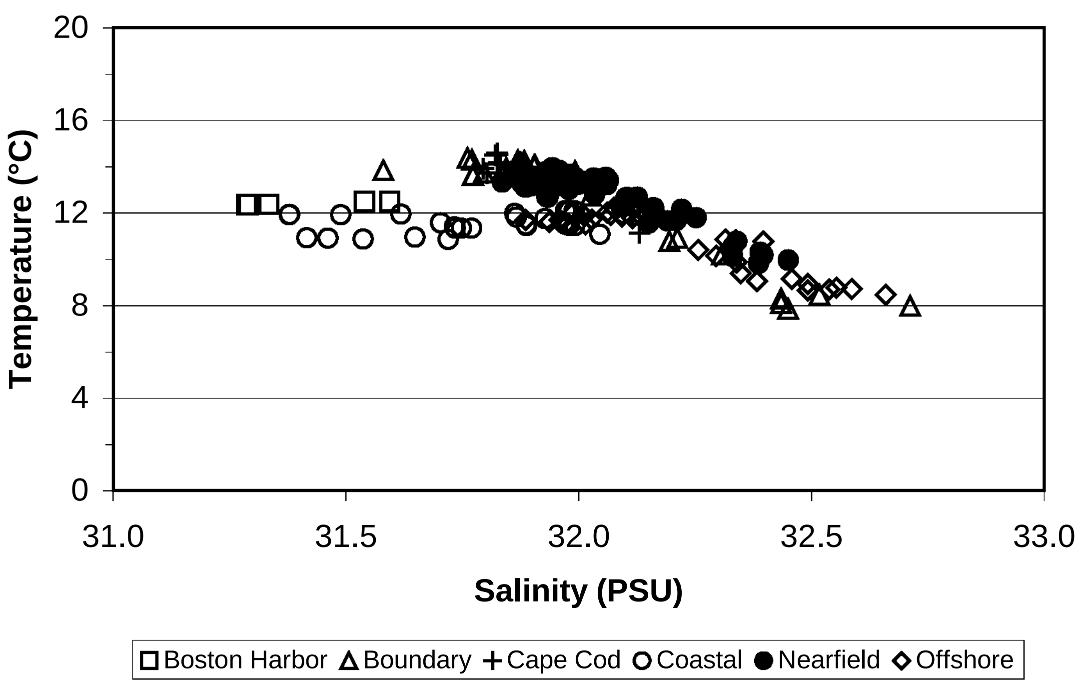


Figure 4-13. Temperature/Salinity Distribution for All Depths during August and October

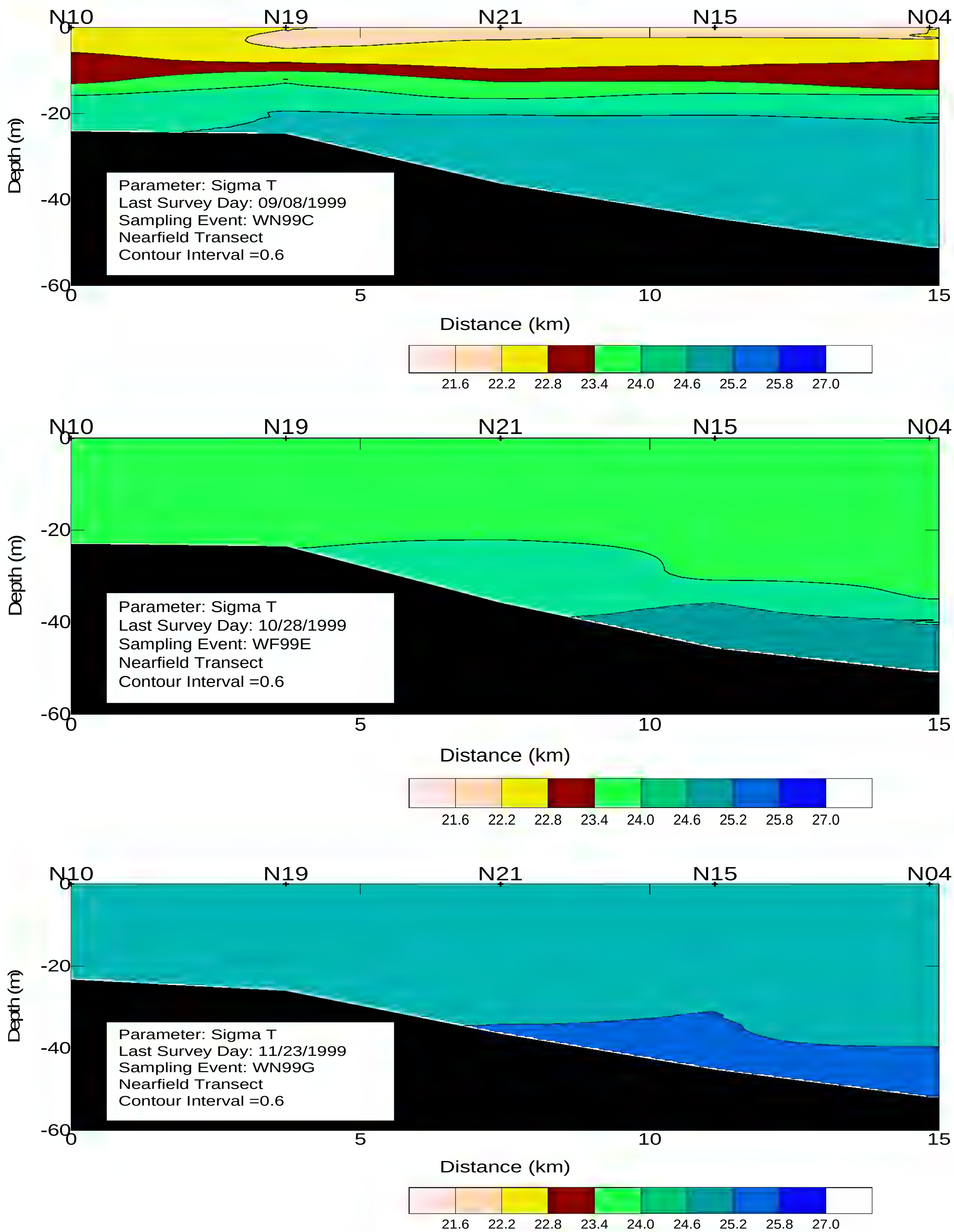


Figure 4-14. Sigma-T Vertical Nearfield Transect for Surveys, WN99C, WF99E, and WN99G

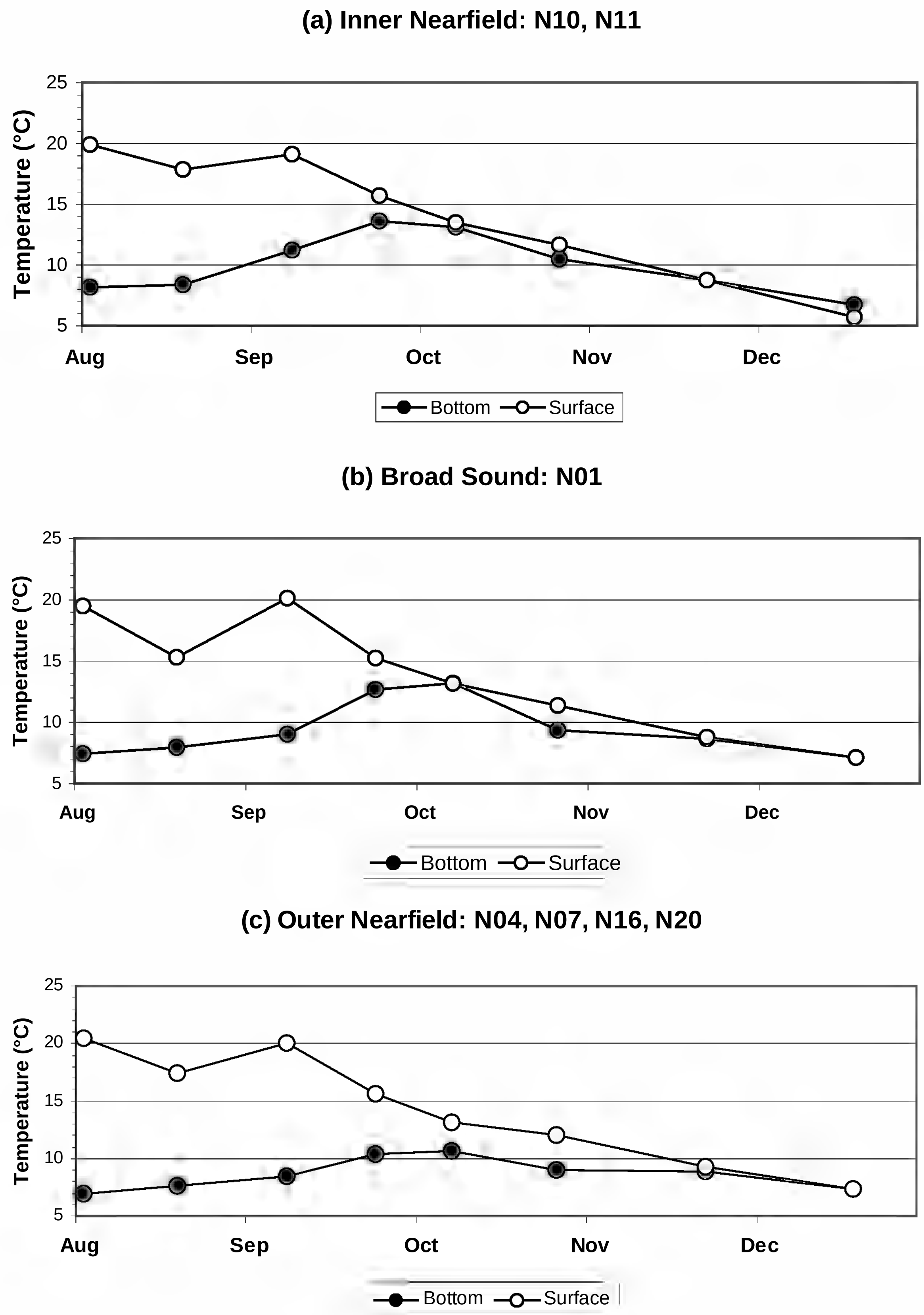


Figure 4-15. Time-Series of Average Surface and Bottom Temperature (°C) in the Nearfield

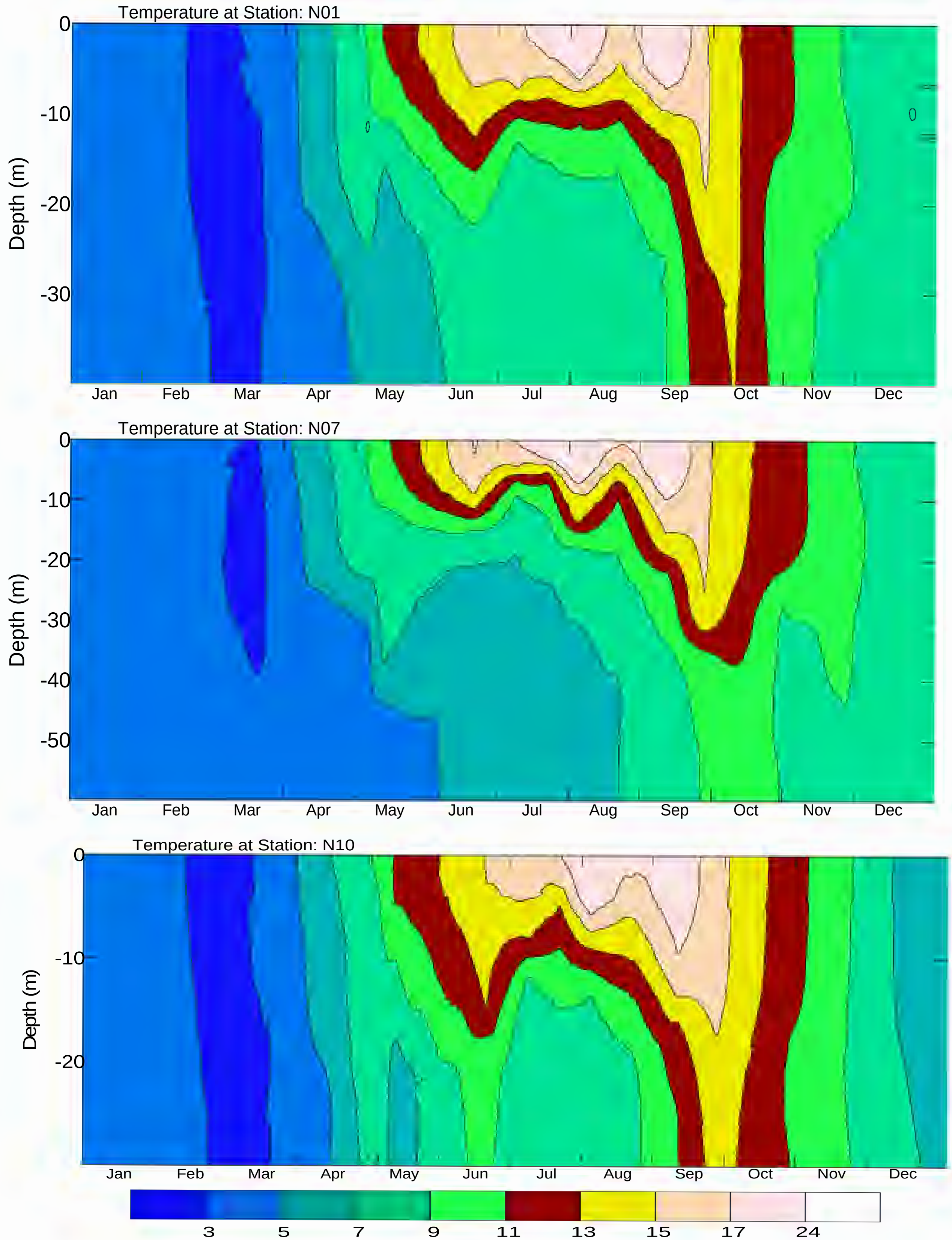
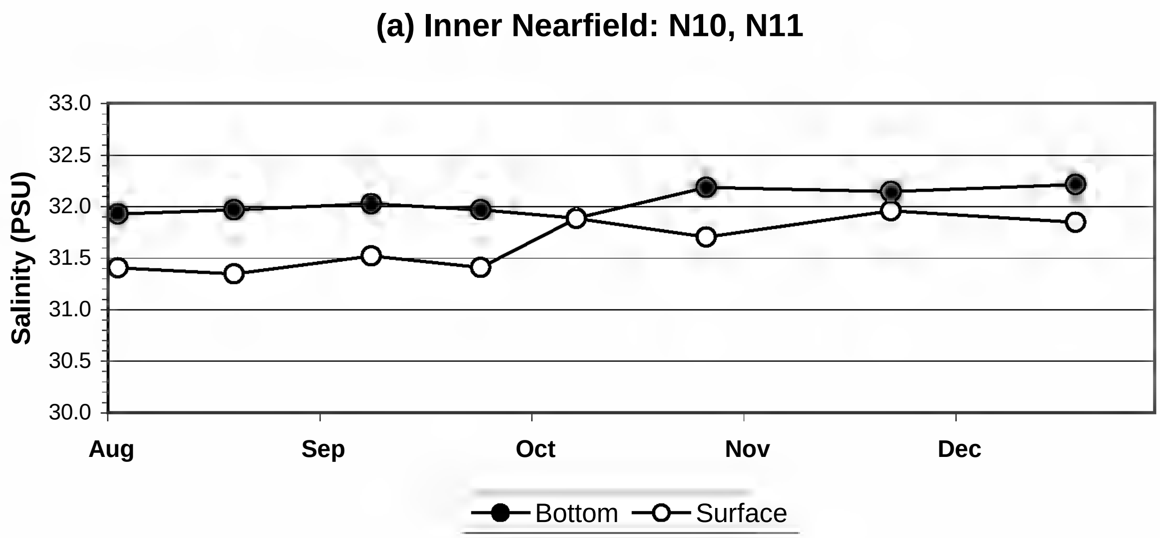
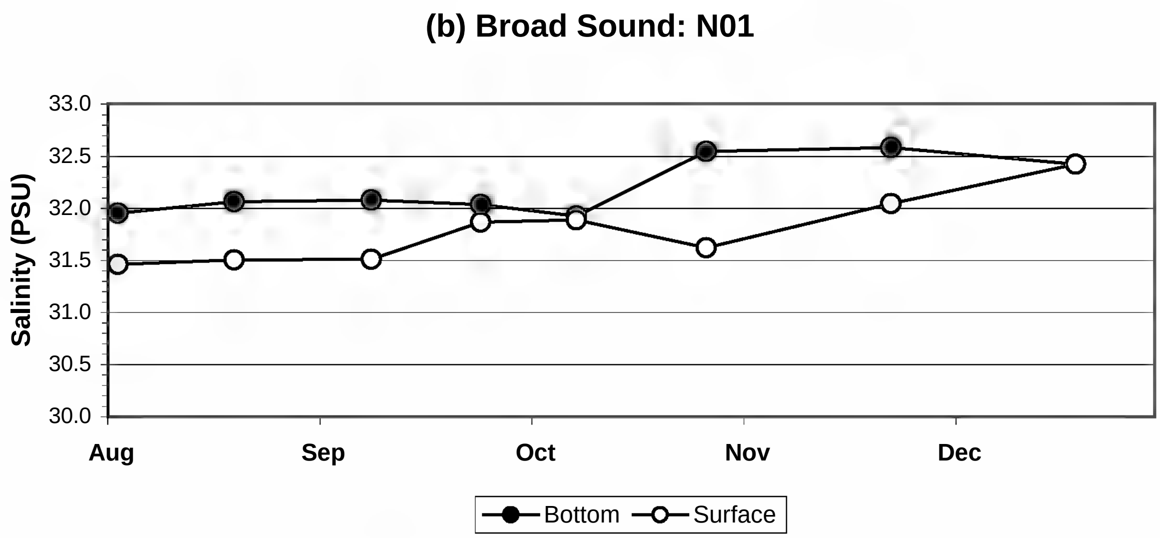


Figure 4-16. Temperature Depth vs Time Contour Profiles for Stations N01, N07, and N10





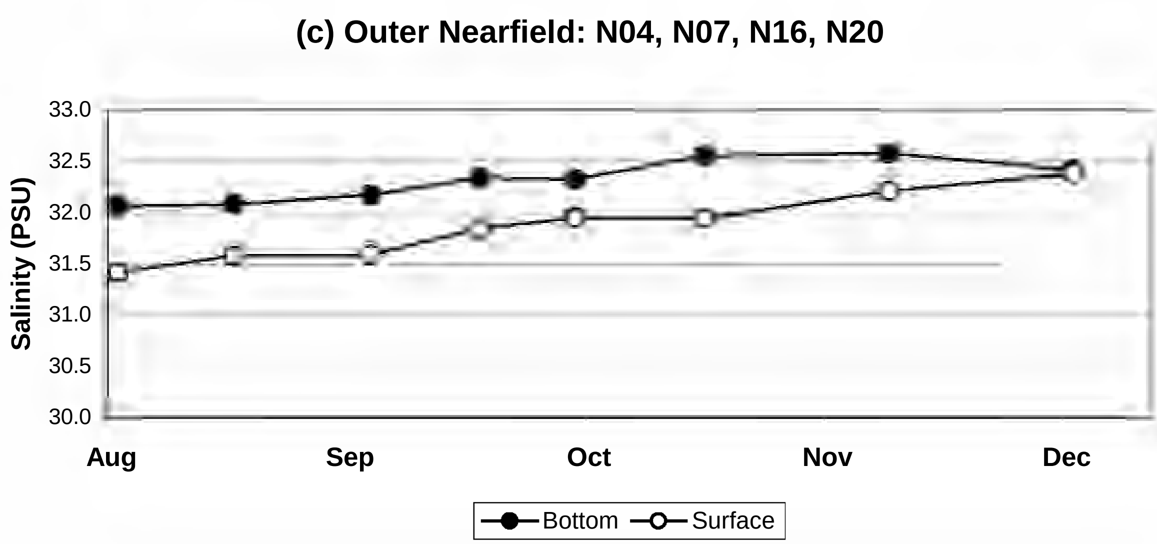


Figure 4-17. Time Series of Average Surface and Bottom Water Salinity (PSU) in the Nearfield

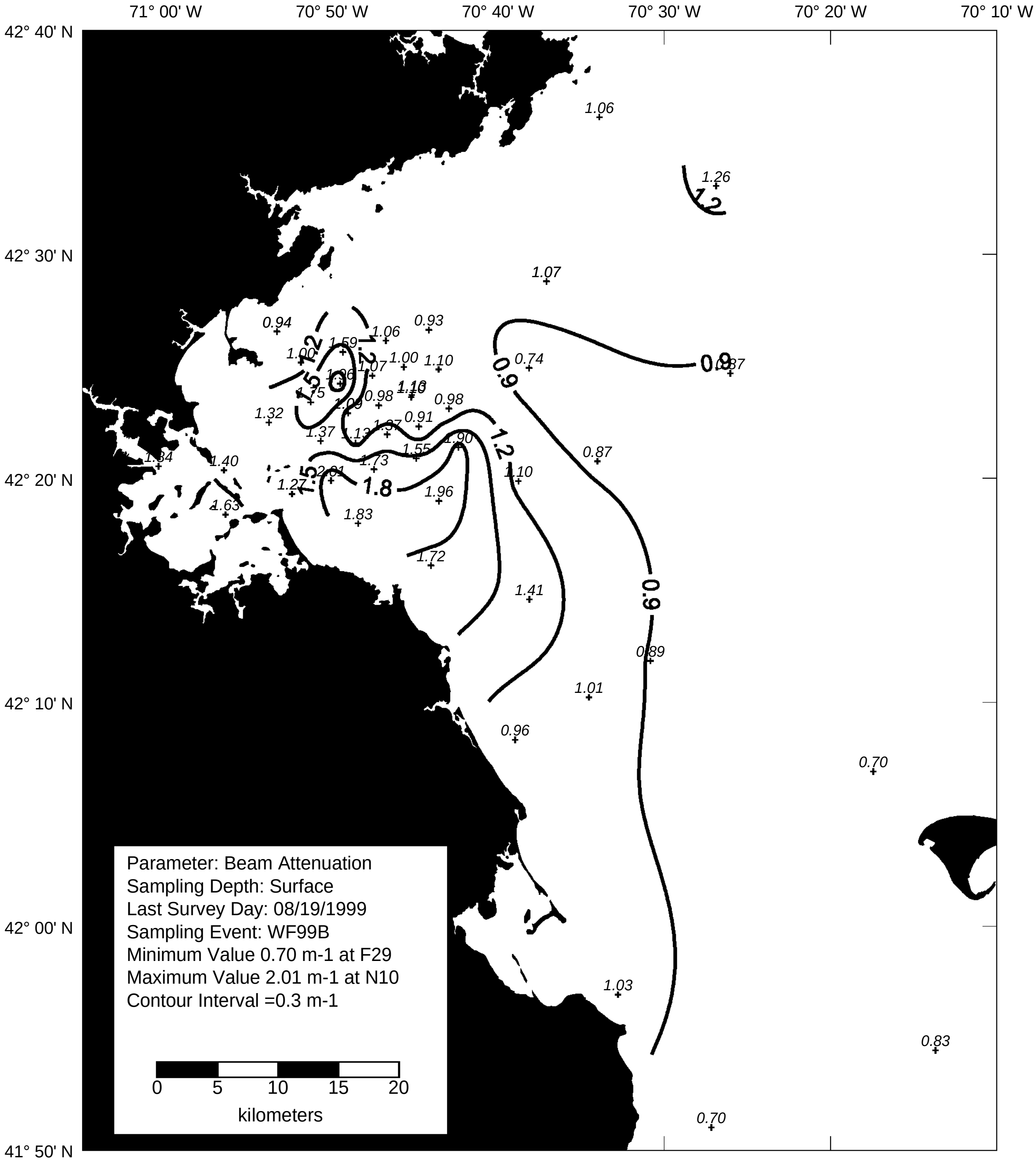


Figure 4-18. Beam Attenuation Surface Contour Plot for Farfield Survey WF99B (Aug 99)

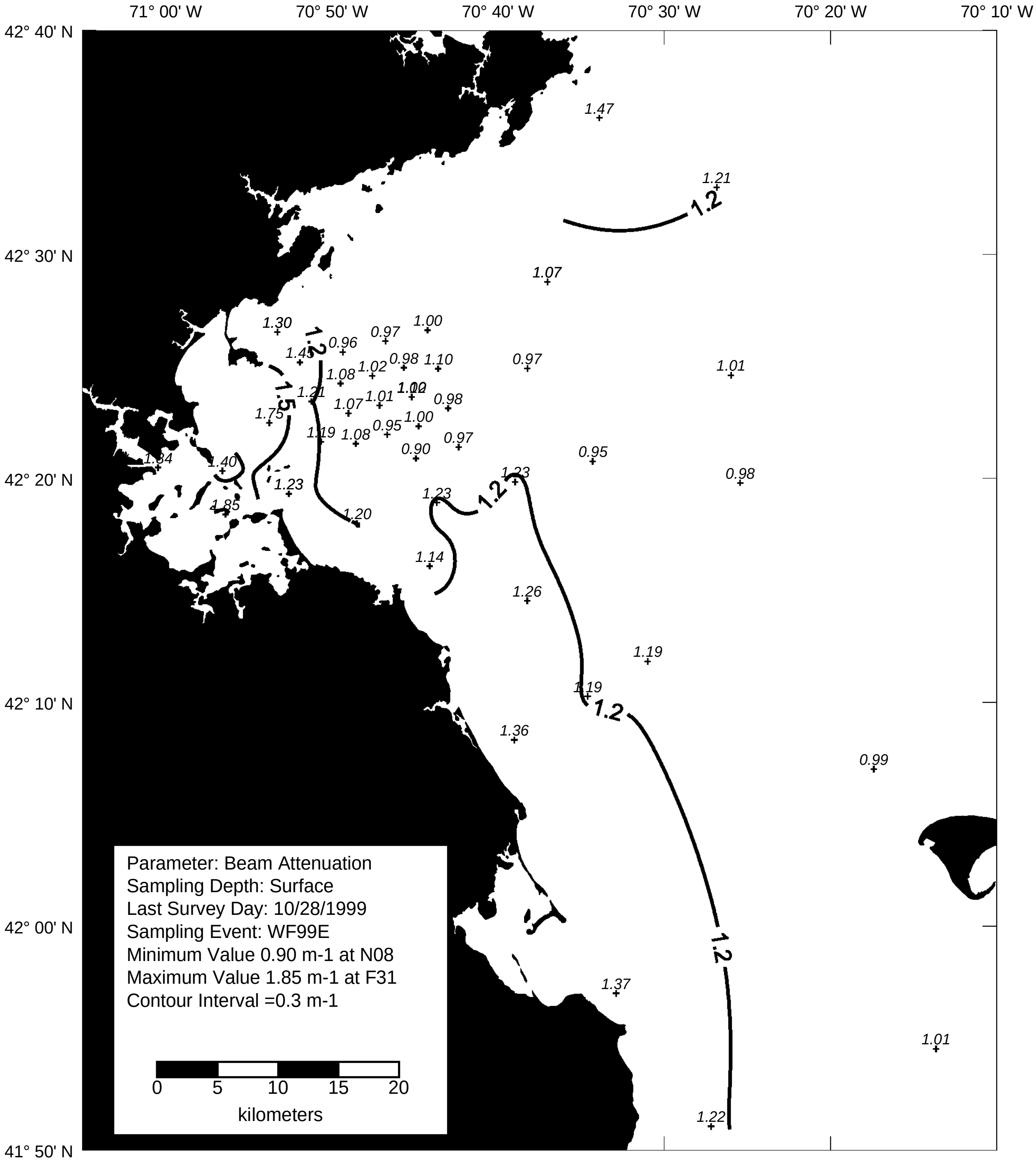


Figure 4-19. Beam Attenuation Surface Contour Plot for Farfield Survey WF99E (Oct 99)

Note: See Figure 4-5 caption for sampling dates.

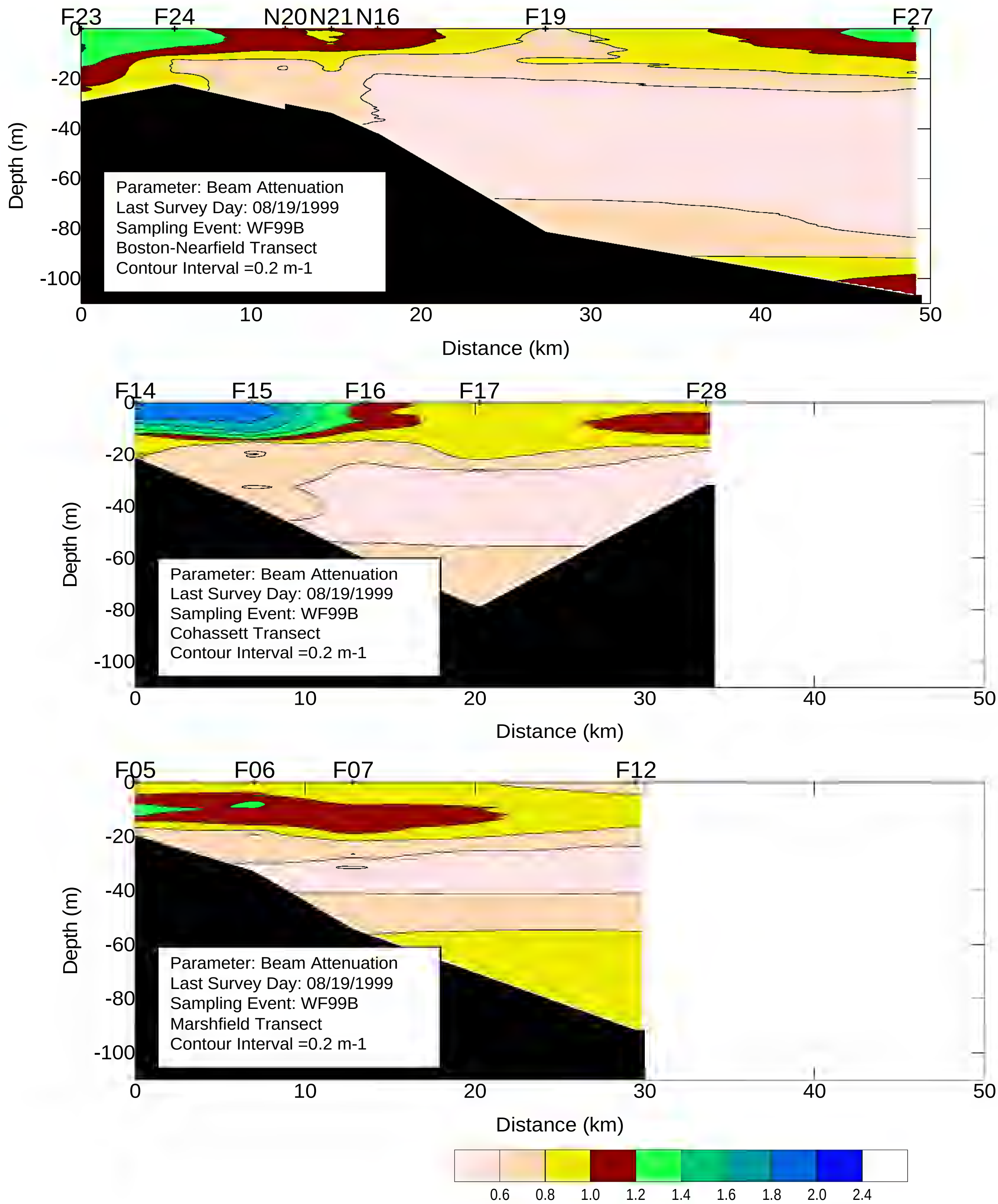


Figure 4-20. Beam Attenuation Vertical Transects for Farfield Survey WF99B (Aug 99)

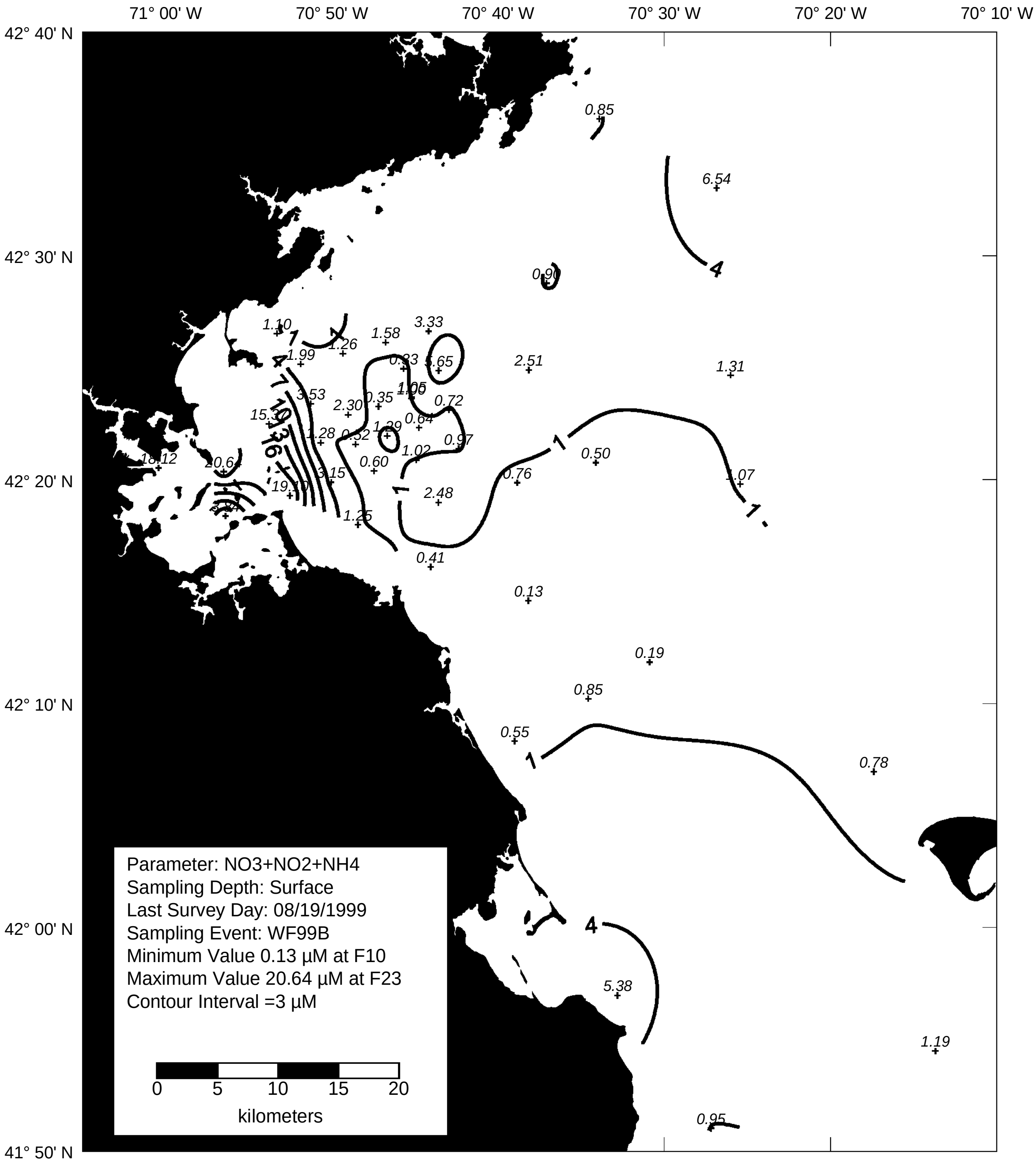


Figure 4-21. DIN Surface Contour Plot for Farfield Survey WF99B (Aug 99)

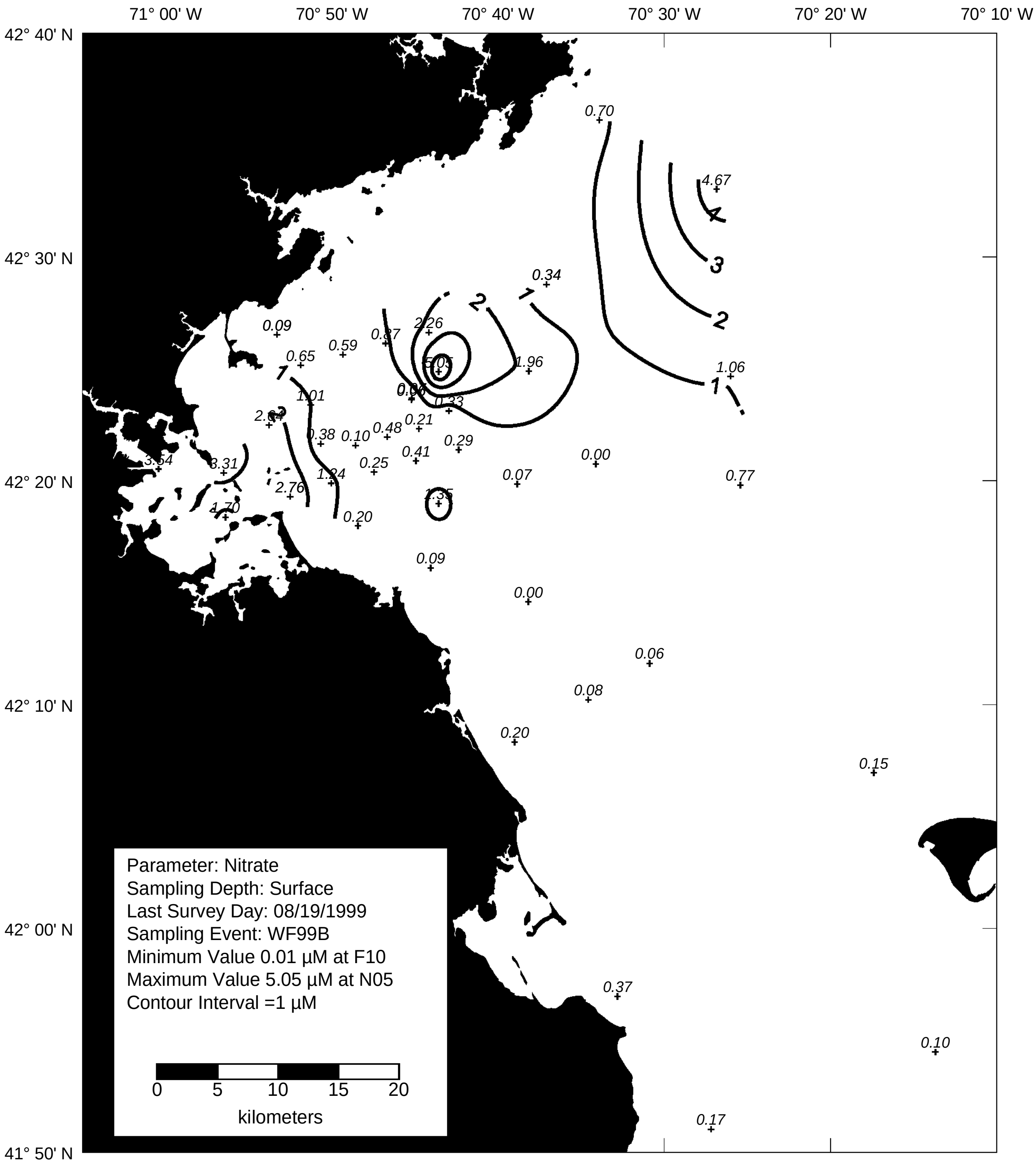


Figure 4-22. Nitrate Surface Contour Plot for Farfield Survey WF99B (Aug 99)

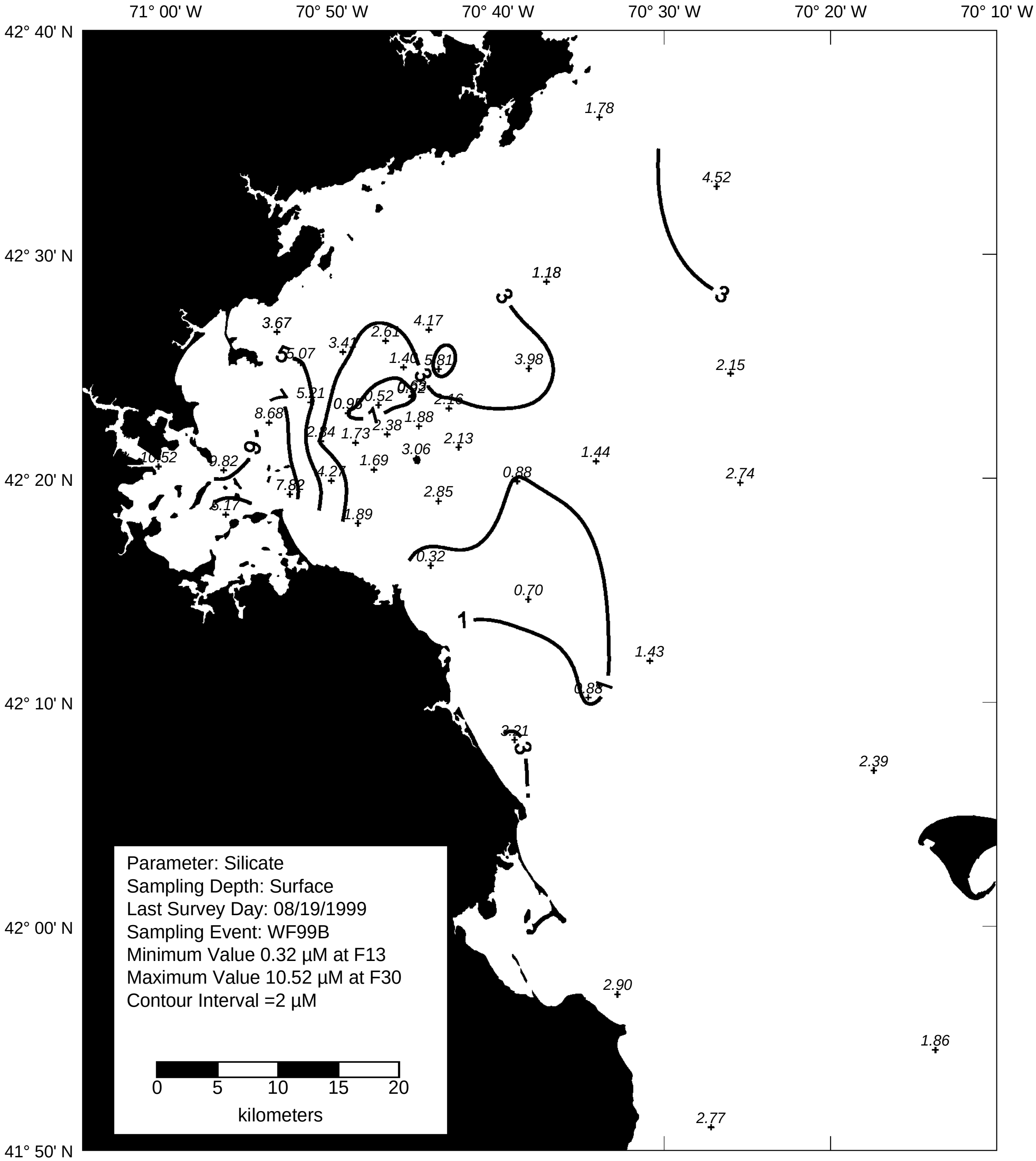


Figure 4-23. Silicate Surface Contour Plot for Farfield Survey WF99B (Aug 99)

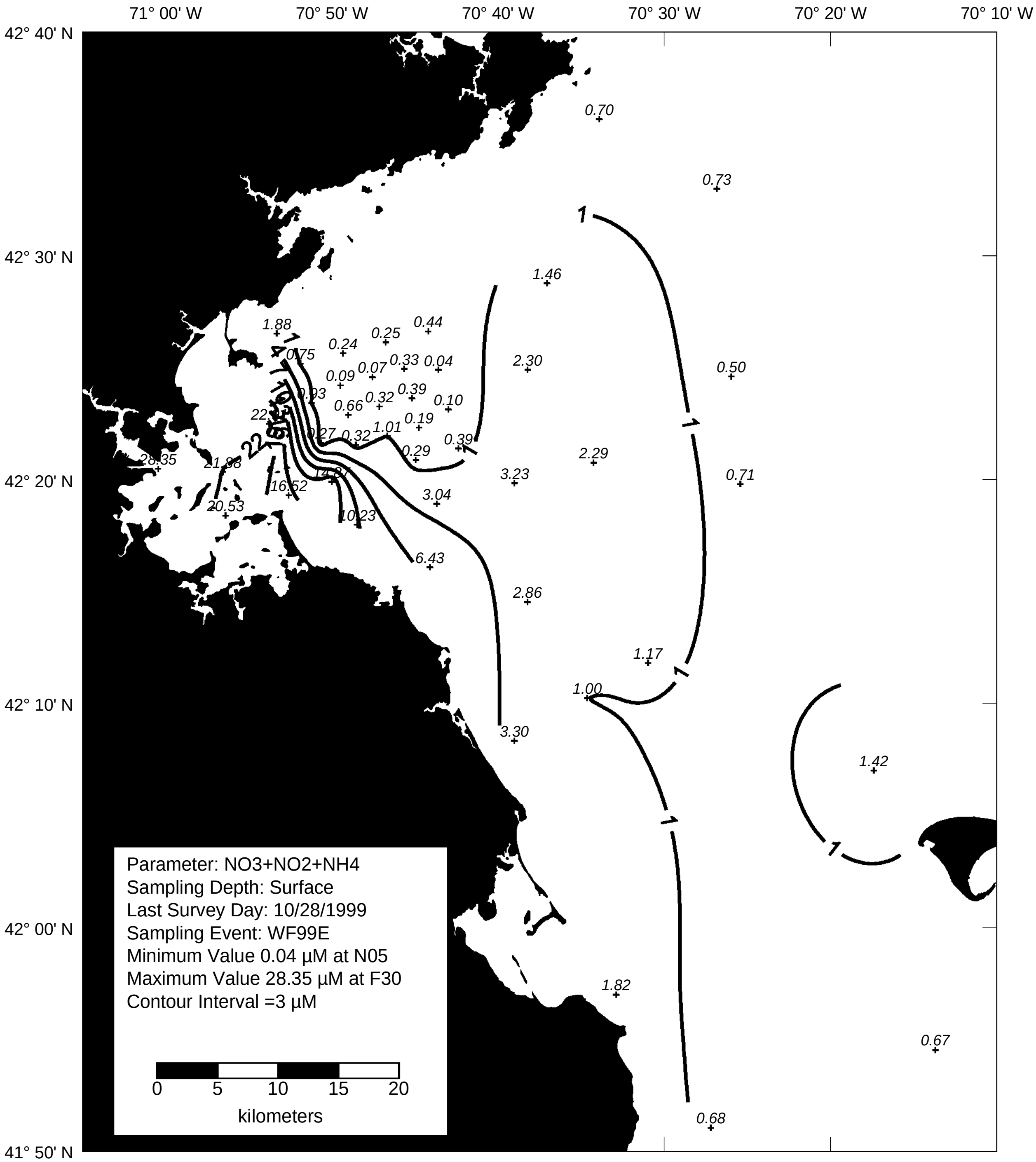


Figure 4-24. DIN Surface Contour Plot for Farfield Survey WF99E (Oct 99)

Note: See Figure 4-5 caption for sampling dates.

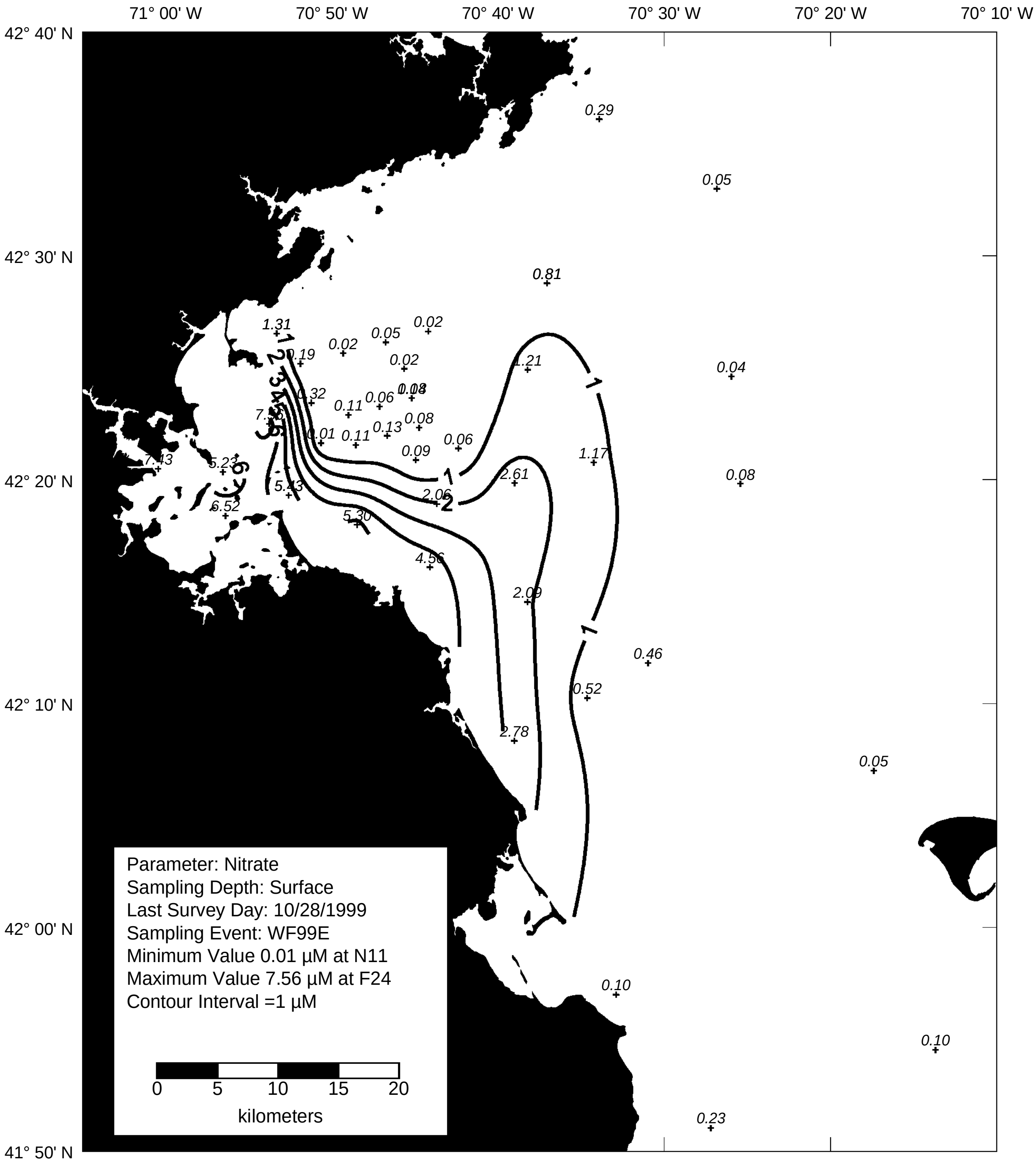


Figure 4-25. Nitrate Surface Contour Plot for Farfield Survey WF99E (Oct 99)

Note: See Figure 4-5 caption for sampling dates.

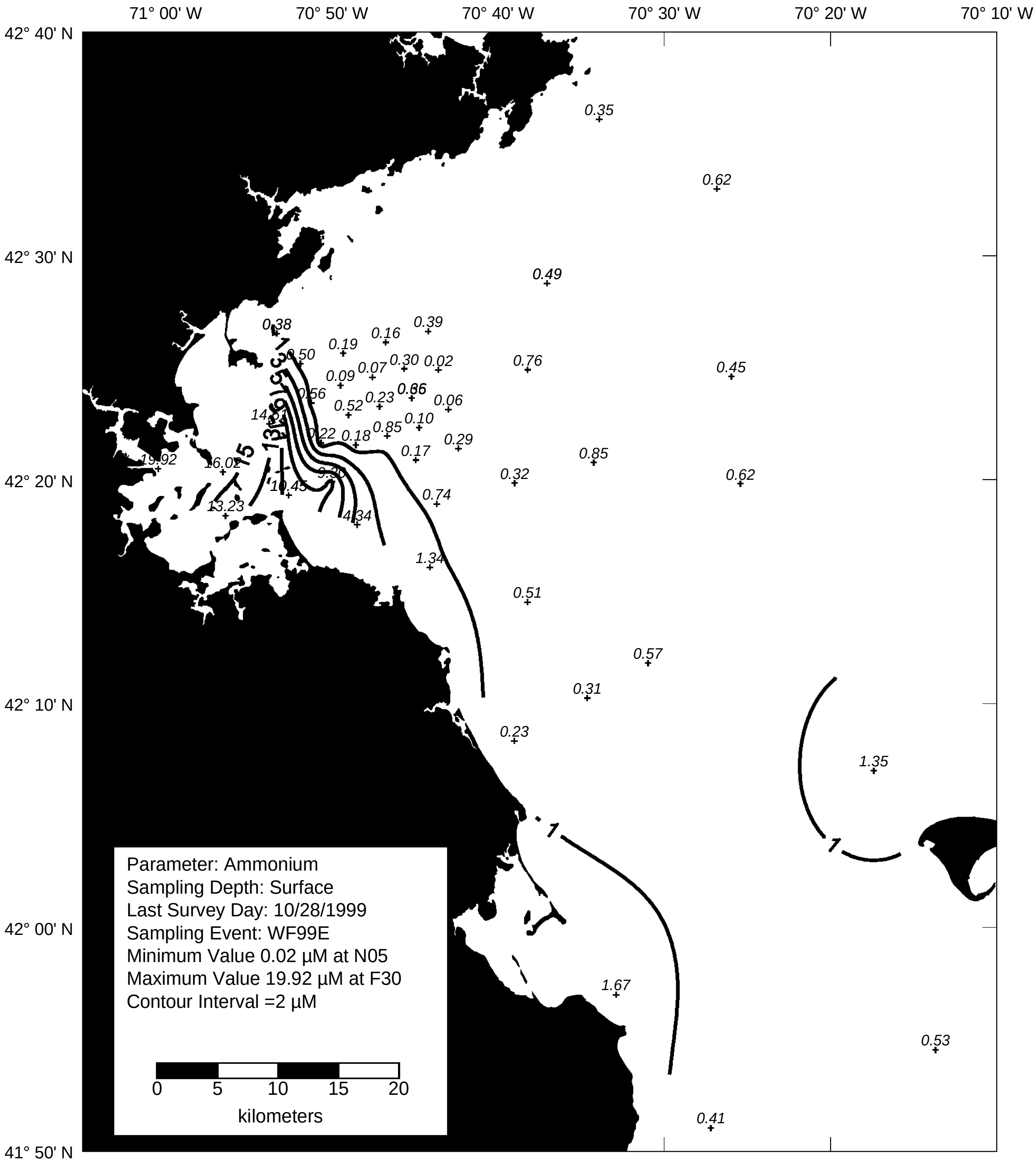


Figure 4-26. Ammonium Surface Contour Plot for Farfield Survey WF99E (Oct 99)

Note: See Figure 4-5 caption for sampling dates.

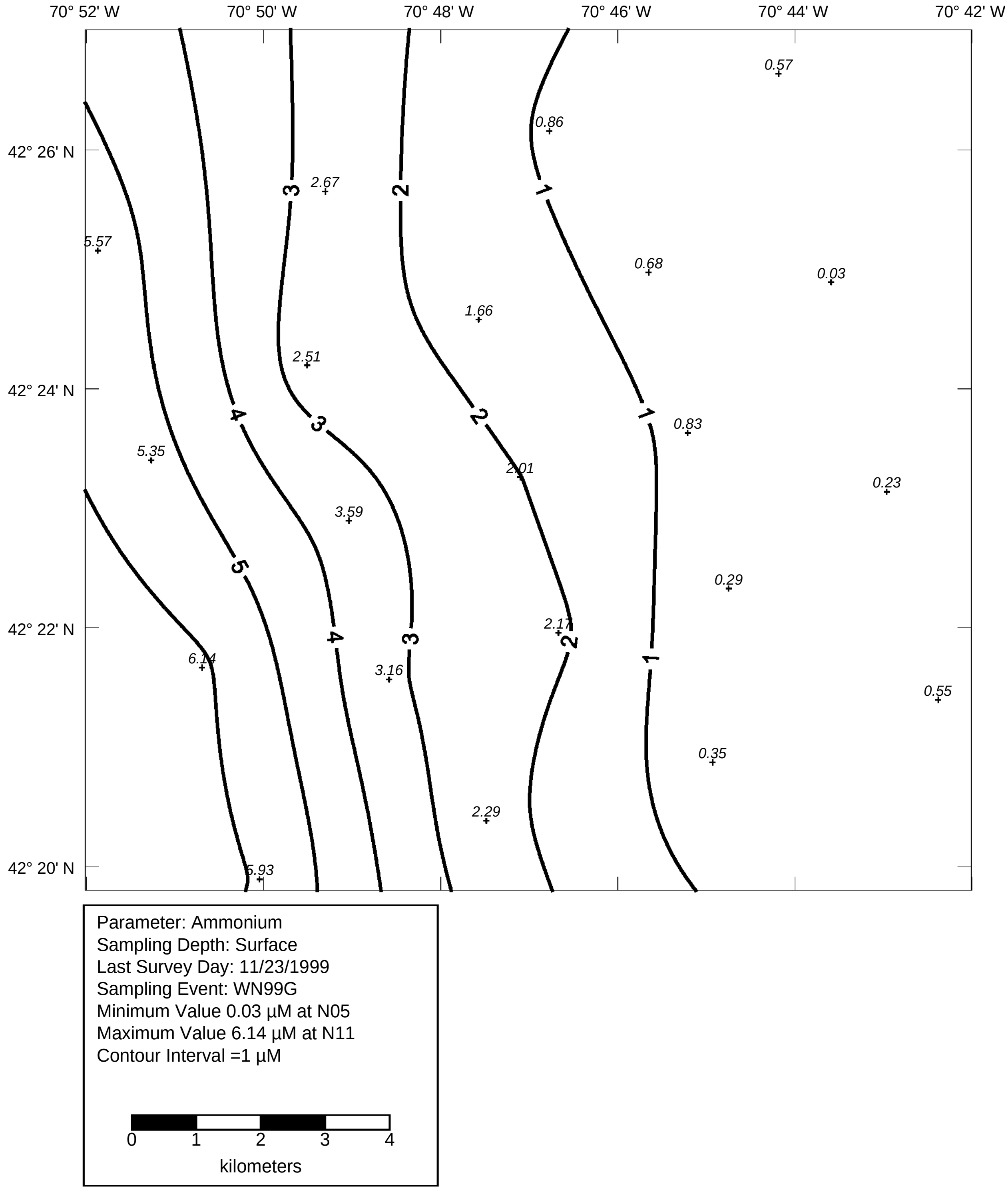


Figure 4-27. Ammonium Surface Contour Plot for Nearfield Survey WN99G (Nov 99)

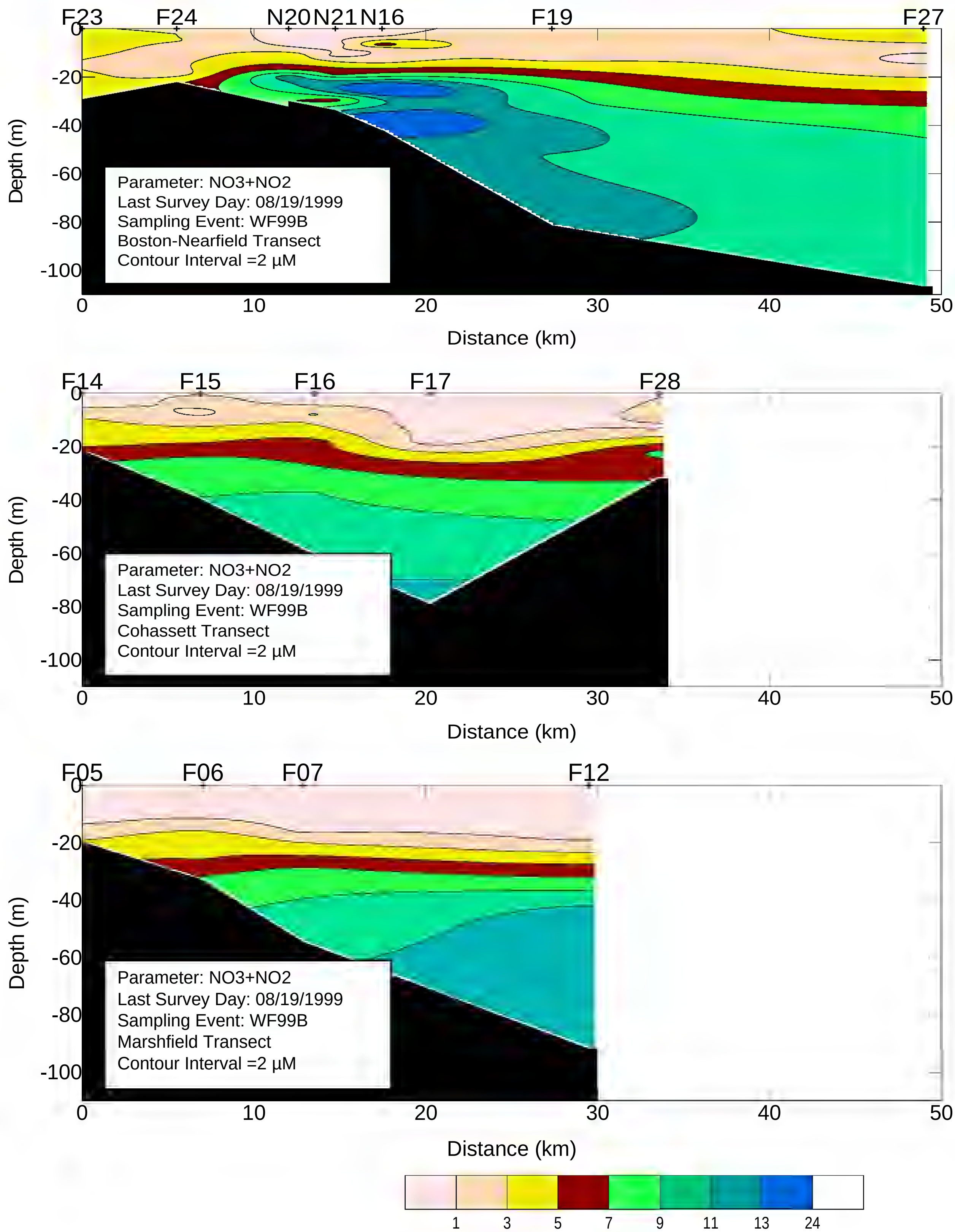


Figure 4-28. Nitrate and Nitrite Vertical Transect Plots for Farfield Survey WF99B (Aug 99)

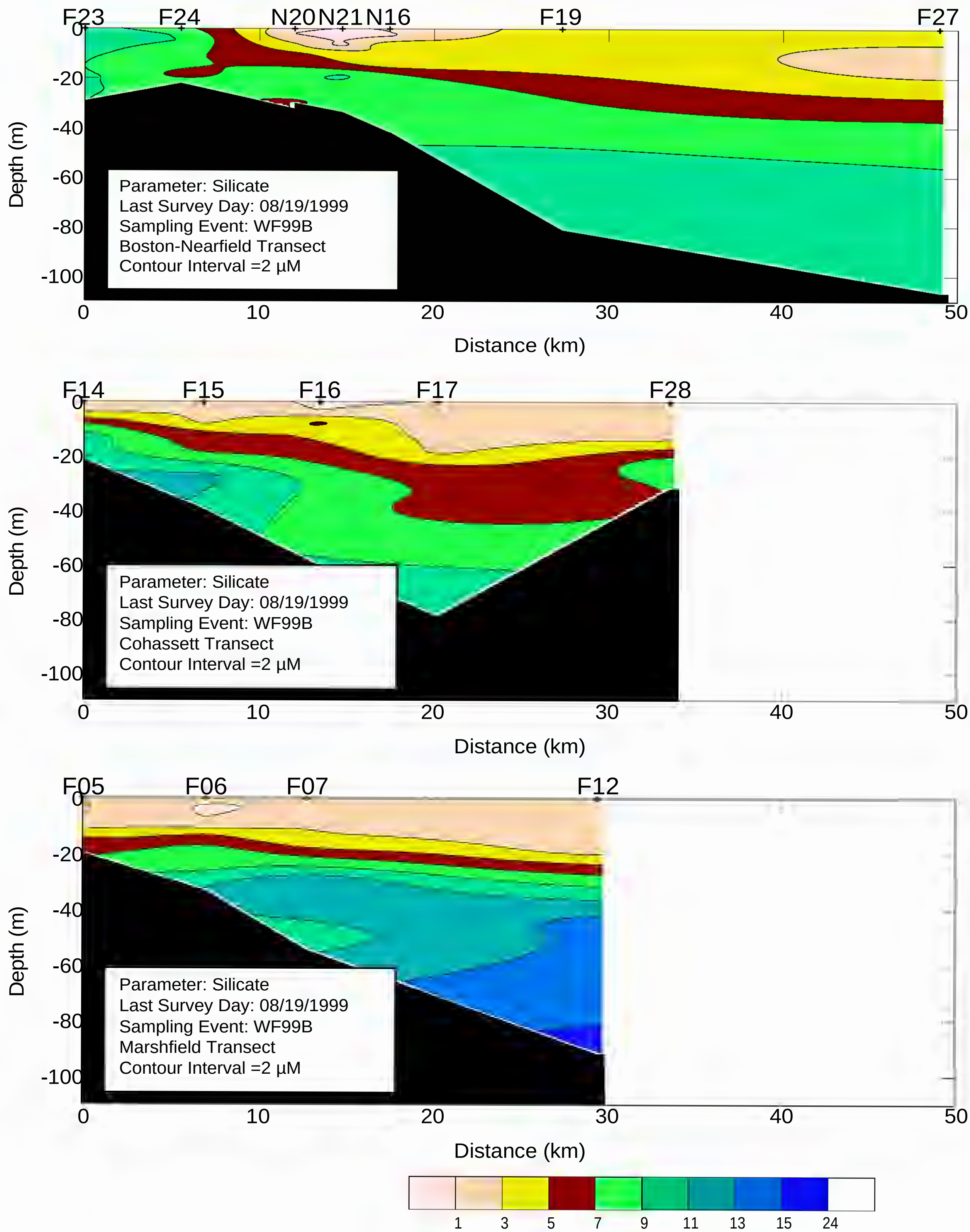


Figure 4-29. Silicate Vertical Transect Plots for Farfield Survey WF99B (Aug 99)

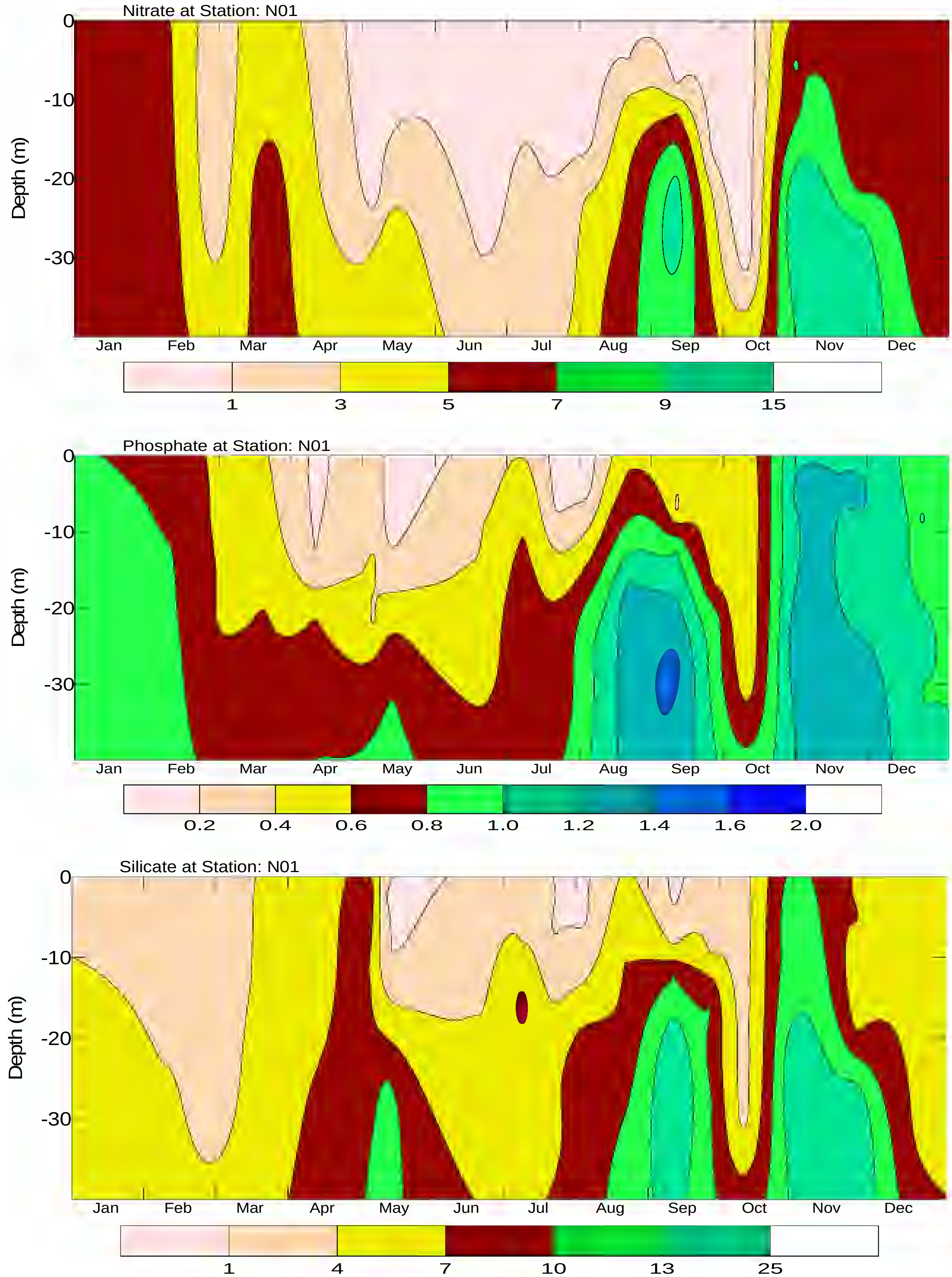


Figure 4-30. Nitrate, Phosphate, and Silicate Depth vs. Time Plots for Station N01

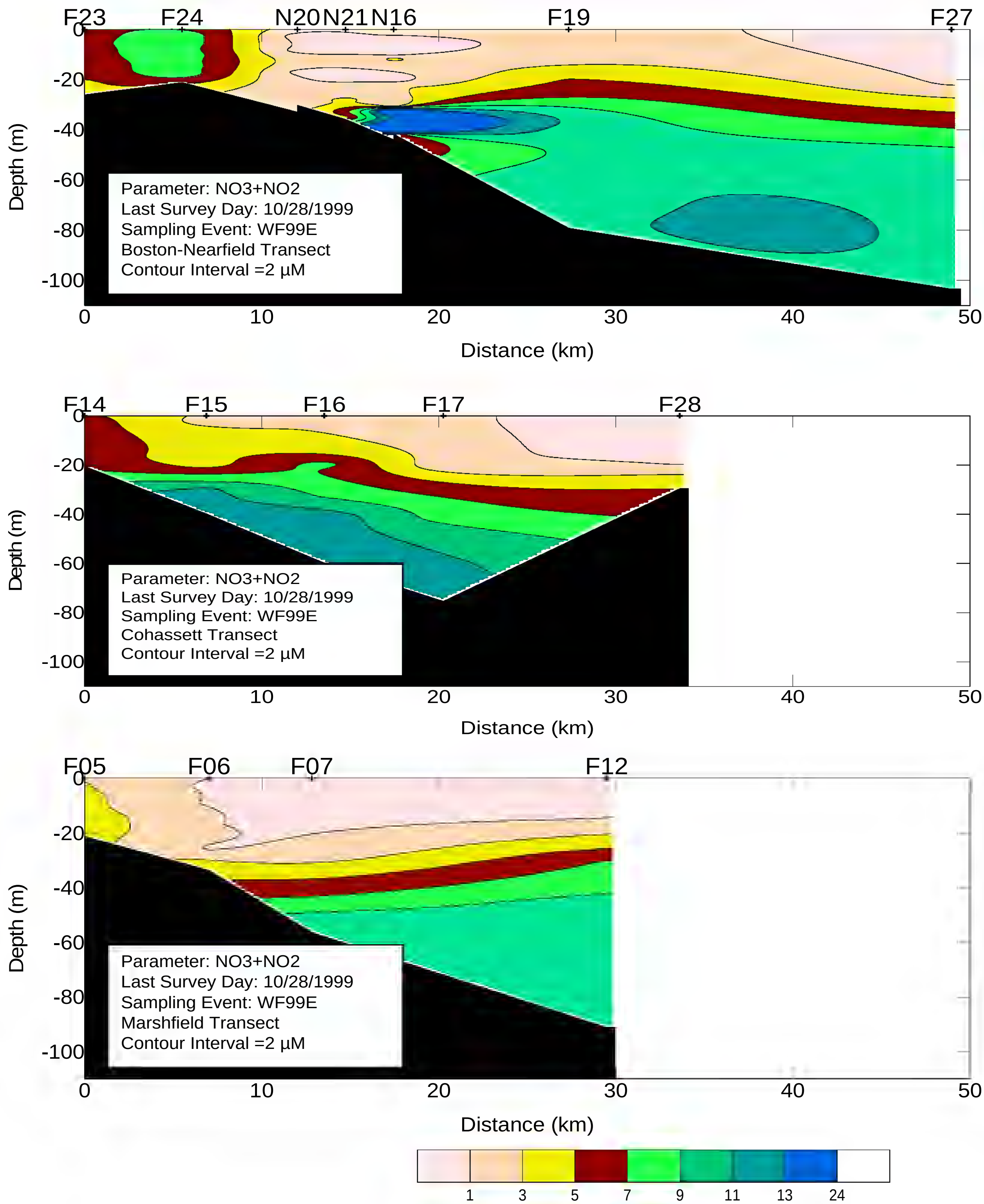


Figure 4-31. Nitrate and Nitrite Vertical Transect Plots for Farfield Survey WF99E (Oct 99)

Note: See Figure 4-5 caption for sampling dates.

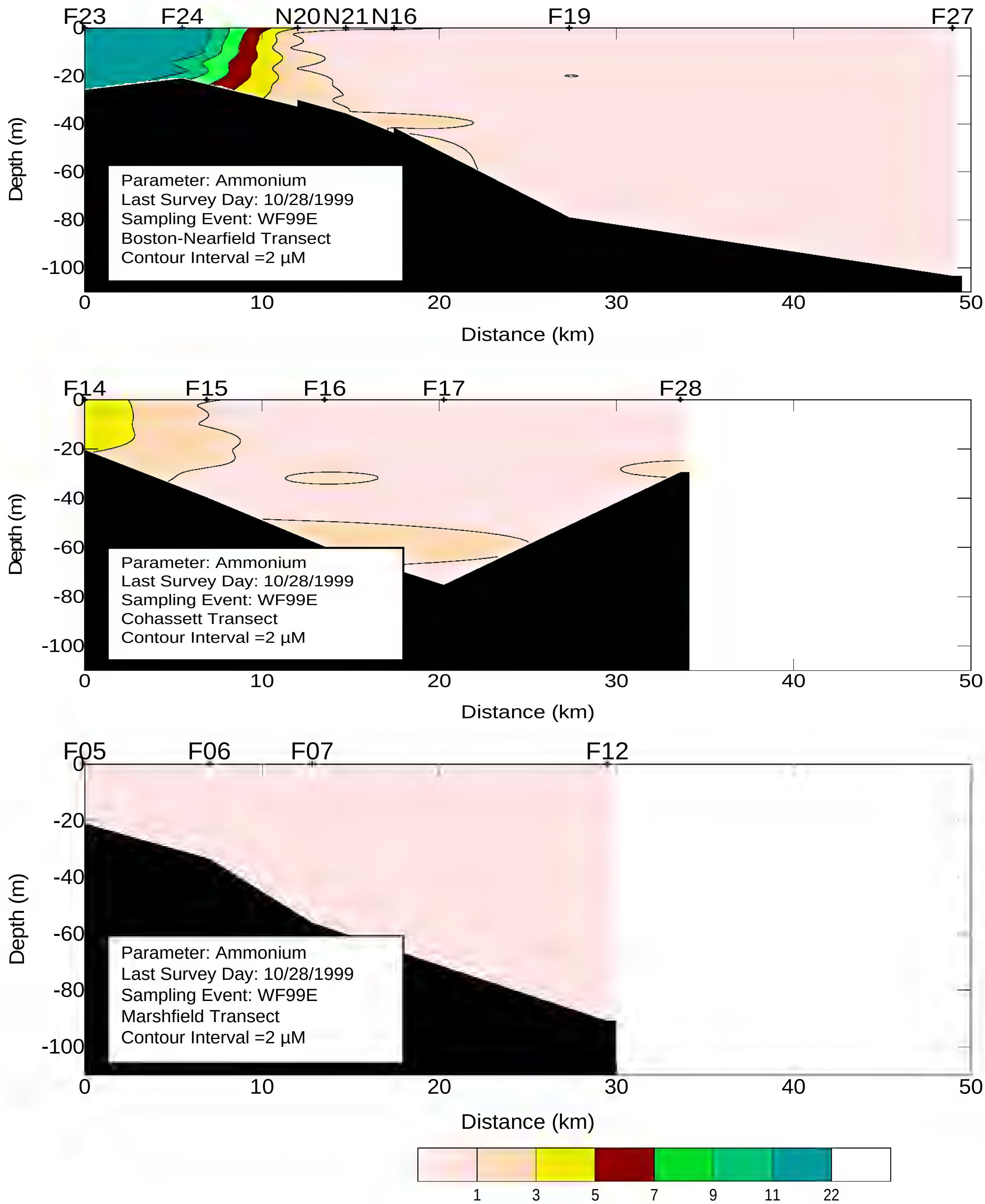
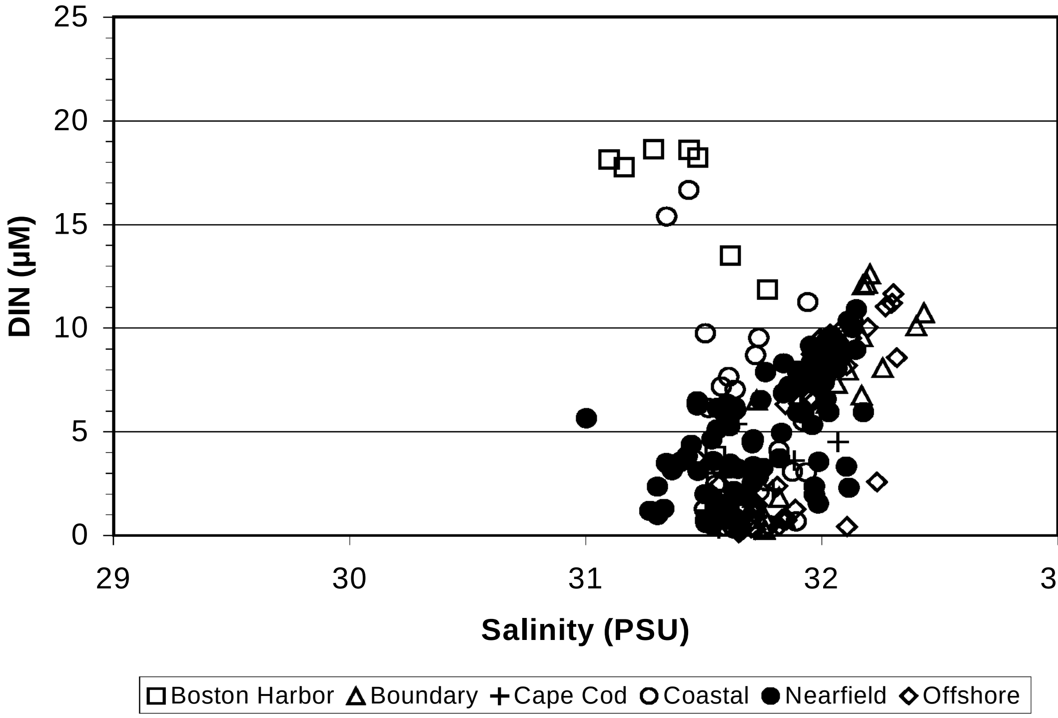


Figure 4-32. Ammonium Vertical Transect Plots for Farfield Survey WF99E (Oct 99)

Note: See Figure 4-5 caption for sampling dates.

(a) WF99B



(b) WF99E

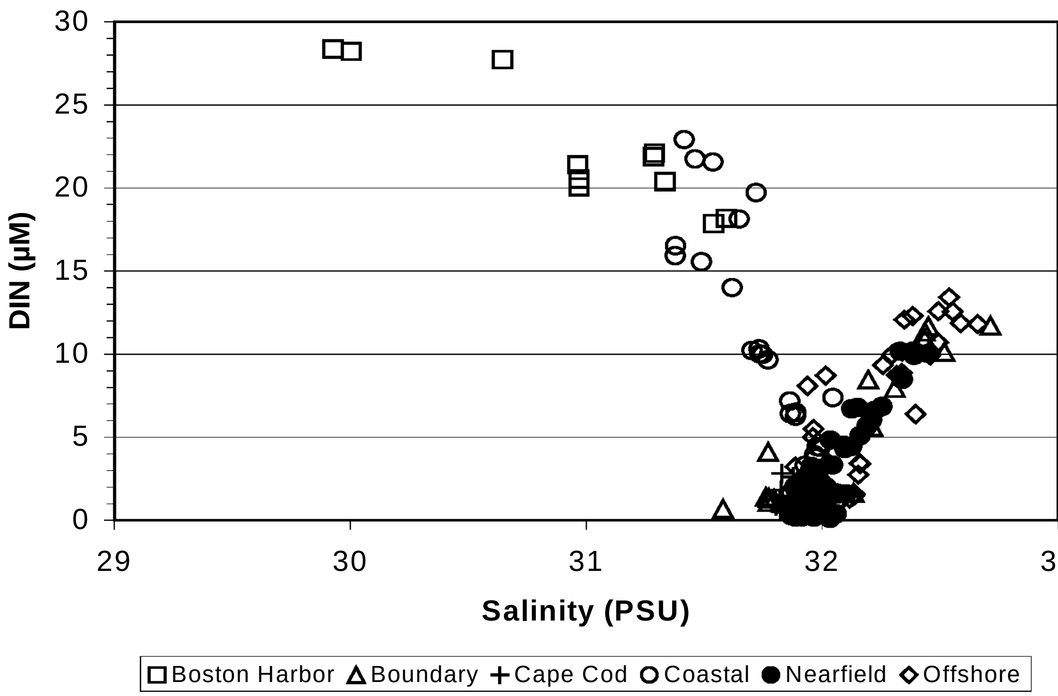


Figure 4-33. Dissolved Inorganic Nitrogen vs Salinity Plots for All Depths during Surveys WF99B (Aug 99) and WF99E (Oct 99)

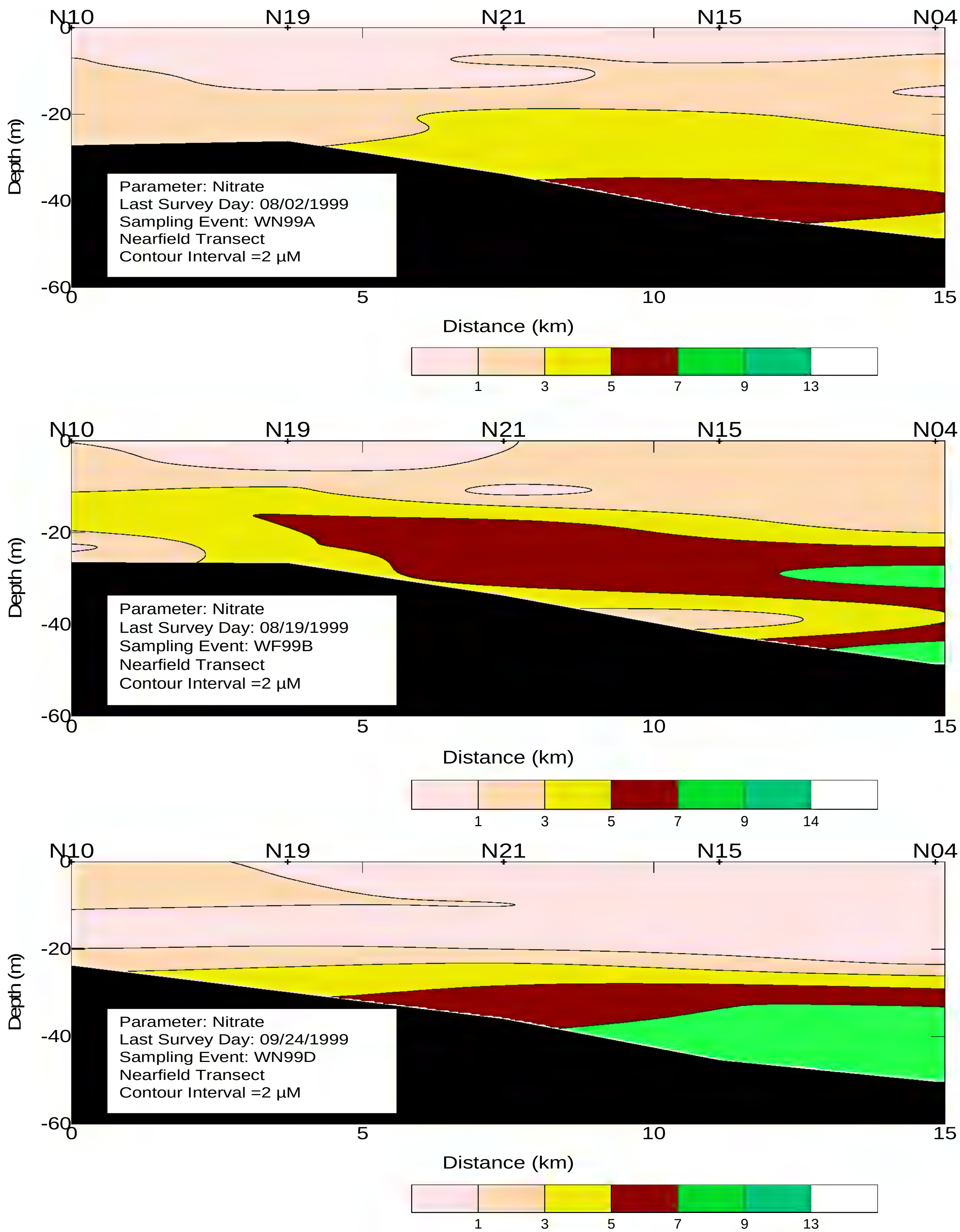


Figure 4-34. Nitrate Vertical Nearfield Transects for Surveys WN99A, WF99B, and WN99D

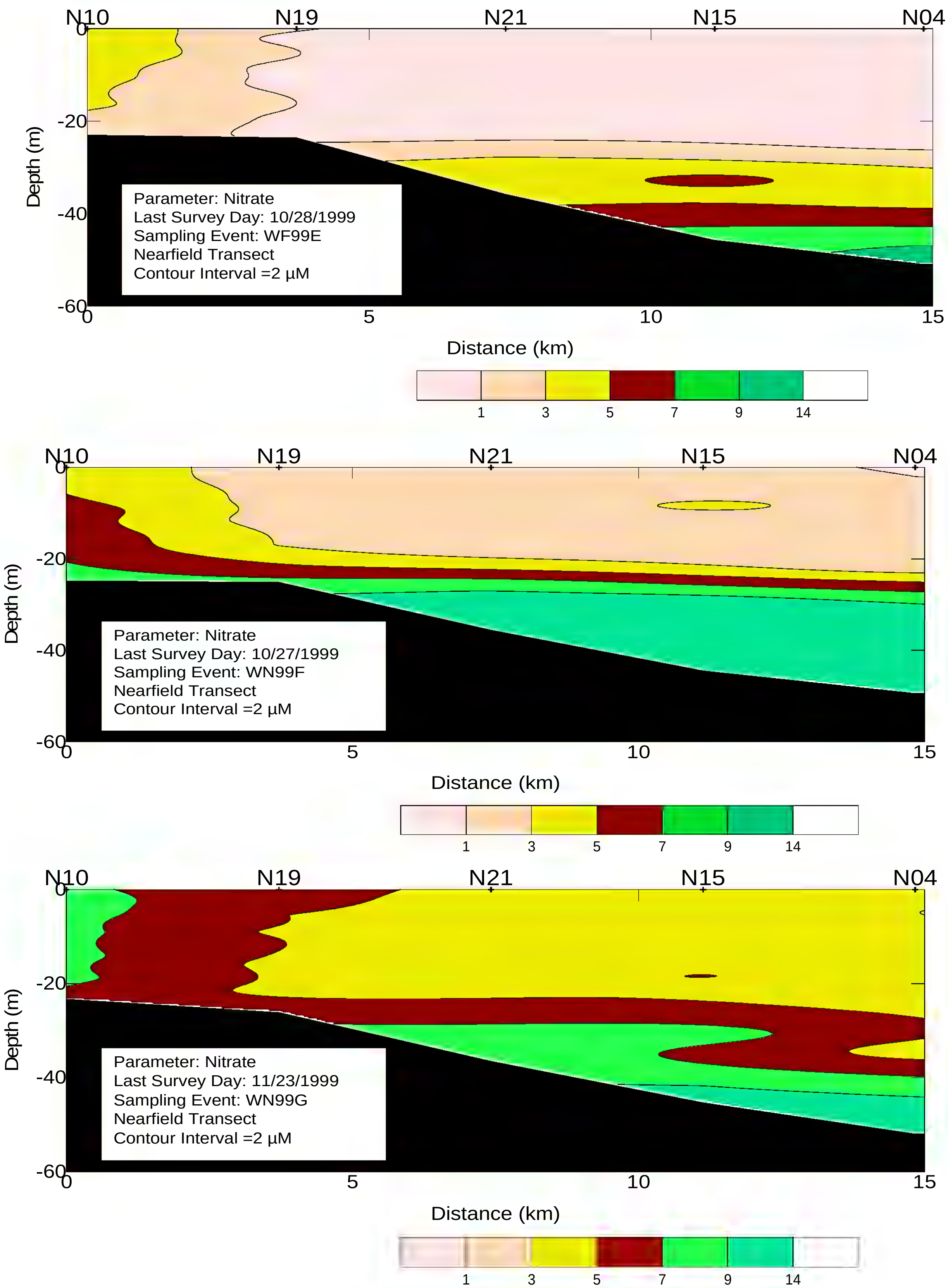


Figure 4-35. Nitrate Vertical Nearfield Transects for Surveys WF99E, WN99F, and WN99G

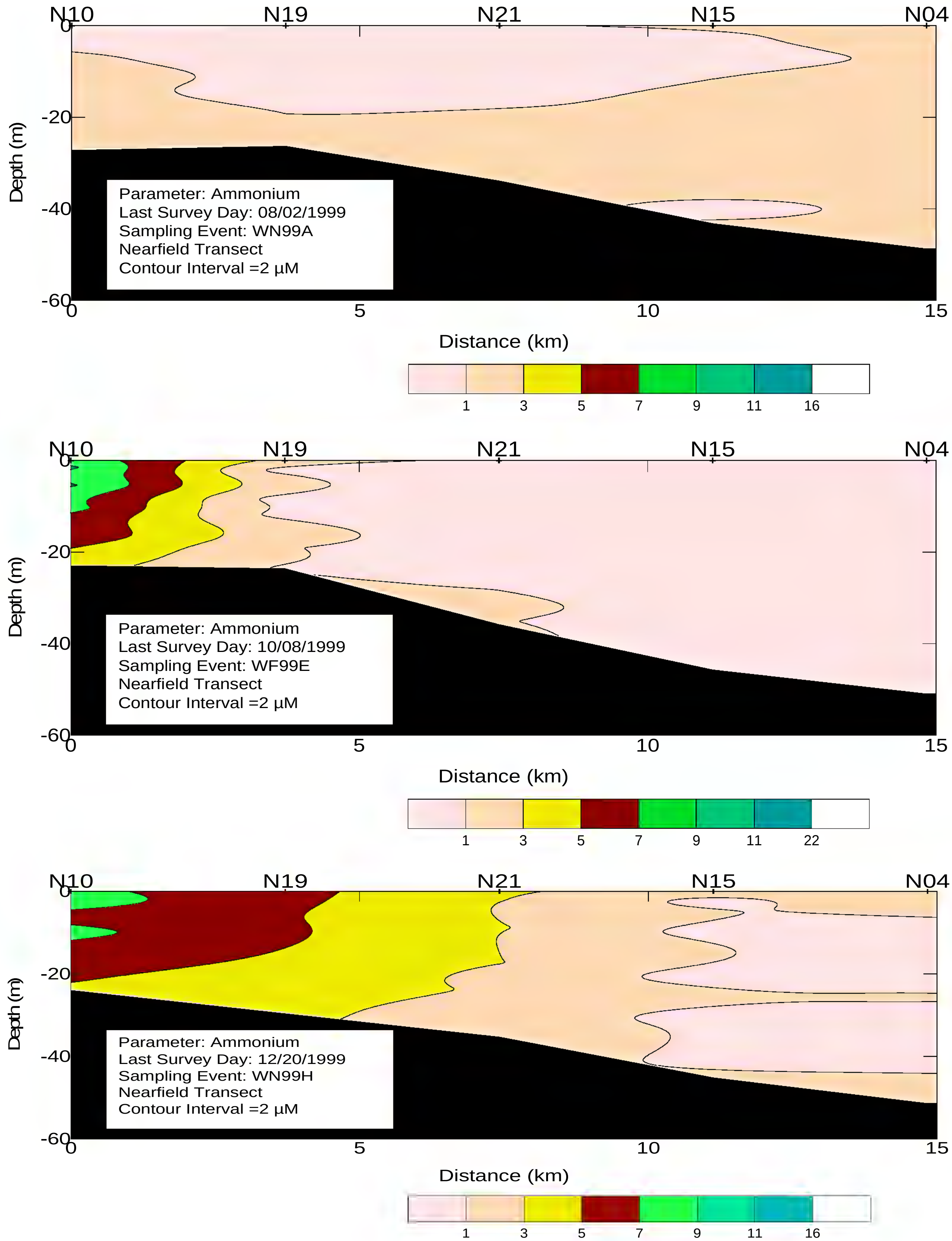


Figure 4-36. Ammonium Vertical Nearfield Transects for Surveys WN99A, WF99E, and WN99H

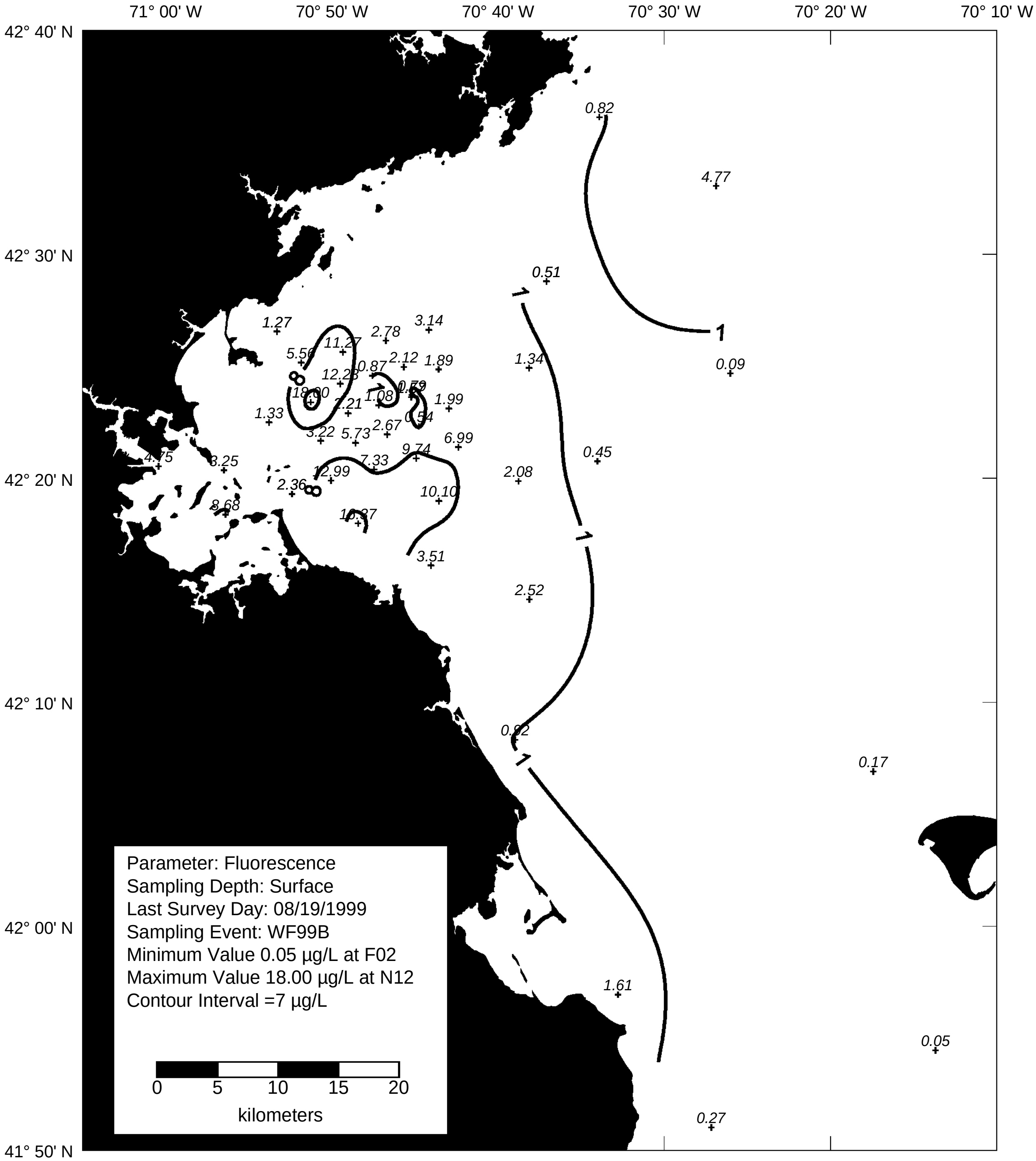


Figure 4-37. Fluorescence Surface Contour Plot for Farfield Survey WF99B (Aug 99)

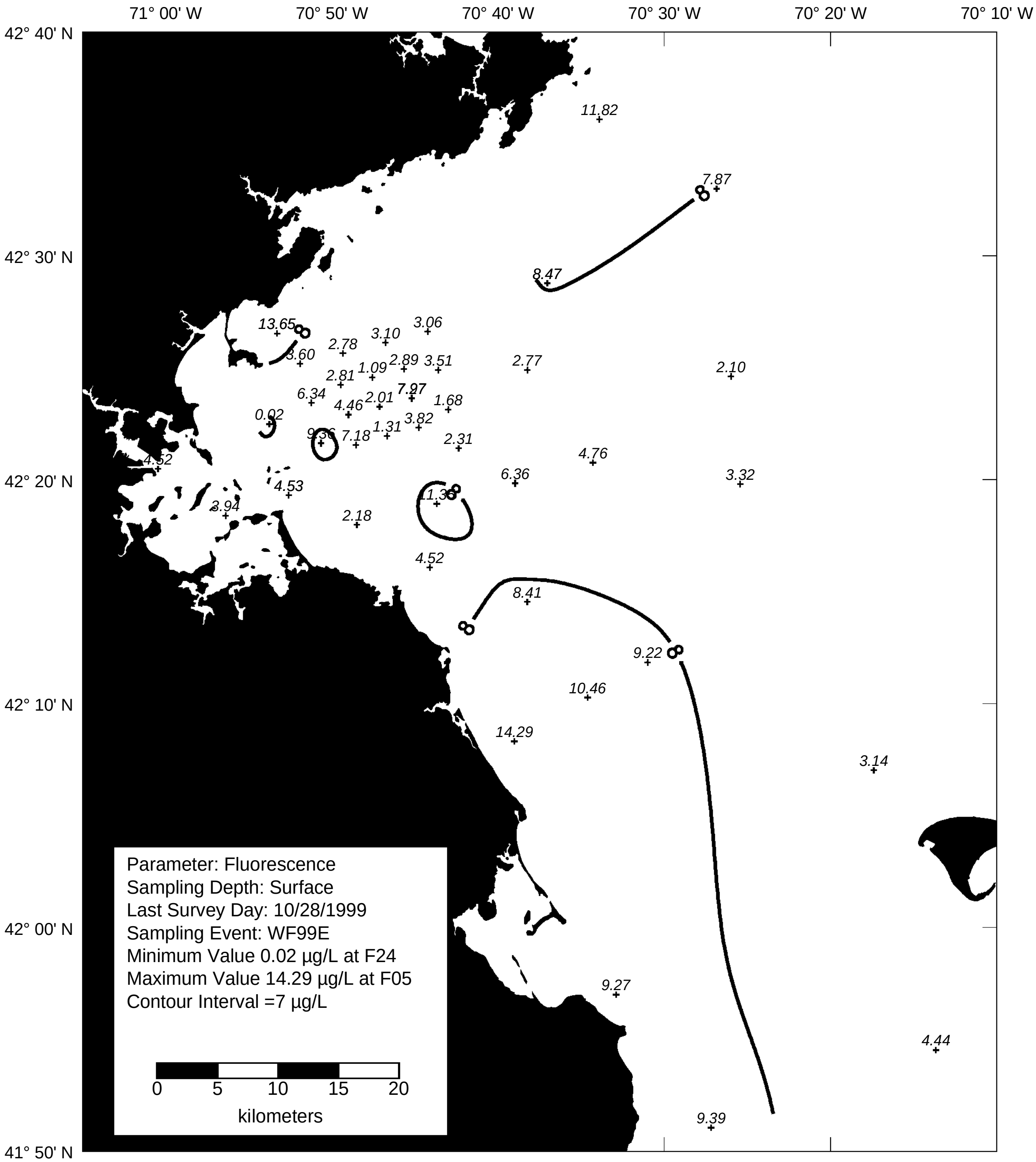


Figure 4-38. Fluorescence Surface Contour Plot for Farfield Survey WF99E (Oct 99)

Note: See Figure 4-5 caption for sampling dates.

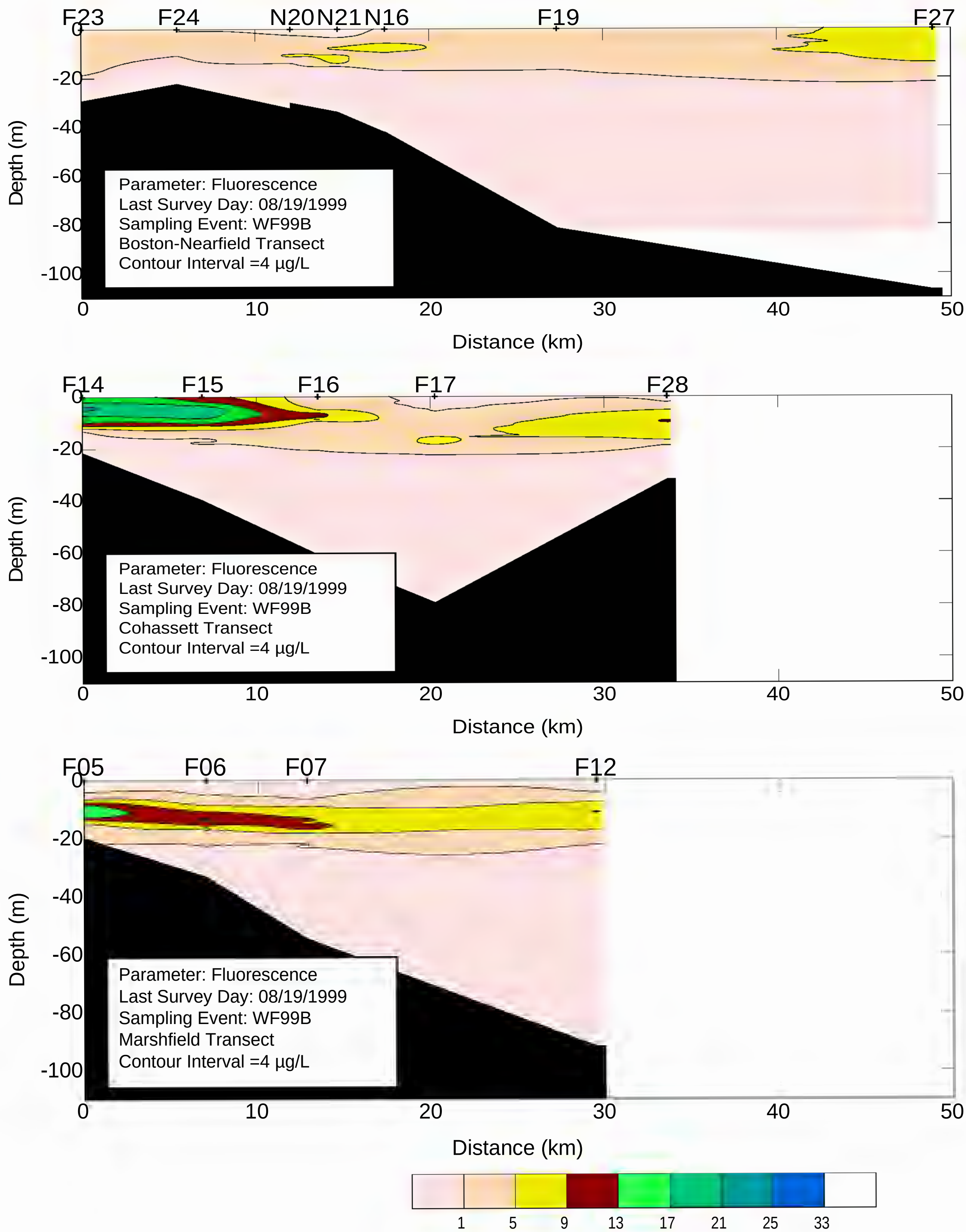


Figure 4-39. Fluorescence Vertical Transects for Farfield Survey WF99B (Aug 99)

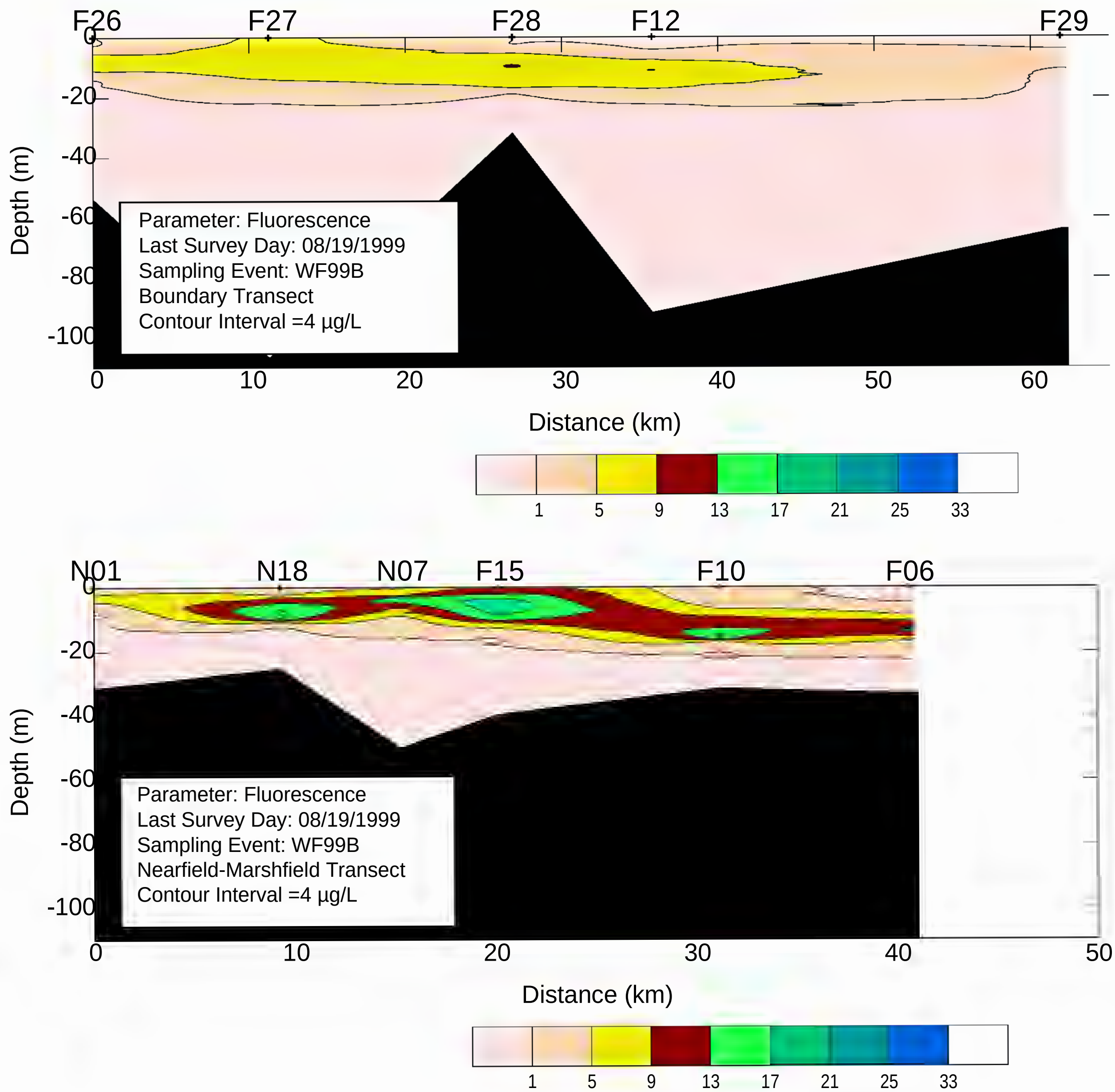


Figure 4-40. Fluorescence Vertical Transect Plots for Farfield Survey WF99B (Aug 99)

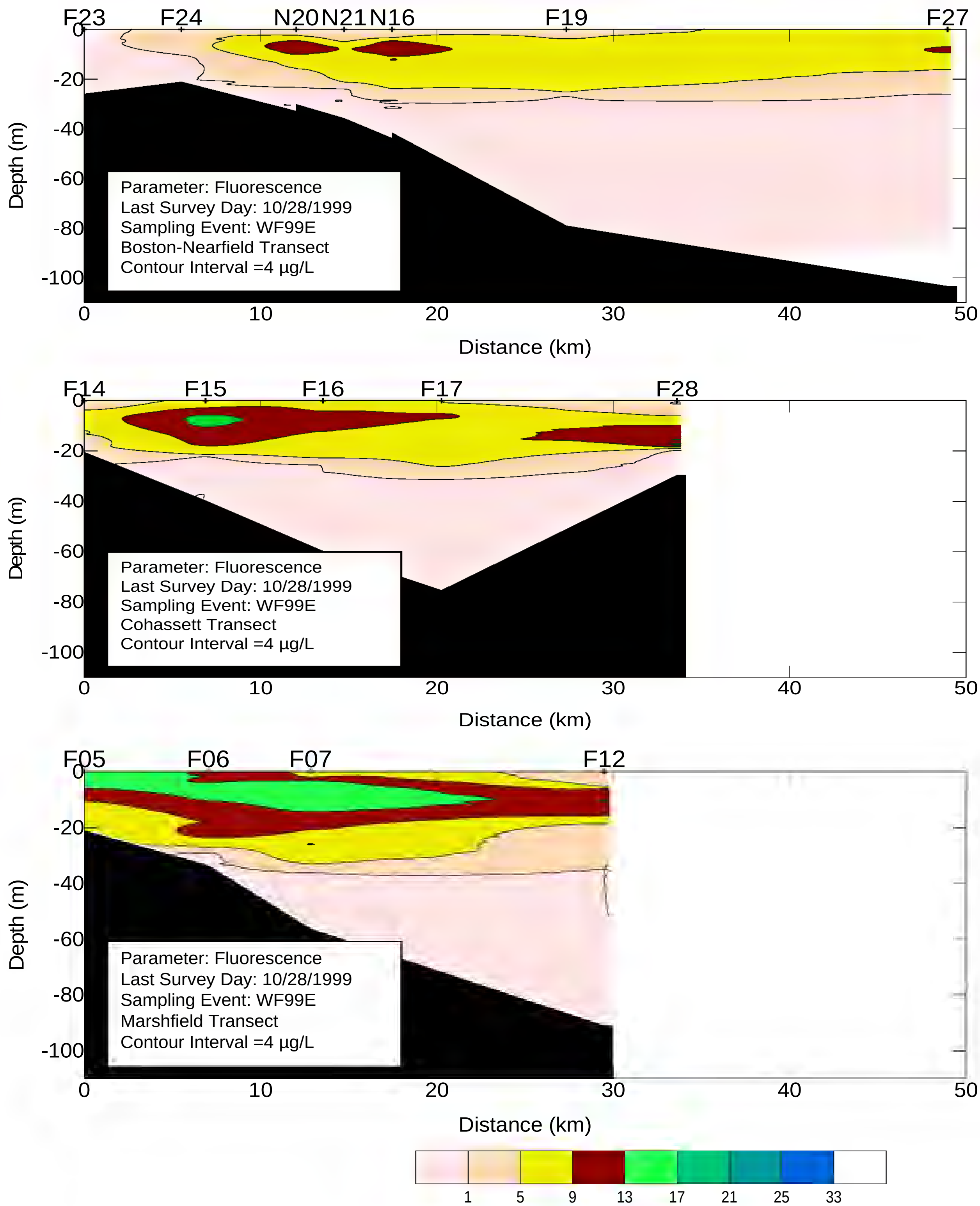


Figure 4-41. Fluorescence Vertical Transect Plots for Farfield Survey WF99E (Oct 99)

Note: See Figure 4-5 caption for sampling dates.

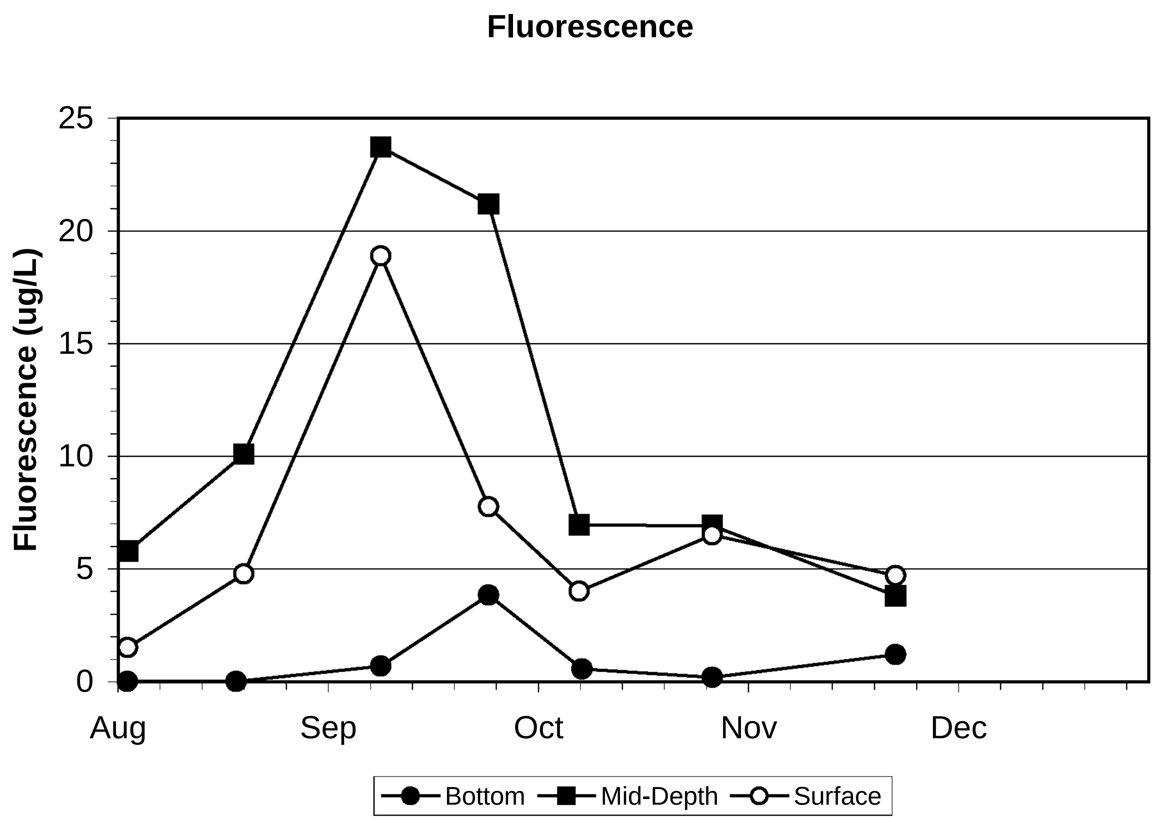


Figure 4-42. Time Series of Average Fluorescence in the Nearfield – Surface, Mid-Depth, and Bottom Depth

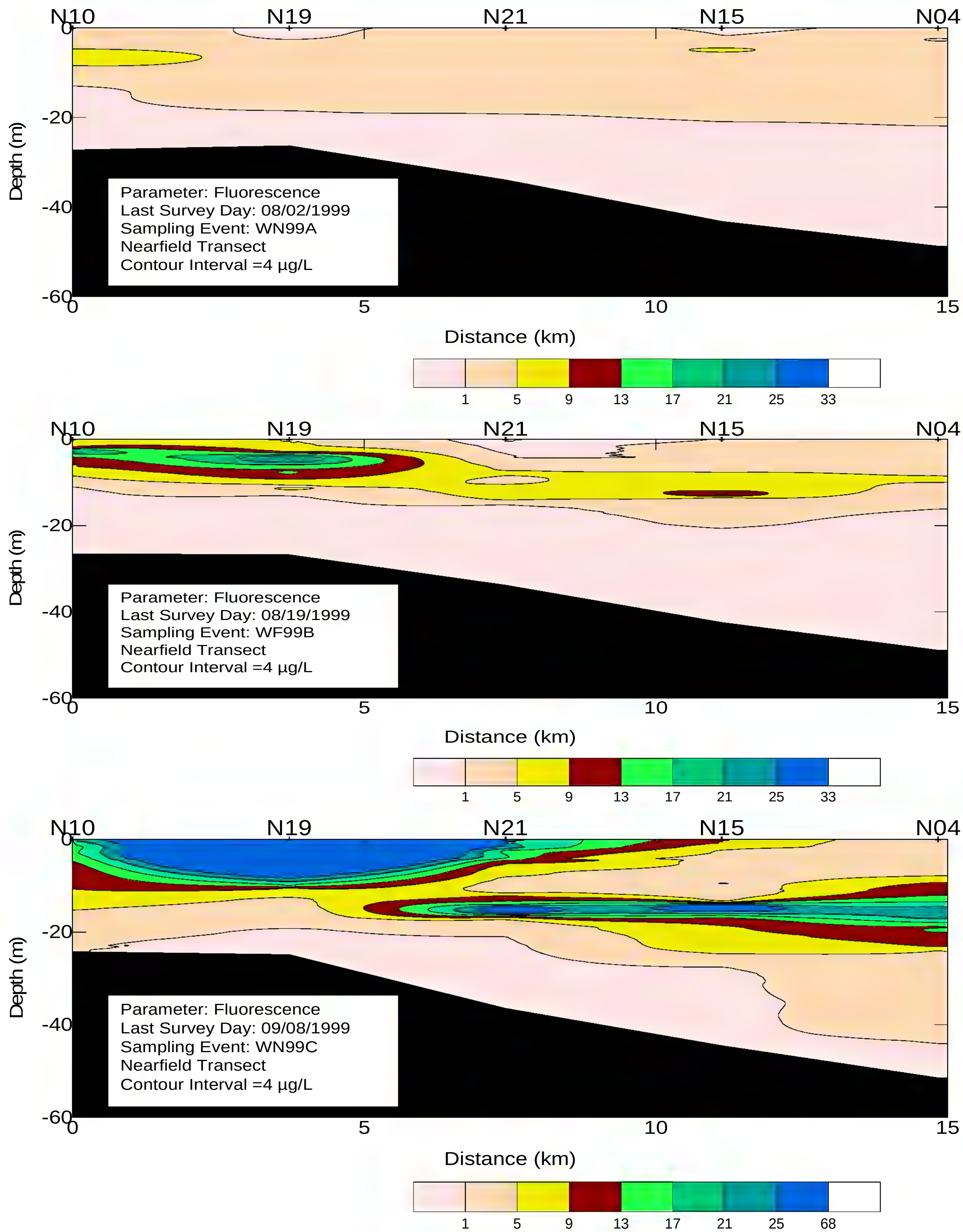


Figure 4-43. Fluorescence Vertical Nearfield Transect Plots for Surveys WN99A, WF99B, and WN99C

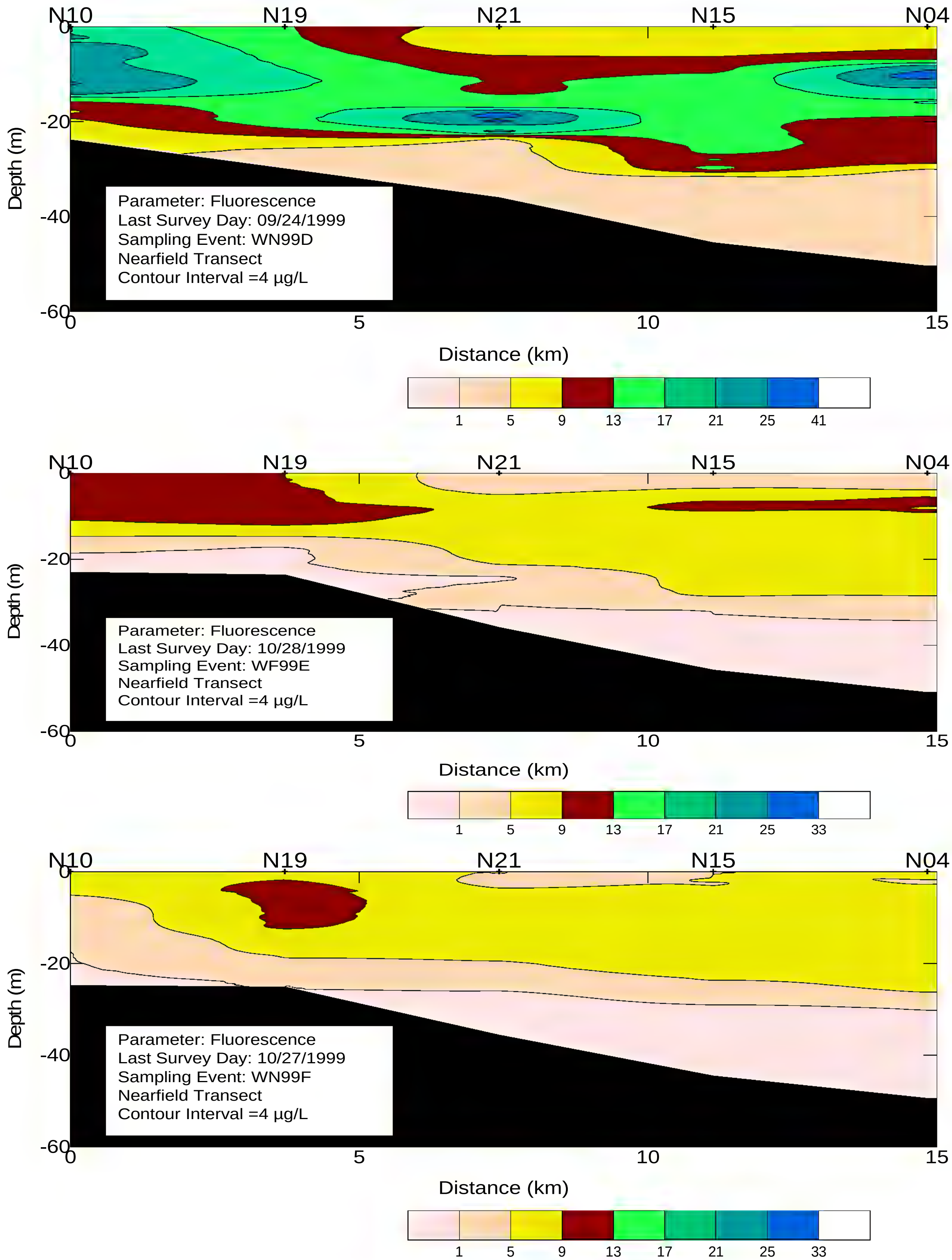


Figure 4-44. Fluorescence Vertical Nearfield Transect Plots for Surveys WN99D, WF99E, and WN99F

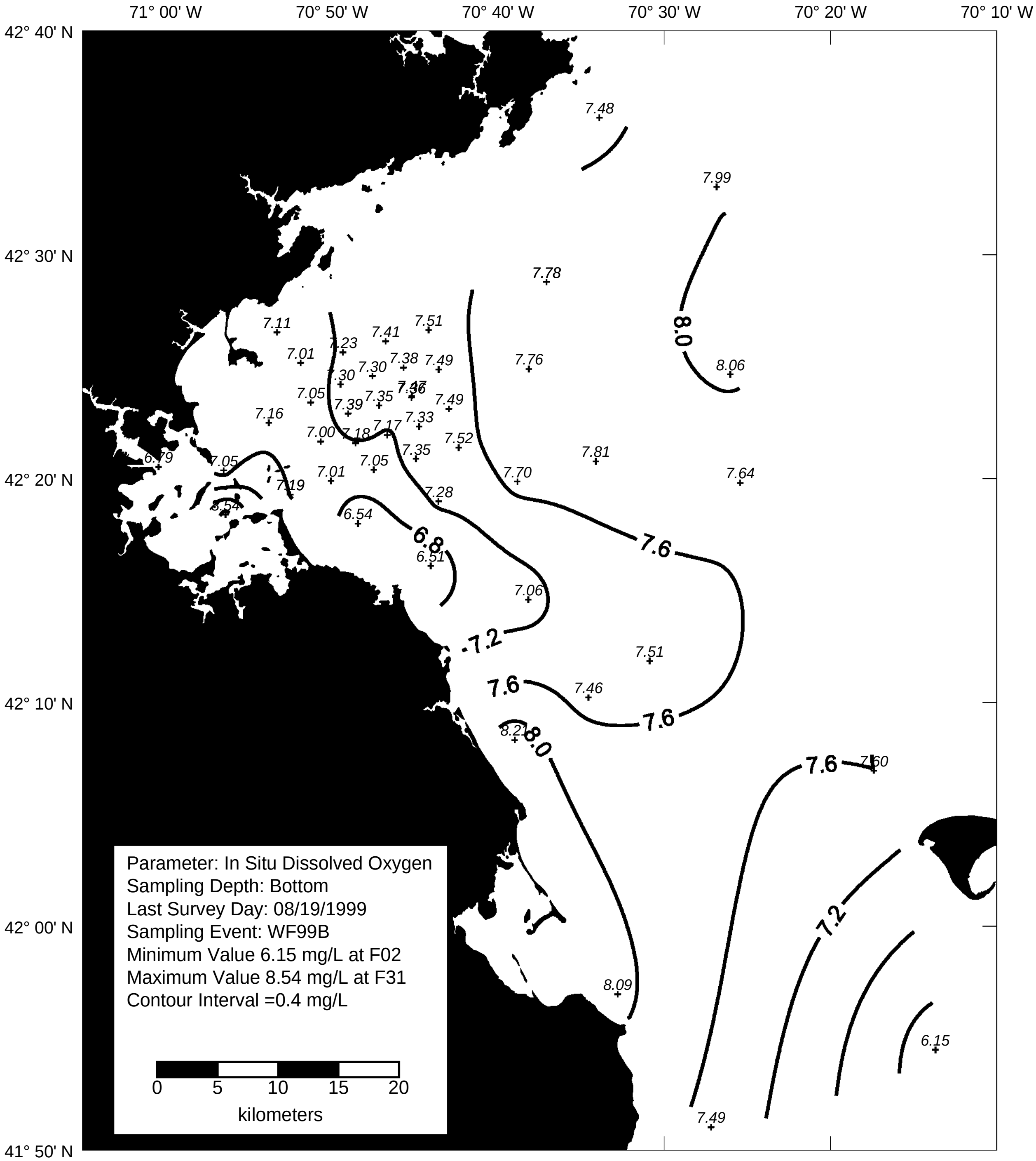


Figure 4-45. Dissolved Oxygen Bottom Contour in the Farfield Survey WF99B

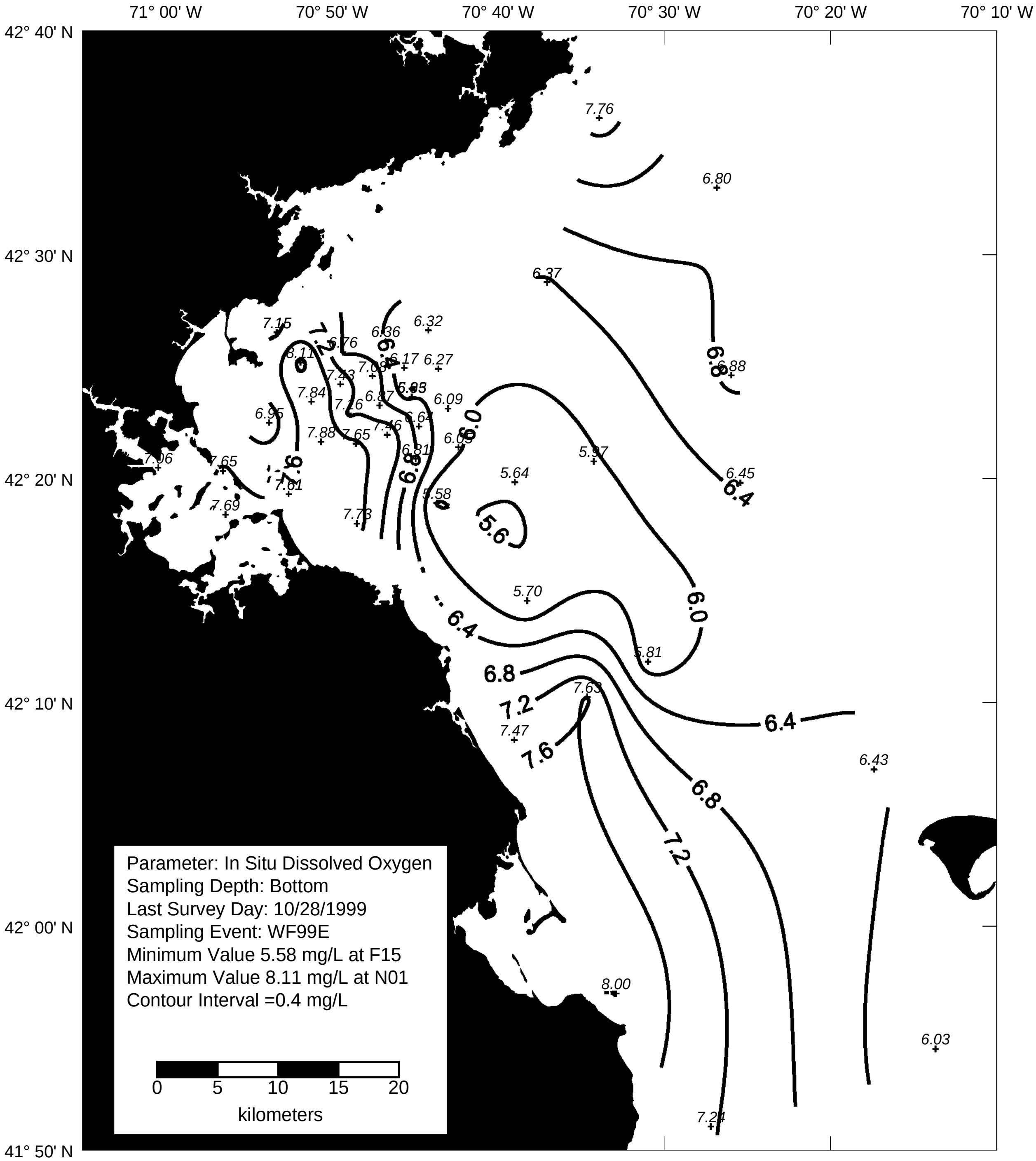


Figure 4-46. Dissolved Oxygen Bottom Contour in the Farfield Survey WF99E

Note: See Figure 4-5 caption for sampling dates.

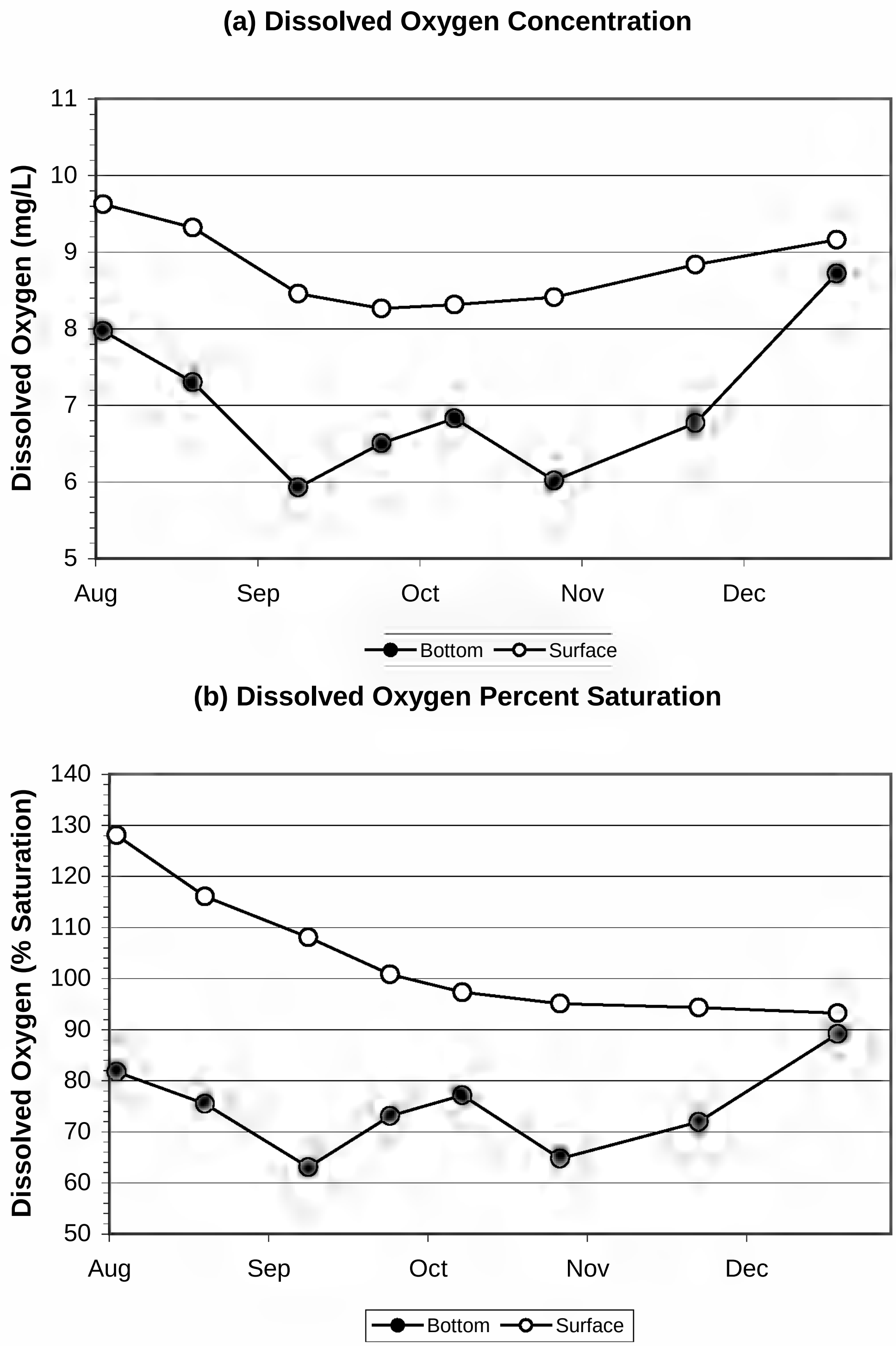


Figure 4-47. Time Series of Average Bottom DO Concentration and Percentage Saturation in the Farfield

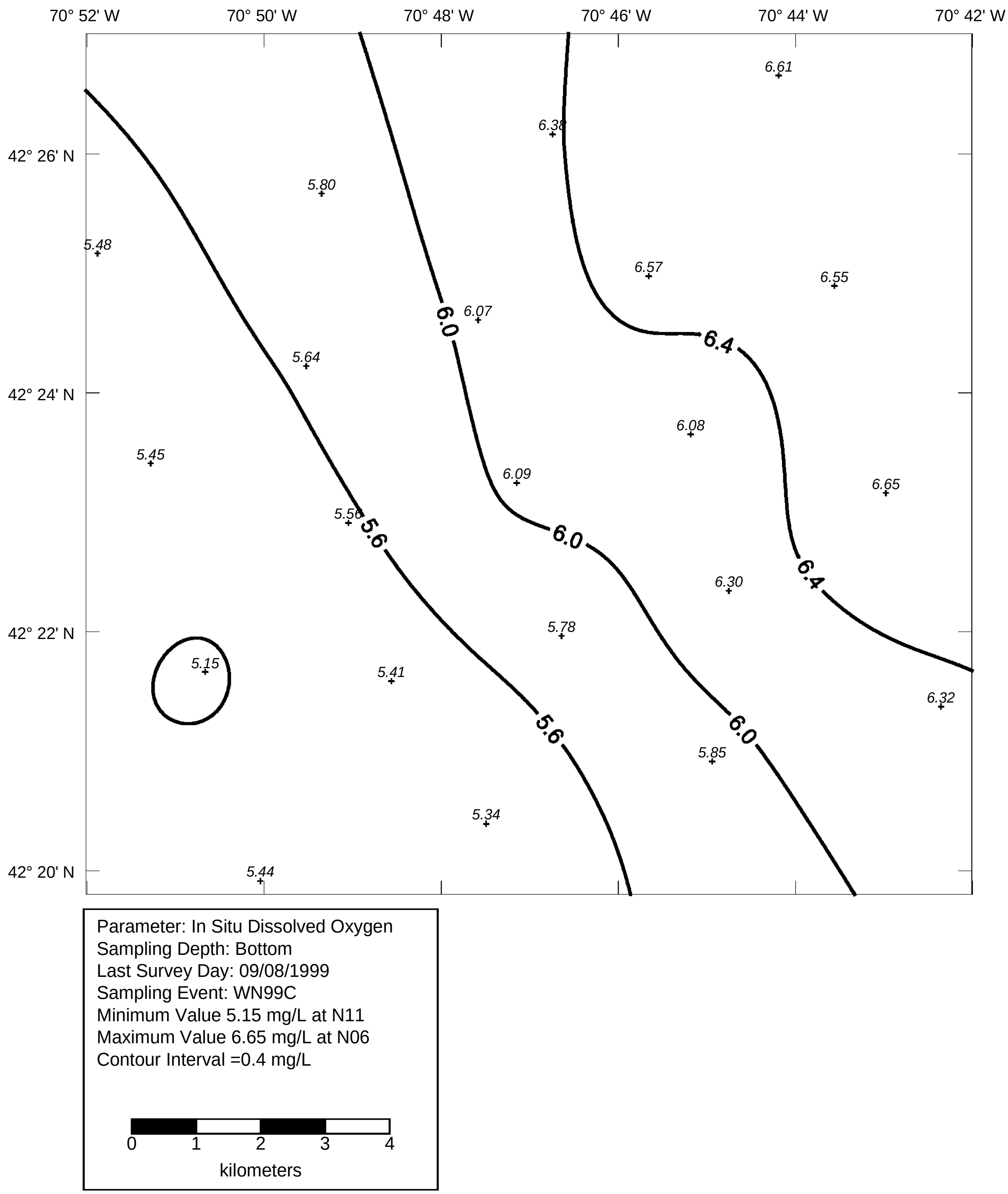


Figure 4-48. Dissolved Oxygen Bottom Contour for Nearfield Survey WN99C (Aug 99)

5.0 RESULTS OF WATER COLUMN MEASUREMENTS

5.1 Productivity

Production measurements were taken at two nearfield stations (N04, N18) and one farfield station (F23) near the entrance of Boston Harbor. All three stations were sampled on 18 August 1999 (WF99B) and 8 October 1999 (WF99E). N04 and N18 were additionally sampled on August 2, 1999 (WN99A), September 8, 1999 (WN99C), September 24, 1999 (WN99D), October 27,1999 (WN99F), November 23, 1999 (WF99G) and December, 20 1999 (WN99H). Samples were collected at five depths throughout the euphotic zone. Production was determined by measuring ^{14}C at varying light intensities as summarized below and in Appendix A.

In addition to samples collected from the water column, productivity calculations also utilized light attenuation data from a CTD-mounted 4π sensor, and incident light time-series data from a 2π irradiance sensor located on Deer Island, MA. After collection, productivity samples were returned to the Marine Ecosystems Research Laboratory (MERL) in Rhode Island and incubated in temperature controlled incubators. The resulting photosynthesis versus light intensity (P-I) curves (Figure 5-1 and comprehensively in Appendix E) were used, in combination with light attenuation and incident light information, to determine hourly production at 15-min intervals throughout the day for each sampling depth.

For this semi-annual report, areal production (mg C m^{-2} d^{-1}) and chlorophyll-specific areal production (mg C mg Chl^{-1} d^{-1}) are presented (Figures 5-2, 5-3). Areal productions are determined by integrating measured productivity (and chlorophyll-specific productivity) over the depth interval. Chlorophyll-specific productivity for each depth was first determined by normalizing productivity by measured chlorophyll *a*. Productivity and chlorophyll-specific productivity for each depth are also presented as contour plots (Figures 5-4, 5-5, 5-6, 5-7).

5.1.1 Areal Production

Areal production at the nearfield stations (N04, N18) was similar throughout most of the semi-annual sampling period (August 2 - December 20,1999) (Figure 5-2). Areal production was at its peak summer value (~1400 mg C m^{-2} d^{-1}) for station N04 in early August (WN99A). Production at station N18 was somewhat higher at this time with a value of ~2000 mg C m^{-2} d^{-1}. The major difference in the productivity cycle between these stations occurred during the subsequent survey later in August (WF99B). At station N04 areal productivity declined to less than 1000 mg C m^{-2} d^{-1} while at station N18 productivity increased to the highest value recorded during 1999 (~3500 mg C m^{-2} d^{-1}). Historically, productivity at station N18 (and N16) is generally somewhat greater than that observed at station N04. However this elevated production is unusual since it is greater than the productivity recorded at station F23, at the outer edge of Boston Harbor and continues a trend first noted in 1997. In 1995 and 1996 the highest areal productivity values were recorded at station F23. Beginning in 1997, the highest areal productivity measurements over the annual cycle have been recorded in the central nearfield region (station N18) rather than in Boston Harbor.

Areal production at stations N04 and N18 was remarkably similar for the remainder of the 1999-monitoring period (Figure 5-2). Productivity gradually decreased at stations N04 and N18 during September (WN99C and WN99D). The fall bloom was underway at both stations when sampling occurred during early October (WF99E) as indicated by increasing productivity at both nearfield sites (Figure 5-2). Peak fall bloom production (~1750 mg C m^{-2} d^{-1}) was observed in late October (WN99F) at both stations. Production decreased during the November cruise (WN99G) then reached its lowest annual level on in December (WN99H) at station N04 and its second lowest value of the year at station N18. The patterns observed at the nearfield sites were generally consistent with patterns seen in chlorophyll distributions (Section 4.2.2). Subsurface chlorophyll maxima in September resulted in high average chlorophyll concentrations at Station N04 and N18 which were not reflected in elevated primary productivity. The chlorophyll maxima occurred below the 10% light level and did not result in elevated areal productivity during September.

Boston Harbor (station F23) displayed a different productivity pattern in comparison with the nearfield sites. At the Boston Harbor productivity/respiration station (F23), areal production was relatively high (~1400 mg C m^{-2} d^{-1}) in August (WF99B). Areal production decreased to ~450 mg C m^{-2} d^{-1} by October (WF99E) and was the lowest productivity observed at the three monitoring stations for the early October sampling period. The production data at station F23 are in agreement with the chlorophyll data, which indicated a decrease in chlorophyll concentration over this period.

The fall phytoplankton bloom reached productivity levels close to the values observed in 1998. In general, nearfield stations are characterized by the occurrence of a well-developed fall phytoplankton bloom. The fall blooms observed at nearfield stations in 1995-1998 generally reached values of 1000 to 4000 mg C m^{-2} d^{-1}, with blooms typically lasting about 1 month. The bloom in 1999 reached peak values of ~1750 mg C m^{-2} d^{-1} and lasted from early to late October. The fall bloom was somewhat later than in prior years.

The major difference observed in productivity in the nearfield region relative to other years was the unusually high productivity level observed at station N18 during mid-August (WF99B). Typically the peak productivity during the later half of the annual cycle is observed only during the fall phytoplankton bloom.

Historically, the Boston Harbor site (station F23) exhibits a gradual pattern of decreasing areal production from summer through fall rather than the distinct fall peaks observed at the nearfield sites. In 1999 the pattern for station F23 conformed to this description. Production values decreased from August to October (Figure 5-2). During 1995-1997, late summer-early fall areal productions at station F23 ranged from 1000 to 8000 mg C m^{-2} d^{-1} with an average >2000 mg C m^{-2} d^{-1}. The average areal productions observed in August-October 1999 (~1000 mg C m^{-2} d^{-1}) at station F23 was lower than the average observed in 1995-97 but greater than the average observed in 1998. The productivity cycle at station F23 was also aberrant in 1998. The 1999 productivity cycle represented a return to more typical conditions.

5.1.2 Chlorophyll-Specific Production

Chlorophyll-specific areal production was very similar at both nearfield sites (station N04 and N18) over time (Figure 5-3). Chlorophyll-specific areal production was relatively high at the start of the reporting period then gradually decreased at both stations until the seasonal minima were reached during the late-September survey (WN99D). Seasonal maxima reached during WN99A were greater than 600-1000 mg C mg Chl a^{-1} d^{-1}. Following these peak values chlorophyll-specific areal production decreased to less than 50 mg C mg Chl a^{-1} d^{-1} by late September (WF99D) then gradually climbed to values between 100-300 mg C mg Chl a^{-1} d^{-1}) for the remainder of the sampling period (WF99E – WN99H). Chlorophyll-specific rates in the Harbor (F23) also closely matched the values reported for the nearfield sites (Figure 5-3).

Chlorophyll-specific production is an approximate measure for the efficiency of production and frequently reflects nutrient conditions at the sampling sites. The distribution of chlorophyll-specific production indicates that the efficiency of production was high relative to the amount of biomass present at the station N18 in early August. At both stations N04 and N18 the peak chlorophyll-specific productions for the Aug-Dec 1999 period occurred during the summer rather than during the fall phytoplankton bloom. The peaks observed were similar to the values seen in May.

The spatial and temporal distribution of production and chlorophyll-specific production on a volumetric basis were summarized by showing contoured production over the sampling period (Figures 5-4 to 5-7). Chlorophyll-specific productions (daily production normalized to chlorophyll concentration at each depth) were calculated to compare production with chlorophyll concentrations. Chlorophyll-specific production can be used as an indicator of the optimal conditions necessary for photosynthesis.

The volumetric data reveal that the peak in areal productivity reported during late summer (WN99A) at station N04 was concentrated in the upper 5 m of the water column (Figure 5-4). Areal productivity at Station N18 was also elevated during WN99A, with high values observed in the surface and mid-surface waters at depths to 10 m (Figure 5-5). At station N18, the annual productivity peak occurred on August 18, 1999 (WF99B) and was distributed throughout the upper 10 m of the water column with values from the surface to mid-depth samples ranging from ~280-390 mg C m^{-3} d^{-1} (Figure 5-5). At the two nearfield stations, surface productions tended to decrease following the late summer peak values but increased again in late October (WN99F). For station N04, the highest production value observed (~200 mg C m^{-3} d^{-1}) occurred at the surface on August 2, 1999. For station N18, the highest production value observed (~390 mg C m^{-3} d^{-1}) was recorded at mid-depth (~7 m) in August (WF99B). Peak production values tended to be correlated with the occurrence of the highest chlorophyll *a* measurements.

The subsurface (5-7 m) productivity maximum measured at station N18 in August (WF99B) was a major component of the elevated areal productivity recorded here. Station N04 did not exhibit a subsurface elevation in productivity during WF99B, thus accounting for the wide difference in areal production between the nearfield sites during the mid-August cruise. This situation was reversed during the fall bloom period. A subsurface production maximum was observed at station N04 during the late October survey (WN99F) but not at station N18. The productivity pattern at specified depths observed in 1999 was similar to that observed in prior years. At station N04 productivity >15 mg m^{-3} d^{-1} was rarely observed at depths >20 m. At station N18 productivity as high as 60 mg C m^{-3} d^{-1} was recorded from depths of 20 m with values from 10-30 mg C m^{-3} d^{-1} frequently observed here. Productivity in the Harbor was largely restricted to the upper 10 m of the water column.

Chlorophyll-specific production (mg C mg Chl^{-1} d^{-1}) at N04 and N18 exhibited a much more uniform behavior (Figures 5-6 and 5-7) compared to depth-specific daily productivity. Elevated chlorophyll-specific production was primarily concentrated in the upper portions of the water column at both nearfield sites (Figures 5-6, 5-7). Peak chlorophyll-specific productions occurred during the early August sampling cruise (WN99A) at station N04 and station N18. In general, the efficiency of photosynthesis decreased both with depth and as the season progressed. The slight increase in chlorophyll-specific production that was observed at station N18 in late October was associated with the fall phytoplankton bloom. The absence of this increase at station N04 and its moderate level at station N18 indicate that the fall production peak reflects higher phytoplankton biomass (measured as total chlorophyll *a*) at this time.

5.2 Respiration

Respiration measurements were made at the same nearfield (N04, N18) and farfield (F23) stations as productivity and at an additional station in Stellwagen Basin (F19). All four stations were sampled during each of the combined farfield/nearfield surveys and Stations N04 and N18 were also sampled during the six nearfield surveys. Respiration samples were collected from three depths (surface, mid-depth, and bottom) and were incubated in the dark at *in situ* temperatures for 8±1 days.

Both respiration (in units of μMO_2/hr) and carbon-specific respiration (μMO_2/μMC/hr) rates are presented in the following sections. Carbon-specific respiration was calculated by normalizing respiration rates to the coincident particulate organic carbon (POC) concentrations. Carbon-specific respiration rates provide a relative indication of the biological availability (labile) of the particulate organic material for microbial degradation.

5.2.1 Water Column Respiration

Due to the timing of the surveys, the farfield stations were only sampled twice (August – WF99B and October – WF99E). Evaluation of the temporal trends is therefore focused on the nearfield area where data are available over the whole August to December time period.

Respiration rates had decreased by the end of the previous reporting period to <0.2 μMO_2hr^{-1} at the nearfield stations from the very high values of >0.6 μMO_2hr^{-1}observed in late spring. By early August (WN99A), respiration rates had increased to ~0.25 μMO_2hr^{-1} in the surface and mid-depth waters at N18 and surface waters at N04 (Figure 5-8). Low respiration rates (<0.05 μMO_2hr^{-1}) were observed in the bottom waters at both stations and mid-depth at station N04. Nearfield respiration rates reached a maximum for this time period during the late August survey (WF99B) with rates reaching 0.3 μMO_2hr^{-1} in the surface and mid-depth waters at station N18. This was coincident with elevated chlorophyll concentrations and very high production at this station. Respiration rates at station N04 had decreased to 0.16 μMO_2hr^{-1} at the surface and increased to 0.1 μMO_2hr^{-1} in mid-depth waters. Bottom water respiration rates remained low (<0.05 μMO_2hr^{-1}) at station N04 throughout the semiannual time period.

By early September (WN99C), respiration rates in the surface and mid-depth waters of both stations had decreased to 0.09 to 0.13 μMO_2hr^{-1}. In late September (WN98D), respiration rates had increased slightly over the entire water column at each of the stations reaching values of 0.2 μMO_2/hr in the surface and mid-depth waters at station N04 and ~0.15 at those depths at N18. The increase was coincident with an increase in chlorophyll levels in late September. During October (WF99E and WN99F), an increase in production was observed at stations N04 and N18, but chlorophyll concentrations were lower than those observed in August and September. Respiration rates remained comparable to those observed in September and ranged from 0.10-0.17 μMO_2hr^{-1} at the surface and mid depths. Bottom water rates remained low at station N04 (<0.03 μMO_2hr^{-1}), but increased by late October to 0.13 μMO_2hr^{-1} at station N18.

Respiration rates decreased with the decreasing water temperatures through November (WN99F and WN99G) and December (WN99H). By late November, respiration rates were <0.1 μMO_2hr^{-1} at each of the depths at stations N04 and N18. The magnitude of the rates observed in the respiration data for the nearfield stations were similar to previous years for this time period. The pattern, however, was different with higher values being observed earlier in the period – late summer instead of September and October. This was likely due to the August bloom in diatoms and production that was observed in 1999. Usually the nearfield has relatively low phytoplankton abundance and production rates in the summer, which increase when the fall bloom occurs. Respiration rates did increase at station N04 in late September and October, but did not reach the levels observed in August. Rates did decrease in November with the seasonal decrease in water temperature and increased mixing associated with the fall/winter turnover of the water column.

Given the paucity of data at the farfield stations for this period, it is difficult to characterize the seasonal trends in respiration. At station F23, respiration rates were at a maximum for surface and mid-depth samples (0.19 and 0.14 μMO_2hr^{-1}, respectively) during the August survey (WF99B) and decreased to ~0.1 μMO_2hr^{-1} by October. Bottom water respiration at station F23 increased from ~0.1 to 0.13 μMO_2hr^{-1} over this time period and was higher than the upper water column rates during the October survey (WF99E). Respiration rates at the Stellwagen Basin station F19 exhibited a similar pattern with surface and mid-depth rates decreasing from August to October (0.18 to 0.14 μMO_2hr^{-1} and 0.09 to 0.04 μMO_2hr^{-1}, respectively). Bottom water respiration rates were low during both surveys, but did increase from 0.03 to 0.06 μMO_2hr^{-1} over this time period.

5.2.2 Carbon-Specific Respiration

Carbon-specific respiration accounts for the effect variations in the size of the particulate organic carbon (POC) pool have on respiration. Differences in carbon-specific respiration result from variations in the quality of the available particulate organic material or from environmental conditions such as temperature. Particulate organic material that is more easily degraded (more labile) will result in higher carbon-specific respiration. In general, newly produced organic material is the most labile. Water temperature is the main physical characteristic that controls the rate of microbial oxidation of organic material – the lower the temperature the lower the rate of oxidation. When stratified conditions exist, the productive, warmer surface and/or mid-depth waters usually exhibit higher carbon-specific respiration rates and bottom waters have lower carbon-specific respiration rates due to both lower water temperature and lower substrate quality due to the degradation of particulate organic material during sinking.

At station N18, POC concentrations increased sharply from levels measured at the end of July (~25 µM at all depths) to late August and into early September (Figure 5-9). POC data for the early August survey are suspect and have not been included in this report. During the late August survey, POC concentrations at N18 were 36 µM in the bottom water, 56 µM at the surface and 69 µM at mid-depth. By early September, POC concentrations in the mid-depth (or subsurface chlorophyll maximum) sample had increased to 175 µM. Surface water POC concentrations had also increased substantially to 115 µM. The high POC concentrations were consistent with the trends observed in chlorophyll and the large increase from late August to early September may have resulted from the high production that was observed in late August at station N18. In late September, POC concentrations were still elevated, but had decreased to the levels observed in late August (25 to 70 µM over the water column). A similar, yet less intense, pattern was observed at station N04. In late August, POC concentrations in the surface and mid-depth waters were ~25µM. By early September, mid-depth concentrations had increased to 66 µM though surface concentrations remained at 25 µM. This increase coincided with an increase in chlorophyll concentrations at subsurface depths. Elevated POC concentrations persisted at mid-depth (68 µM) and increased to 48 µM in the surface waters at station N04 by late September. Bottom water POC concentrations in September were about 25 µM at N18 and 15 µM at N04. By early October, POC concentrations had decreased to 25-38 µM from bottom to surface waters at station N18. At station N04, surface and mid-depth waters had POC concentrations of 37µM and bottom water POC remained low at 11 µM. From late October to late November, POC concentrations at the two stations ranged from 25-35 µM in the surface and mid-depth waters and was <15 µM at bottom. In December, POC was relatively consistent between stations and over the water column with concentrations of 15-21 µM. At station F23, POC concentrations were relatively constant at ~25 µM over this time period. In August, a wider range of concentrations was observed, *i.e.*, 29µM in the surface waters decreasing to 19 µM in bottom waters. By October, POC concentrations were 22±1 µM over the entire water column.

Surprisingly, carbon-specific respiration rates were low and relatively constant with depth over the entire August to December time period (Figure 5-10). Given the high chlorophyll concentrations and production rates at station N18 in late August and the increase in POC concentrations by early September that resulted, it was expected that carbon-specific respiration would increase with the increased availability of newly produced, labile organic carbon. The lack of an increase in carbon-specific respiration at N18 may be indicative of the timing of the bloom and surveys. In late August, respiration and production reach maximum levels for the time period at station N18 and relatively high POC and chlorophyll concentrations were measured. The late August survey may have been conducted at the beginning of this late summer diatom bloom (supported by increase in POC and chlorophyll from late August to early September). An increase in respiration rates had been observed from earlier in the month, but respiration had not caught up with production at the time of sampling. By early September, production values had greatly decreased at N18 and although POC concentrations were very high, the carbon-specific respiration rates were relatively uniform. This suggests that less labile carbon was present and that the early September survey was conducted near the conclusion of this late summer diatom bloom. At stations N04 and F23, carbon-specific respiration rates remained relatively low and constant throughout this time period.

5.3 Phytoplankton Results

Plankton samples were collected on each of the eight surveys conducted during this reporting period. Phytoplankton and zooplankton samples were collected at two stations (N04 and N18) during each nearfield survey and at 11 farfield plus the two nearfield stations (total = 13) during the farfield surveys. Phytoplankton samples included both whole-water and 20 μm-mesh screened samples, from the surface and mid-depth. The mid-depth sample corresponds to the subsurface chlorophyll maximum if one is present. Zooplankton samples were collected by vertical/oblique tows with 102 μm-mesh nets. Methods of sample collection and analyses are detailed in Albro *et al*. (1998).

In this section, the seasonal trends in plankton abundance and regional characteristics of the plankton assemblages are evaluated. Total abundance and relative abundance of major taxonomic group are presented for each phytoplankton and zooplankton community. Tables in the appendices provide data on cell densities and relative abundance for all dominant plankton species (>5% abundance): Appendix F – whole water phytoplankton, Appendix G – 20-μm screened phytoplankton, and Appendix H – zooplankton.

5.3.1 Phytoplankton

5.3.1.1 Seasonal Trends in Total Phytoplankton Abundance

Total phytoplankton abundance in nearfield whole water samples (surface and mid-depth) was high (up to 4.63 x 10^6 cells L^{-1}) in early August, declining to more typical levels (0.43 – 2.51 x 10^6 cells L^{-1}) from late August to October (Table 5-1; Figures 5-11 and 5-12). After a small increase in late October (station N18 only), phytoplankton abundance declined even further to levels < 1.0 x 10^6 cells L^{-1} in November through December. The large decrease in phytoplankton abundance from early August to later in the month may have resulted from intense grazing by zooplankton, which were present in numbers >200,000 individuals m^{-3} (see Section 5.3.2.1)

Total phytoplankton abundance in farfield whole water samples (surface and subsurface mid-depths) showed similar high abundances (0.69 – 3.25 x 10^6 cells L^{-1}) in August (Figure 5-13), with lower levels (0.47 – 1.58 x 10^6 cells L^{-1}) in October (Figure 5-14; Table 5-1).

Total abundance of dinoflagellates and silicoflagellates in 20 μm-mesh-screened water samples were considerably lower than those recorded for total phytoplankton in whole-water samples, due to the screening technique which selects for larger, albeit rarer cells. Screened phytoplankton abundance fluctuated, but overall remained high (means of 2,015 – 17,007 cells L^{-1}) from August through December (Table 5-2). These high levels of screened phytoplankton abundance largely reflected a sustained bloom of the dinoflagellates *Ceratium fusus, Ceratium tripos*, and *Ceratium longipes* that was observed from the first half of 1999 through November (Libby *et al*. 1999b). The *Ceratium* species were abundant in August and September, together with the dinoflagellate *Prorocentrum micans* and the silicoflagellates *Distephanus speculum* and *Dictyocha fibula,* which were also abundant from October through December.

Table 5-1. Nearfield and Farfield Averages and Ranges of Abundance (10^6 Cells L^{-1}) of Whole-Water Phytoplankton

Survey	Dates (1999)	Nearfield Mean	Nearfield Range	Farfield Mean	Farfield Range
WN99A	8/2	2.8115	0.7799-4.6306	NA	NA
WF99B	8/16-19	1.6484	1.1547-2.5065	1.7746	0.6869-3.2498
WN99C	9/8	1.0894	1.0176-1.2419	NA	NA
WN99D	9/24	0.9996	0.8970-1.2189	NA	NA
WF99E	10/6,8,22,28	0.8486	0.4342-1.2233	1.0309	0.4706-1.5757
WN99F	10/27	1.4030	1.1918-1.7295	NA	NA
WN99G	11/23	0.6748	0.5517-0.8873	NA	NA
WN99H	12/20	0.5252	0.2973-0.9179	NA	NA

NA- Data not available because the farfield stations were not sampled during this survey.

Table 5-2. Nearfield and Farfield Average and Ranges of Abundance (Cells L^{-1}) for >20 µM-Screened Dinoflagellates

Survey	Dates (1999)	Nearfield Mean	Nearfield Range	Farfield Mean	Farfield Range
WN99A	8/2	2015	1265-2871	NA	NA
WF99B	8/16-19	4246	1037-8385	5475	262-29115
WN99C	9/8	4642	609-11110	NA	NA
WN99D	9/24	12070	6606-19260	NA	NA
WF99E	10/6,8,22,28	9887	5878-15902	8587	373-24060
WN99F	10/27	8794	6968-11166	NA	NA
WN99G	11/23	17007	9018-23704	NA	NA
WN99H	12/20	6128	4422-7354	NA	NA

NA- Data not available because the farfield stations were not sampled during this survey.

5.3.1.2 Nearfield Phytoplankton Community Structure

Whole-Water Phytoplankton – In early August (WN99A), nearfield whole-water phytoplankton assemblages from both depths were dominated by unidentified microflagellates. Cryptomonads and the centric diatom *Leptocylindrus danicus* were subdominants (Figures 5-11 and 5-12). By mid August (WF99B), the abundance of microflagellates had decreased considerably at station N18, while the abundance of the centric diatom *L. danicus* had increased substantially. The increase in *L. danicus* was coincident with the peak production measured during this August- December period and suggests that there was an atypical late summer bloom in the central nearfield. Phytoplankton and chlorophyll data indicates that the late summer bloom may have been a regional western Massachusetts Bay event (see Section 5.3.1.3). L. danicus is typically observed as a dominant in the nearfield and the rest of Massachusetts Bay during August (Libby *et al*. 1999a).

In early September (WN99C), abundance had decreased and the dominance of <10 µm microflagellates and cryptomonads continued in the nearfield, with *L. danicus*, small centric diatoms and pennate diatoms of the genus *Pseudo-nitzschia* as subdominants. By late September (WN99D) microflagellate dominance was shared with cryptomonads and small centric diatoms <10 µm in longest dimension.

During October (WF99E) microflagellate dominance was shared with cryptomonads, small centric diatoms, larger centrics such as 10-20 µm *Thalassiosira* sp. cells. An increase in *Thalassiosira* sp. was observed from early to late October (WN99F) in the nearfield. The increase was coincident with increases in productivity and a slight increase in chlorophyll concentrations. This constituted the fall bloom in the nearfield in 1999, which was less substantial than in previous baseline years. The frequency of occurrence and strength of the fall bloom in Massachusetts Bay will be examined for the baseline-monitoring period in the 1999 annual water column report.

By November (WN99G) microflagellate and cryptomonad abundance was shared with the diatoms *Leptocylindrus danicus* and *Rhizosolenia setigera,* small centrics <10 µm in longest dimension, and the dinoflagellates *Gymnodinium* sp. and *Prorocentrum micans*. Microflagellates and cryptomonads dominated the December (WN99H) assemblage, with lesser contributions by small centric diatoms <10 µm in longest dimension, *Thalassiosira* sp. and *Rhizosolenia delicatula*.

Screened Phytoplankton – The dinoflagellates *Ceratium fusus, Ceratium tripos,* and *Ceratium longipes* were abundant in screened phytoplankton samples in August and September. These *Ceratium* species, the dinoflagellate *Prorocentrum micans* and the silicoflagellates *Distephanus speculum* and *Dictyocha fibula* were abundant from October through December. In general, there was a sustained bloom of the dinoflagellates *Ceratium fusus, Ceratium tripos,* and *Ceratium longipes* over the first half of 1999 that continued into the August-December period. In comparison with other years, the screened phytoplankton in the nearfield was typical for this time of year, with the bloom of *Ceratium tripos/longipes* as the major feature of the screened-water dinoflagellate assemblage.

5.3.1.3 Farfield Phytoplankton Assemblages

Whole-Water Phytoplankton - During WF99B in August, most farfield station assemblages were dominated at both depths by unidentified microflagellates, with lesser contributions by cryptomonads and centric diatoms <10 µm in cell size, and the diatoms *Leptocylindrus danicus, L. minimus,* and *Thalassiosira* sp. (Figure 5-13).

During WF99E in October, most farfield stations were dominated by unidentified microflagellates and cryptomonads <10 µm in size, with small centric diatoms < 10µm in size present in subdominant abundance (Figure 5-14). At stations N16, F06 and F13, which were sampled in late October due to the delay during survey WF99E, there were also unidentified centric diatoms of the genus *Thalassiosira* 10-20 µm in individual cell diameter at several other stations. Elevated numbers of *Thalassiosira* sp. were also observed at nearfield stations N18 and N14 in late October (WN99F).

Screened Phytoplankton – During both WF99B and WF99E, 20-µm screened phytoplankton samples were dominated by the dinoflagellates *Ceratium fusus* and *C. tripos*, which continued the trend observed in the nearfield of a sustained bloom of *Ceratium* sp. from the first half of 1999 through October. Several other dinoflagellates were also observed including *Protoperidinium* sp., *Scrippsiella trochoidea*, *Prorocentrum micans* and several other taxa. The *silicoflagellates Distephanus speculum* and *Dictyocha fibula* were also abundant at some stations. This is a typical assemblage for the late summer to early winter period in Massachusetts Bay.

5.3.1.4 Nuisance Algae

There were no confirmed blooms of harmful or nuisance phytoplankton species in Massachusetts and Cape Cod Bays during August – December 1999. Some species that have caused harmful blooms in different seasons in previous years, such as *Phaeocystis pouchetii* (early spring), or *Alexandrium tamarense* (late spring and summer), were unrecorded during this period. Other non-toxic species whose blooms have caused anoxic events elsewhere, such as *Distephanus speculum* and *Ceratium tripos* (*longipes*) were routinely present, but not at abundances approaching those previously associated with anoxia. Potentially toxic species of the diatom genus *Pseudo-nitzschia* were present, in early September, but in low abundances (92 – 134 x 10^3 cells L^{-1}).

There were high abundances of the dinoflagellate *Prorocentrum micans* (4,236-21,012 cells L^{-1}), particularly in November and December. Although other species of this genus have been associated with diarrheic shellfish poisoning (DSP), in particular *P. lima* (Maranda *et al*. 1999), *P. micans* has not been associated with DSP.

5.3.2 Zooplankton

5.3.2.1 Seasonal Trends in Total Zooplankton Abundance

Total zooplankton abundance at nearfield stations declined from very high levels in early August (>10^5 animals m^{-3}) to fluctuating levels that were about an order-of-magnitude lower from late August through December (Table 5-3). The values in the nearfield of >200 x 10^3 animals m^{-3} recorded in early August were among the highest during the entire 1992-1999 baseline and continue the trend of very high zooplankton abundance that had been observed during the first half of 1999 (Libby *et al*. 1999b). The high number of zooplankton and associated grazing pressure may have contributed to the large decrease in phytoplankton that was observed in the nearfield during August.

Total zooplankton abundance at farfield stations in October was generally half or less that of August levels at most stations (compare axes in Figures 5-15 and 5-16). Maximum abundances in both periods occurred in Cape Cod Bay.

Table 5-3. Nearfield and Farfield Average and Ranges of Abundance (10^3 Animals m^{-3}) for Zooplankton

Survey	Dates (1999)	Nearfield Mean	Nearfield Range	Farfield Mean	Farfield Range
WN99A	8/2	209.5	185.8-233.1	NA	NA
WF99B	8/16-19	55.9	41.4-79.5	50.4	15.2-83.2
WN99C	9/8	49.5	32.8-66.3	NA	NA
WN99D	9/24	20.0	19.5-20.4	NA	NA
WF99E	10/6,8,22,28	20.8	16.0-26.5	18.6	2.3-38.9
WN99F	10/27	29.8	29.8-29.9	NA	NA
WN99G	11/23	36.5	30.7-42.4	NA	NA
WN99H	12/20	25.5	23.5-27.4	NA	NA

NA- Data not available because the farfield stations were not sampled during this survey.

5.3.2.2 Nearfield Zooplankton Community Structure

In August (WN99A and WF99B), the nearfield zooplankton assemblages were dominated by copepod nauplii, and females and copepodites of *Oithona similis* and *Pseudocalanus* sp (Figure 5-17). In September, salps and bivalve veligers made lesser contributions (WN99C) and the tunicate *Oikopleura dioica*, the copepods *Microsetella norvegica* and *Paracalanus parvus*, and copepodites of the genus *Centropages* were subdominants in late September (WN99D).

By October (WN99E and WN99F), the dominance of copepod nauplii and *Oithona similis* was being shared with bivalve veligers, and to a lesser and copepodites of the genus *Centropages*. In November (WN99G) and December (WN99H) copepod nauplii, *Oithona similis* and *Centropages* sp. copepodites dominated nearfield zooplankton.

5.3.2.3 Farfield Zooplankton Assemblages

At farfield stations during survey WF99B, copepod nauplii were dominants, with subdominant contributions at various stations by adults and copepodites of copepods such as *Oithona similis*, *Pseudocalanus* sp., with lesser contributions at some stations by *Temora longicornis*. Non-copepod subdominants at most stations included *Oikopleura dioica*, and meroplankters such as bivalve veligers. At Stations F23 and F30 in Boston Harbor polychaete larvae comprised 13-19% of total animals. During WF99E, copepod nauplii, *Oithona similis* and *Centropages* sp. copepodites and bivalve veligers were abundant at most farfield stations, and polychaete larvae comprised 11-64% of animals at stations F23, F30 and F31 in Boston Harbor.

In summary, zooplankton assemblages during the second half of 1999 were comprised of taxa recorded for this time of year in previous baseline monitoring years.

5.4 Summary of Water Column Biological Results

- Production was at its peak summer value (~1400 mg C m^{-2} d^{-1}) for station N04 during early August (WN99A), while at station N18 productivity peaked during late August (WF99B) with the highest value recorded during 1999 (~3500 mg C m^{-2} d^{-1}).
- A weak fall bloom was observed at both nearfield stations in October (WF99E and WN99F). The bloom reached peak values of ~1750 mg C m^{-2} d^{-1}. The fall bloom developed somewhat later in the fall than in prior years.
- The major difference that was observed in productivity relative to other years was the unusually high level observed at station N18 during mid-August. Typically the peak productivity during the later half of the annual cycle is observed during the fall phytoplankton bloom.
- At the Boston Harbor site (station F23) productivity decreased from August (~1400 mg C m^{-2} d^{-1}) to October (~450 mg C m^{-2} d^{-1}). This is the general trend for the Harbor - decreasing areal production from summer through fall.
- Chlorophyll-specific areal production maxima were reached in early August (greater than 600-1000 mg C mg Chl a^{-1} d^{-1}) rather than during the fall bloom. Chlorophyll-specific rates in the Harbor closely matched the values reported for the nearfield sites.
- Nearfield respiration rates reached a maximum for this time period during the late August survey with rates reaching 0.3 $\mu MO_2 hr^{-1}$ at station N18 coincident with elevated chlorophyll concentrations and very high production at this station. These rates are comparable to those observed during previous August-December baseline periods.
- At station N18, POC concentrations increased sharply from late August to early September reaching a maximum of 175 µM in mid-depth waters. The high POC concentrations were consistent with the trends observed in chlorophyll and the large increase from late August to early September may have resulted from the high production that was observed in late August.
- Carbon-specific respiration rates were low over the entire semiannual time period. The lack of a relationship between carbon-specific respiration and the high production rates observed in late August suggests that the WF99B and WN99C surveys may have been conducted before and after the height of the late summer diatom bloom.

- Total phytoplankton abundances in the whole water samples were high in early August, declining through September and October to low levels in November and December.
- The whole water phytoplankton assemblage was dominated by unidentified microlagellates and cryptomonads, the diatom *Leptocylindrus danicus*, and other centric diatoms.
- A weak fall bloom was observed in the nearfield and southwestern Massachusetts Bay in late October with an increase in the abundance of *Thalasiossira* sp. and a coincident increase in production.
- The abundance of >20-µm screened dinoflagellates remained high from August through December due to a sustained bloom of *Ceratium tripos, C. longipes* and *C. fusus* for most August through November.
- There were no confirmed blooms of harmful or nuisance phytoplankton species in Massachusetts and Cape Cod Bays during August – December 1999.
- Zooplankton abundance declined from high levels in early August to progressively lower levels through September and October, into November and December.
- Zooplankton abundance was, as usual, dominated by copepod nauplii and adults and copepodites of the small copepods *Oithona similis*, and copepodites of *Pseudocalanus* and *Centropages* sp., with lesser contributions, at some stations, by meroplankters such as bivalve veligers and, in Boston Harbor, polychaete larvae.

- **WN99A** **Station N04**

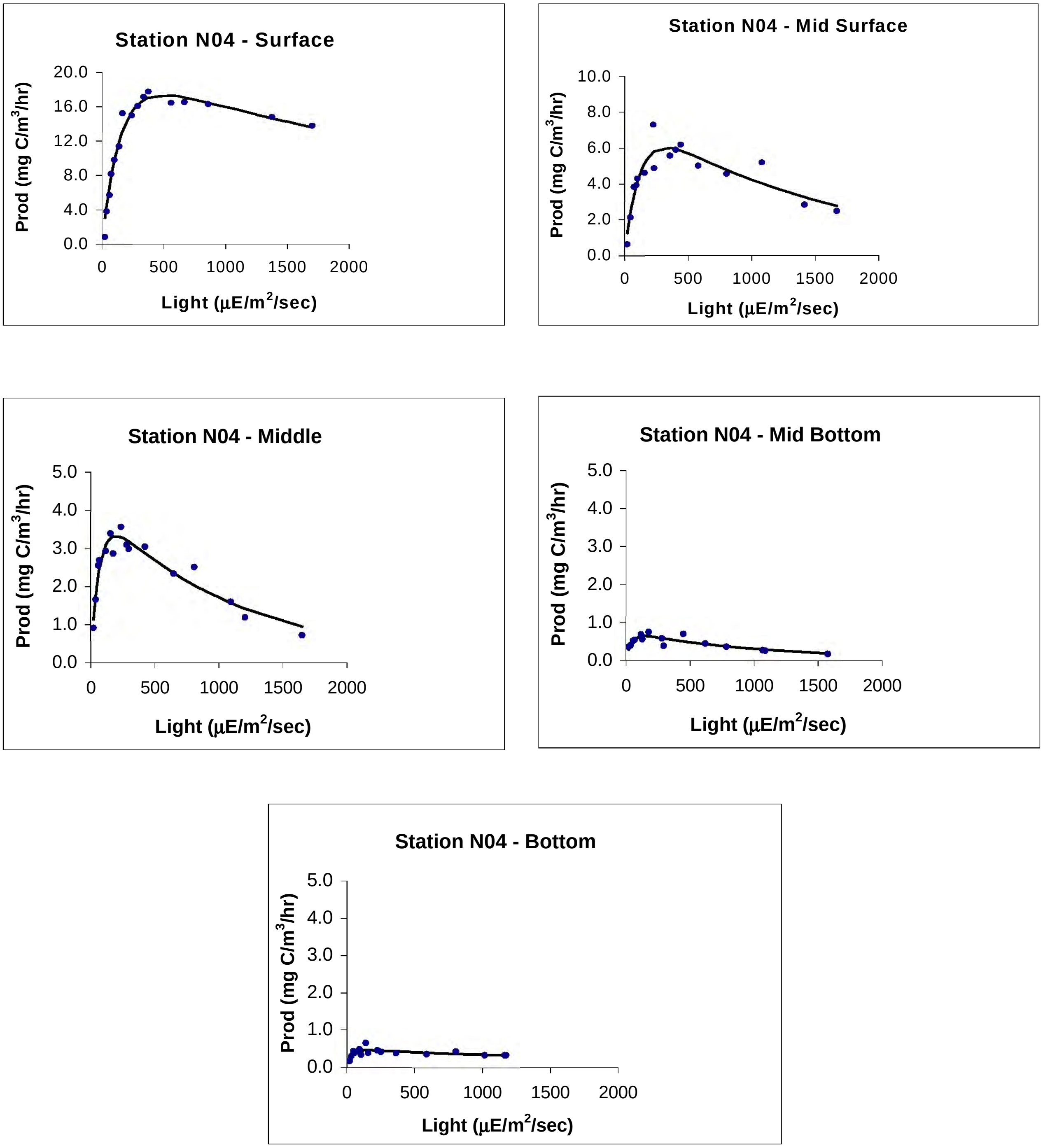


Figure 5-1. An Example Photosynthesis-Irradiance Curve From Station N04 Collected in August 1999

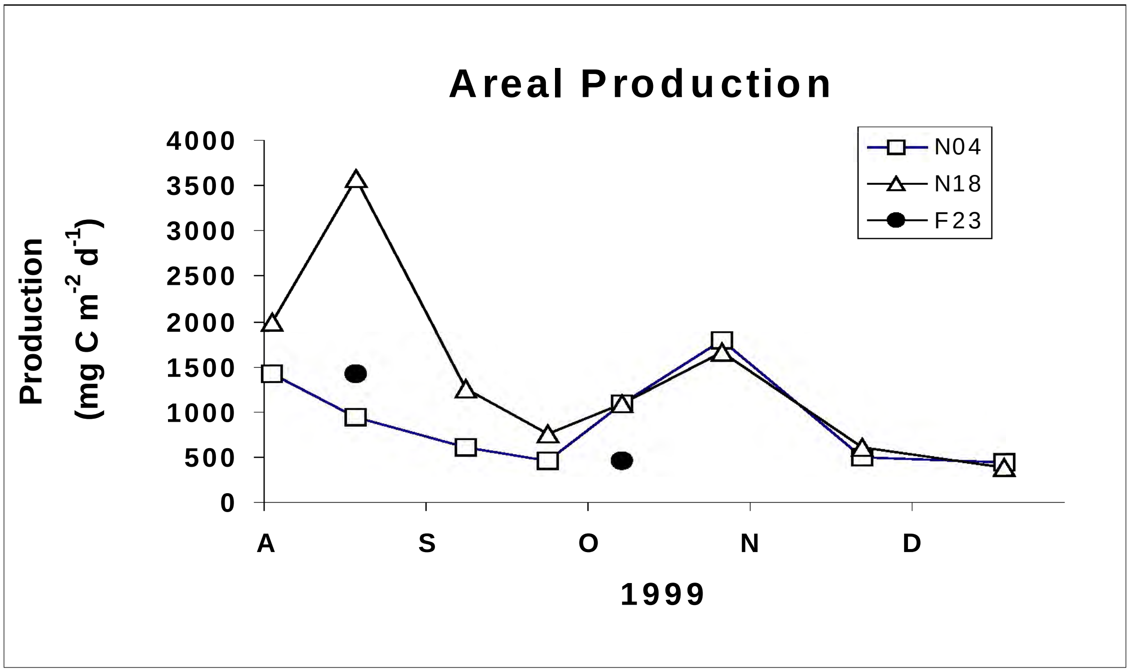


Figure 5-2. Time-Series of Areal Production (mg C m^{-2} d^{-1}) for Productivity Stations

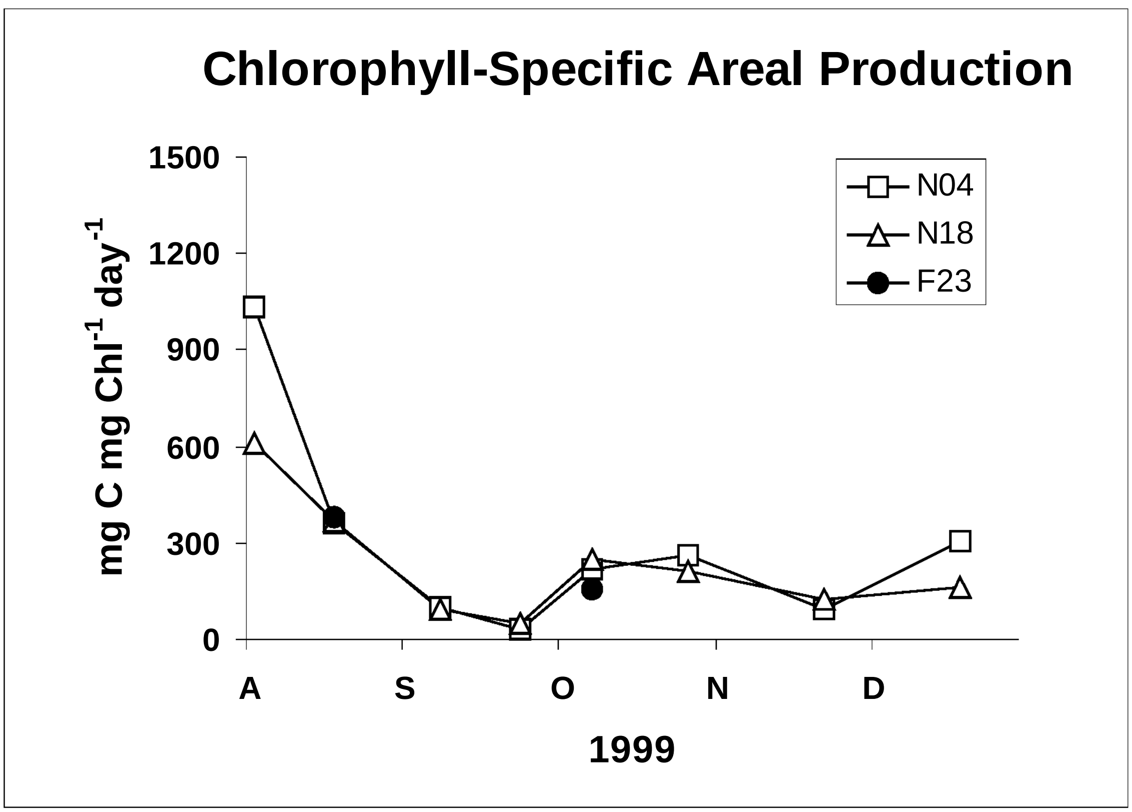


Figure 5-3. Time-Series of Chlorophyll-Specific Areal Production (mg C mg Chl^{-1} d^{-1}) for Productivity Stations

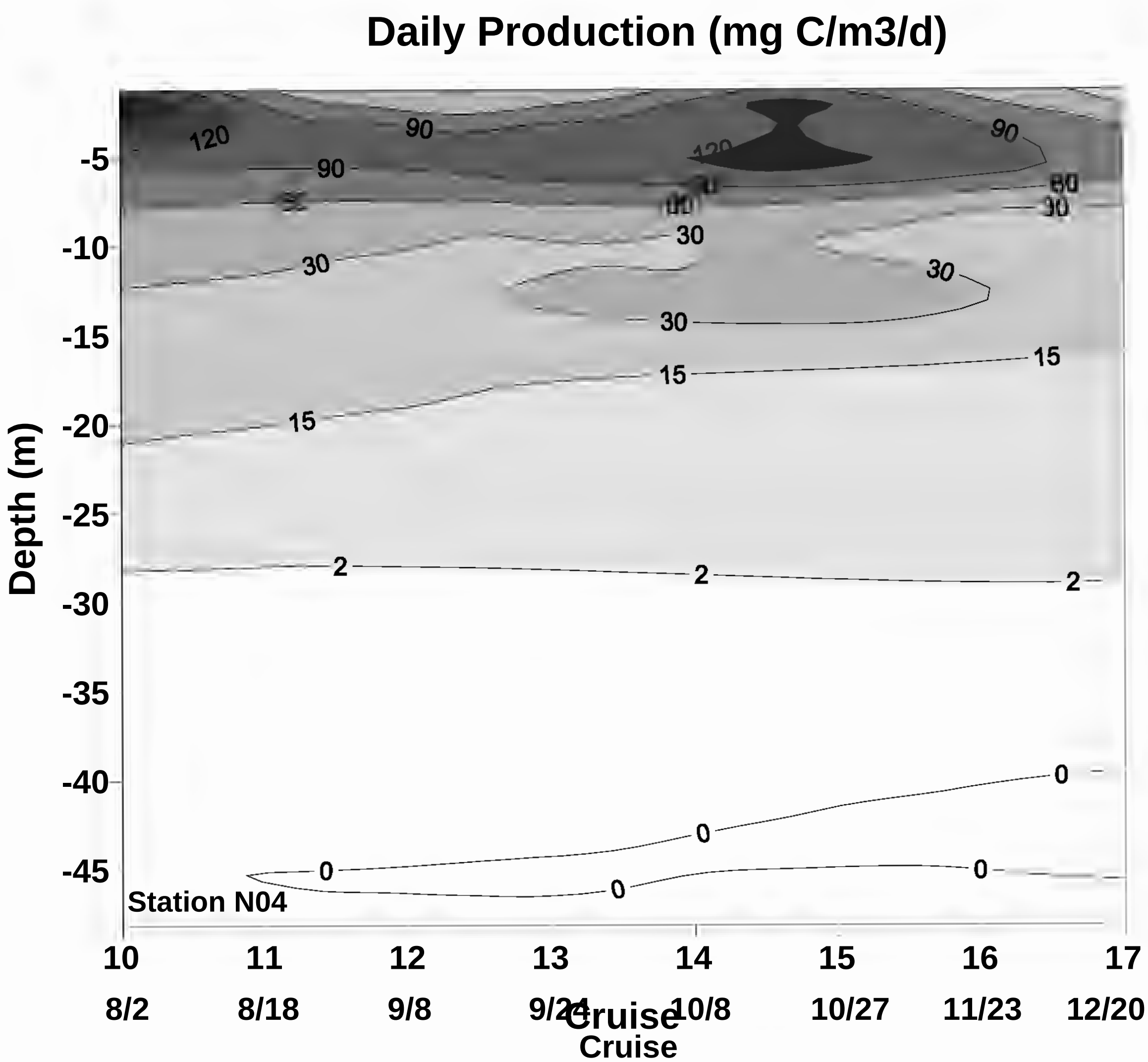


Figure 5-4. Time Series of Contoured Daily Production (mgCm^{-3}d^{-1}) Over Depth at Station N04

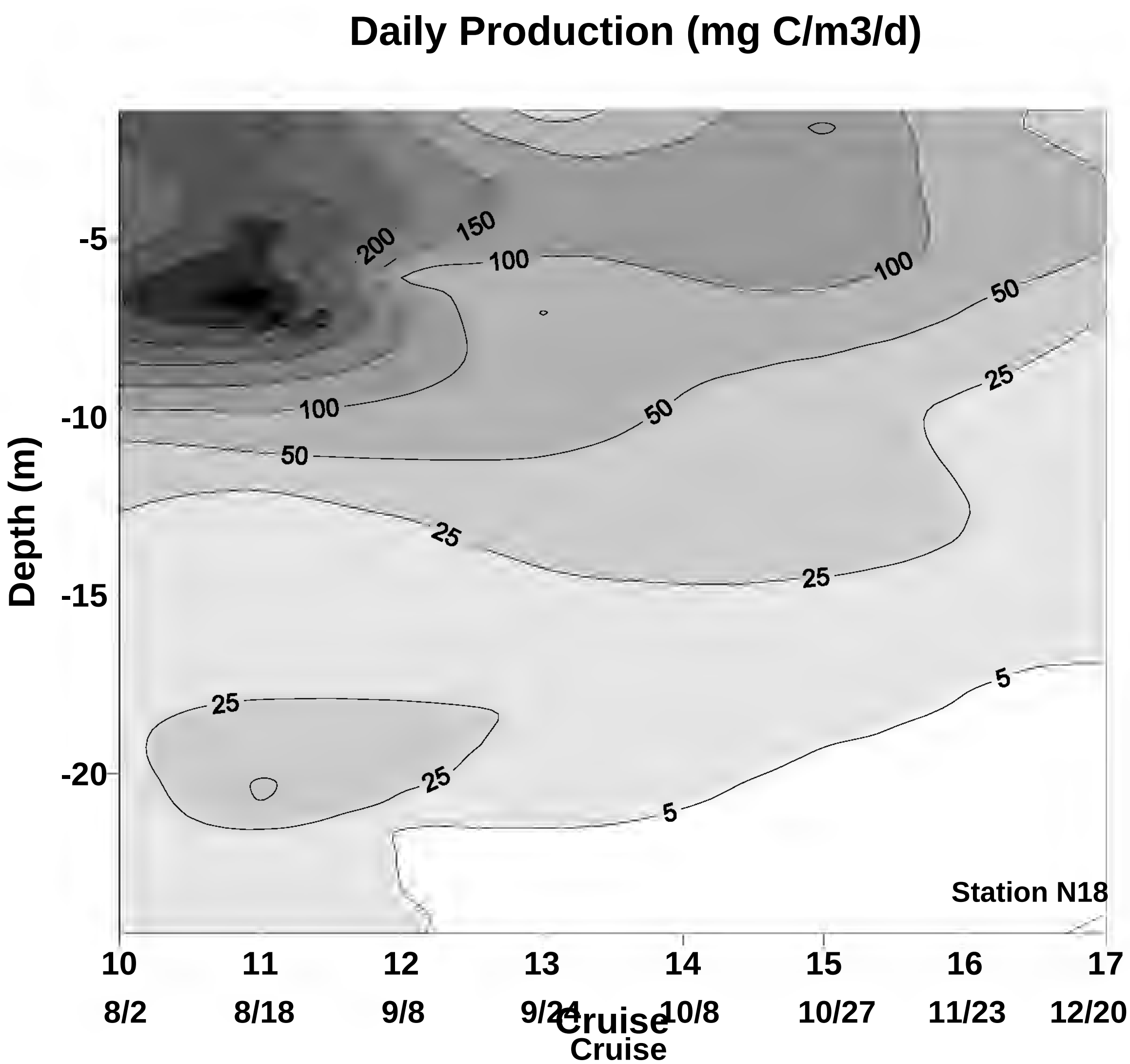


Figure 5-5. Time Series of Contoured Daily Production (mgCm^{-3}d^{-1}) Over Depth at Station N18

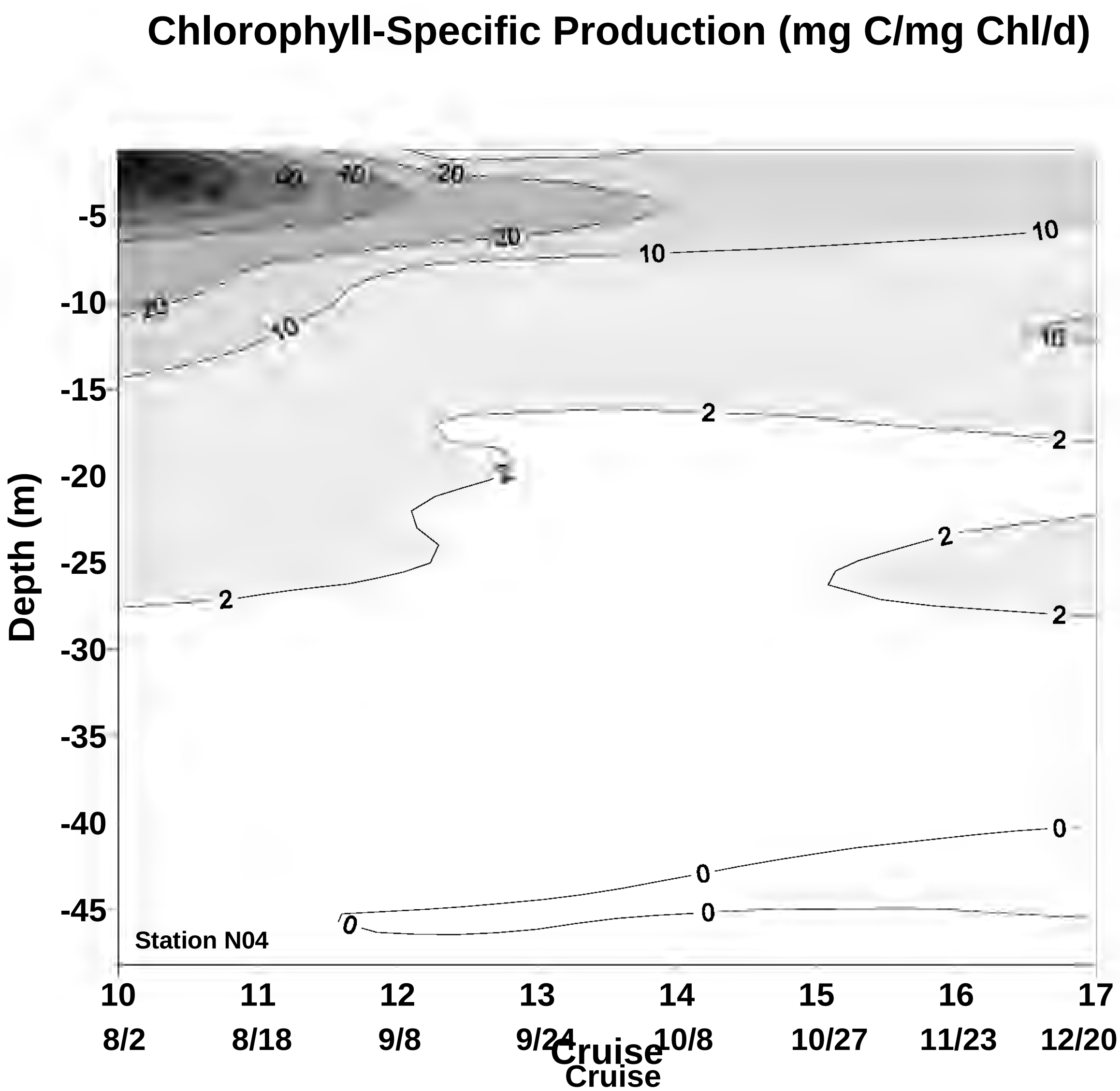


Figure 5-6. Time Series of Contoured Chlorophyll-Specific Production (mg Cmg Chl^{-1}d^{-1}) at Station N04

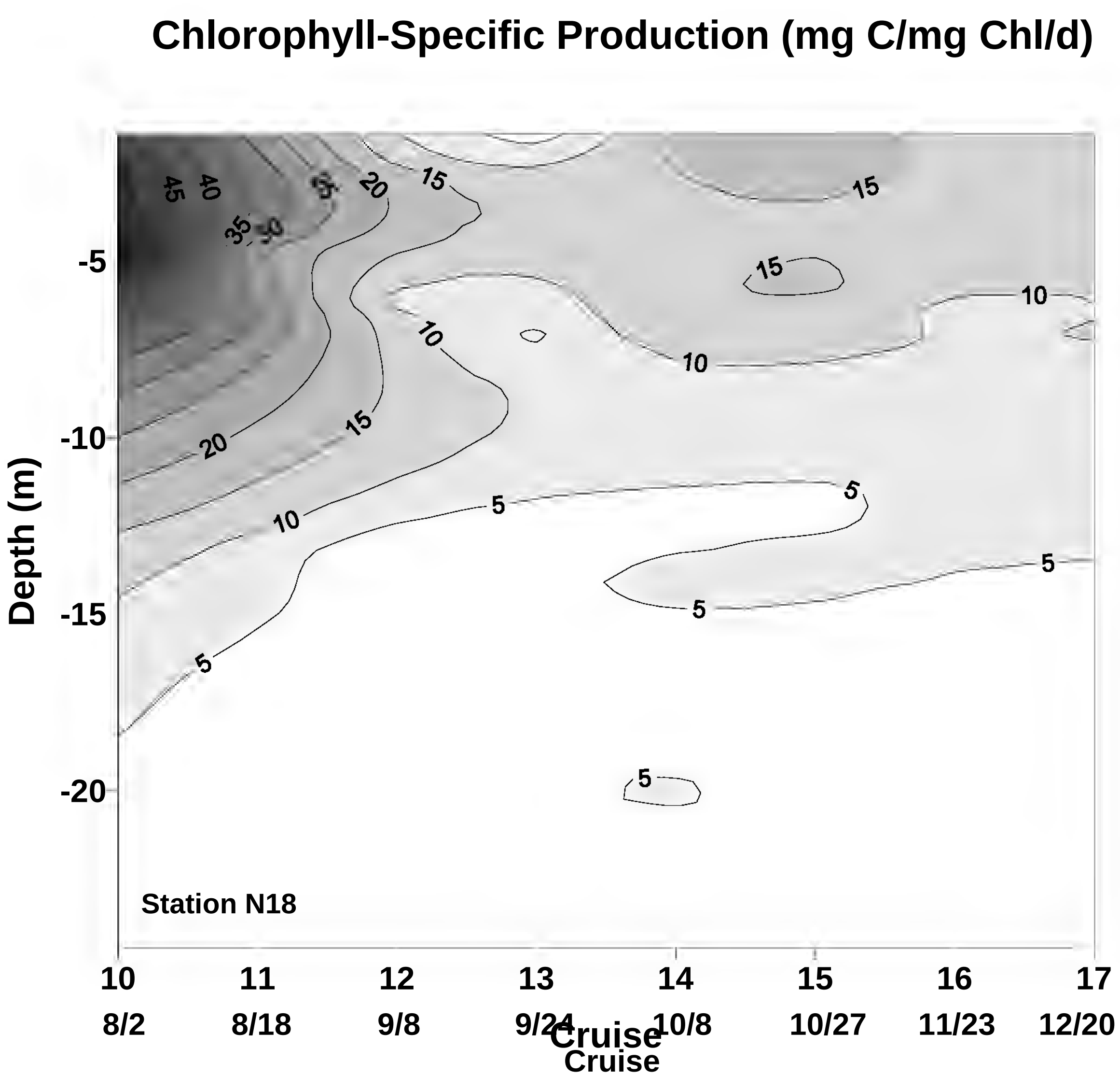


Figure 5-7. Time Series of Contoured Chlorophyll-Specific Production (mg Cmg Chl^{-1}d^{-1}) at Station N18

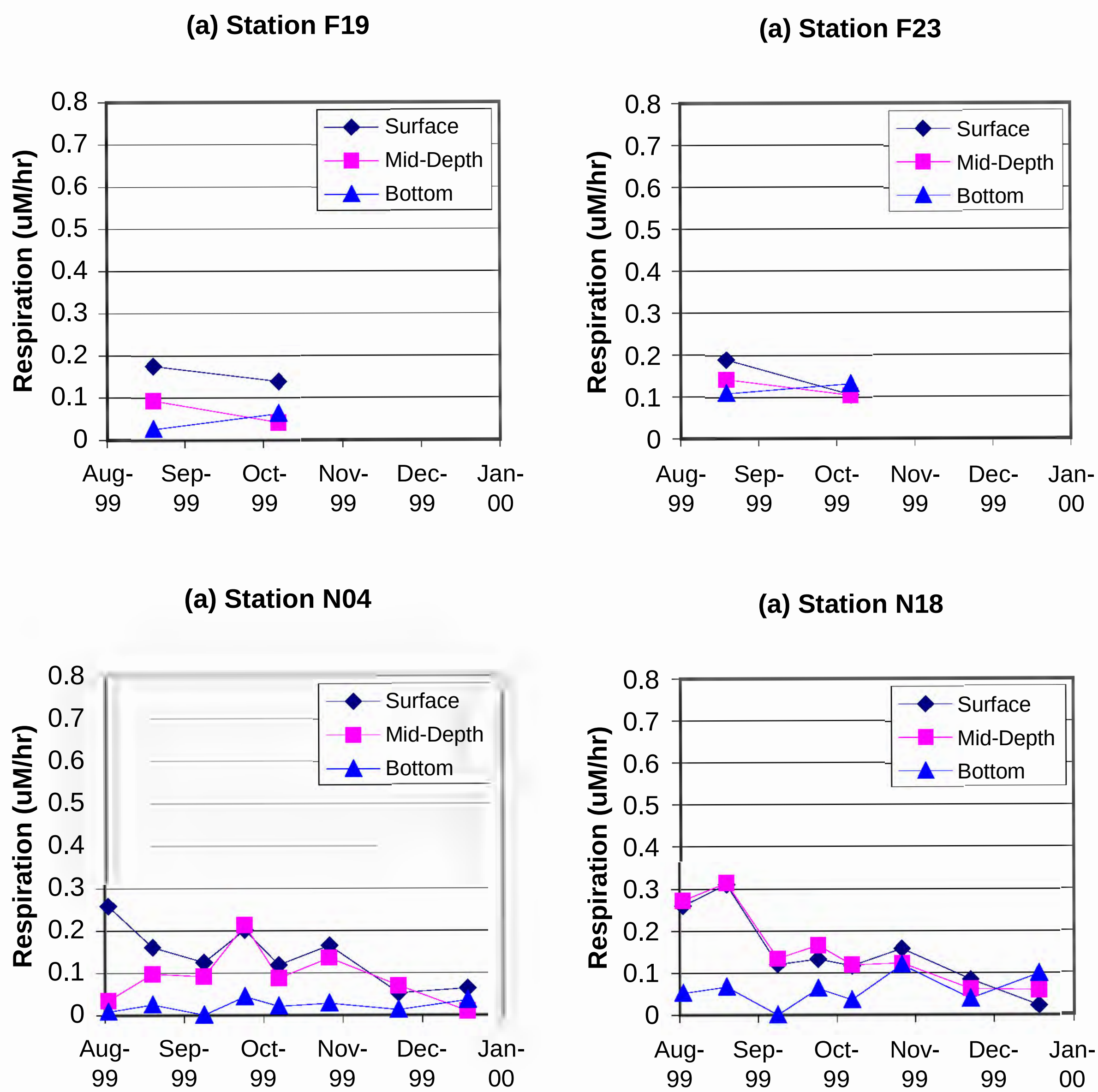


Figure 5-8. Time Series Plots of Respiration Stations F19, F23, N04, and N18

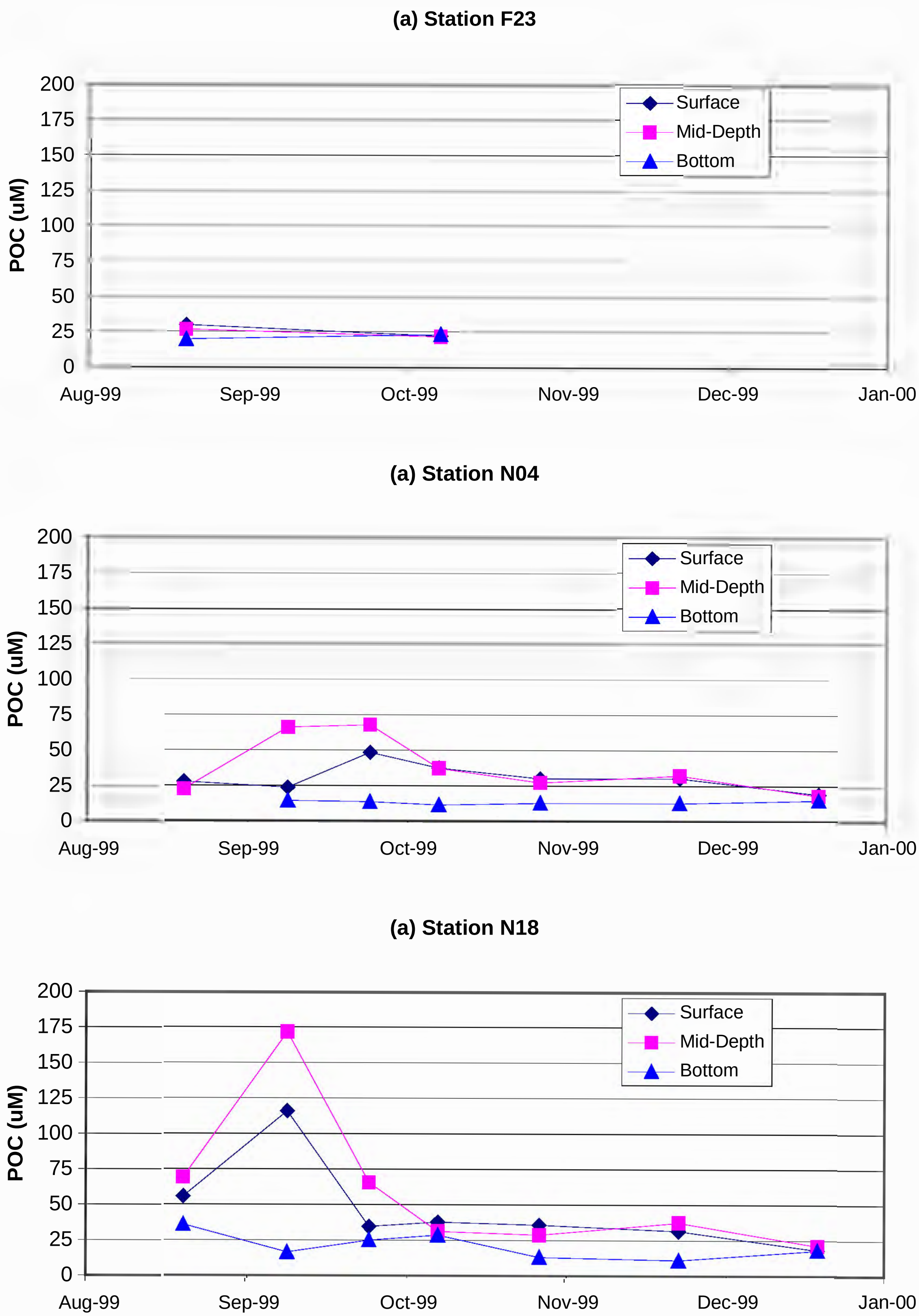


Figure 5-9. Time Series Plots of POC at Stations F23, N04, and N18

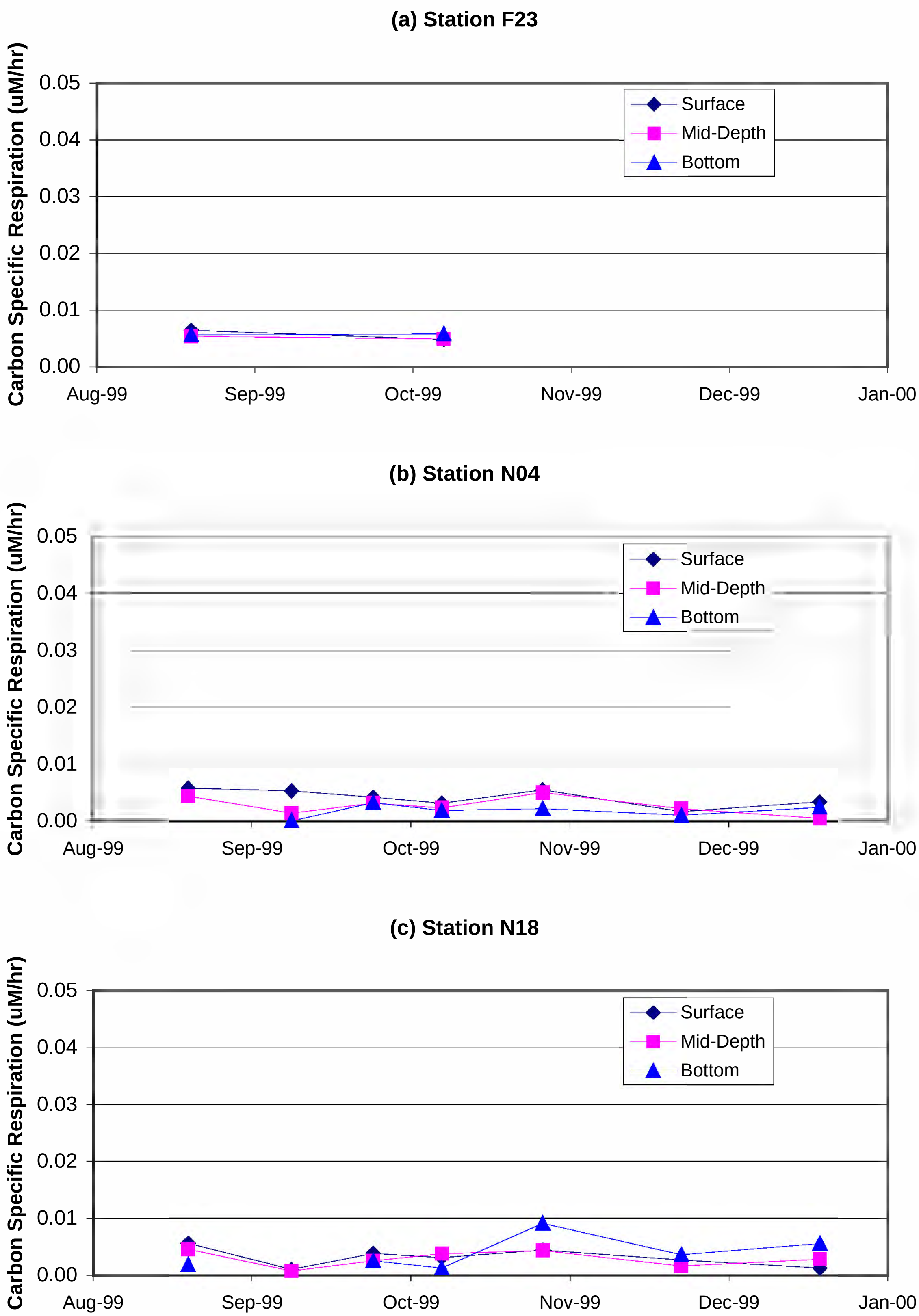


Figure 5-10. Time Series Plots of Carbon-Specific Respiration at Stations F23, N04, and N18

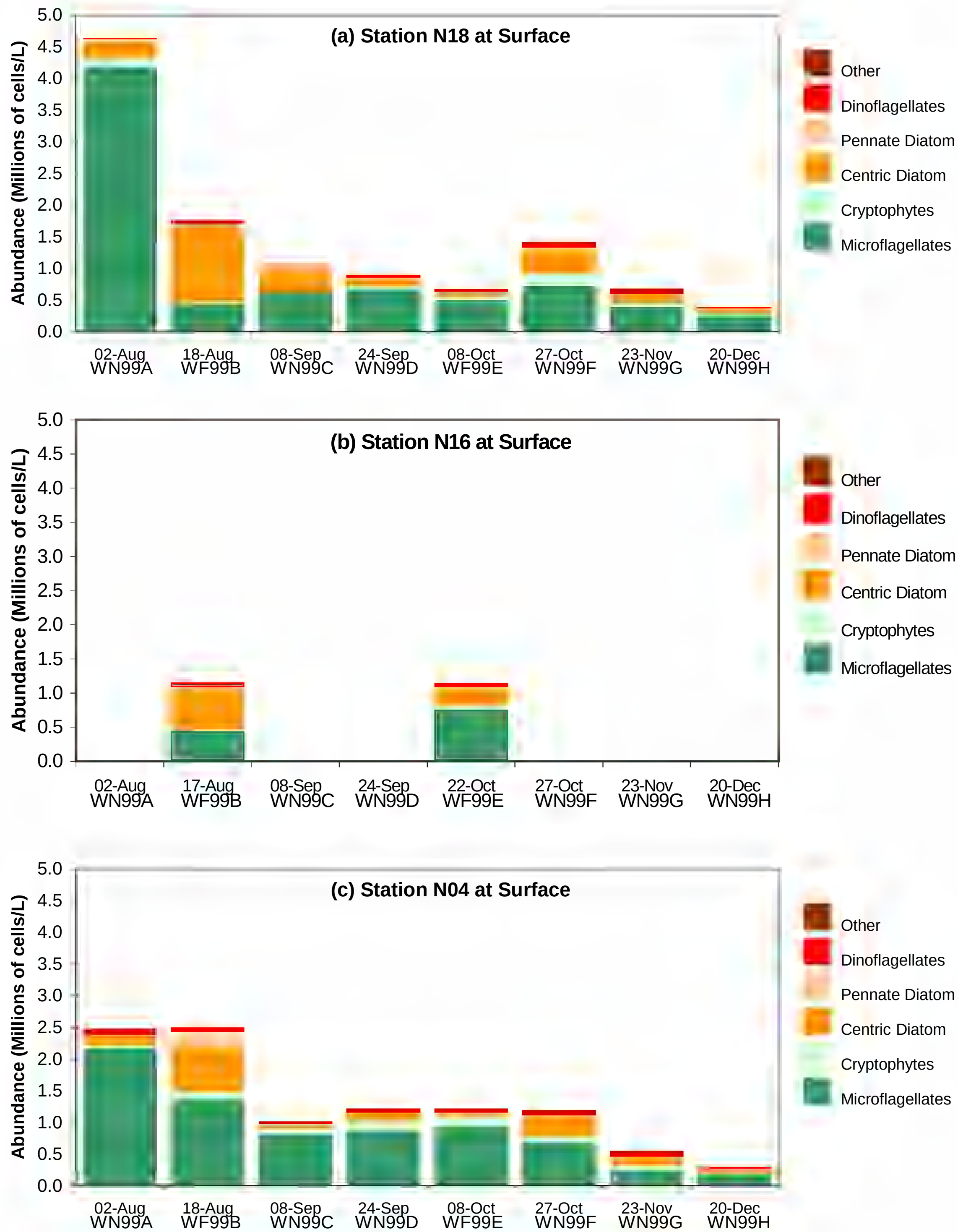


Figure 5-11. Phytoplankton Abundance by Major Taxonomic Group, Nearfield Surface Samples

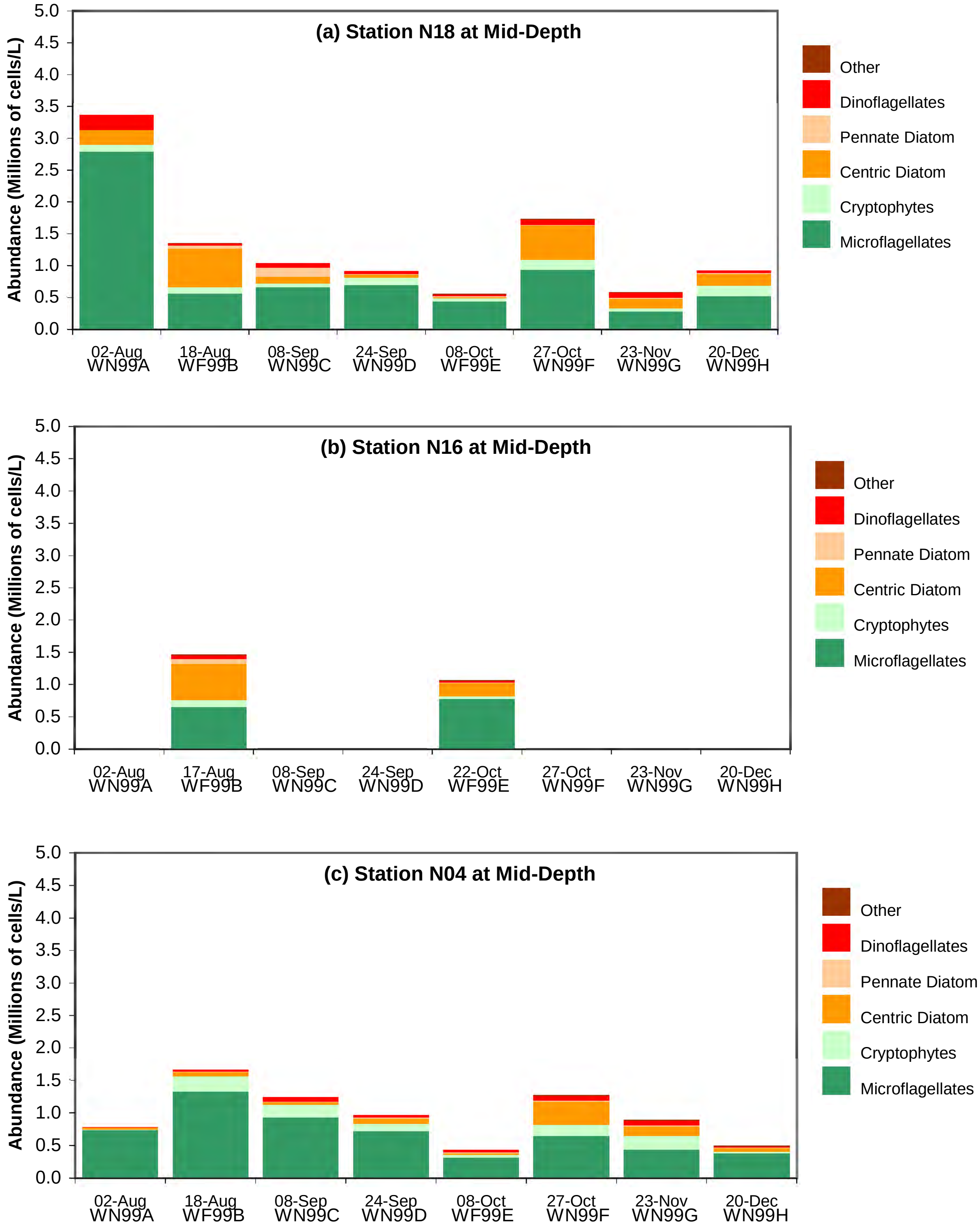


Figure 5-12. Phytoplankton Abundance by Major Taxonomic Group, Nearfield Mid-Depth Samples

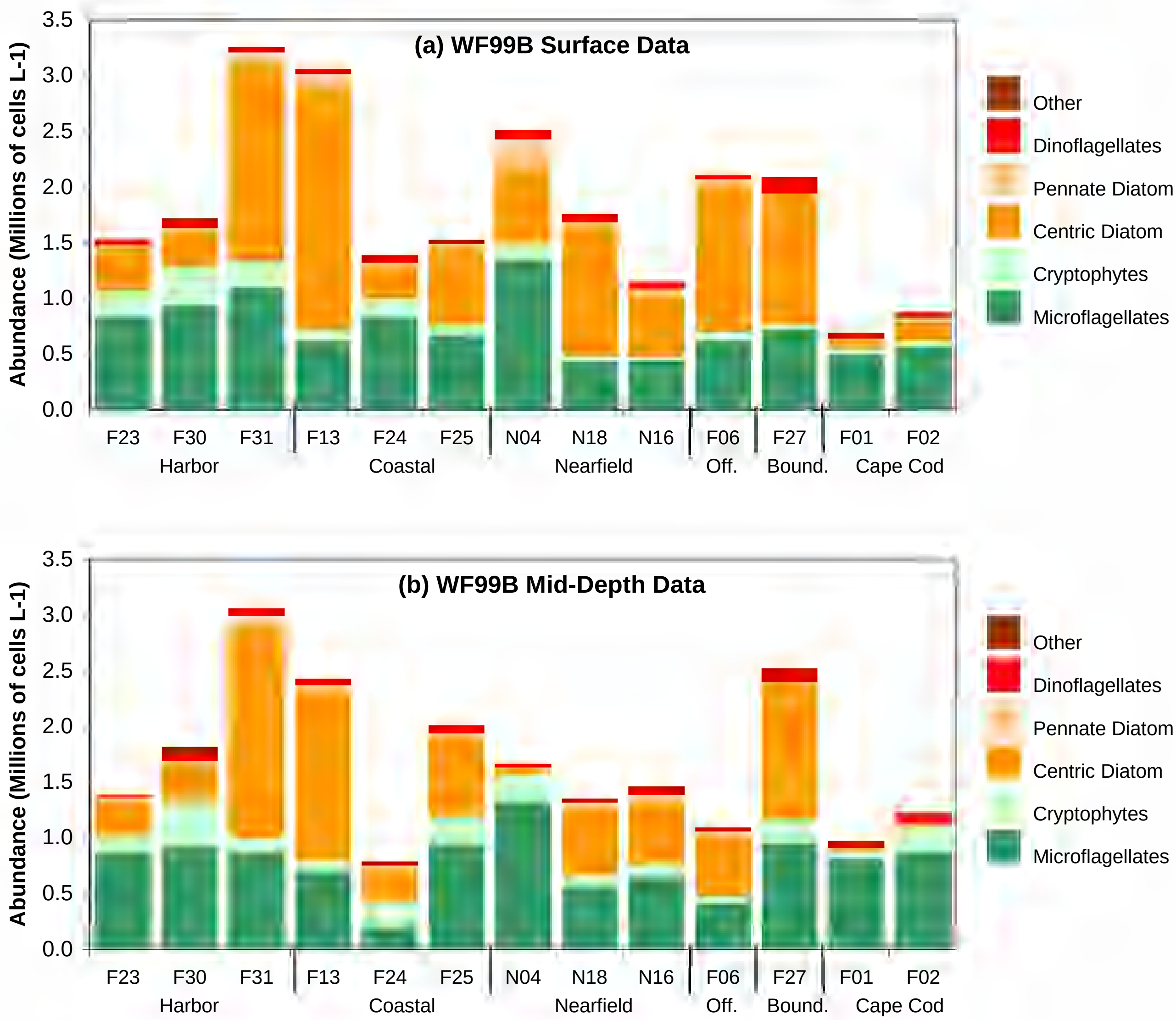
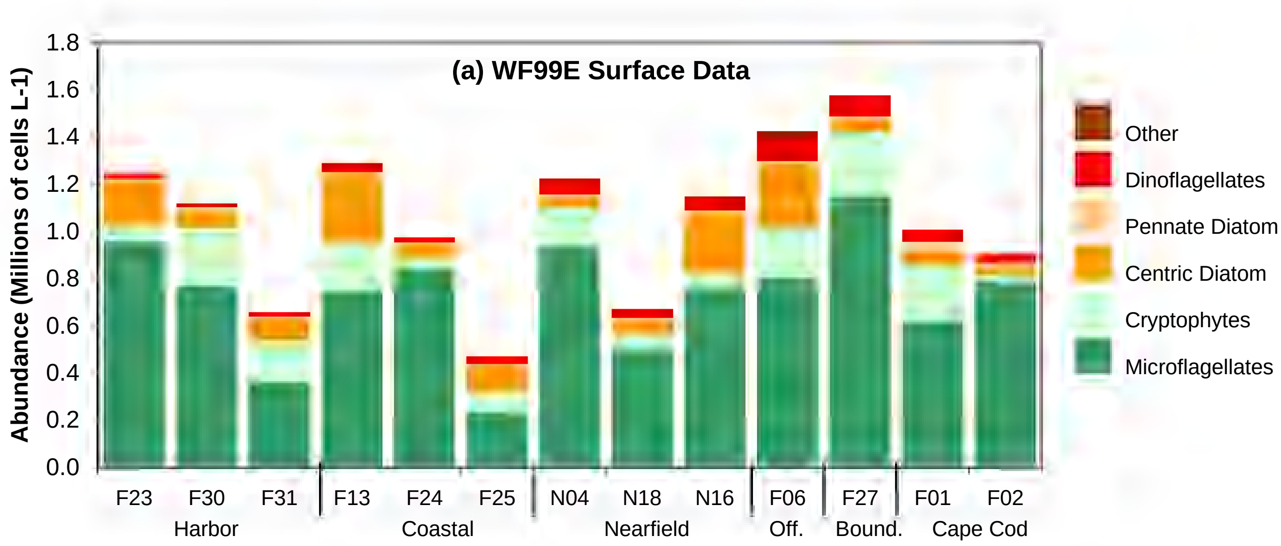


Figure 5-13. Phytoplankton Abundance by Major Taxonomic Group, WF99B Farfield Survey



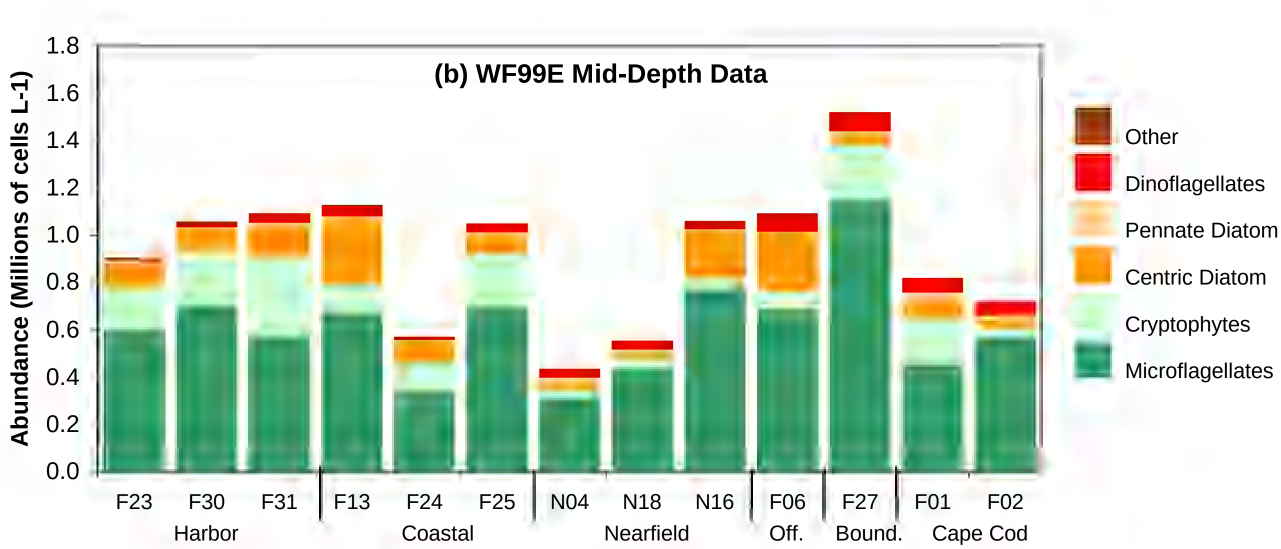


Figure 5-14. Phytoplankton Abundance by Major Taxonomic Group, WF99E Farfield Survey

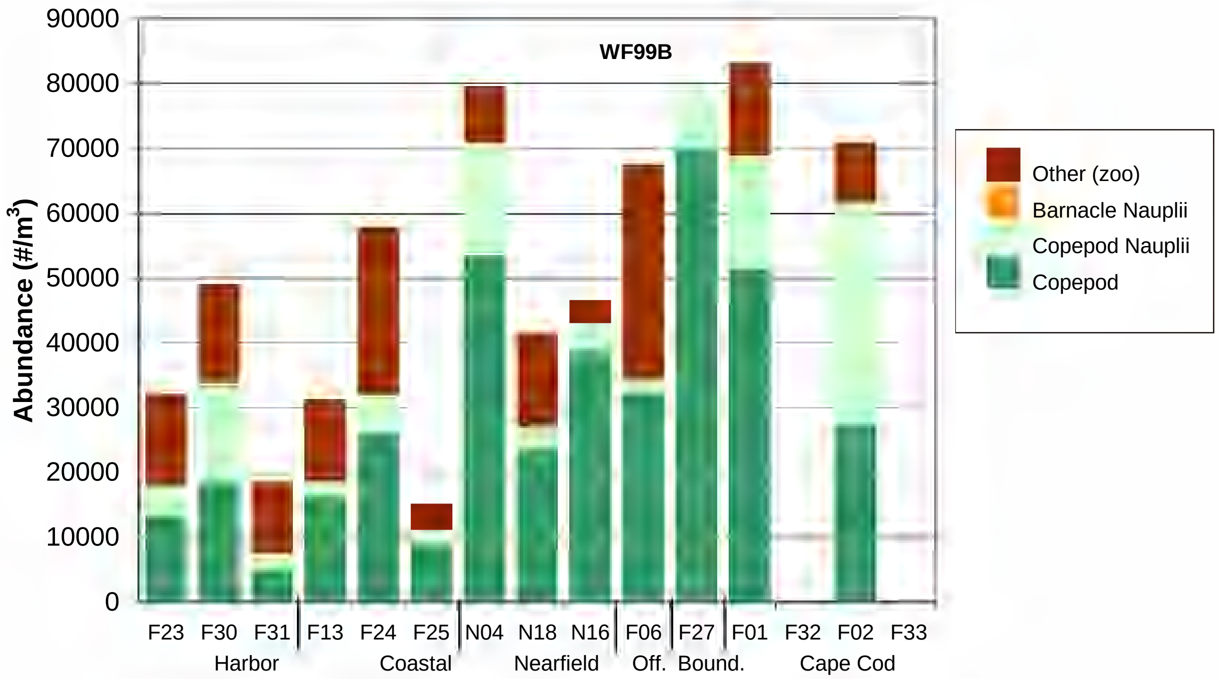


Figure 5-15. Zooplankton Abundance by Major Taxonomic Group – WF99B Farfield Survey

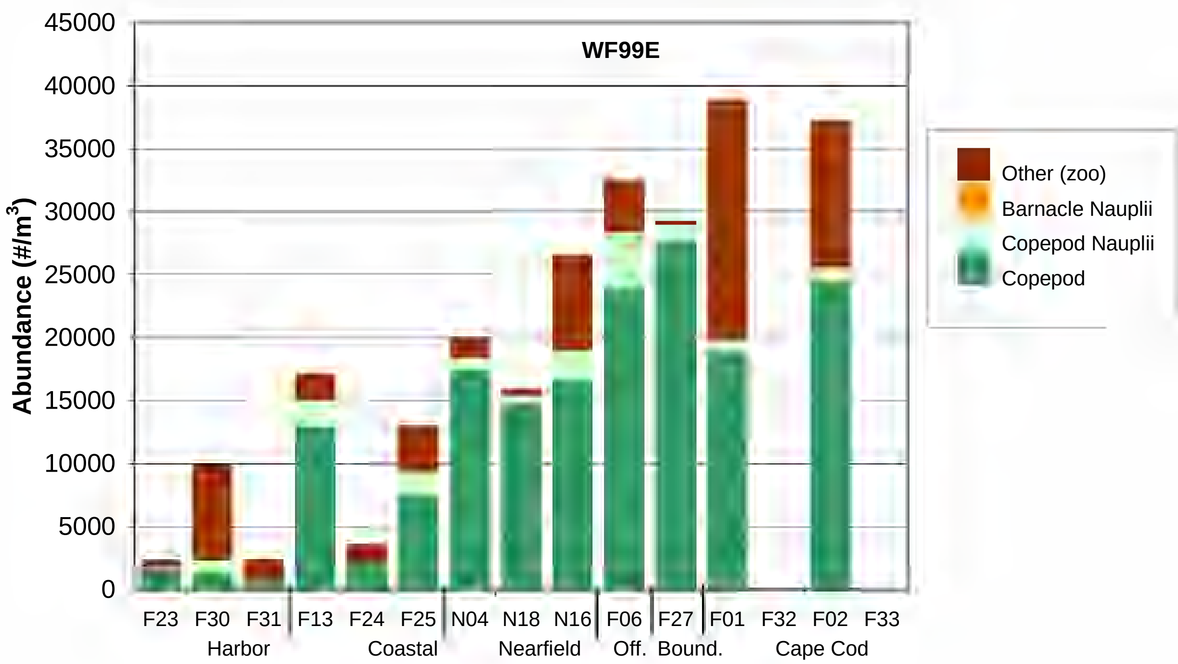


Figure 5-16. Zooplankton Abundance by Major Taxonomic Group, WF99E Farfield Survey

Note: no samples were collected at stations F32 and F33 during the Aug-Dec period.

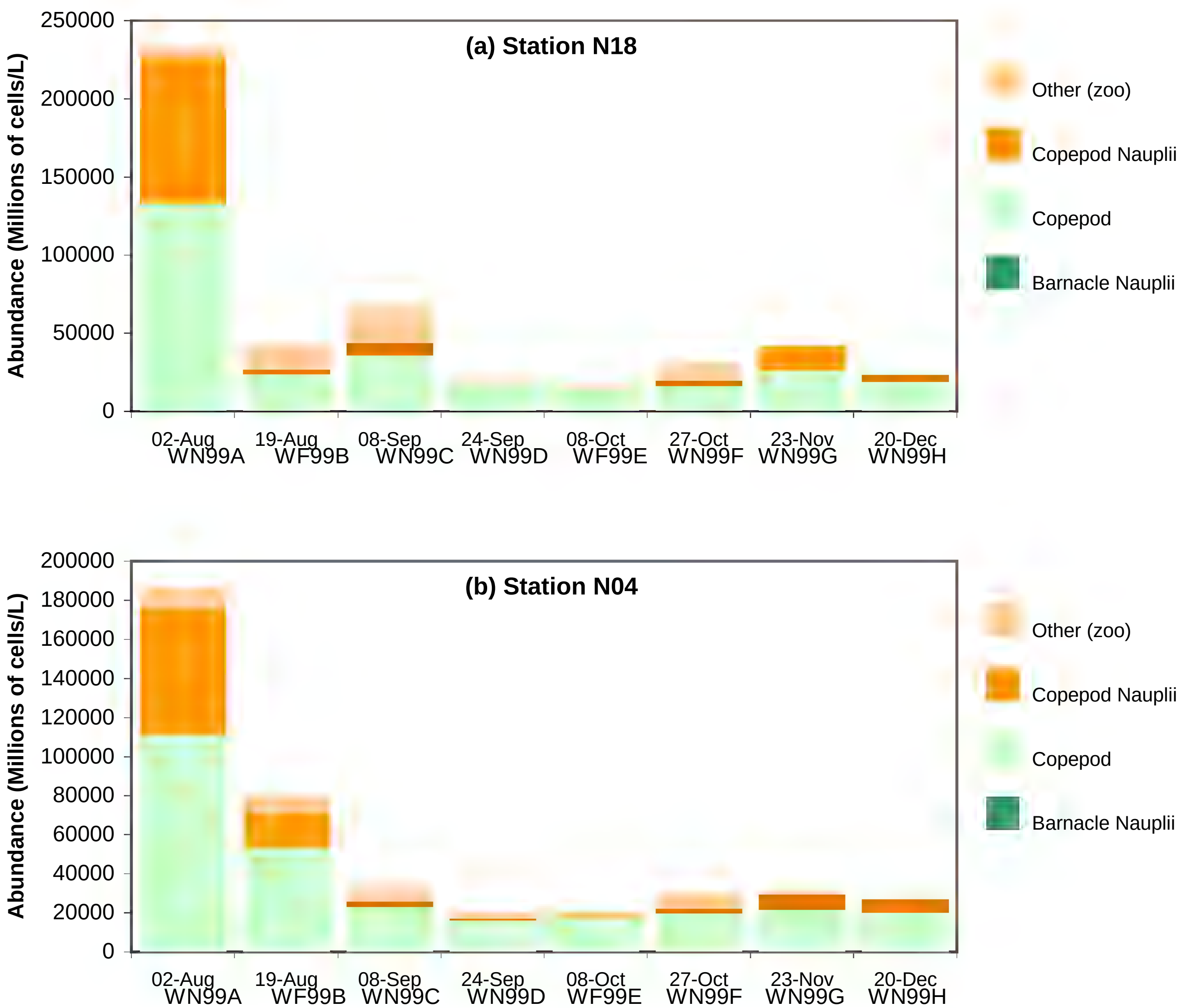


Figure 5-17. Zooplankton Abundance by Major Taxonomic Group, Nearfield Samples

6.0 SUMMARY OF MAJOR WATER COLUMN EVENTS

The primary physical characteristic of this period was the overturn of the water column and the return to winter conditions. Regionally, seasonal stratification had deteriorated at the coastal stations and had begun to weaken at the offshore stations by the October survey (WF99E). The nearfield survey data indicated the pycnocline had broken down in the eastern nearfield by early October (WF99E), but the water column at the outer nearfield stations had not mixed until late November (WN99G). Intermittent upwelling in August brought cooler, nutrient-replete waters into the surface layer at coastal and western nearfield stations.

The general trend in nutrient concentrations during the 1999 August to December period was similar to previous baseline monitoring years. Nutrients were depleted in the surface waters during the summer due to biological utilization and increased in concentration with the change from a stratified to a well-mixed water column.

Chlorophyll, productivity and phytoplankton data suggest that an atypical late summer bloom occurred in the nearfield and coastal waters in late August. In early August, nearfield phytoplankton abundance was at a maximum for this period (2.8 million cells L^{-1}). The high phytoplankton abundance did not result in elevated chlorophyll concentrations, but was coincident with very high zooplankton counts (>200,000 individuals m^{-3}) dominated by copepodites and females of *Oithona similis* and *Pseudocalanus* sp. and copepod nauplii.

By mid August, phytoplankton abundance had decreased in the nearfield perhaps due to intense grazing pressure. Although total phytoplankton abundance had decreased, the numbers and relative contribution of the centric diatom, *Leptocylindrus danicus*, had increased at station N18. This diatom was also numerous at stations along the south shore (F06 and F13) where total phytoplankton counts reached a maximum of 3 million cells L^{-1}. High chlorophyll concentrations (>13 $\mu g\ L^{-1}$) were observed in conjunction with elevated phytoplankton counts at these stations and appeared to extend along the south shore toward Cape Cod bay and north into the nearfield area. Although phytoplankton abundance was lower at nearfield station N18, the areal production was very high (~3500 $mgCm^{-2}d^{-1}$), which suggests that the mid-August survey may have been conducted at the start of the late summer bloom. Normally, diatom blooms of this magnitude do not occur during the summer, but rather, later in the fall in these waters (or during the winter/spring bloom).

Maximum chlorophyll values (>25 μgL^{-1}) were measured in the nearfield during the early September survey WN99C. These high chlorophyll levels were not coincident with maximum phytoplankton abundance or maximum production. The high production values in the nearfield in late August may have continued and contributed to the elevated chlorophyll concentrations seen in early September. The atypical late summer increase in production and chlorophyll concentrations overshadowed the increase observed in these parameters during a weak fall bloom in late October (WN99F). Although a substantial fall bloom did not develop in the nearfield in 1999, farfield chlorophyll and phytoplankton data suggest that the weak fall bloom was relatively widespread and present off the coast of southwestern Massachusetts Bay.

The DO minimum in the nearfield occurred relatively early in the fall of 1999 and along the shallow, inshore side of the nearfield. The annual minimum usually occurs later in the fall and at the deeper offshore nearfield stations. The early DO minimum may have resulted from a combination of relatively low bottom water DO concentrations observed earlier in the summer, elevated production in late summer and relatively calm weather and winds. Due to the early occurrence of such low DO concentrations, there was added concern about the levels that would be found in October when minima usually are observed in the nearfield area. Mixing events in September (Hurricane Floyd) prevented DO levels from continuing to decline into late September and October. The 1999 nearfield mean bottom water DO minimum, however, was the lowest observed during the baseline monitoring program (1992-1999) and was lower than the proposed warning threshold of 6.0 mg L^{-1}.

From October through December, high concentrations of ammonium were observed in the western nearfield. This continues a trend of high ammonium concentrations that were first observed during the fall/winter period of 1998. The source of the ammonium appears to be due to an increase in the discharge of ammonium from the Deer Island facility. This increase resulted from a combination of a change to secondary treatment and increased sewage flows through the system as sewage from Nut Island is now transferred to the Deer Island facility for treatment (summer of 1998). Secondary treatment leads to the breakdown of organic wastes, but one of the consequences or byproducts of the secondary treatment process is higher ammonium concentrations in the effluent. Unlike the winter of 1998, however, the elevated NH_4 concentrations did not translate into unusually high chlorophyll concentrations in November or December 1999, but may have contributed to the major chlorophyll peak observed in September.

A number of topics were called out in this report that will be discussed in greater detail in the 1999 annual water column report including the following:

- Effect of relatively calm weather and weak wind conditions in New England region on physical and biological processes in Massachusetts Bay – interannual variability in strength and occurrence of upwelling in coastal waters and potential biological ramification leading to intensified decline in bottom water dissolved oxygen.
- Continued observation of elevated ammonium concentrations and the effect on biological processes in the nearfield and near-harbor coastal waters – examine local trends in chlorophyll and nutrients with additional data from Boston Harbor Monitoring Program. Contributing factor to the late summer maxima in phytoplankton abundance, chlorophyll concentration and productivity observed in the nearfield?
- Continuation of trend of higher productivity in the central nearfield region compared to Boston Harbor that was first noted in 1997.
- Comparison of productivity, biomass and phytoplankton species observed during the late summer and fall blooms – atypical peak in productivity in August and weak fall bloom in 1999. Evaluate the factors contributing to the differences observed and compare with previous baseline data.
- Apparent disconnect between production and respiration – examine correlations between respiration and other physical, chemical and biological factors.

7.0 REFERENCES

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2000-08 APPENDICES

(CLICK TO OPEN)

APPENDIX A

Productivity Methods

METHODS

URI conducted a study of the reliability of using reduced sample volumes to measure primary productivity using ^{14}C. The study found that analyses using 5-mL samples could produce results that were comparable to analyses using larger sample volumes. A summary of the study is in Appendix E of the Combined work/quality assurance plan for baseline water quality monitoring: 1998-2000 (Albro *et. al.*, 1998).

URI also measured the effects of sample holding time and increased incubation time on measurements of primary productivity using the photosynthetrons at URI. The results, summarized below, show that sample analysis must begin within 6 h of sample collection and incubation between 0.5 h and 2 h produce comparable results.

Incubation Time	
Time (h)	**Productivity (g/C/m²/h)**
0.5	0.195
1	0.207
1.5	0.182
2	0.212

Holding Time	
Time (h)	**Productivity (g/C/m²/h)**
0	0.207
4	0.182
6	0.210
8	0.177

Based on the results of these tests the following method has been used to collect and analyze water samples for productivity.

Primary Analysis by ^{14}C – Field Procedures

From each of 5 depths at each productivity station, samples are obtained by filtration through 300-μm-mesh screen (to remove large zooplankton) from the Rosette sampling bottle into opaque 1-L polyethylene bottles. The bottles are rinsed twice prior to filling. The samples are then placed in a cooler and transferred to the URI laboratory within 5 hours of water sampling. Productivity samples are taken from the same bottles and depths as the other analyses.

Primary Analysis by ^{14}C – Laboratory Procedures

Under subdued green light, each depth is processed separately starting with the surface water sample. Each sample is mixed thoroughly and then poured into a repipette set to deliver 5 mL. The repipette is rinsed twice with sample prior to use. The delivery tip of the repipette is flushed three times and 5 mL of sample will be pipetted into 20 mL borosilicate vials. A total of 16 bottles (14-16 light bottles, 2 dark bottles) are filled for each depth. These vials are incubated in a light and temperature controlled incubator. Light bottles from each depth are incubated at 14 to 16 light intensities (250 w Tungsten-halogen lamps attenuated with neutral density filters, range 0 to 2000 $\mu E\ m^{-2}\ s^{-1}$) and all bottles are incubated within 2°C of the *in situ* temperature.

The 5 mL samples are incubated with 100 μL of 10 μCi/mL (1 μCi for 5 mL sample) Carbon-14 (^{14}C) stock solution. All vials are then placed in the incubator for two hours. Time and temperature are recorded at the start and end of the incubation period. The light intensity within the incubator is measured before and after the incubation period. Temperature is constantly monitored throughout the incubation period and the location of each vial in the incubator is recorded. Upon removal from the incubator, 100 μL of 0.05N HCl, is added to each vial. Vials will remain loosely capped while shaken overnight. The following morning 15 mL Ecolume is added to each vial, which is again loosely capped and shaken overnight. Two days following the cruise, vials are tightly capped and placed on the Beckman LS 3801 to be counted.

Calculation of Primary Production. Volume-specific primary production is calculated using equations similar to that of Strickland and Parsons (1972) as follows:

$$P(i) = \frac{1.05(DPM(i))DIC}{A_{sp}T}$$

$$P(d) = \frac{1.05(DPM(d))DIC}{A_{sp}T}$$

$$A_{sp} = DMP(sa) - DPM(back)$$

where:

$P(i)$ = primary production rate at light intensity i (μgC $L^{-1}h^{-1}$ or mgC $m^{-3}h^{-1}$)
$P(d)$ = dark production, (μgC $L^{-1}h^{-1}$ or mgC $m^{-3}h^{-1}$)
$DPM(i)$ = dpm in sample incubated at light intensity i
$DPM(d)$ = dpm in dark incubated sample
$DPM(back)$ = background dpm in vial containing only scintillation cocktail
$DPM(sa)$ = specific activity added to incubation samples (DPM)
T = incubation time (h)
DIC = concentration of dissolved inorganic carbon (μg/mL)

Table A-1 shows the frequency that primary productivity measurements and calculations are performed per vial, depth, station, and survey.

Table A-1. Measurement frequency for variables involved in calculation of primary production.

Measurement/ Calculation	Vial	Depth	Station	Survey
DPM(i)	✓			
P(i)	✓			
DIC		✓		
P(d)		✓		
DPM(d)		✓		
Asp			✓	
T			✓	
DPM(sa)			✓	
DPM(back)				✓

P–I curves. For each of the 5 depths for each photosynthesis station a P–I curve is obtained from the data P(I) = P(i)-P(d) vs. the irradiance (I, μE $m^{-2}s^{-1}$) to which the incubating sample is exposed. The P-I curves are fit via one of two possible models, depending upon whether or not significant photo-inhibition occurs. In cases where photoinhibition is evident the model of Platt *et al.* (1980) is fit (SAS 1985) to obtain the theoretical maximum production, and terms for light-dependent rise in production and degree of photoinhibition:

$$P(I) = P_{sb}(1 - e^{-a})e^{-b}$$

where:

$P(I)$ = primary production at irradiance I, corrected for dark fixation (P(i)-P(d))

P_{sb} = theoretical maximum production without photoinhibition

$a = \alpha I / P_{sb}$ and α is the initial slope, the light-dependent rise in production

$b = \beta I / P_{sb}$ and β is a term relaying the degree of photoinhibition

If ß is not significantly different from zero, an alternative model of Webb *et al.* (1974) is similarly fit to obtain the maximum production and the term for light-dependent rise in production:

$$P(I) = P_{\max}(1 - e^{-a'})$$

where:

$P(I)$ = primary production at irradiance I corrected for dark fixation (P(i)-P(d))

$P_{\max}$ = light saturated maximum production

$a' = \alpha I / P_{\max}$ and α is the initial slope the light-dependent rise in production

P_{max} and P_{sb} are not equivalent but they are mathematically related using the equation:

$$P_{max} = P_{sb}\,[\alpha/(\alpha+\beta)][\beta/(\alpha+\beta)]^{\beta/\alpha}$$

Light vs. Depth Profiles. To obtain a numerical representation of the light field throughout the water column averaged CTD light profiles (0.5 m intervals) are fit (SAS 1985) to an empirical sum of exponentials equation of the form:

$$I_Z = A_1 e^{-a_1 Z} + A_2 e^{-a_2 Z} + \ldots.$$

which is an expansion of the standard irradiance vs. depth equation:

$$I_Z = I_0 e^{-kZ}$$

where:

I_Z = light irradiance at depth Z

I_0 = incident irradiance ($Z = 0$)

k = extinction coefficient

$A_1, A_2 \ldots$ = factors relating to incident irradiance ($I_0 = A_1 + A_2 + \ldots$)

$a_1, a_2 \ldots$ = coefficients relating to the extinction coefficient ($k = a_1 + a_2 + \ldots$)

The expanded equation is used in most instances as spectral shifts, pigment layering and other factors result in deviation from the idealized standard irradiance vs. depth equation. The simplest form of the expanded equation is implemented to adequately model the light field, which in the large majority of cases is the sum of two exponentials.

Daily Incident Light Field. During normal CTD hydrocasts the incident light field is routinely measured via a deck light sensor at high temporal resolution. The average incident light intensity is determined for each of the CTD casts to provide, over the course of the photoperiod (12-hr period centered upon solar noon), a well resolved irradiance time series consisting of 12-17 data points. A 48-point time series (every 15 min) of incident is obtained from these data by linear interpolation. A similar time series of light data is collected at Deer Island, and is used as the photoperiod incident light (I_o) time series described below. The Deer Island data are collected using a 4 π sensor and the light intensity measured in the incubator is collected with a cosine sensor. The cosine values are converted to 4 π readings using an empirically determined equation:

$$4\pi = 17.58 + 1.0529\,(\cos) - 0.00008\,(\cos)^2$$

with both 4 π and cosine light intensity in units of $\mu E\ m^{-2}\ sec^{-1}$. The r^2 for the empirical equation is 0.99. The light data are converted prior to fitting the P-I curves.

Calculation of Daily Primary Production. Given the best fit parameters (P_{sb} or P_{max}, α, β) of the P-I curves obtained for each of the five sampling depths, the in situ light intensity (*i.e.*, I_z) at each depth determined from the sum of exponential fits on the in situ light field, and the photoperiod incident light (I_0) time series, it is possible to compute daily volumetric production for each depth. To do this at a given depth, hourly production is determined for the in situ light intensity computed for each 15 min interval of the photoperiod, using the appropriate P-I parameters and in situ irradiance. Daily production ($\mu g\ C\ L^{-1}\ d^{-1}$) is obtained by integration of the determined activity throughout the 12-hour photoperiod. An advantage of this approach is that seasonal changes in photoperiod length are automatically incorporated into the integral computation. For example, during winter months computed early morning and late afternoon production contributes minimally to whole day production, whereas during summer months the relative contribution during these hours is more significant. The investigator does not have to decide which factor to employ when converting hourly production to daily production. The primary assumption of the approach is that the P-I relationship obtained at the time of sample procurement (towards the middle of the photoperiod) is representative of the majority of production occurring during the photoperiod, which should be the case.

Calculation of Daily Areal Production. Areal production ($mg\ C\ m^{-2}\ d^{-1}$) is obtained by trapezoidal integration of daily volumetric production vs. depth down to the 1% light level.

Calculation of Chlorophyll-Specific Parameters. Chlorophyll-specific measures of the various parameters (including the P-I parameters) is determined by dividing by the appropriate chlorophyll term obtained from independent measurements.

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APPENDIX B

Surface Contour Plots – Farfield Surveys

Surface Contour Plots – Farfield Surveys

All contour plots were created using data from the surface bottle sample (A). Each plot is labeled with the survey number (WF99B and WF99E), and parameter. The minimum and maximum value, and the station where the value was measured are provided for each plot, as well as the contour interval and parameter units.

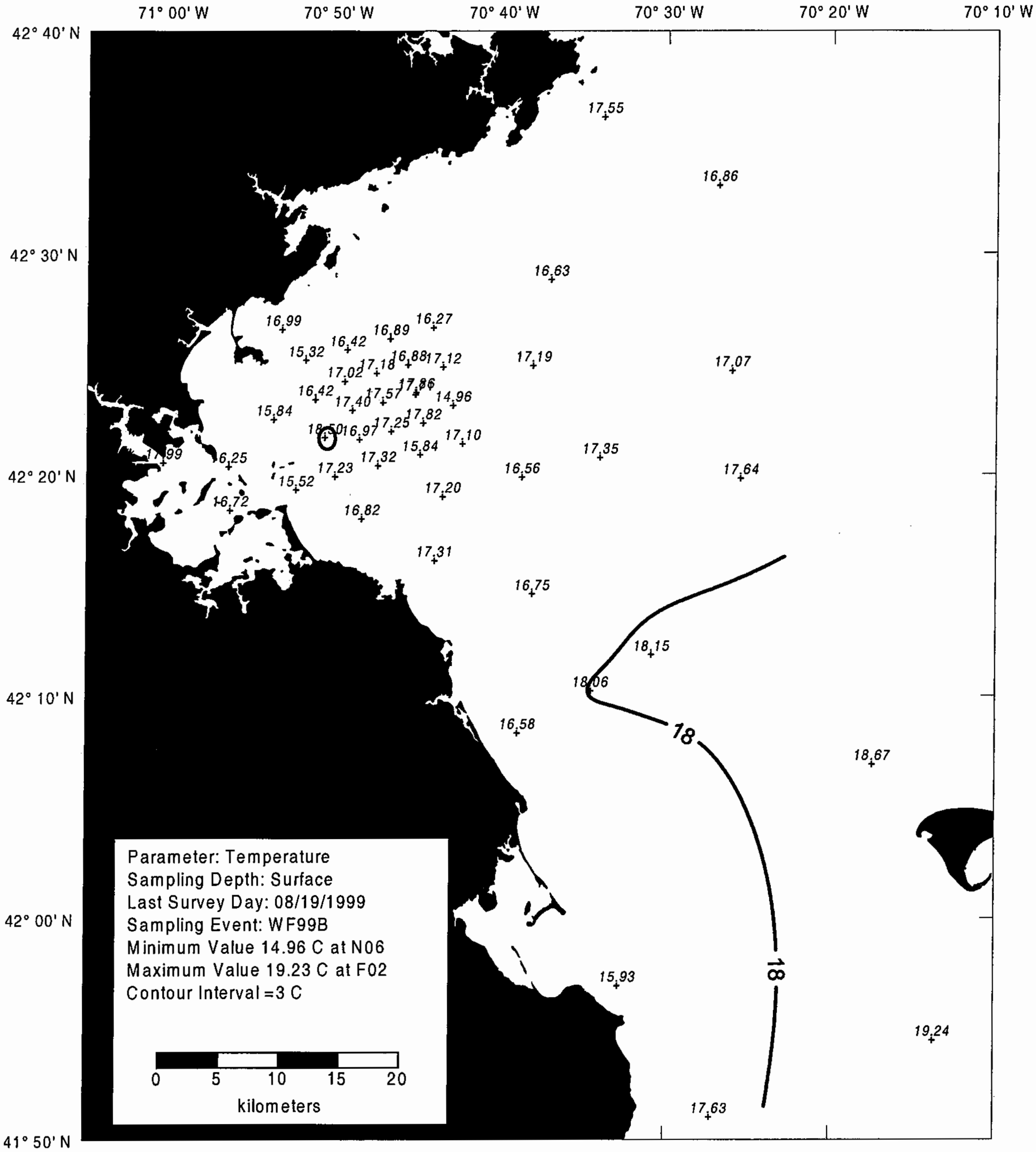


Figure B-1. Temperature Surface Contour Plot for Farfield Survey WF99B (Aug 99)

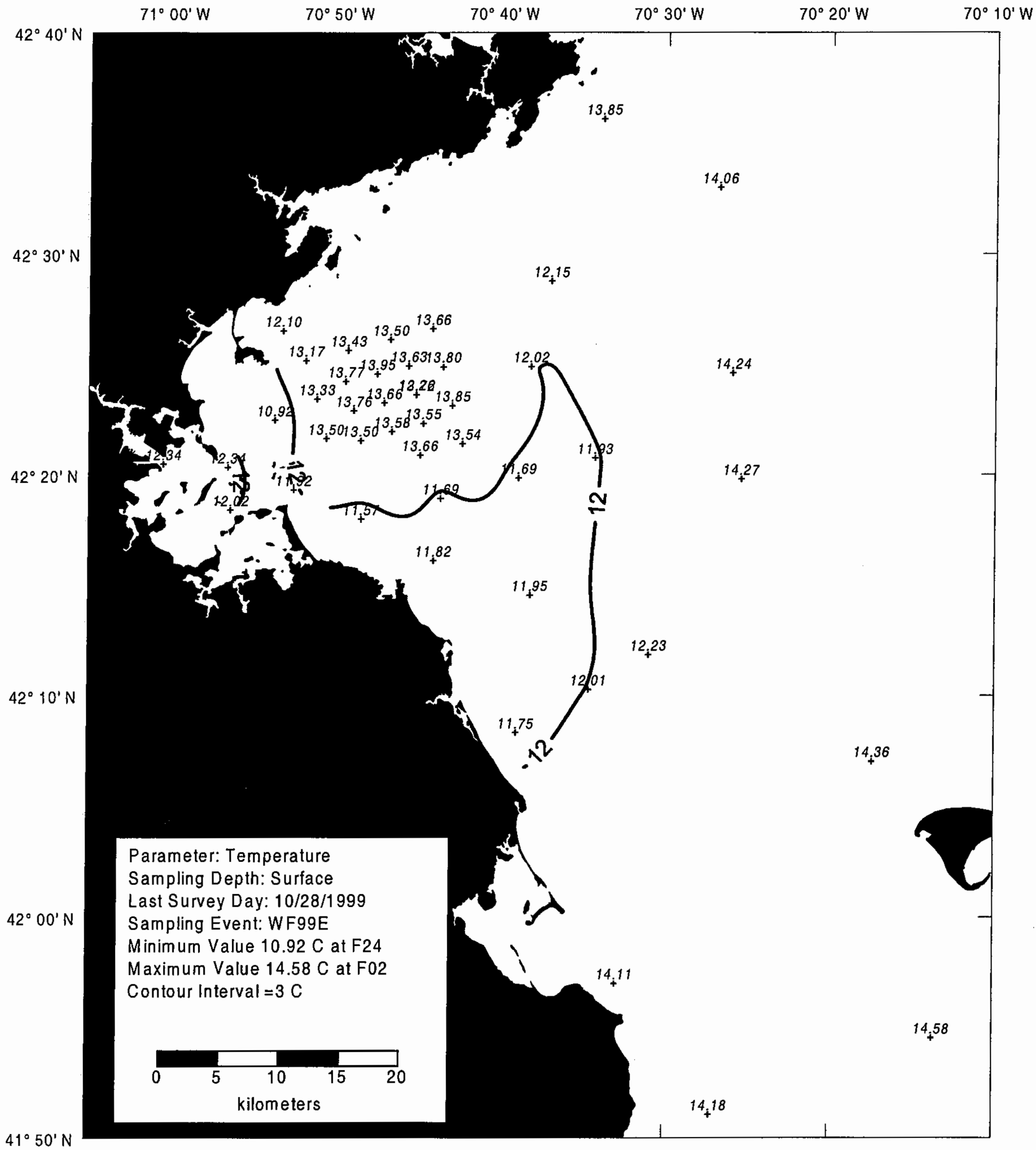


Figure B-2. Temperature Surface Contour Plot for Farfield Survey WF99E (Oct 99)

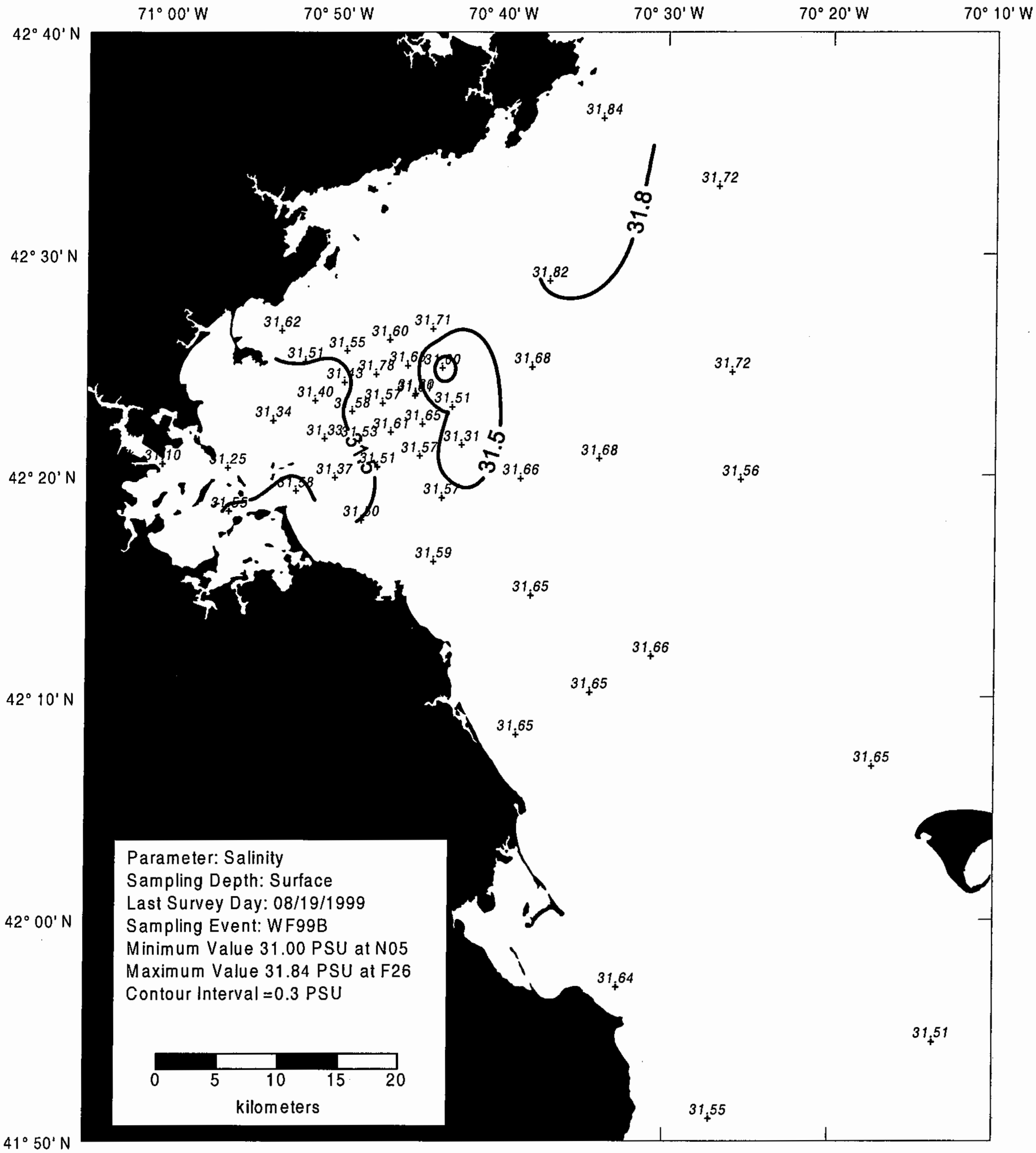


Figure B-3. Salinity Surface Contour Plot for Farfield Survey WF99B (Aug 99)

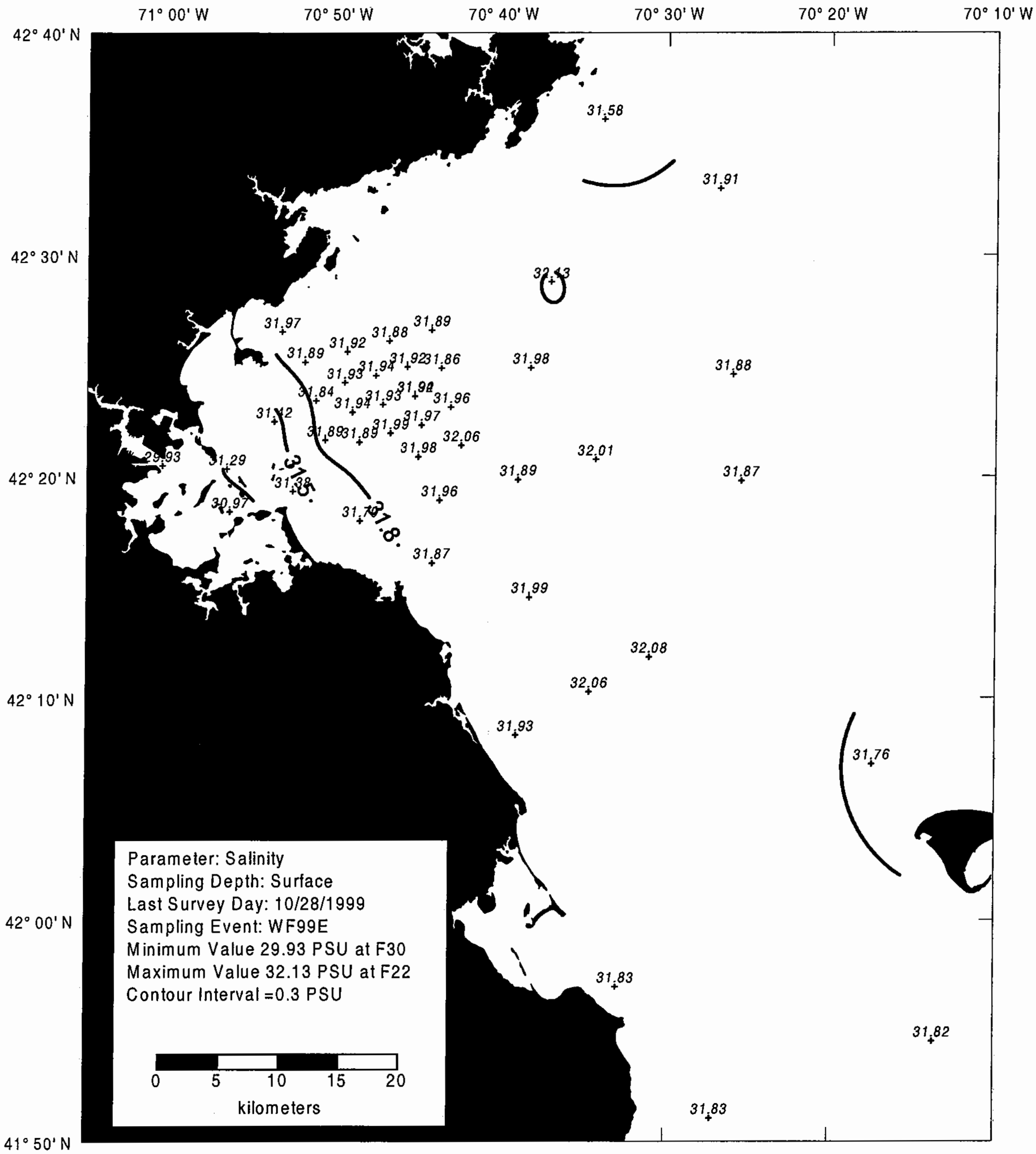


Figure B-4. Salinity Surface Contour Plot for Farfield Survey WF99E (Oct 99)

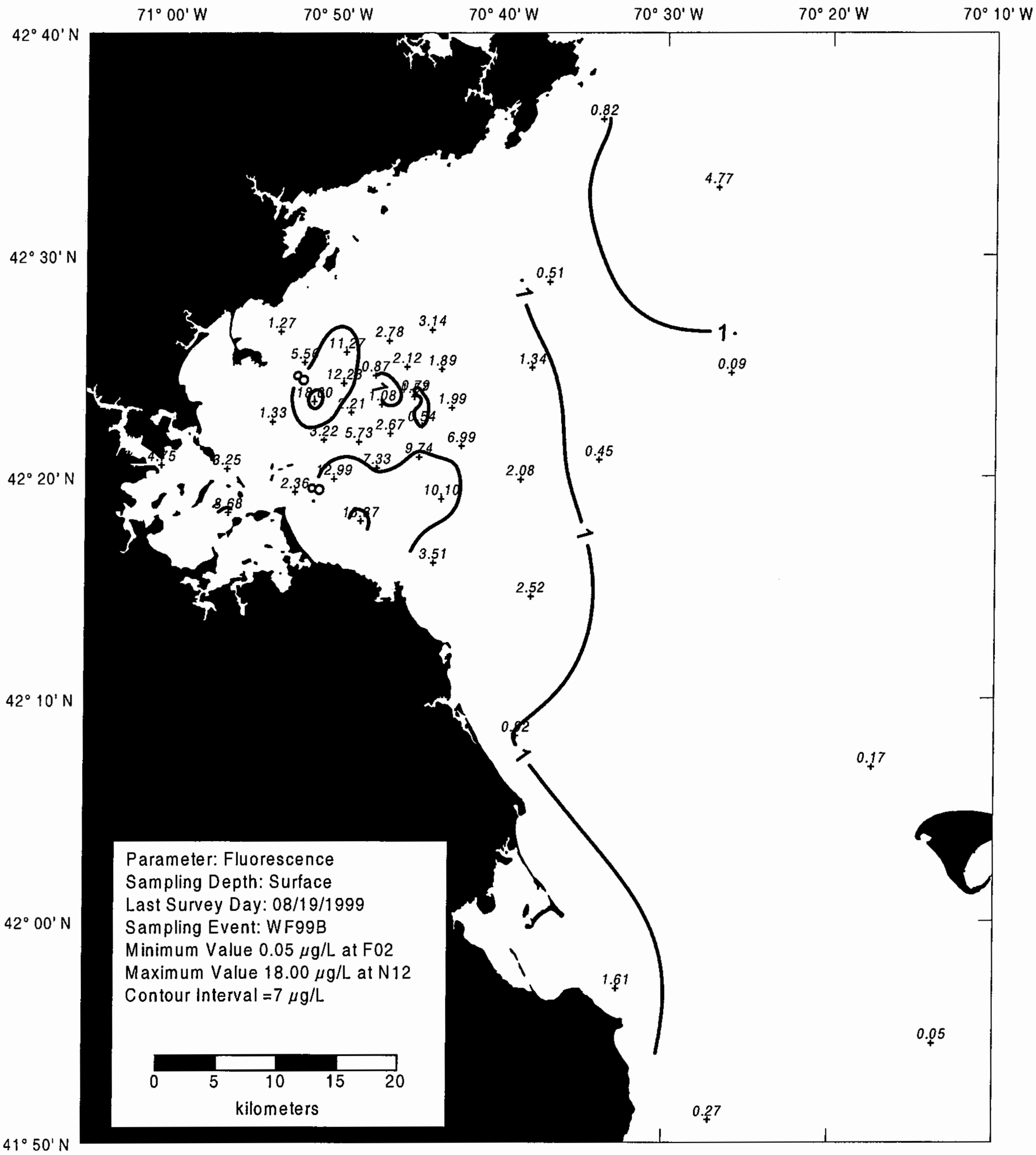


Figure B-5. Fluorescence Surface Contour Plot for Farfield Survey WF99B (Aug 99)

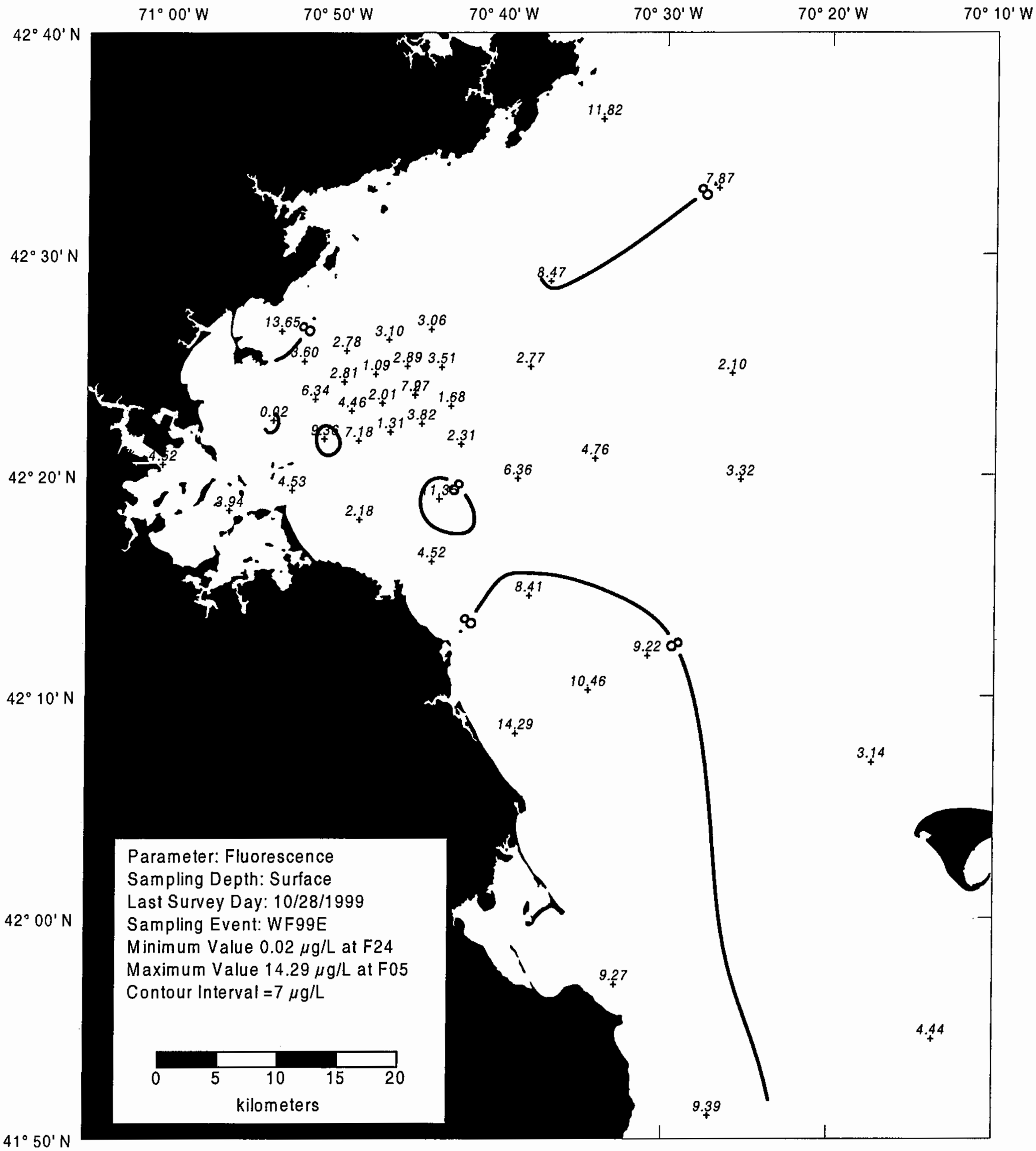


Figure B-6. Fluorescence Surface Contour Plot for Farfield Survey WF99E (Oct 99)

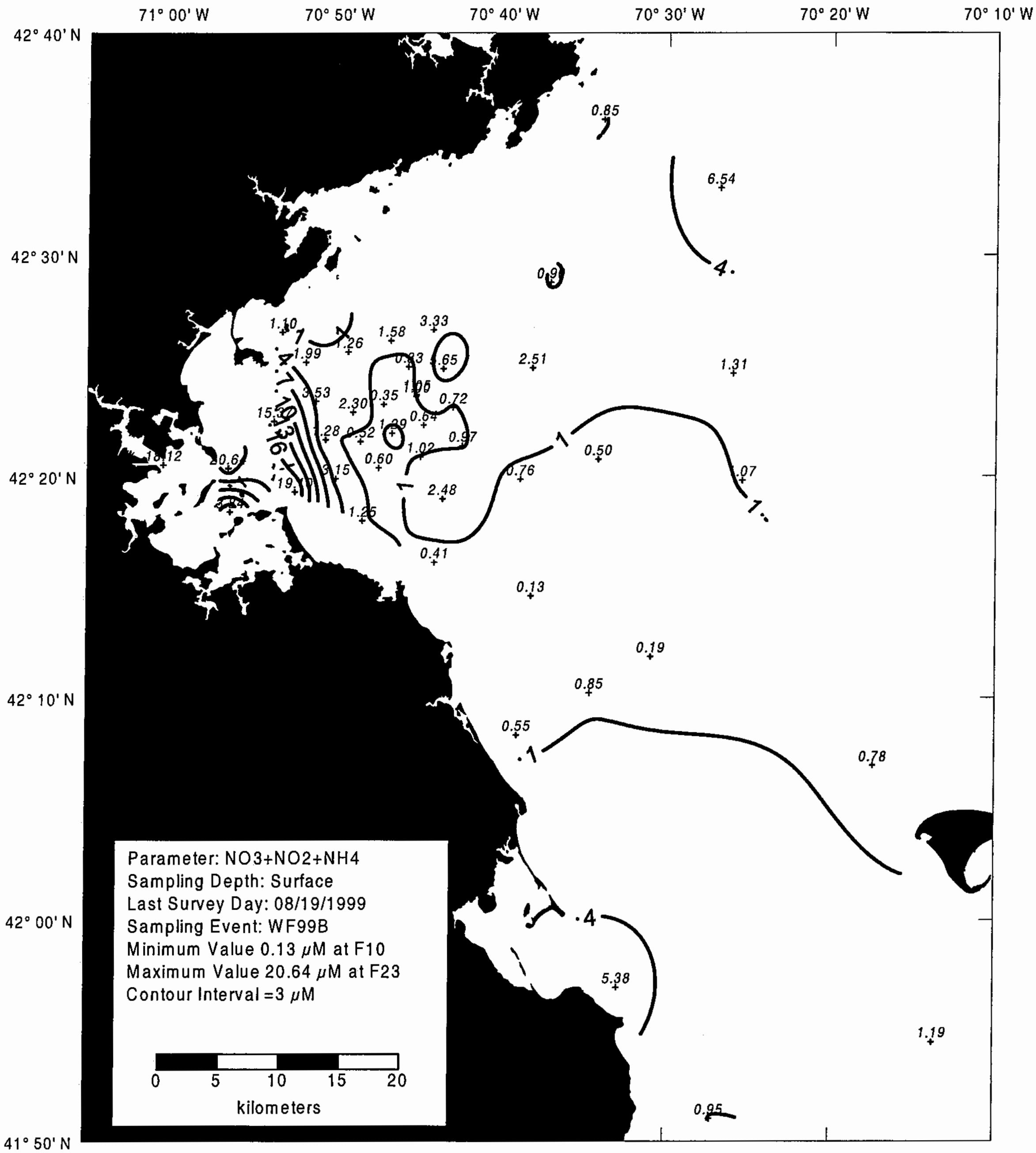


Figure B-7. DIN Surface Contour Plot for Farfield Survey WF99B (Aug 99)

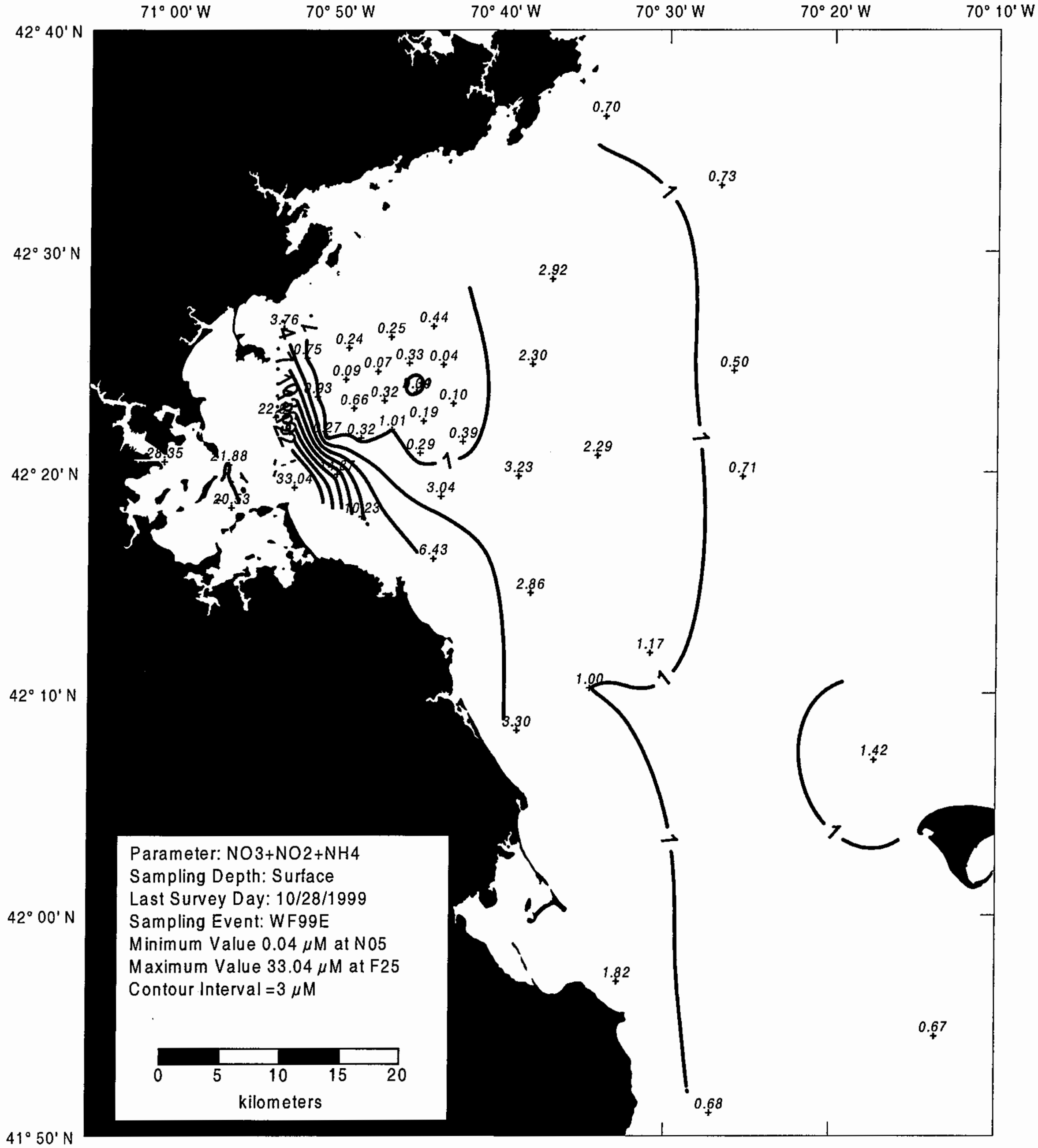


Figure B-8. DIN Surface Contour Plot for Farfield Survey WF99E (Oct 99)

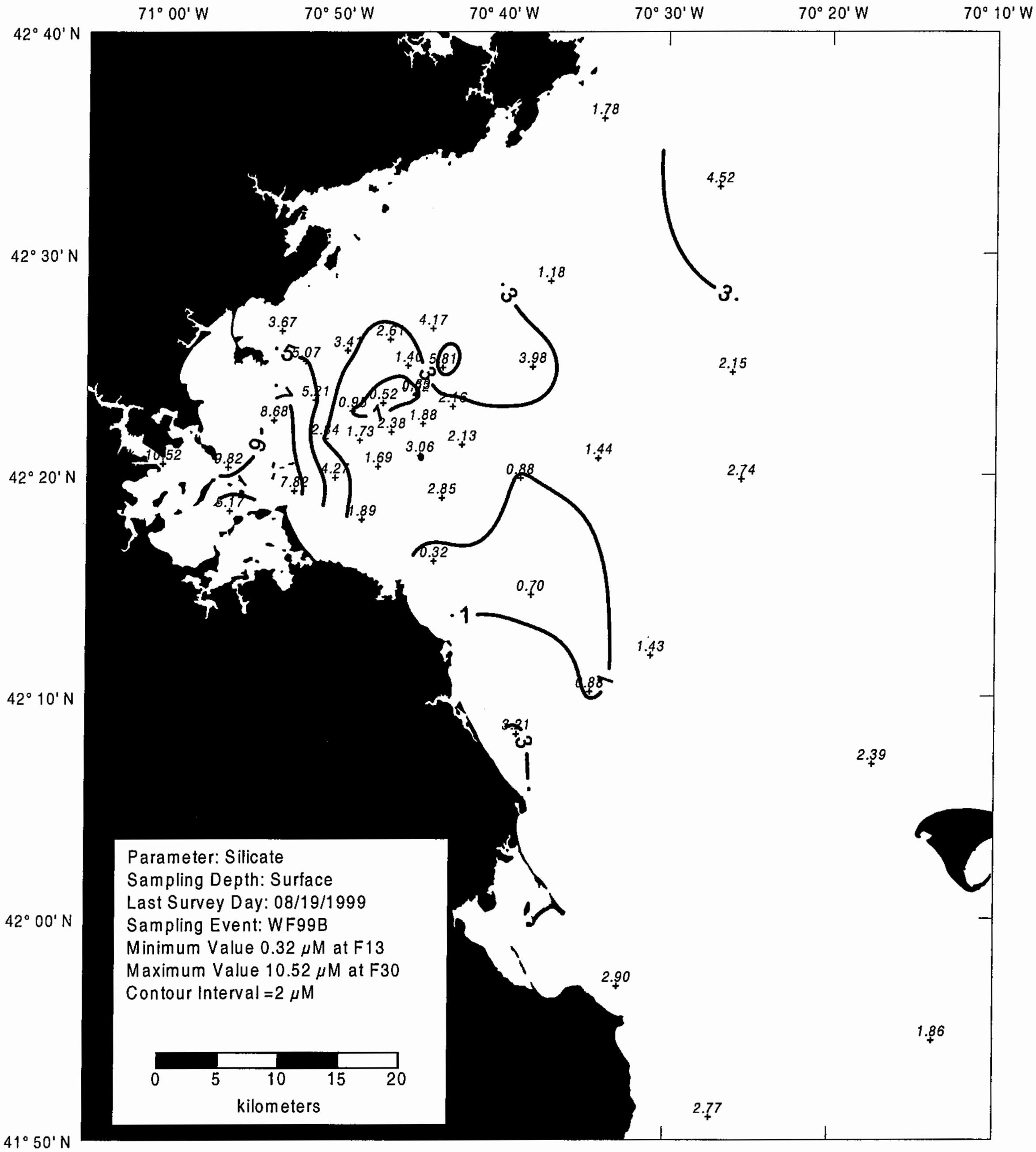


Figure B-9. Silicate Surface Contour Plot for Farfield Survey WF99B (Aug 99)

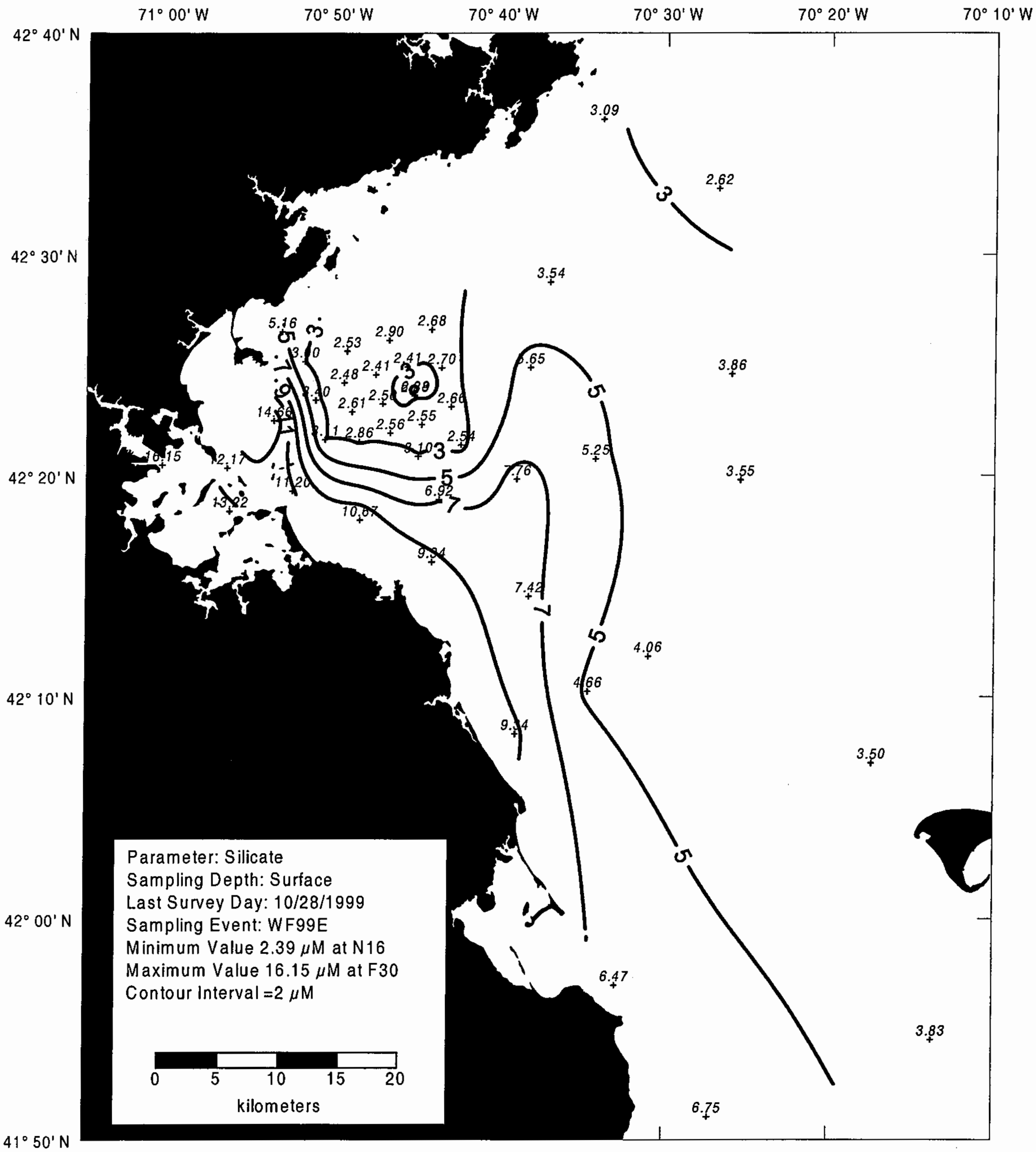


Figure B-10. Silicate Surface Contour Plot for Farfield Survey WF99E (Oct 99)

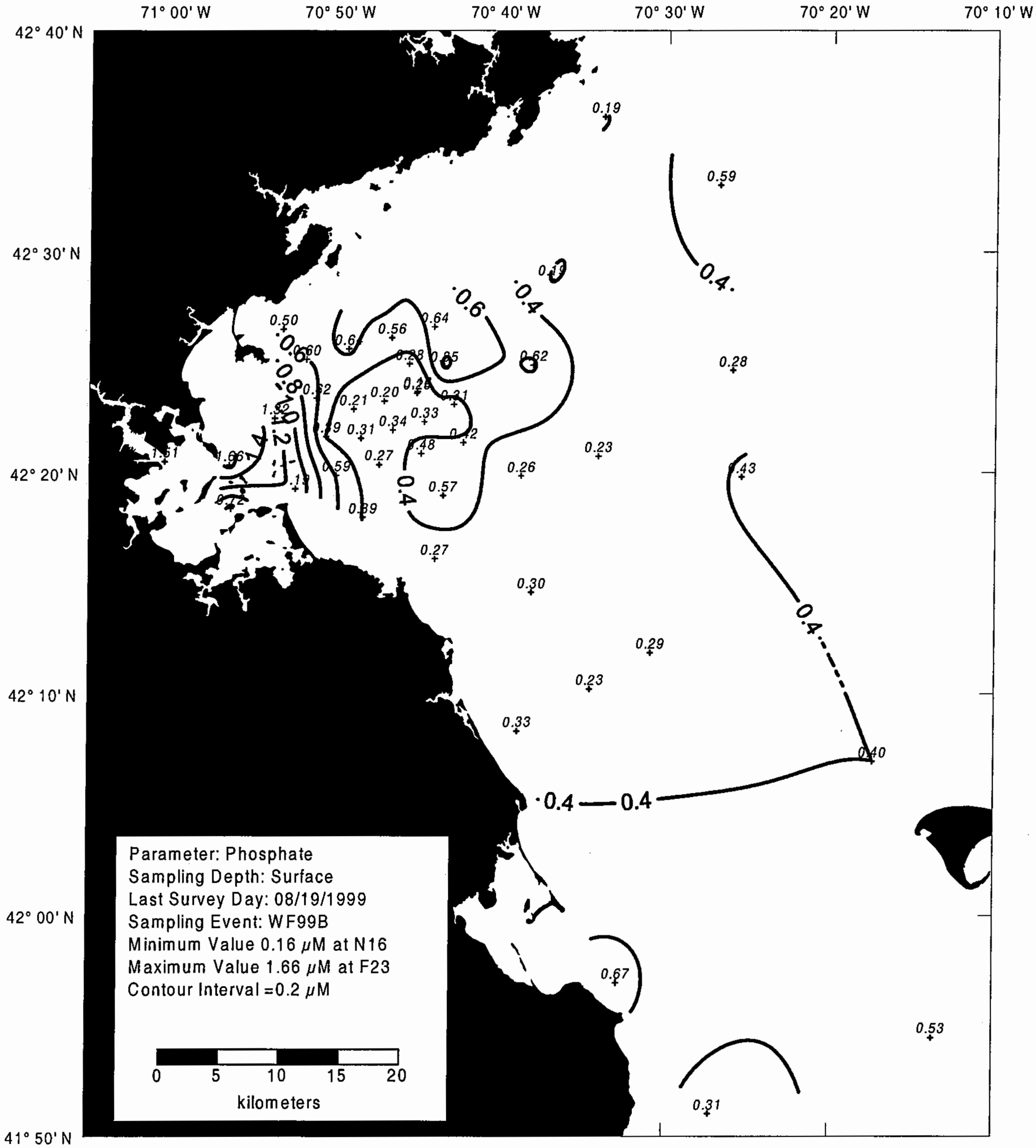


Figure B-11. Phosphate Surface Contour Plot for Farfield Survey WF99B (Aug 99)

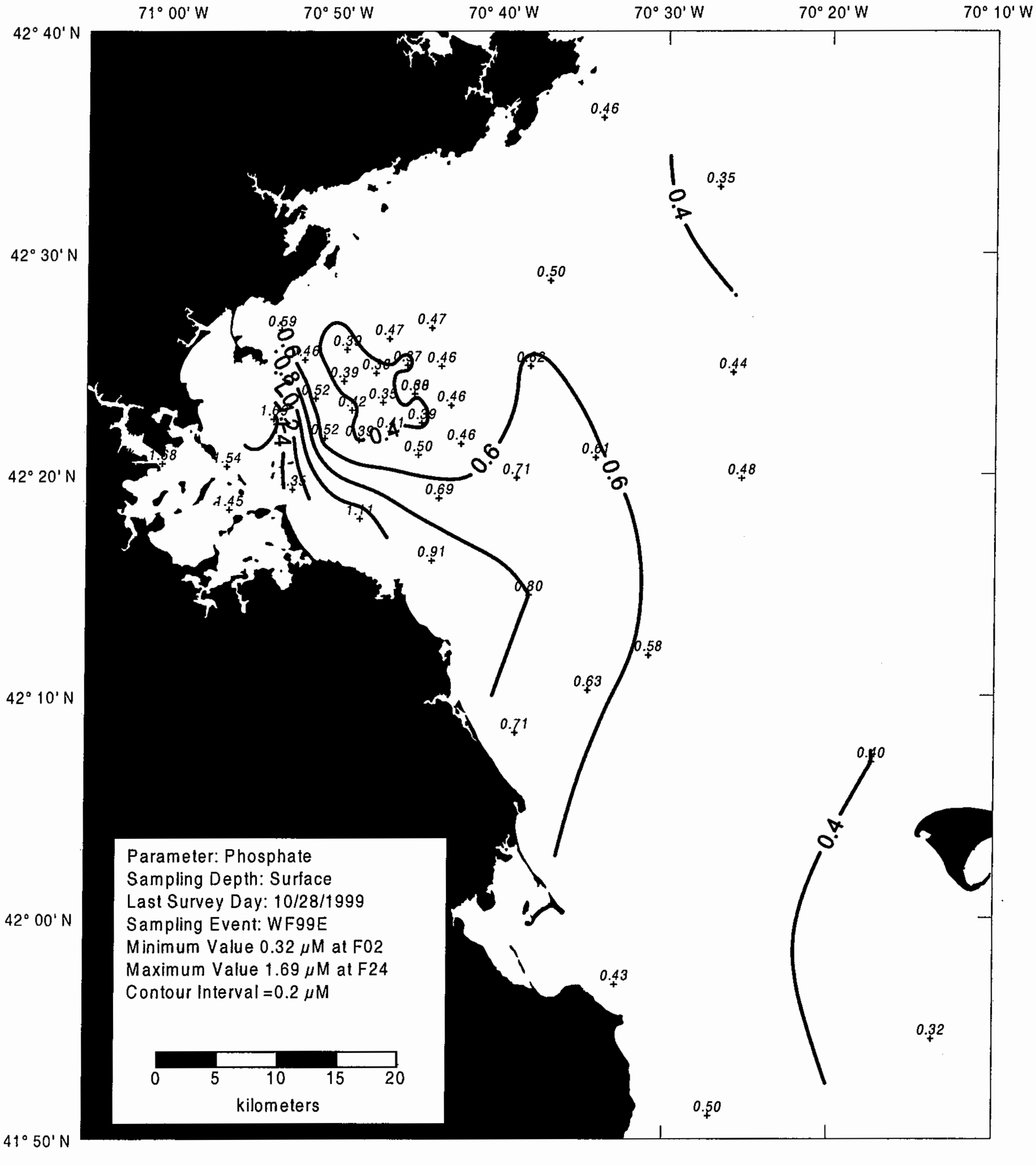


Figure B-12. Phosphate Surface Contour Plot for Farfield Survey WF99E (Oct 99)

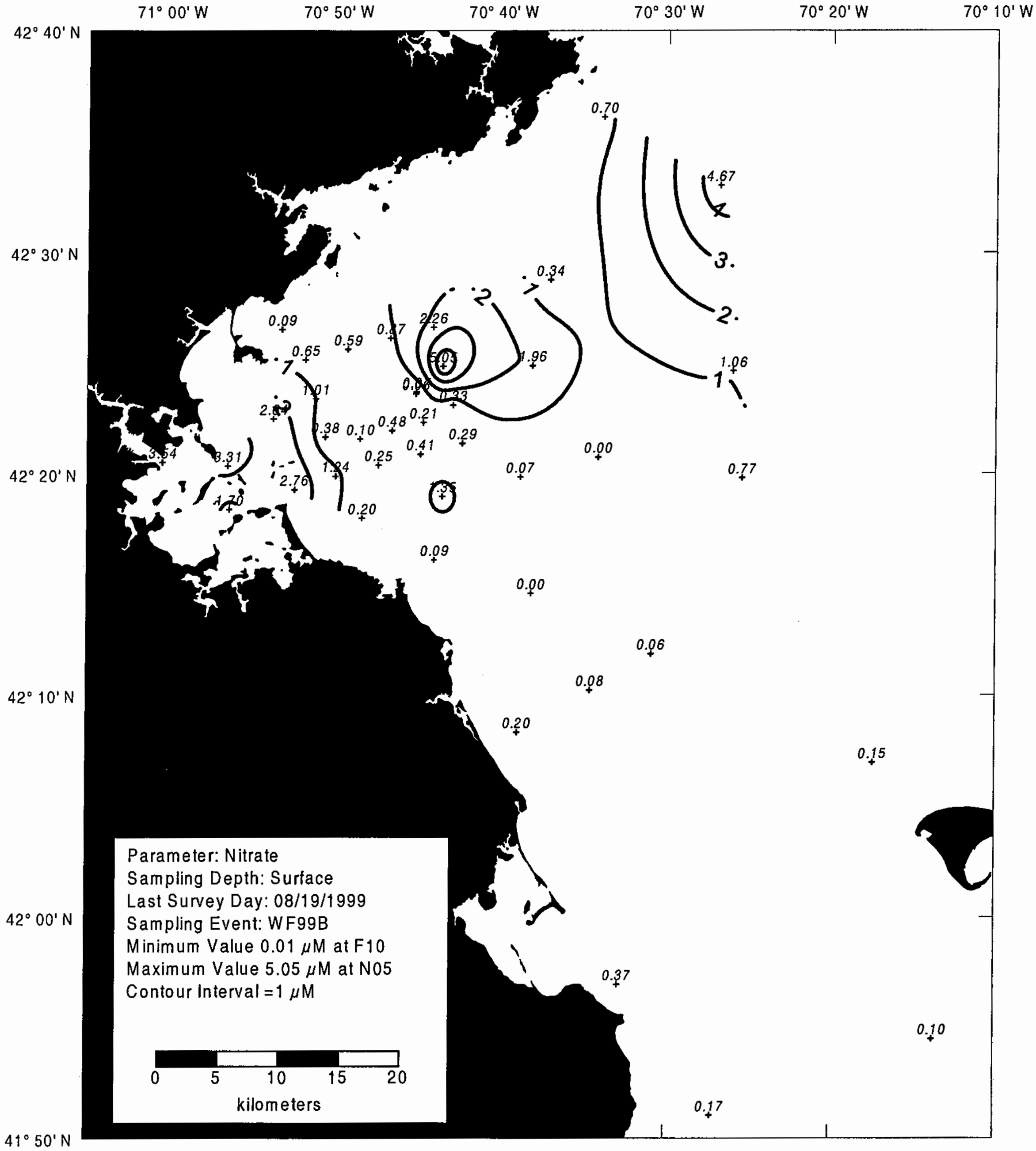


Figure B-13. Nitrate Surface Contour Plot for Farfield Survey WF99B (Aug 99)

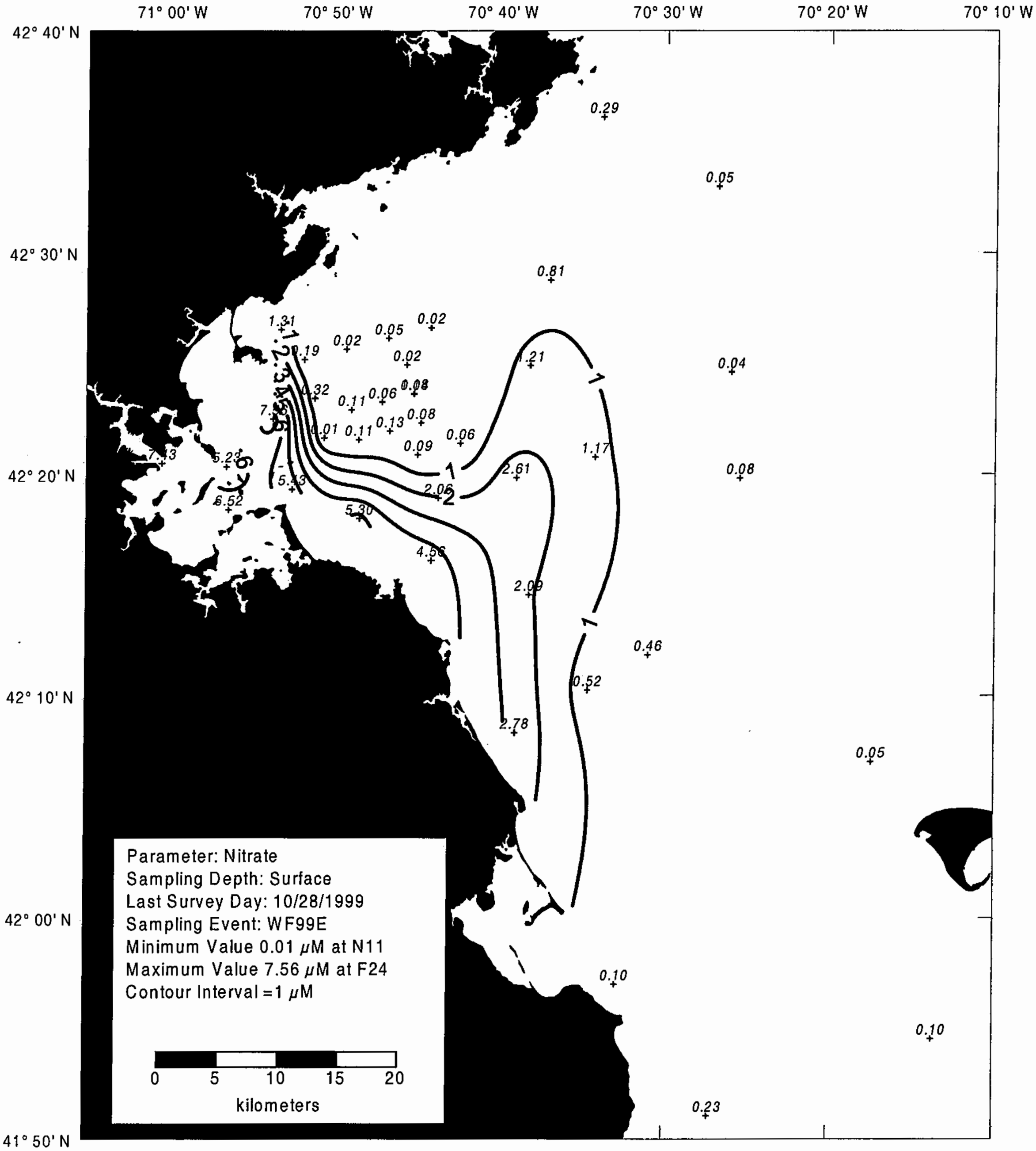


Figure B-14. Nitrate Surface Contour Plot for Farfield Survey WF99E (Oct 99)

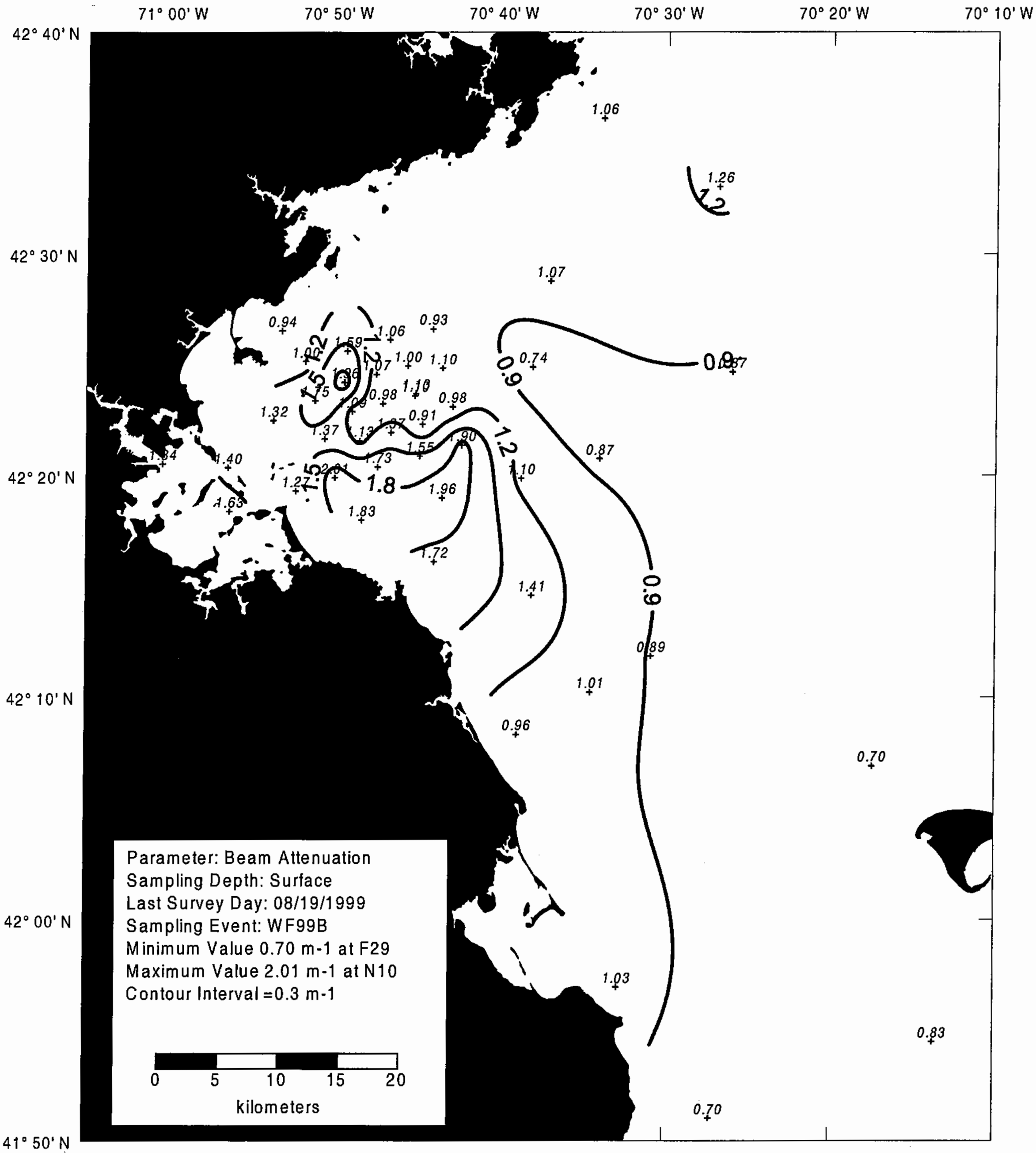


Figure B-15. Beam Attenuation Surface Contour Plot for Farfield Survey WF99B (Aug 99)

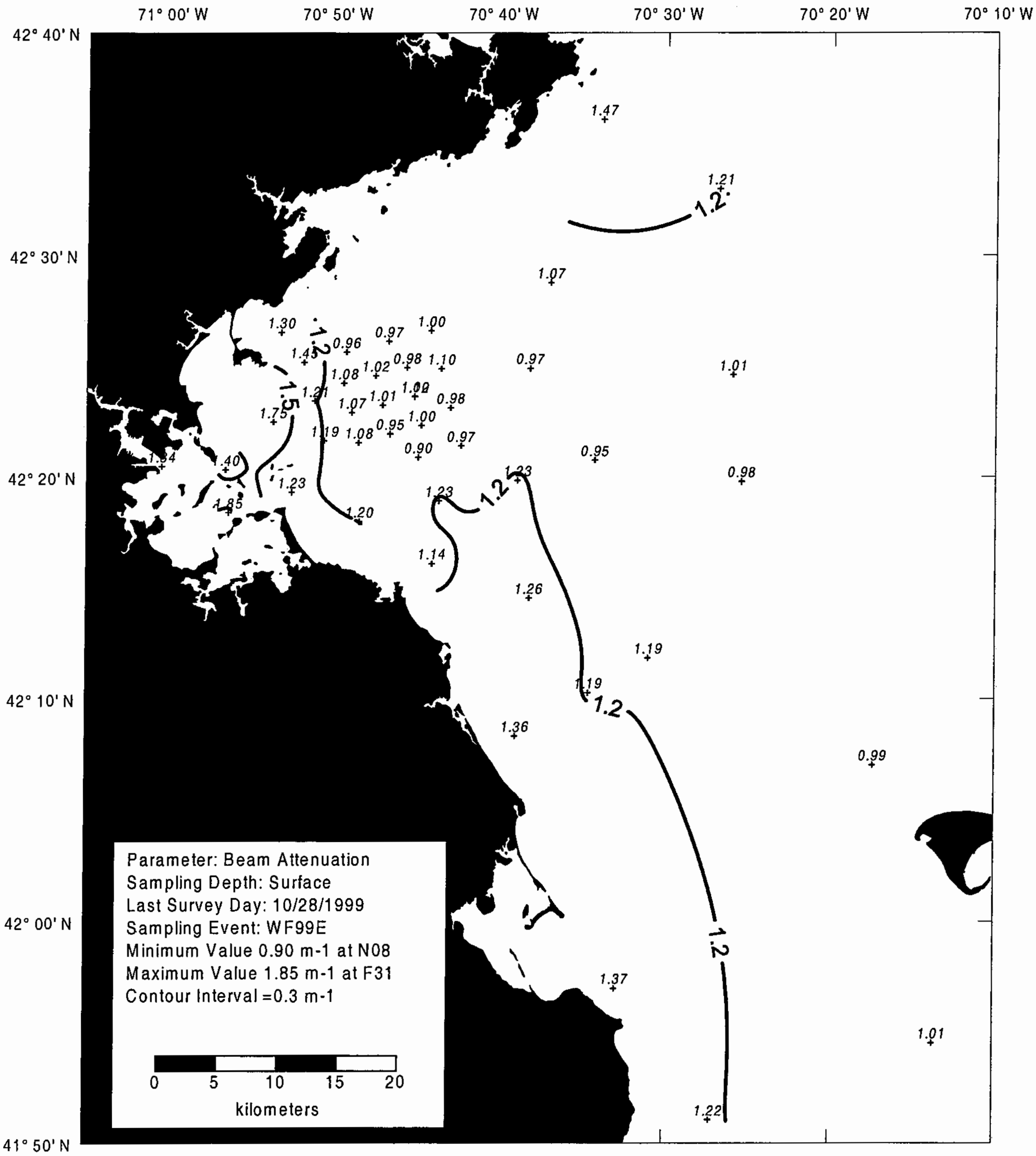


Figure B-16. Beam Attenuation Surface Contour Plot for Farfield Survey WF99E (Oct 99)

APPENDIX C

Transect Plots

Transect Plots – Farfield Surveys

Data were contoured relative to water depth and distance between stations as shown on the transects (Figure 1-3). Distances between stations and water depth at each station is shown on the transect. Water depth is labeled with negative values in meters, with zero depth at the sea surface. The depth to the seabed is shown by the solid shading at the bottom of each plot. Three West-East transects (Boston-Nearfield, Cohasset, and Marshfield) are provided on each plot, as well as shaded contour levels on the scale bar at the bottom of the plot. Additionally, 2 transects which run North-South through Massachusetts Bay have been included for the *in situ* parameters reported in this Appendix. Contour units are as noted on the plot. Each plot is labeled on the bottom left with the parameter, survey number, and last day of the survey date. The data used for the contours were based on high-resolution *in situ* hydrographic casts and individual data points as noted below.

Parameter	**Data Used**
Density (Sigma-T)	High-resolution *in situ* data
Temperature	High-resolution *in situ* data
Salinity	High-resolution *in situ* data
Beam Attenuation	High-resolution *in situ* data
Nitrate plus Nitrite	Individual data points based on discrete water column
Phosphate	Individual data points based on discrete water column
Silicate	Individual data points based on discrete water column
Ammonium	Individual data points based on discrete water column
Fluorescence	High-resolution *in situ* data
Dissolved Oxygen	High-resolution *in situ* data

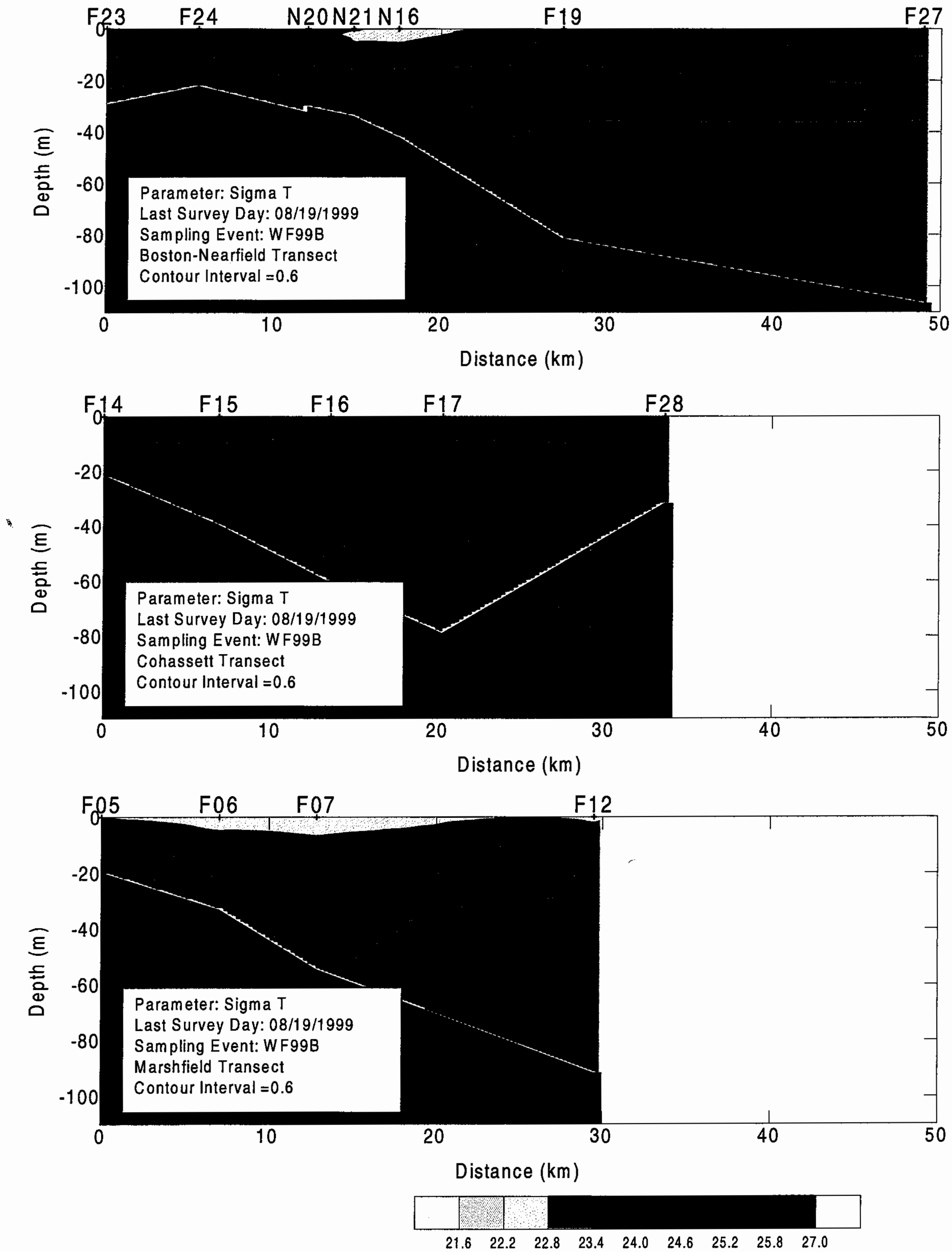
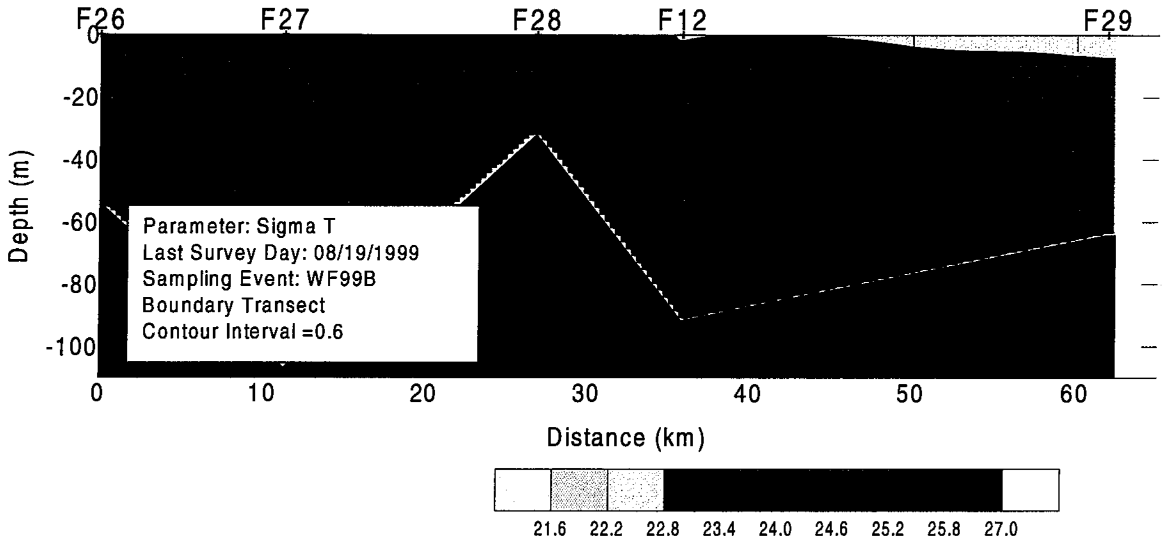


Figure C-1. Density Transect Plots (West - East) for Farfield Survey WF99B (Aug 99)



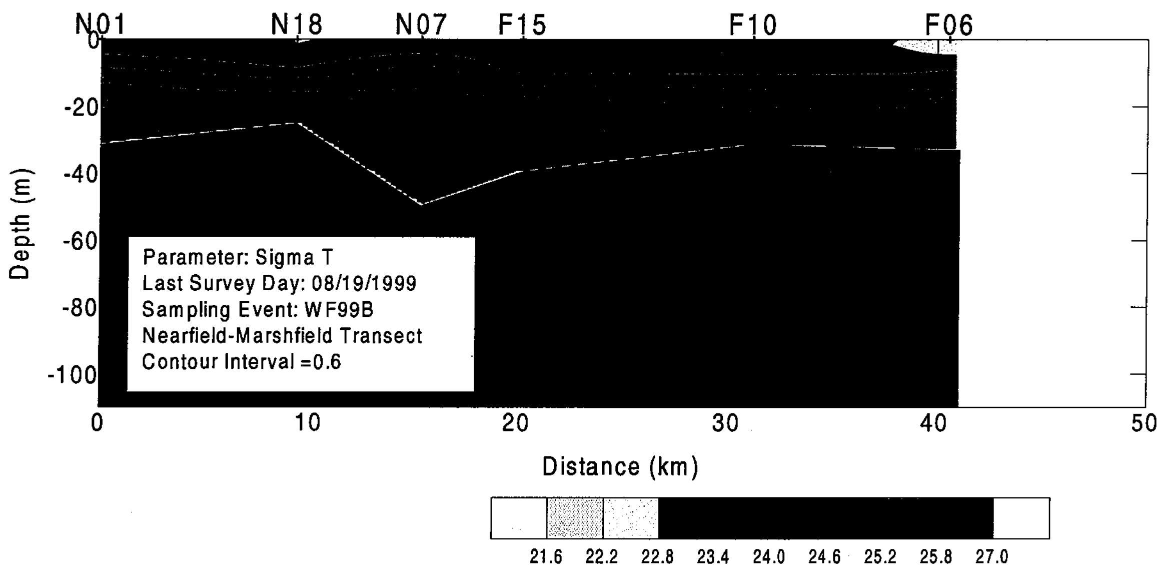


Figure C-2. Density Transect Plots (North - South) for Farfield Survey WF99B (Aug 99)

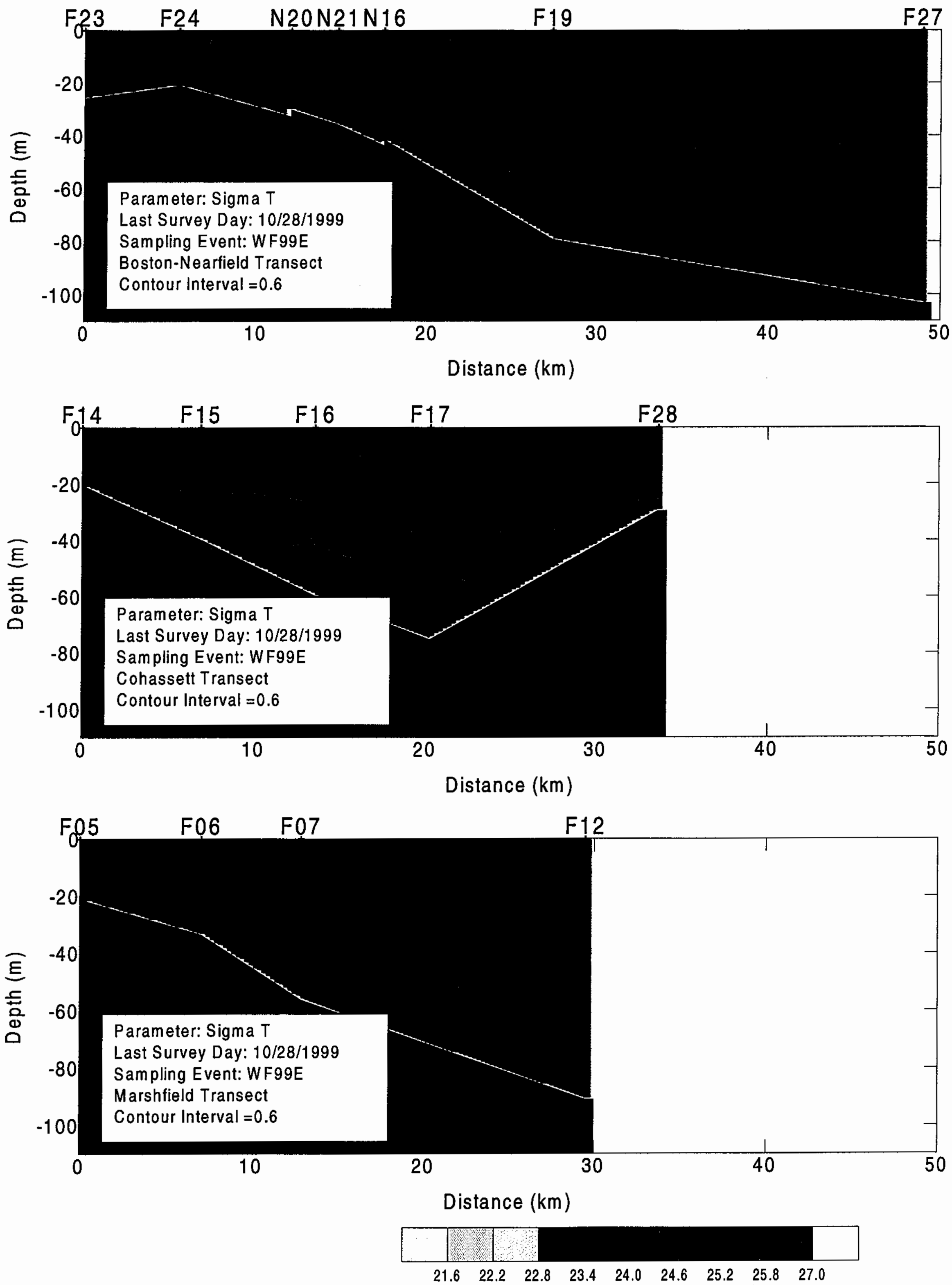
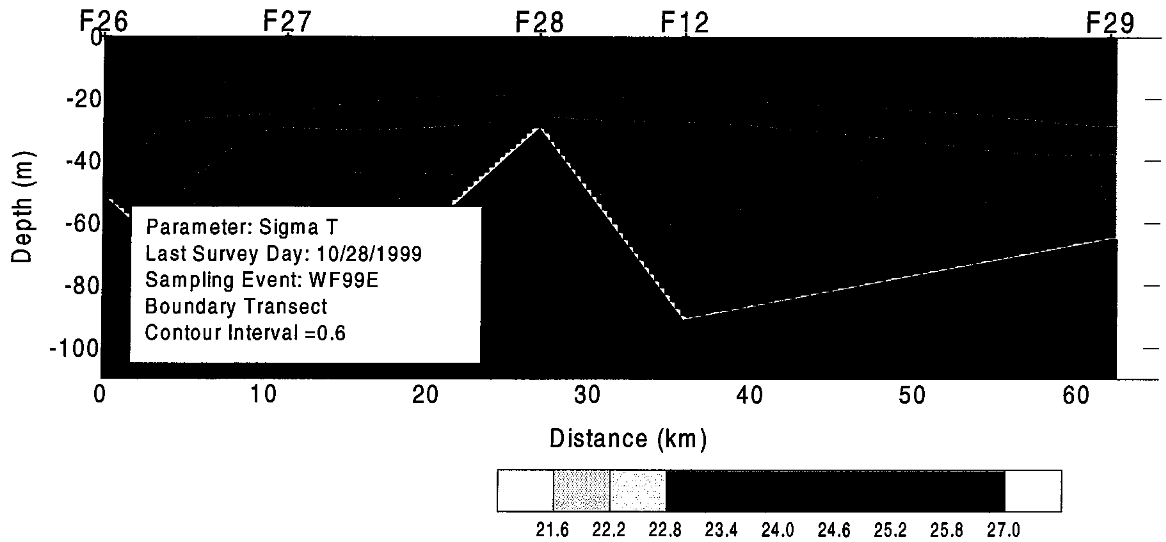


Figure C-3. Density Transect Plots (West - East) for Farfield Survey WF99E (Oct 99)



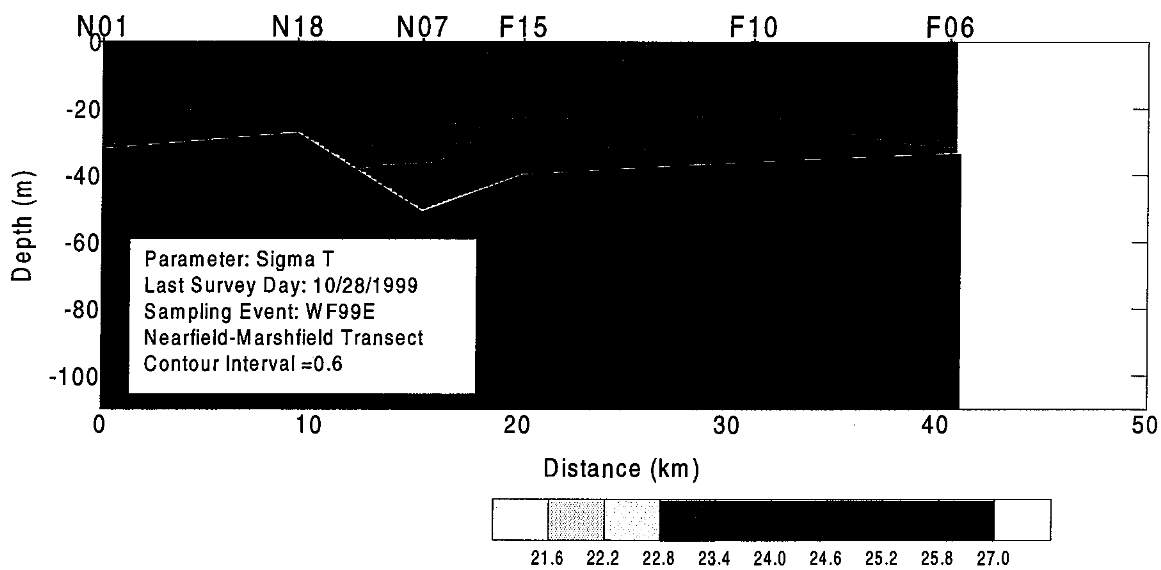


Figure C-4. Density Transect Plots (North - South) for Farfield Survey WF99E (Oct 99)

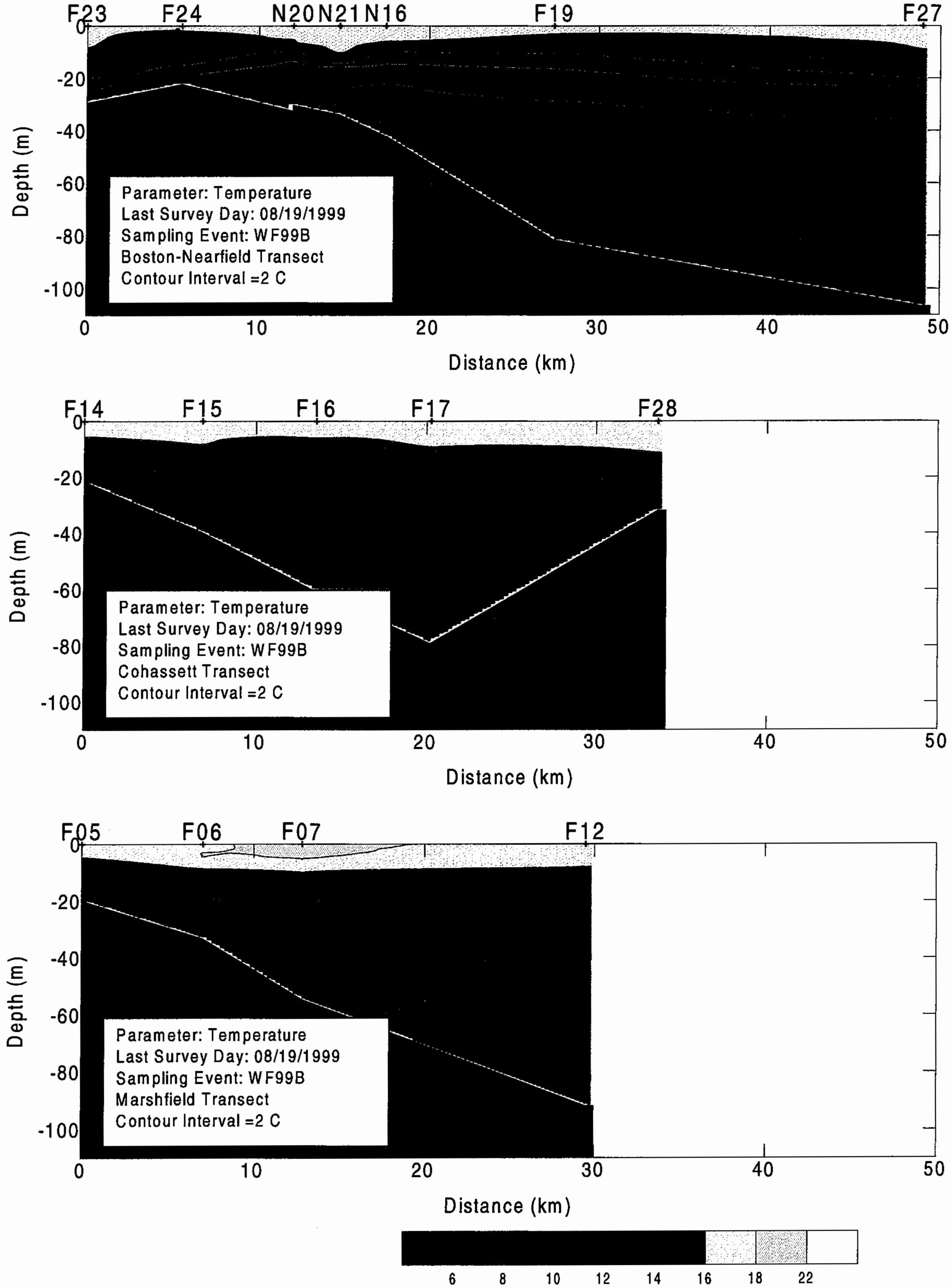
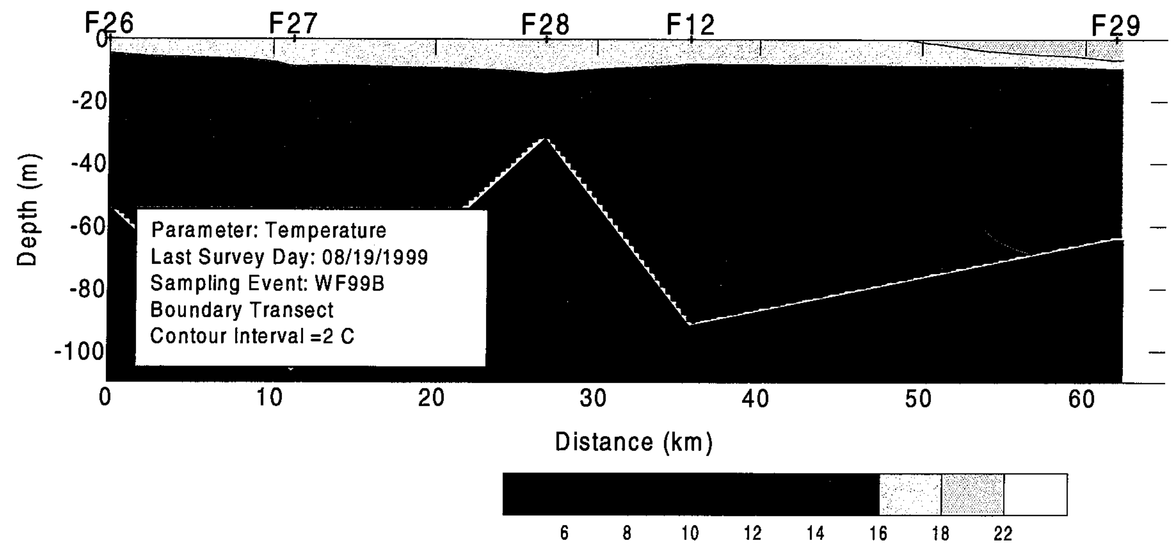


Figure C-5. Temperature Transect Plots (West - East) for Farfield Survey WF99B (Aug 99)



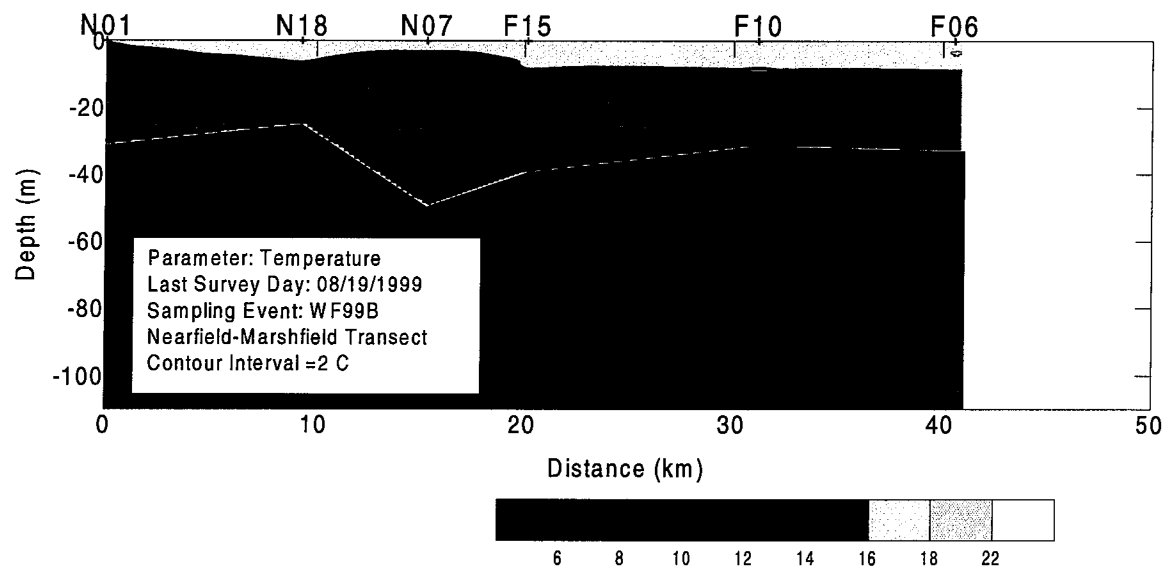


Figure C-6. Temperature Transect Plots (North - South) for Farfield Survey WF99B (Aug 99)

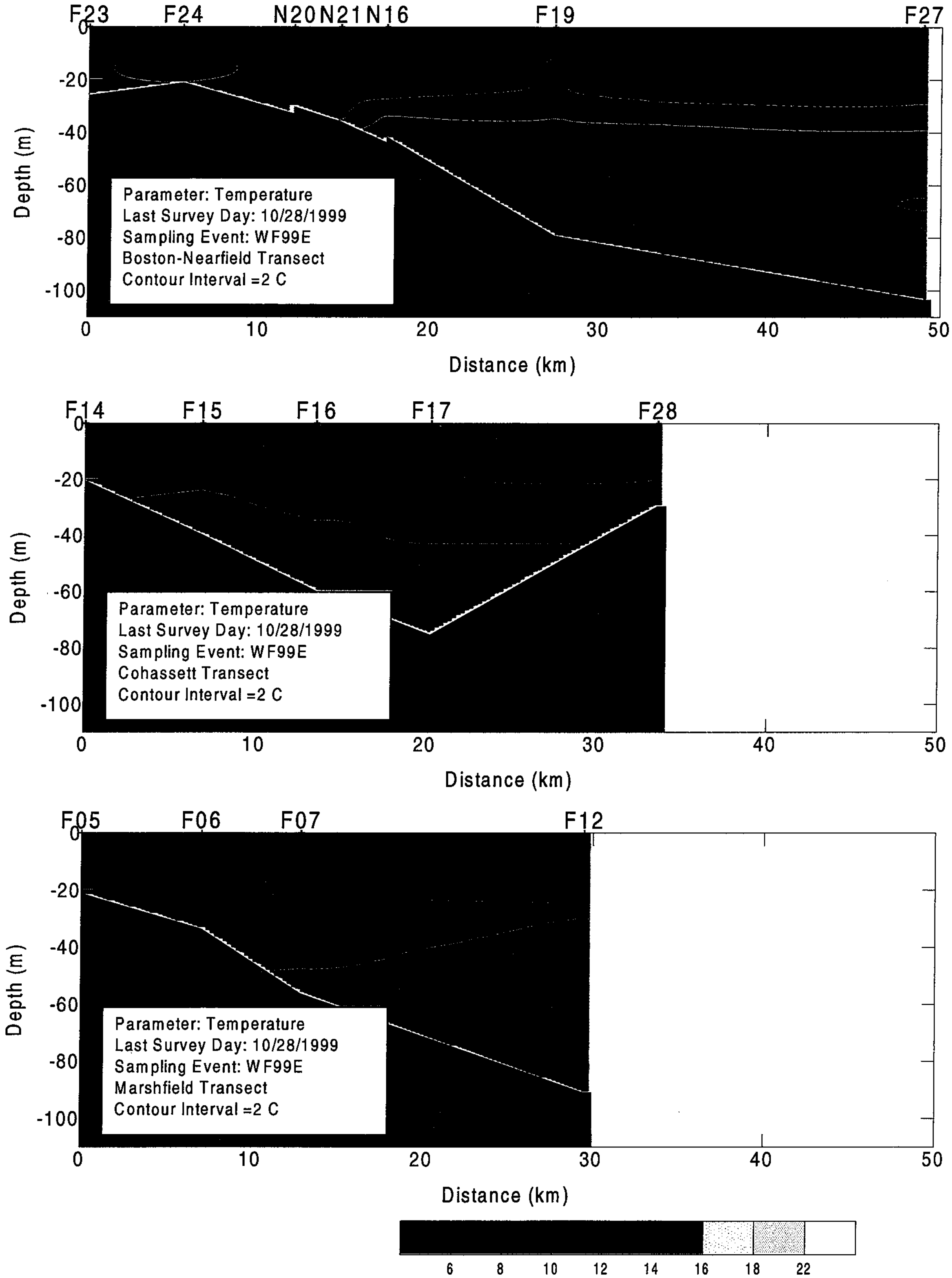
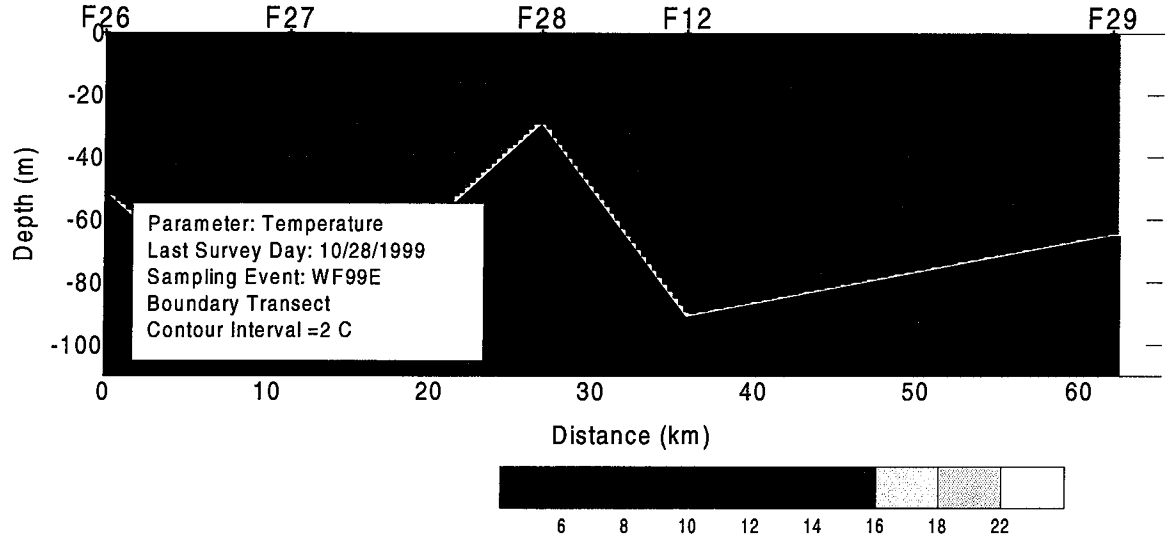


Figure C-7. Temperature Transect Plots (West – East) for Farfield Survey WF99E (Oct 99)



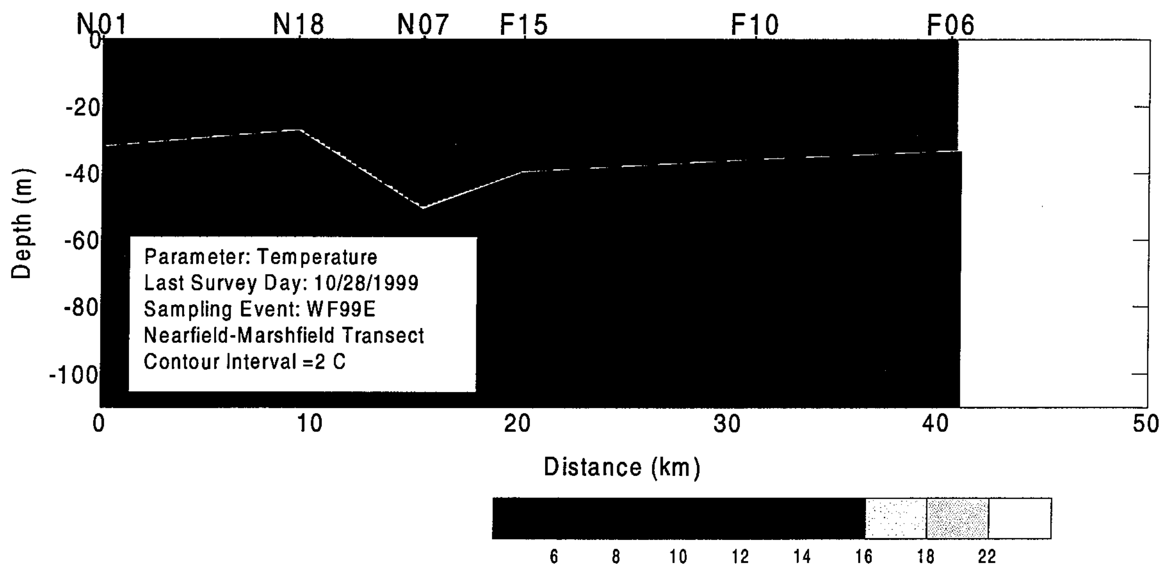


Figure C-8. Temperature Transect Plots (North - South) for Farfield Survey WF99E (Oct 99)

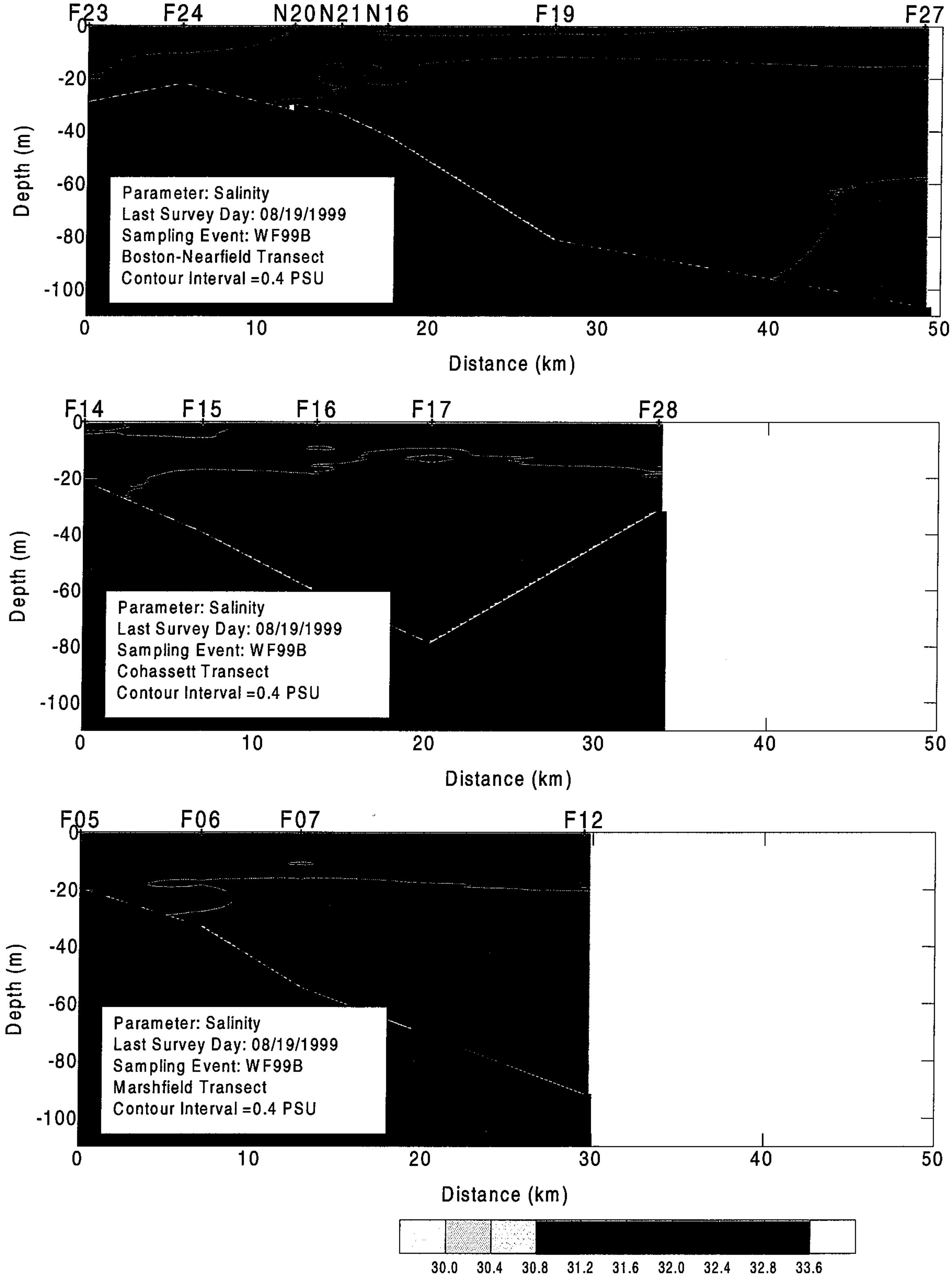
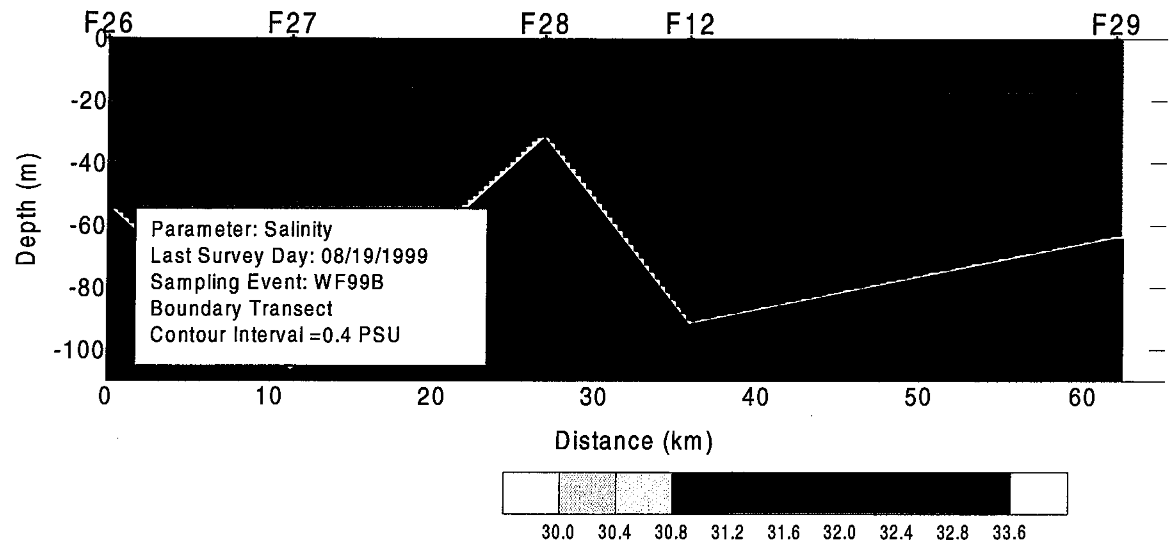


Figure C-9. Salinity Transect Plots (West - East) for Farfield Survey WF99B (Aug 99)



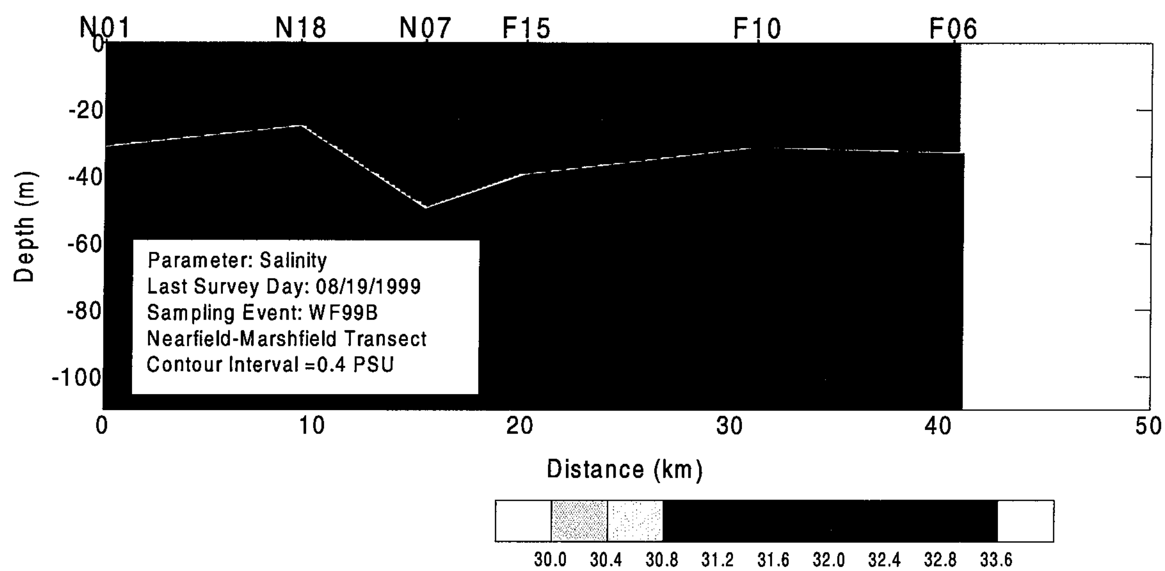


Figure C-10. Salinity Transect Plots (North - South) for Farfield Survey WF99B (Aug 99)

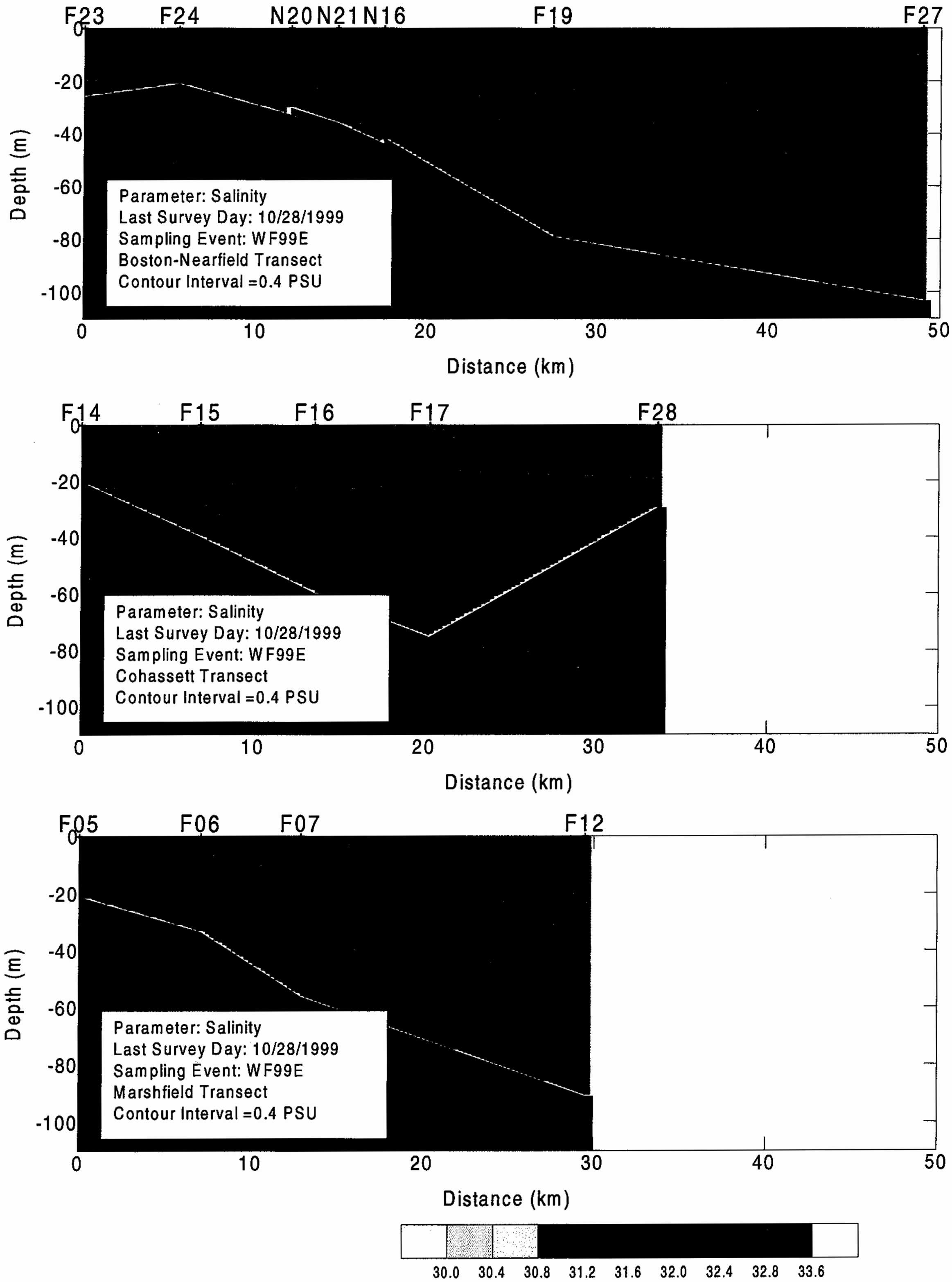
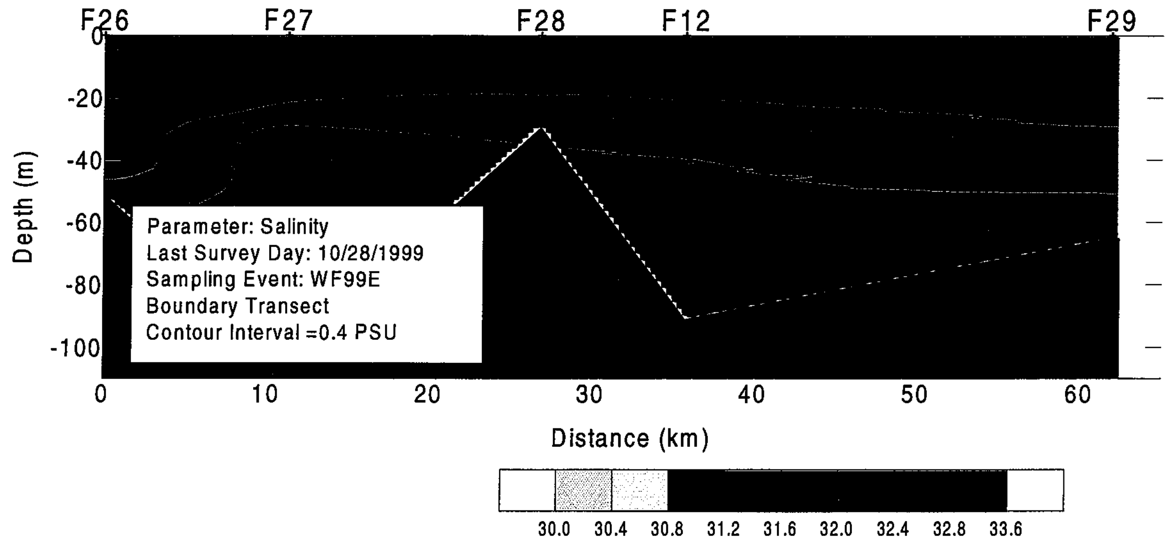


Figure C-11. Salinity Transect Plots (West - East) for Farfield Survey WF99E (Oct 99)



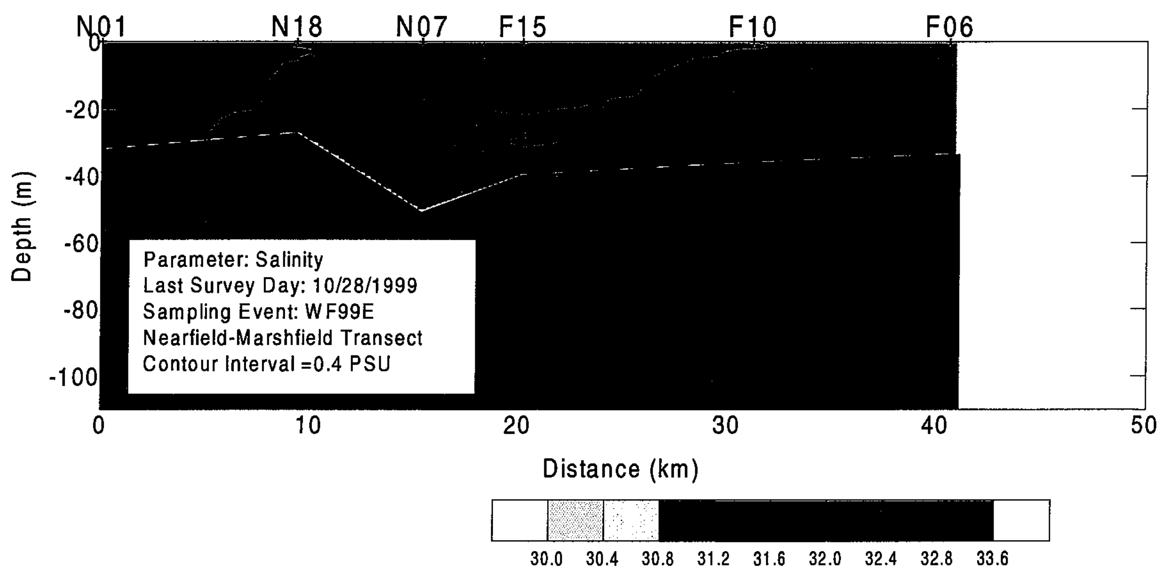


Figure C-12. Salinity Transect Plots (North - South) for Farfield Survey WF99E (Oct 99)

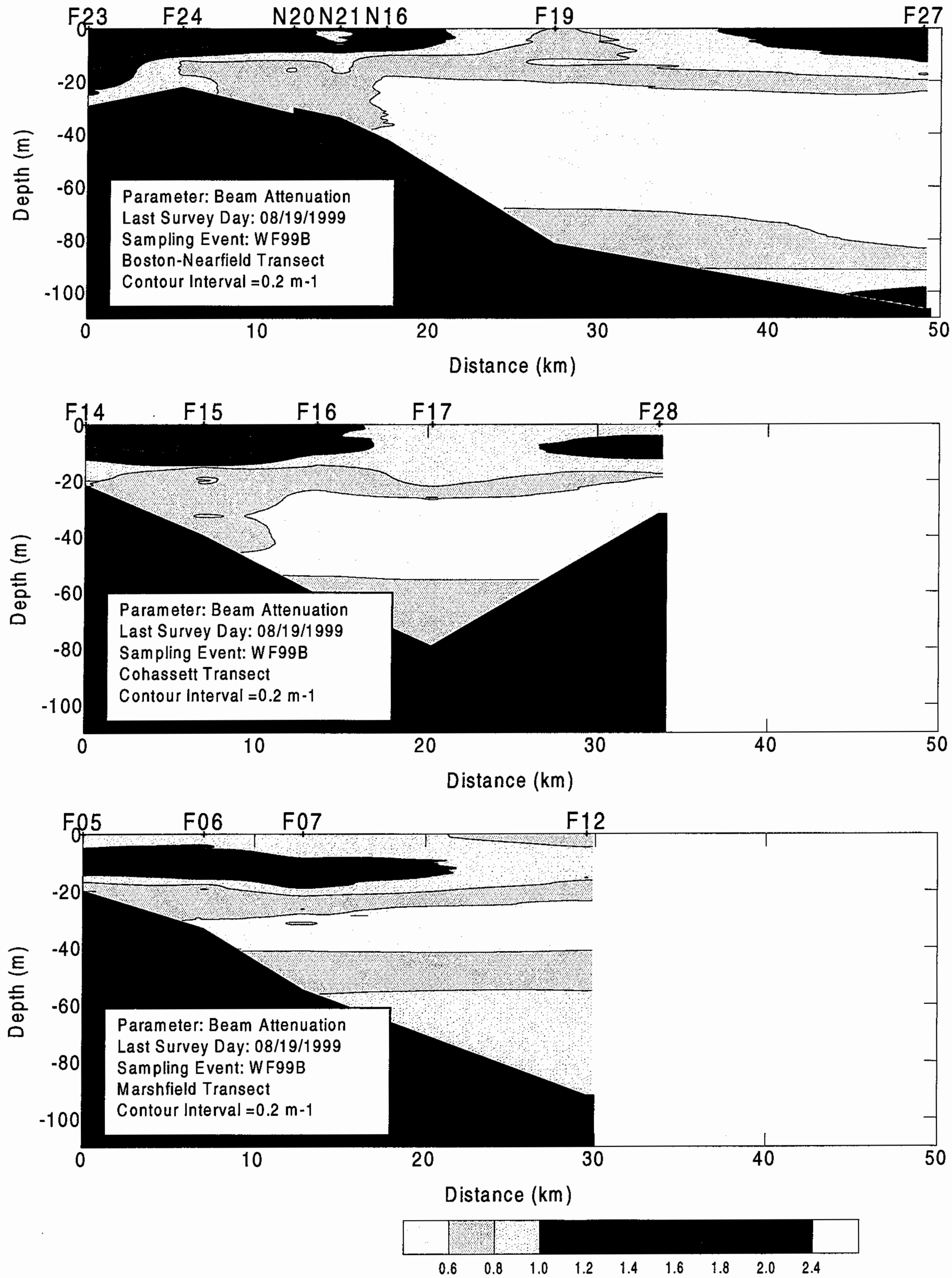


Figure C-13. Beam Attenuation Transect Plots (West - East) for Farfield Survey WF99B (Aug 99)

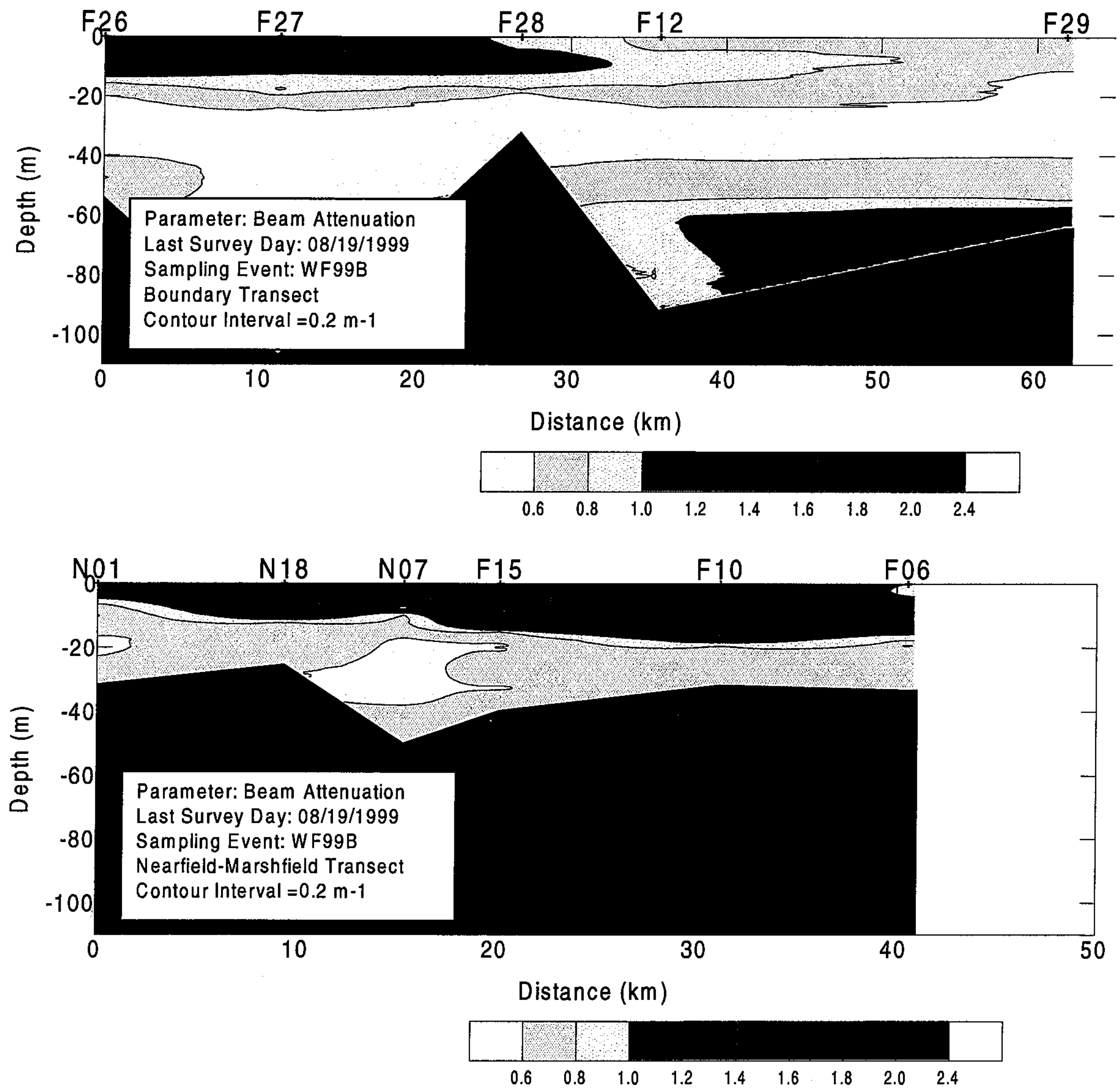


Figure C-14. Beam Attenuation Transect Plots (North - South) for Farfield Survey WF99B (Aug 99)

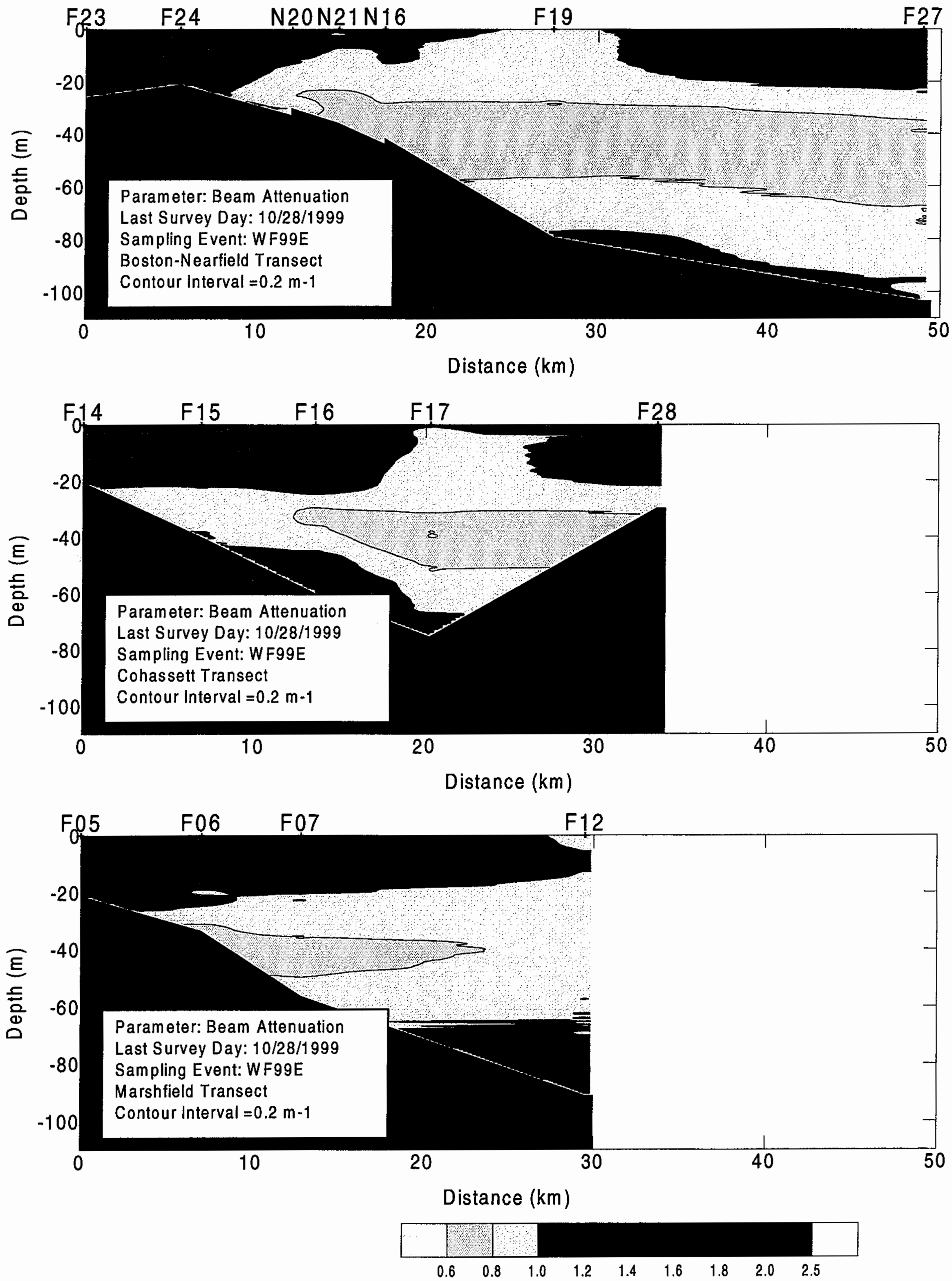
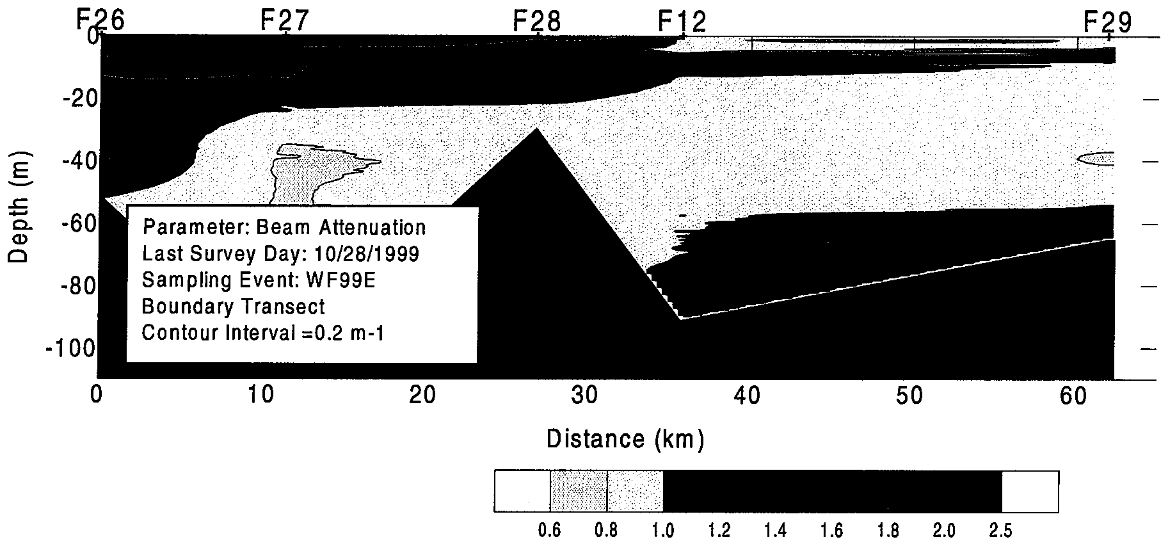


Figure C-15. Beam Attenuation Transect Plots (West - East) for Farfield Survey WF99E (Oct 99)



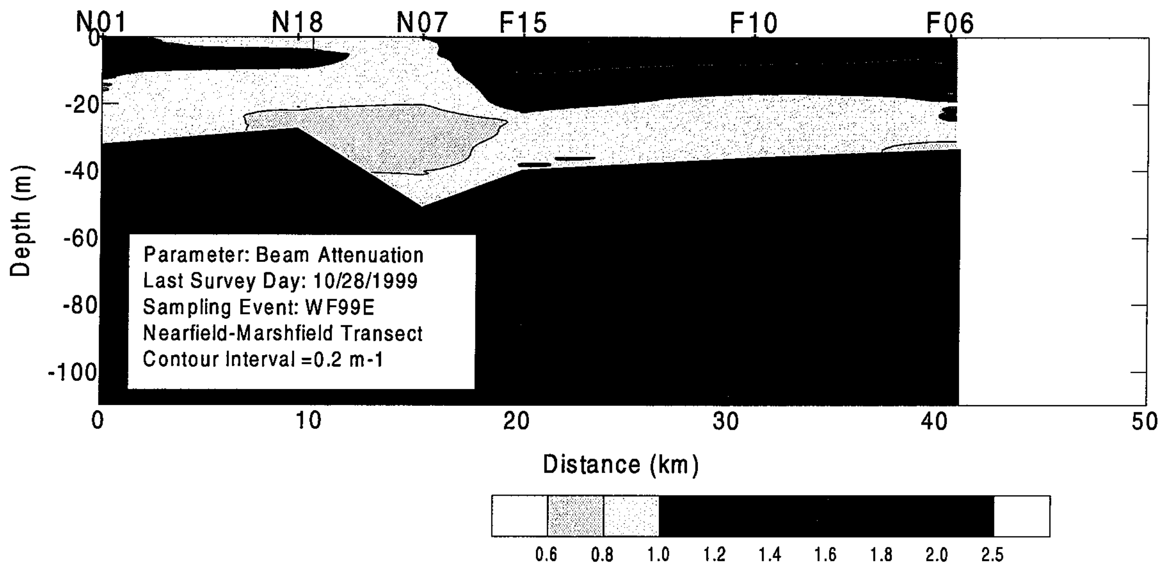


Figure C-16. Beam Attenuation Transect Plots (North - South) for Farfield Survey WF99E (Oct 99)

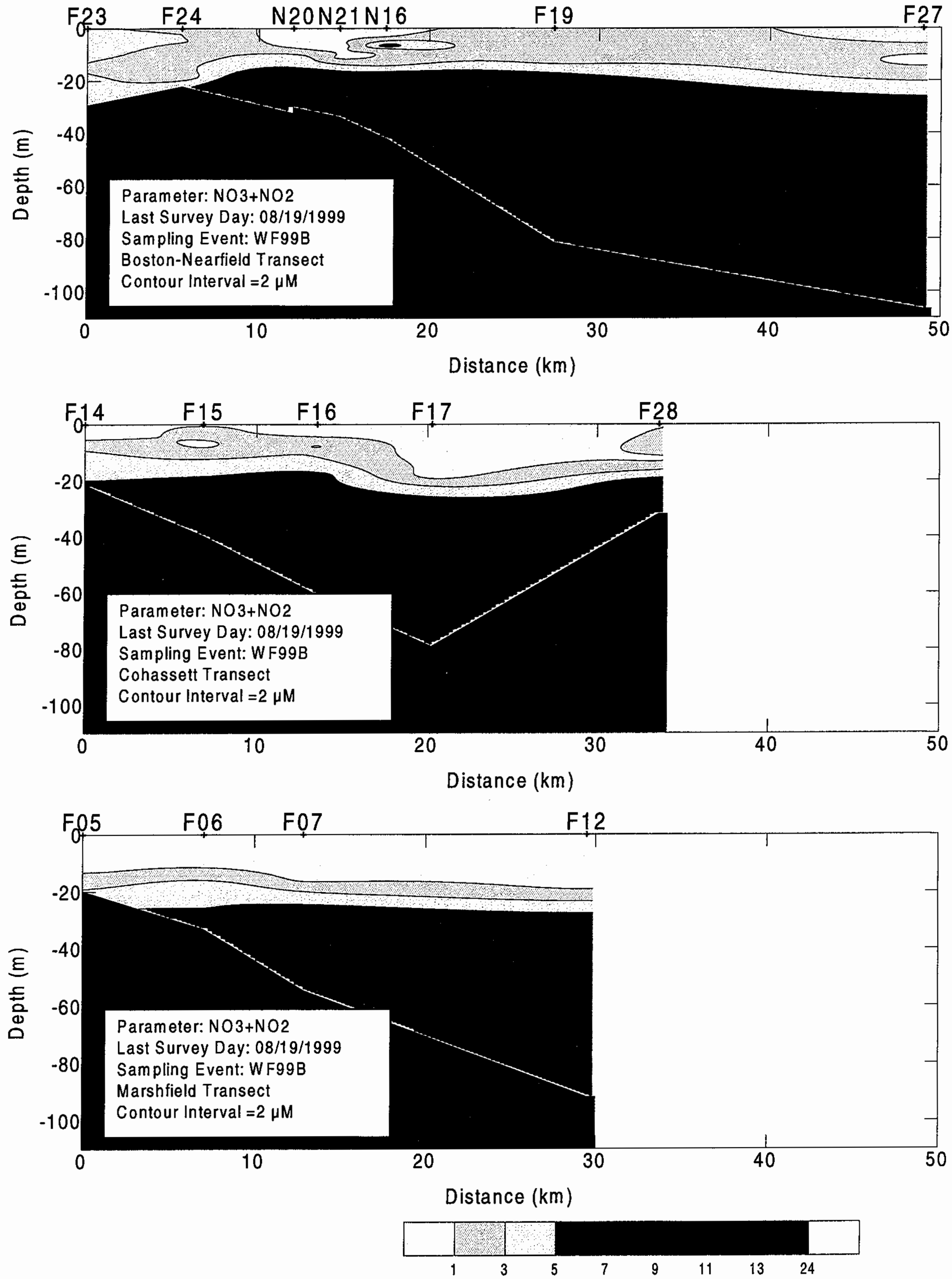


Figure C-17. Nitrate Plus Nitrite Transect Plots (West - East) for Farfield Survey WF99B (Aug 99)

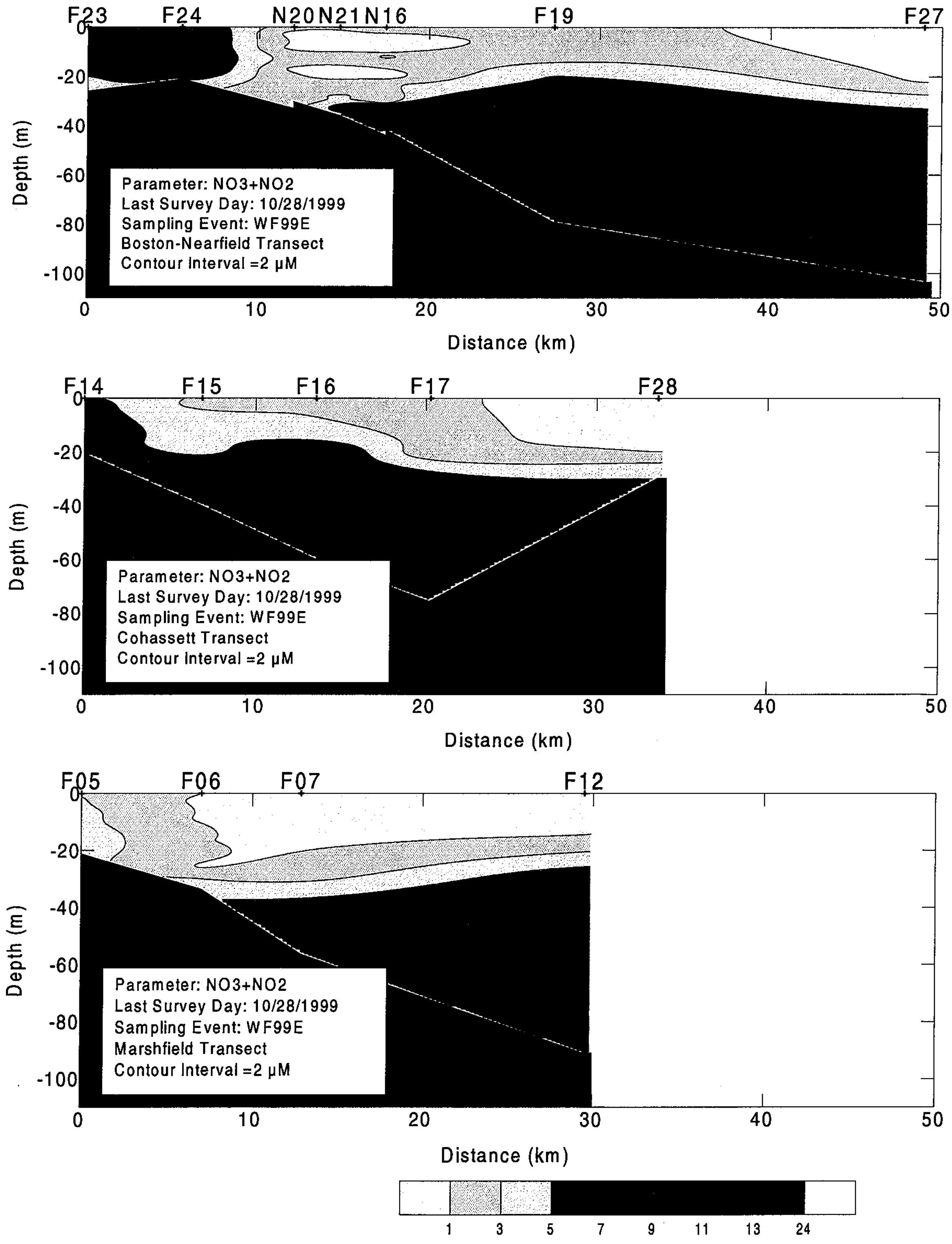


Figure C-18. Nitrate Plus Nitrite Transect Plots (West - East) for Farfield Survey WF99E (Oct 99)

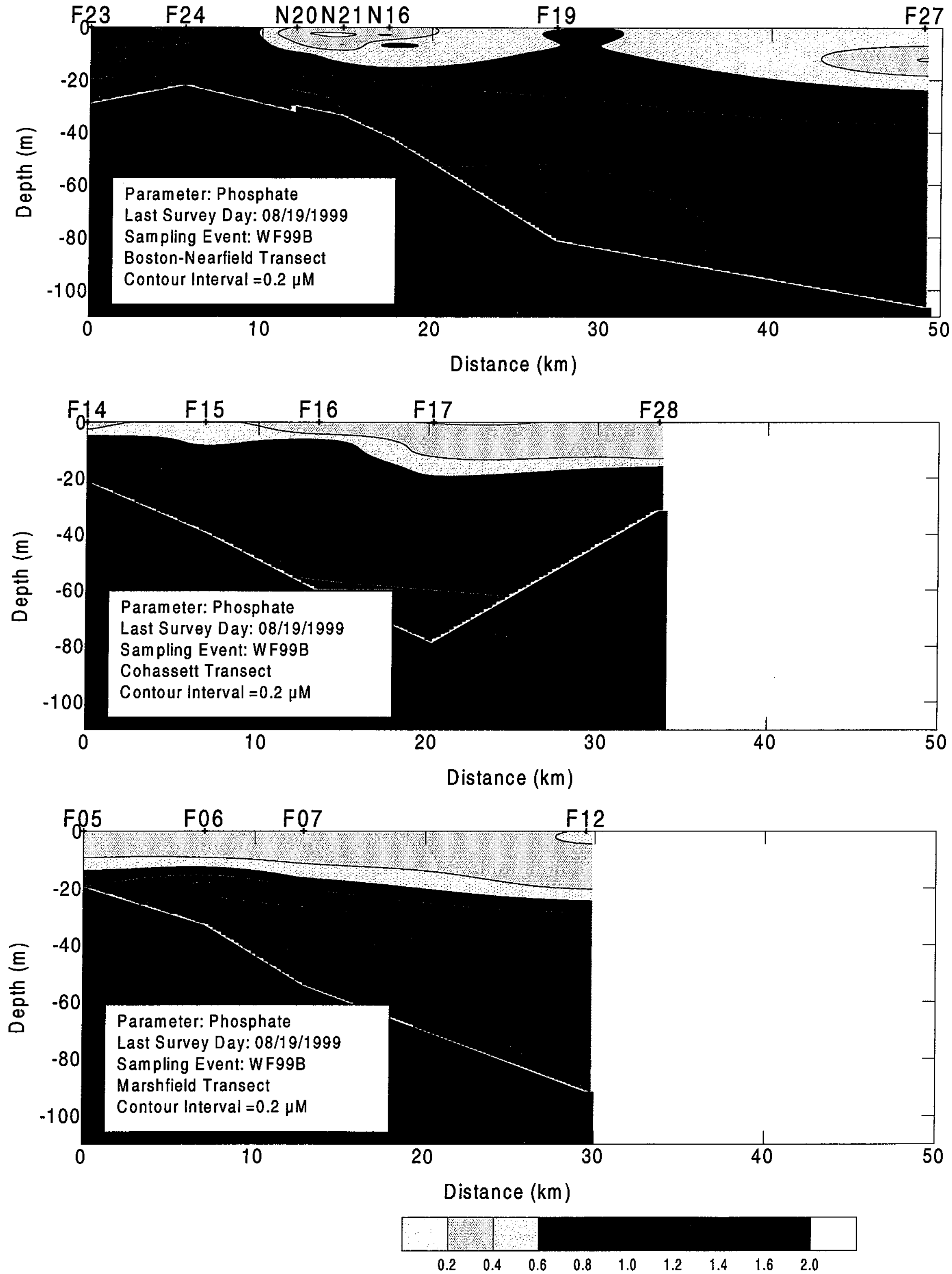


Figure C-19. Phosphate Transect Plots (West - East) for Farfield Survey WF99B (Aug 99)

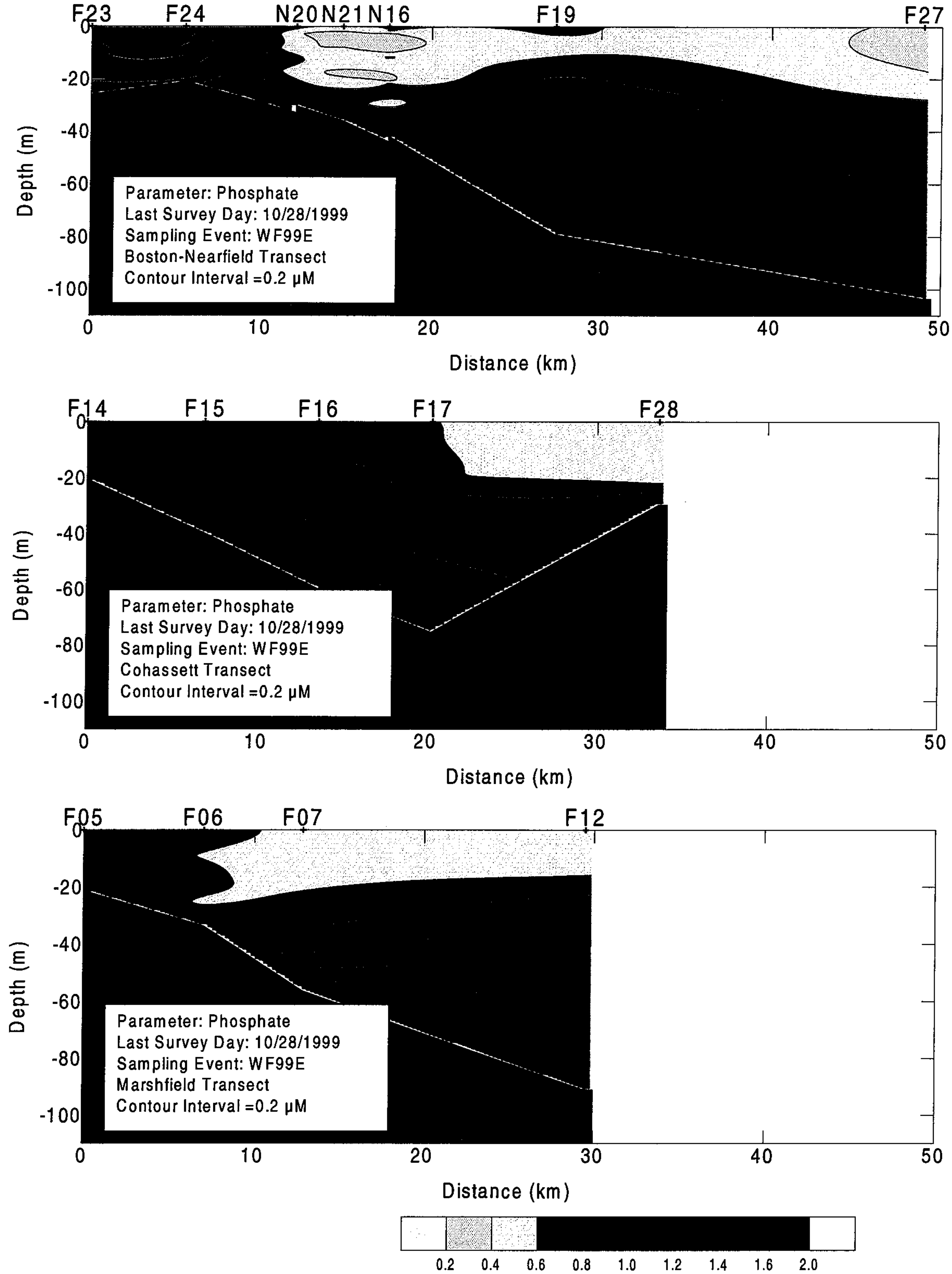


Figure C-20. Phosphate Transect Plots (West - East) for Farfield Survey WF99E (Oct 99)

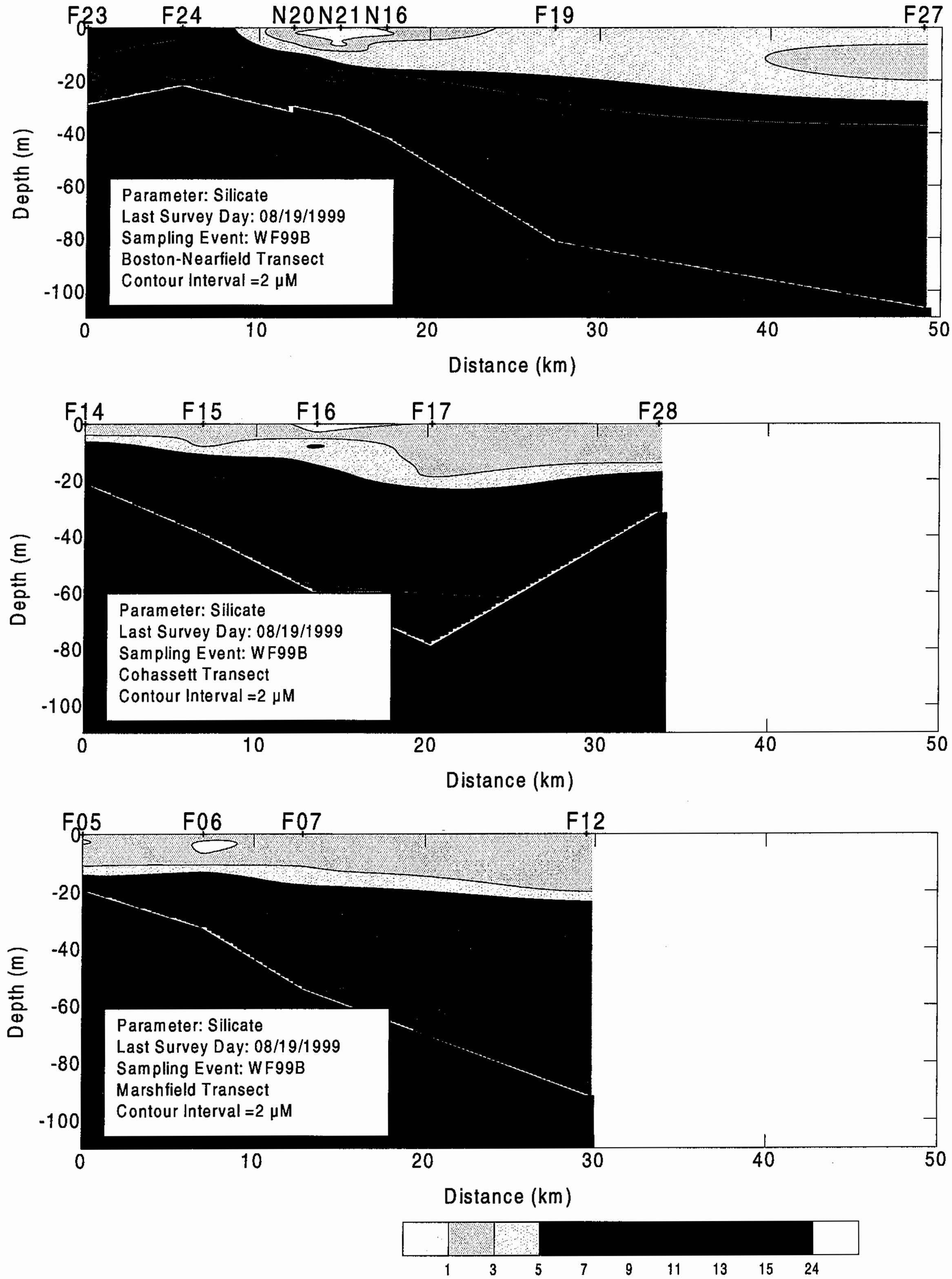


Figure C-21. Silicate Transect Plots (West - East) for Farfield Survey WF99B (Aug 99)

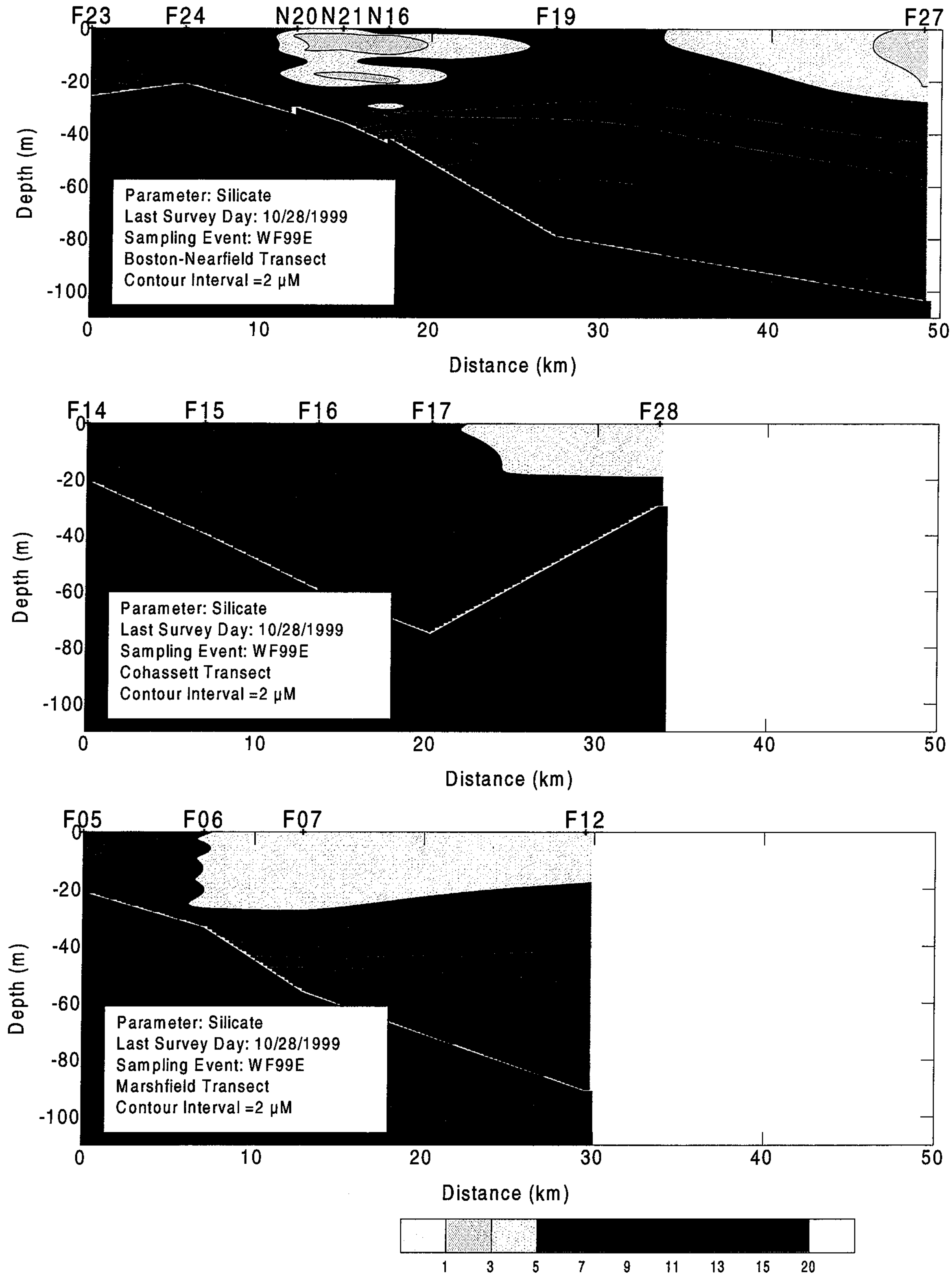


Figure C-22. Silicate Transect Plots (West - East) for Farfield Survey WF99E (Oct 99)

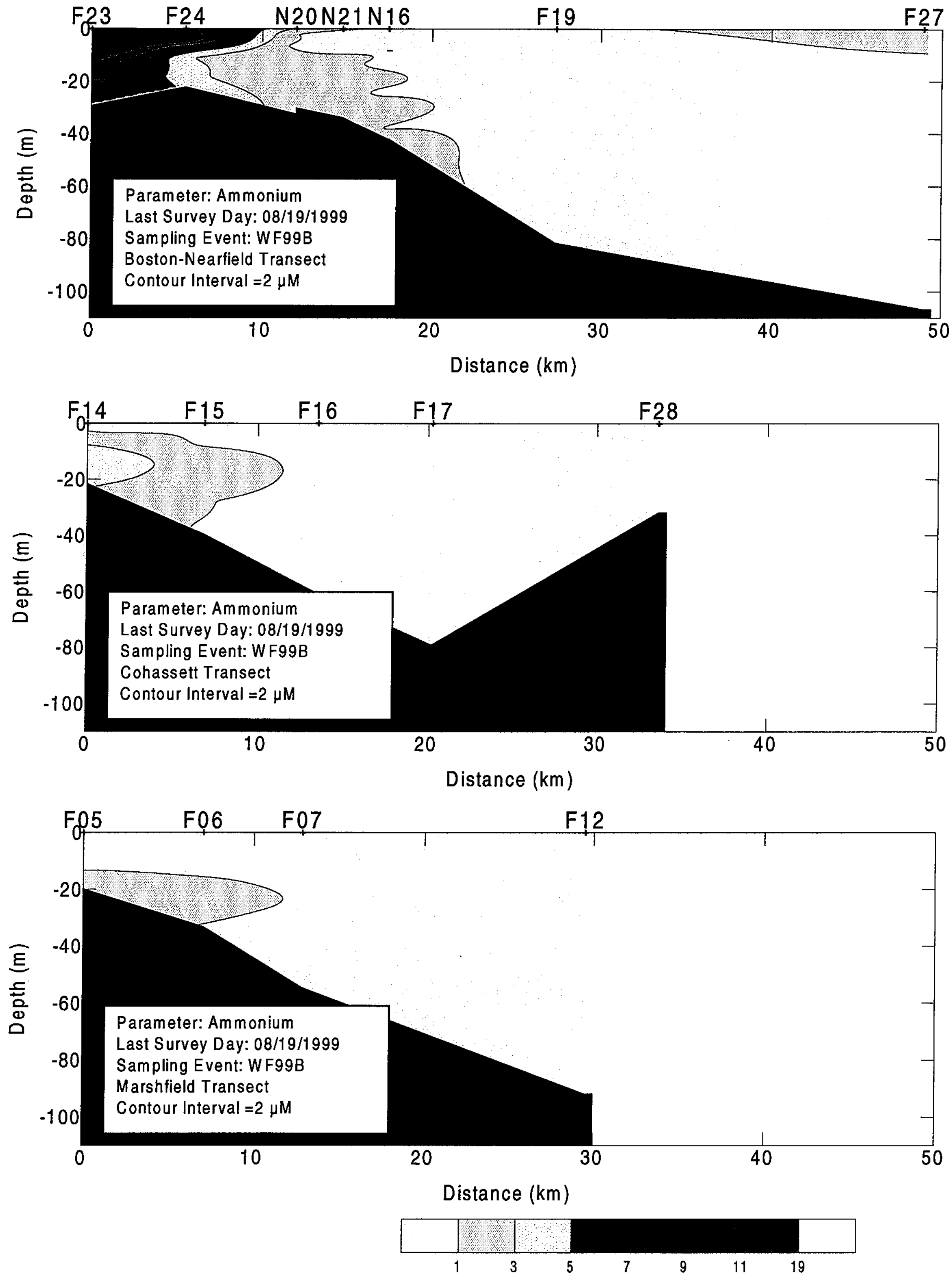


Figure C-23. Ammonium Transect Plots (West - East) for Farfield Survey WF99B (Aug 99)

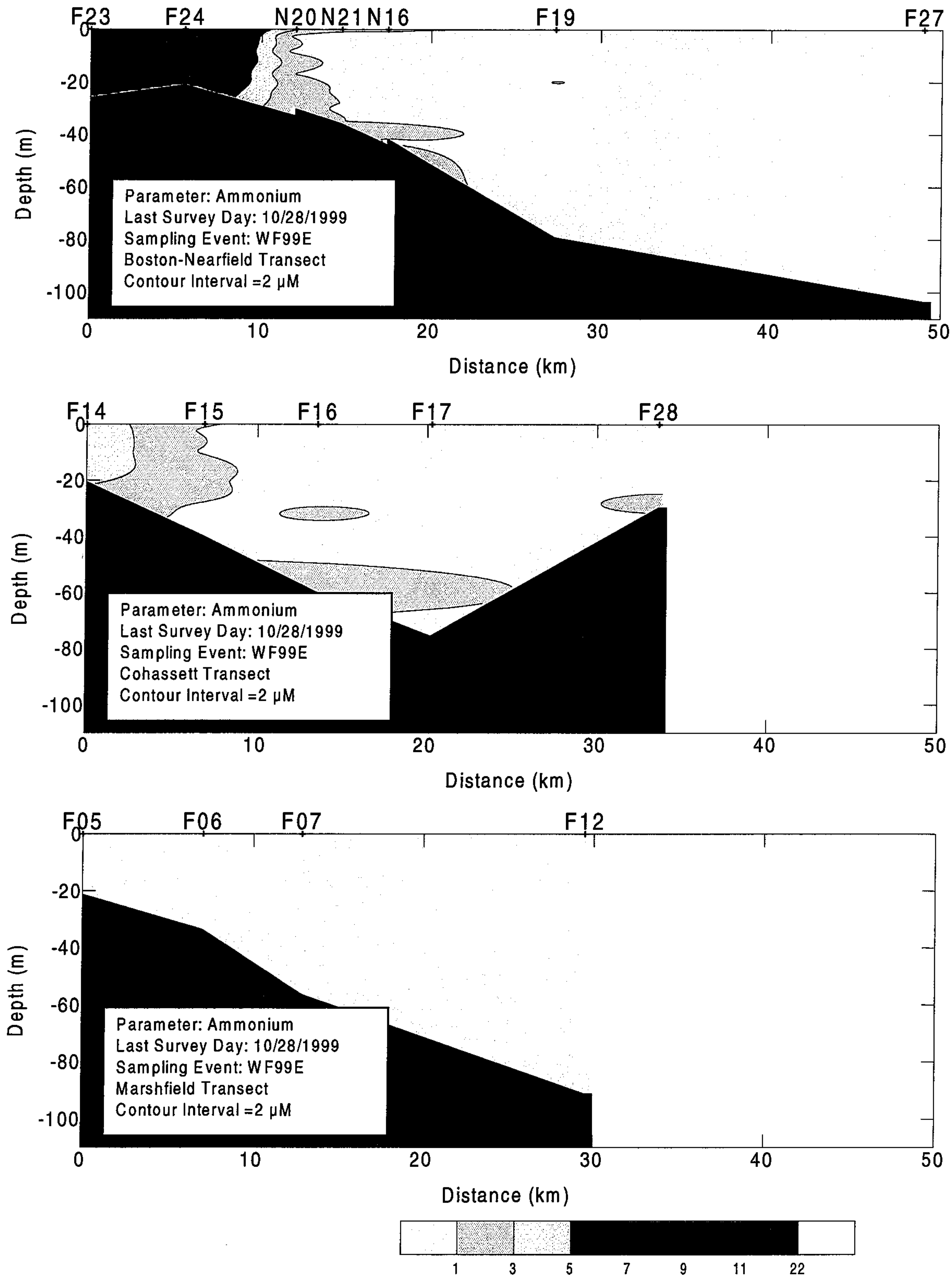


Figure C-24. Ammonium Transect Plots (West - East) for Farfield Survey WF99E (Oct 99)

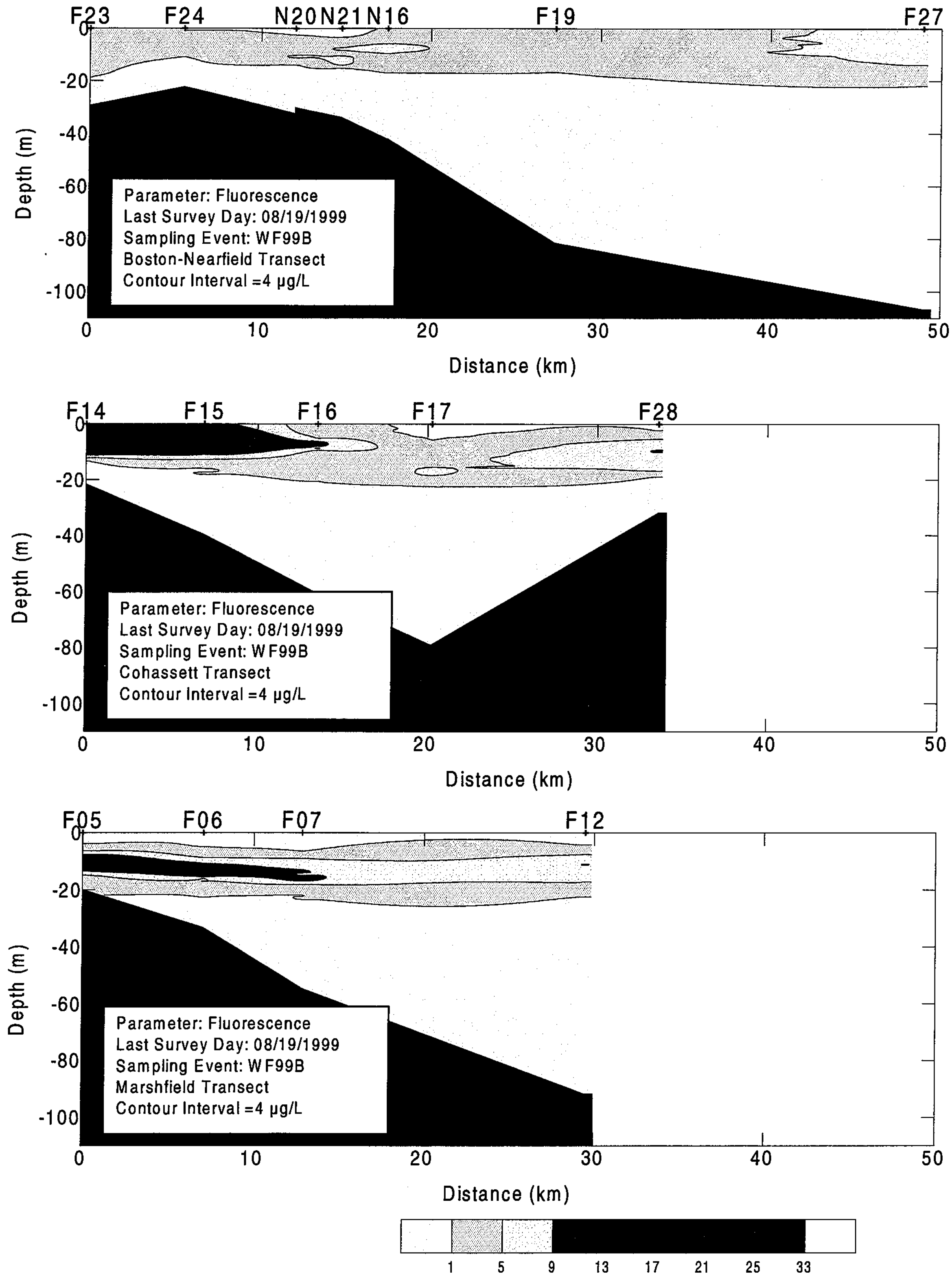
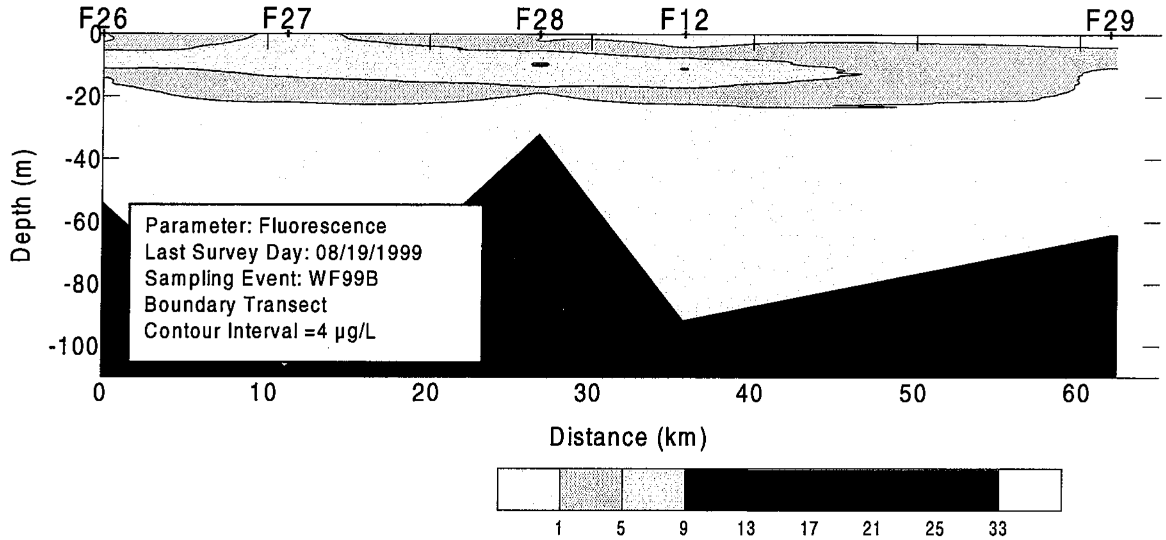


Figure C-25. Fluorescence Transect Plots (West - East) for Farfield Survey WF99B (Aug 99)



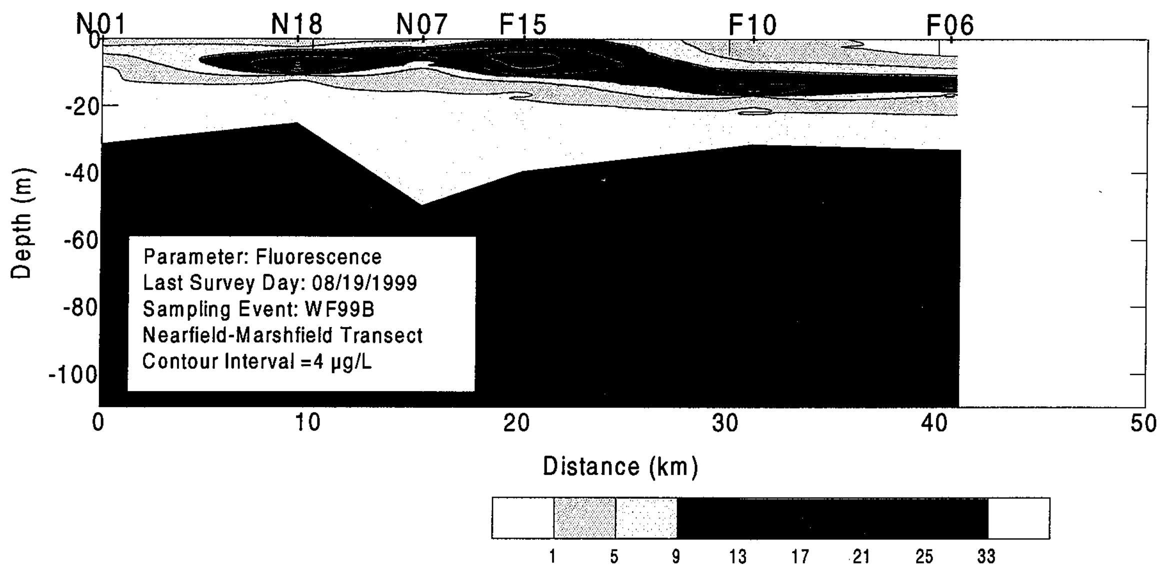


Figure C-26. Fluorescence Transect Plots (North - South) for Farfield Survey WF99B (Aug 99)

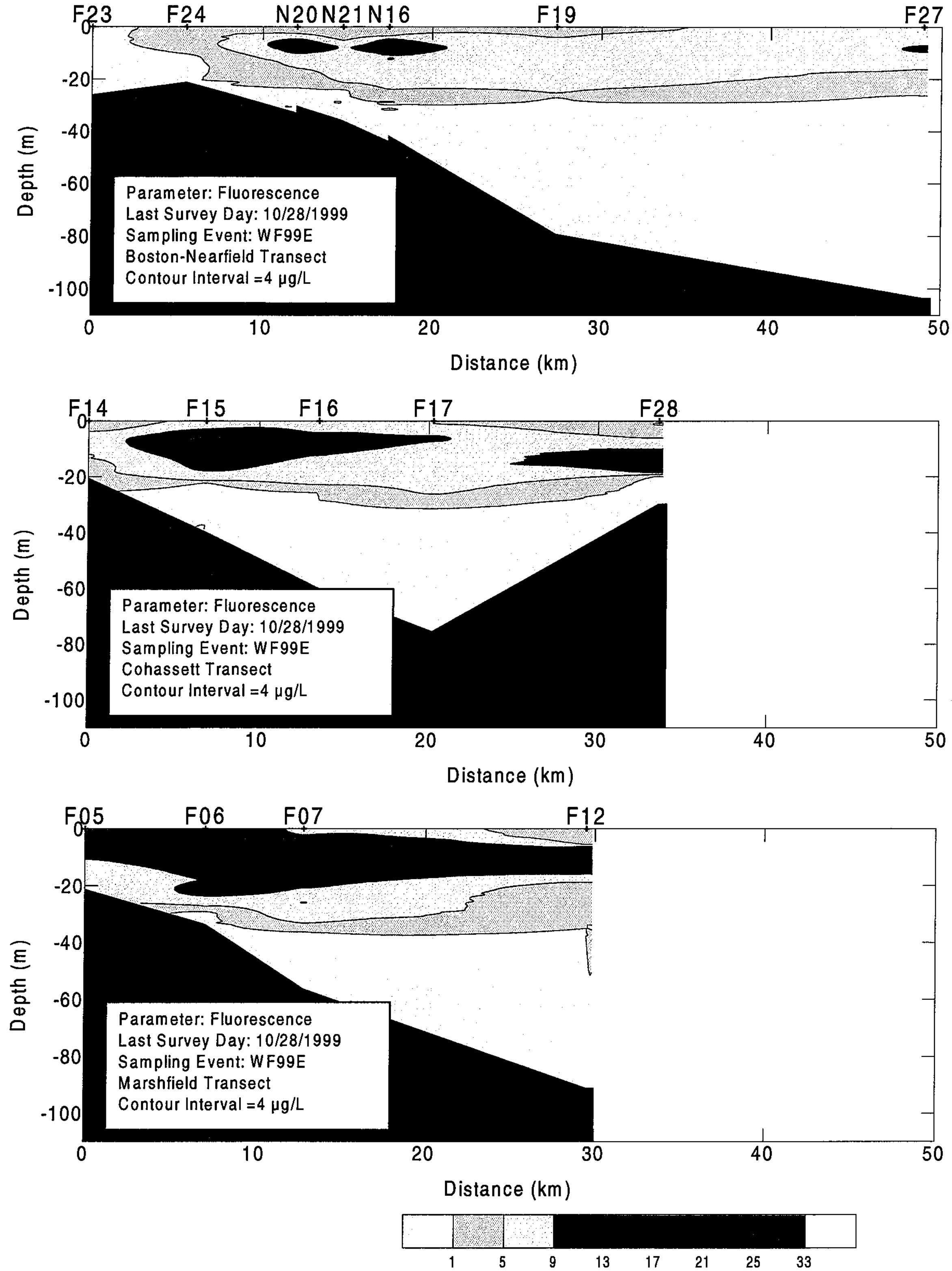
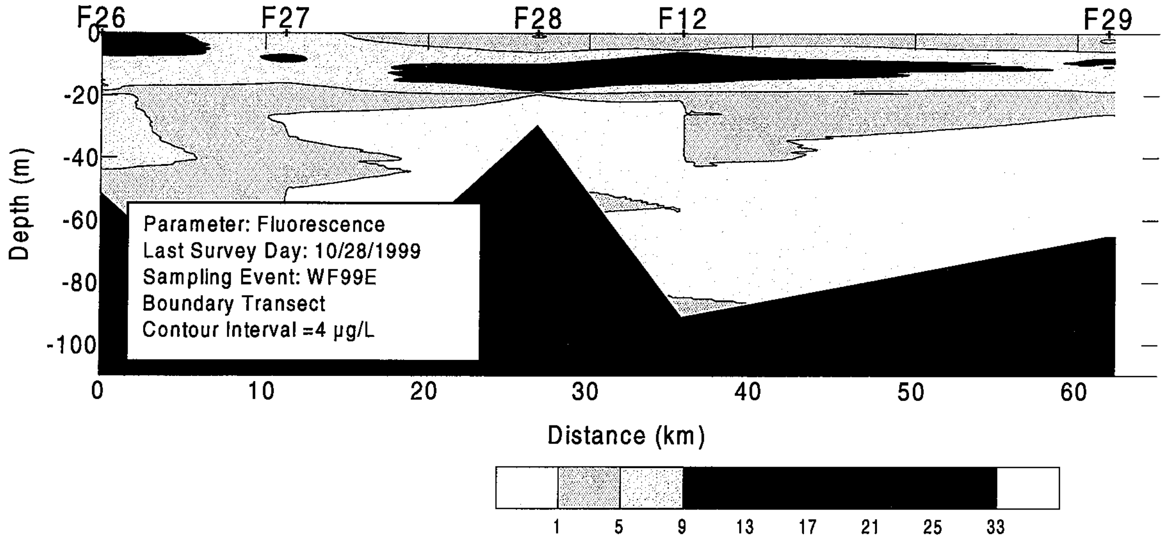


Figure C-27. Fluorescence Transect Plots (West - East) for Farfield Survey WF99E (Oct 99)



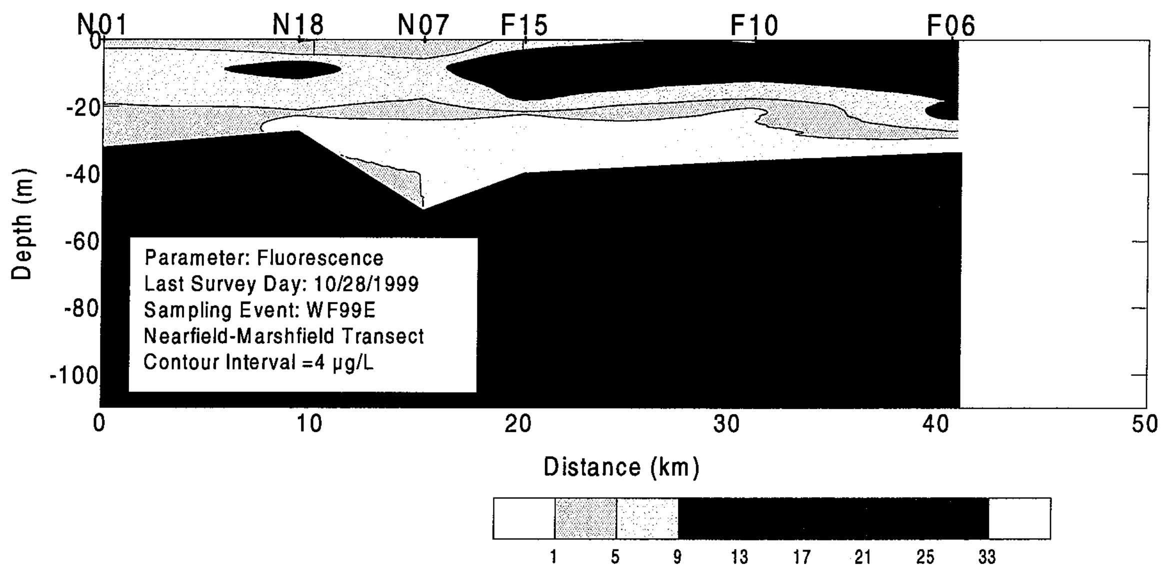


Figure C-28. Fluorescence Transect Plots (North - South) for Farfield Survey WF99E (Oct 99)

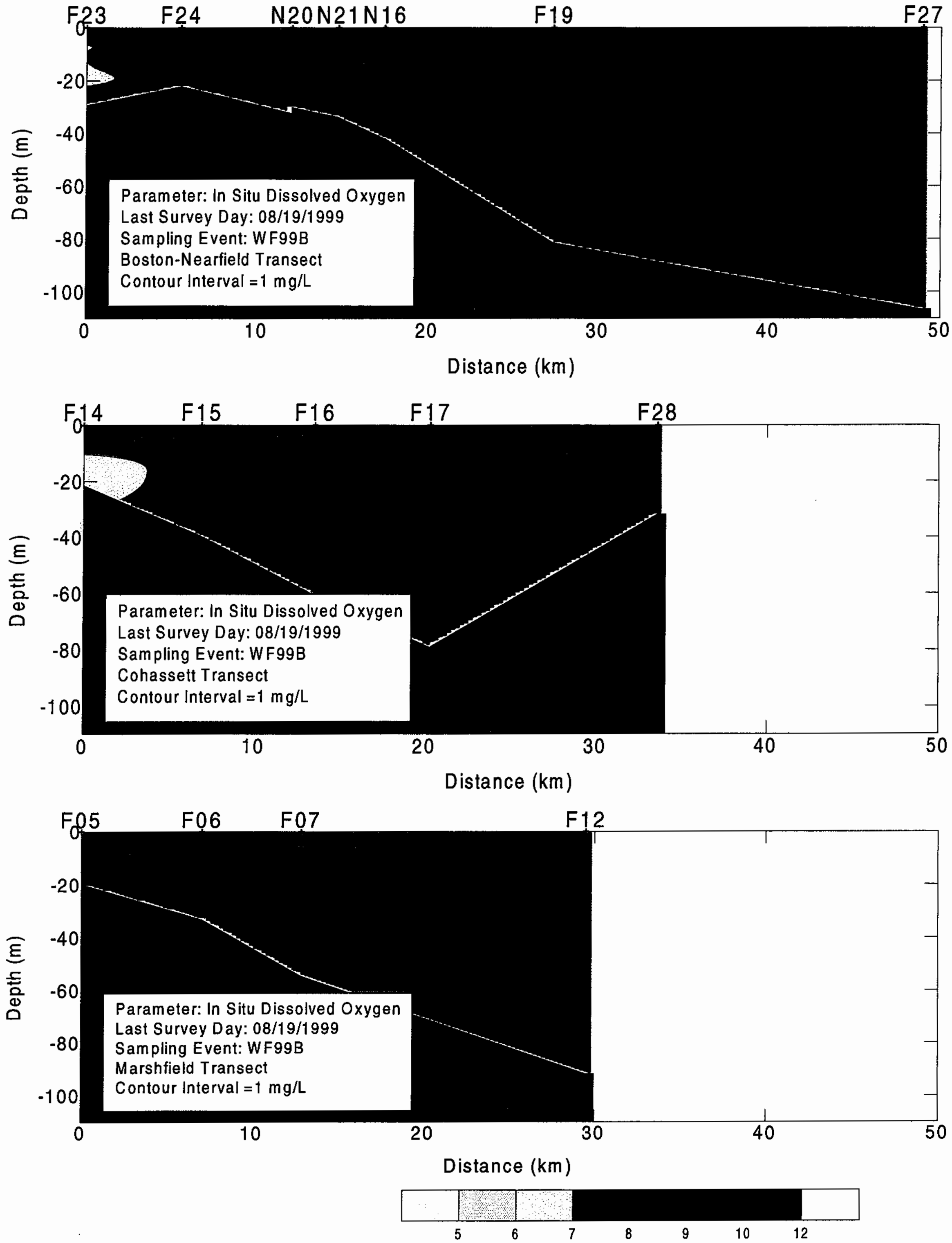


Figure C-29. Dissolved Oxygen Transect Plots (West - East) for Farfield Survey WF99B (Aug 99)

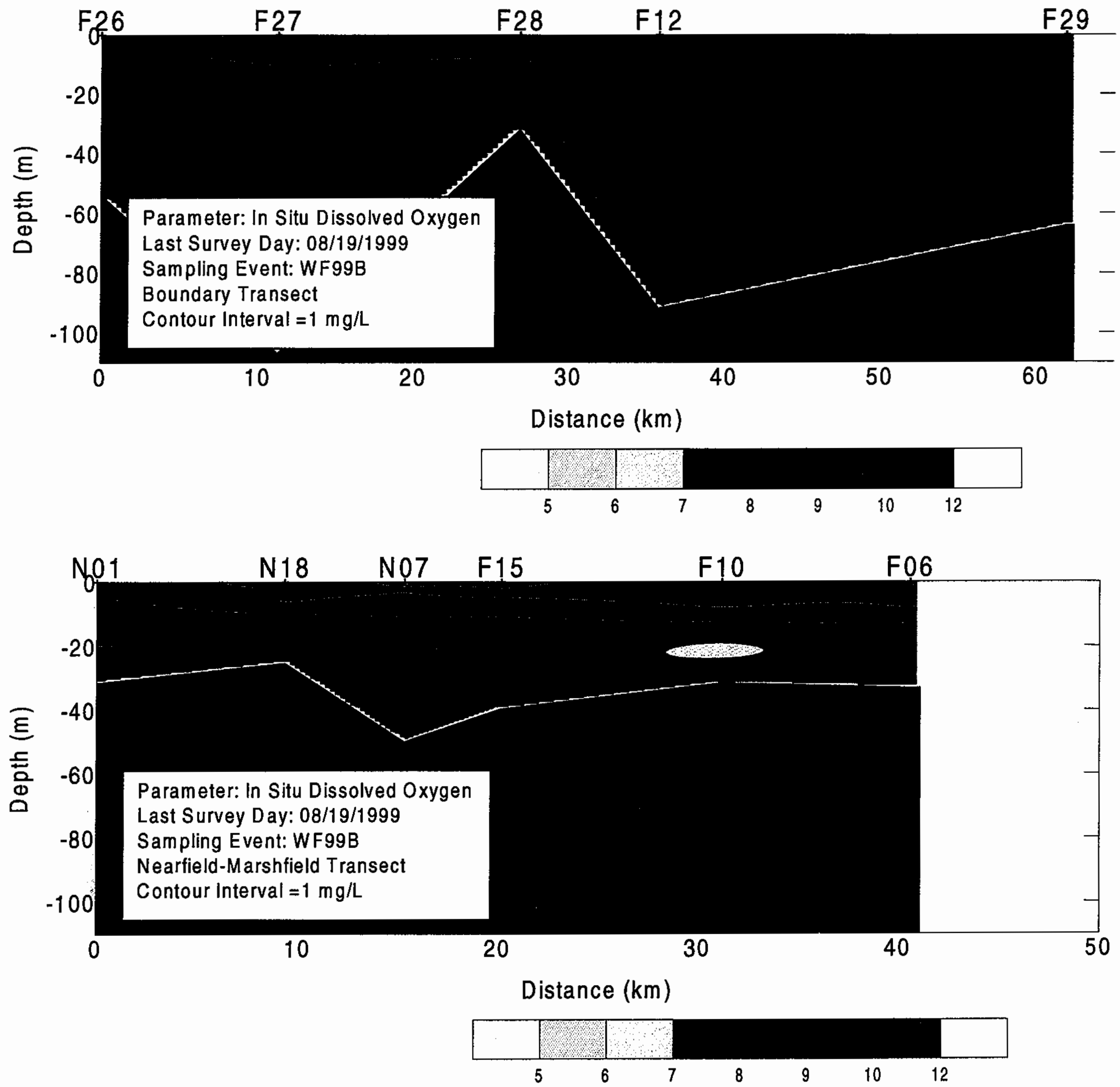


Figure C-30. Dissolved Oxygen Transect Plots (North - South) for Farfield Survey WF99B (Aug 99)

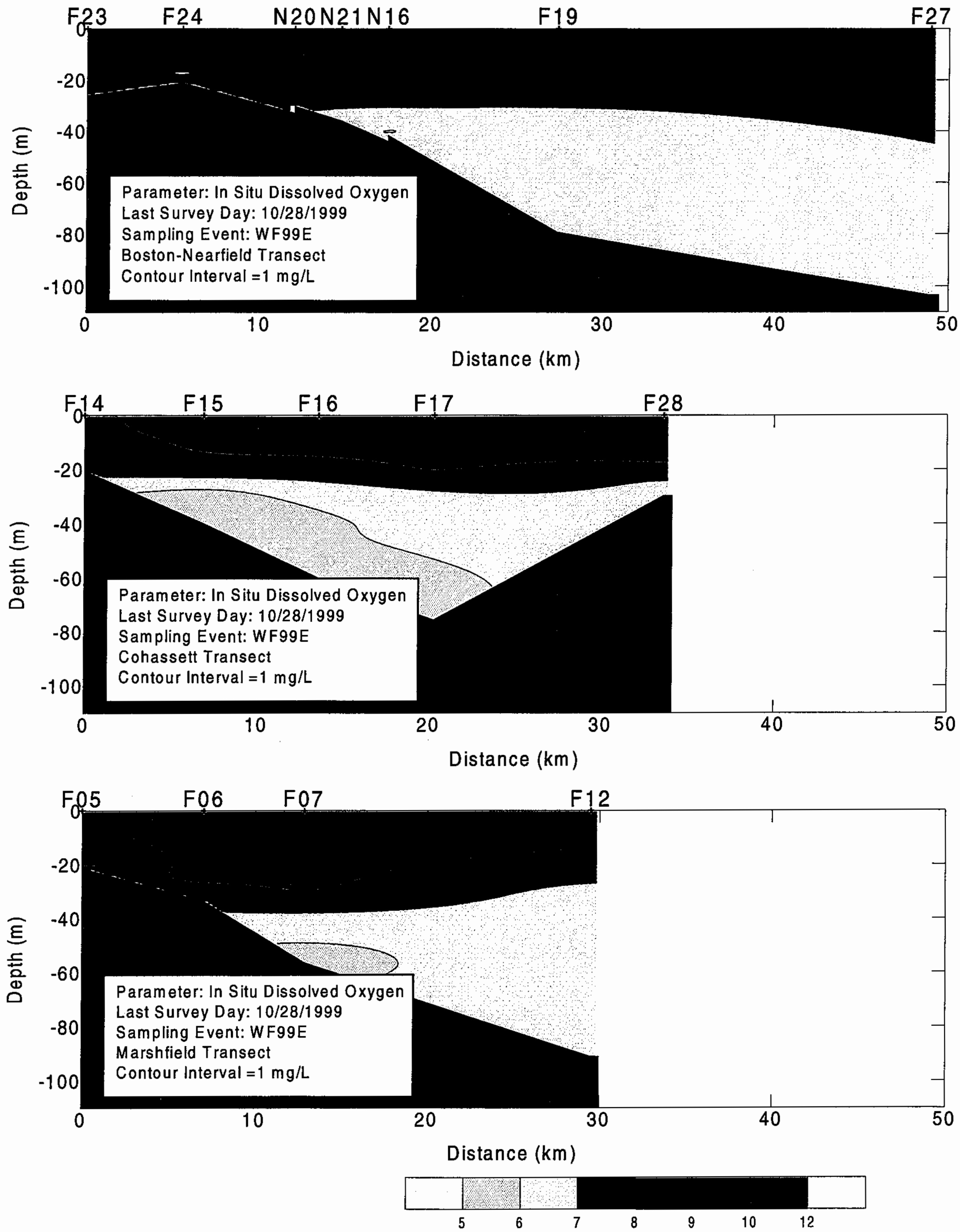
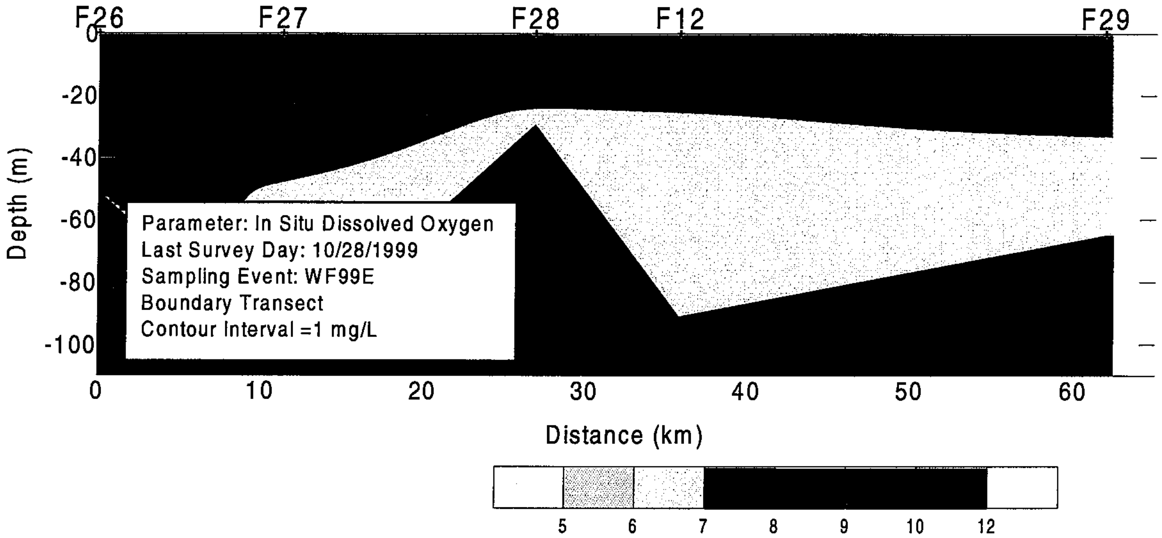


Figure C-31. Dissolved Oxygen Transect Plots (West - East) for Farfield Survey WF99E (Oct 99)



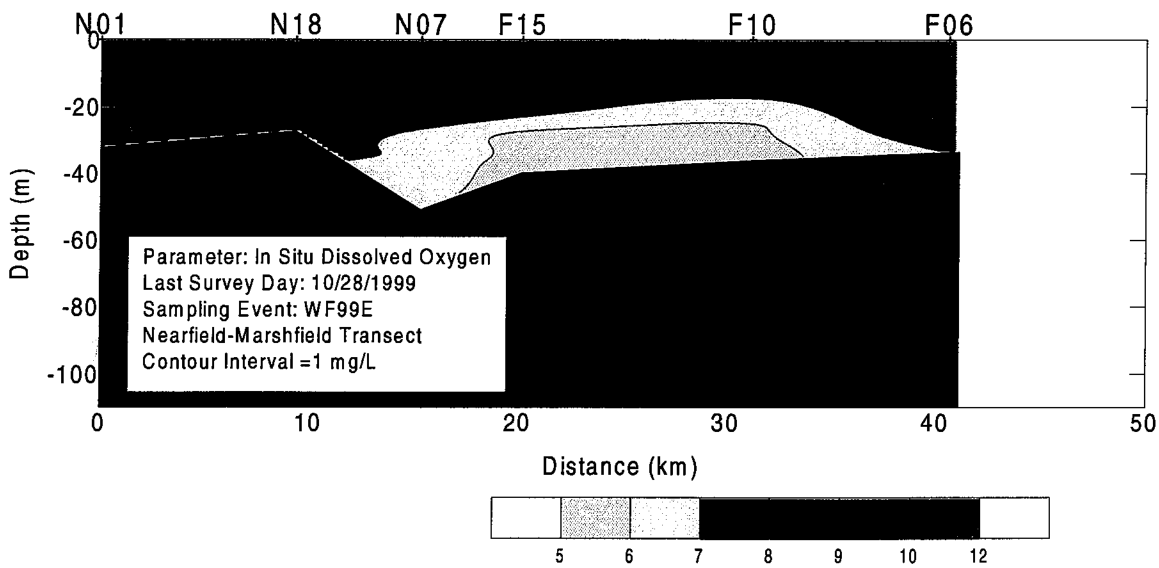


Figure C-32. Dissolved Oxygen Transect Plots (North - South) for Farfield Survey WF99E (Oct 99)

APPENDIX D

Nutrient Scatter Plots for each Survey

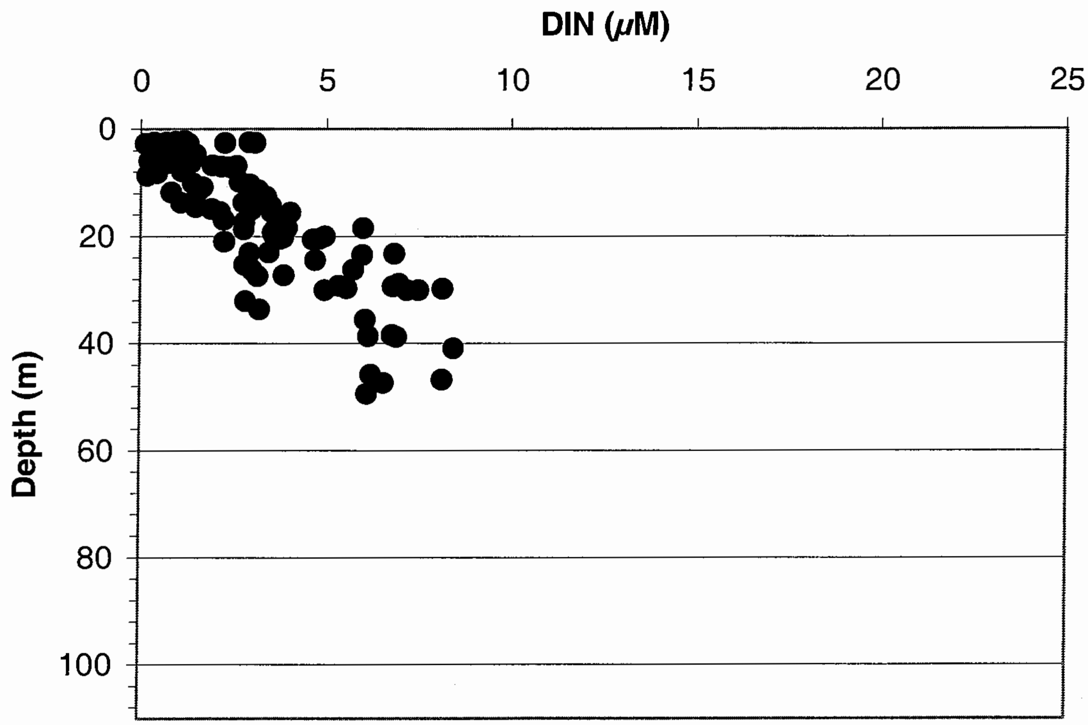
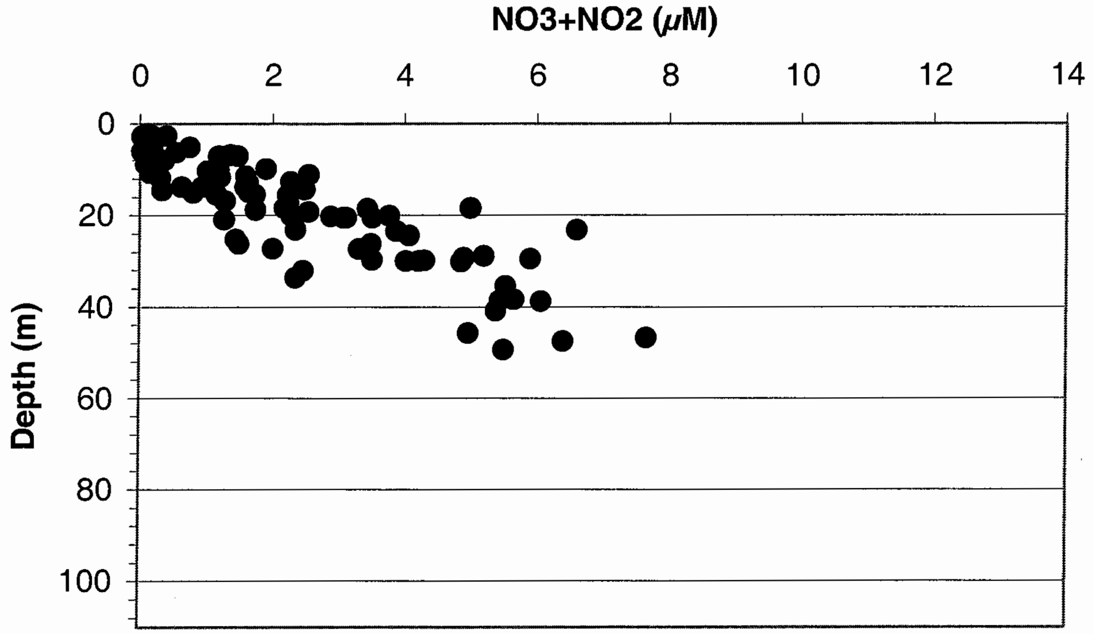


Figure D-1. Depth vs. Nutrient Plots for Nearfield Survey WN99A, (Aug 99)

(a)



(b)

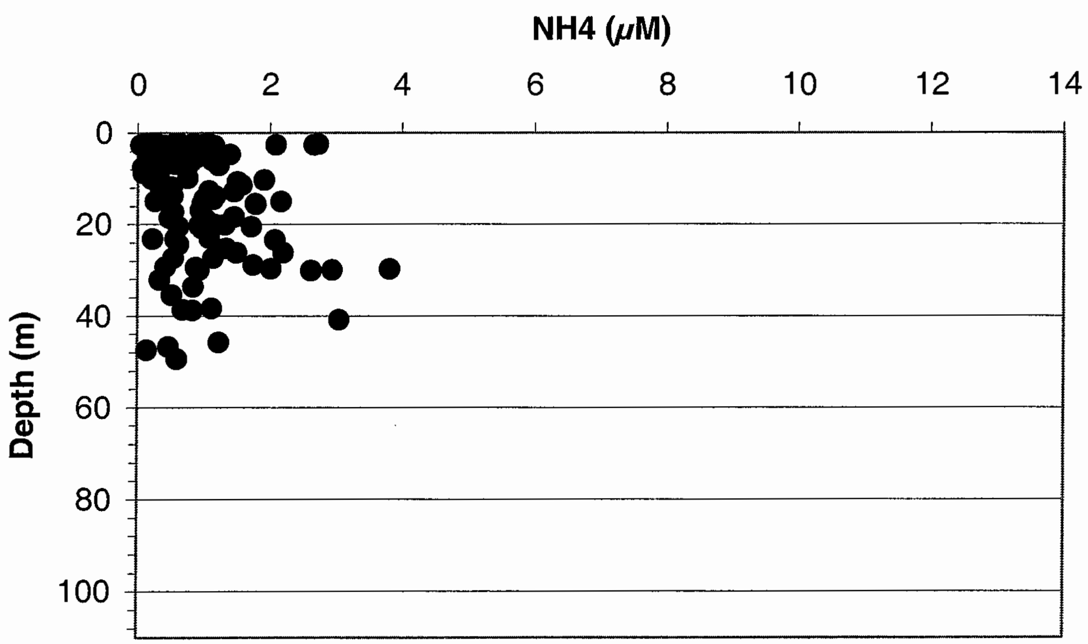
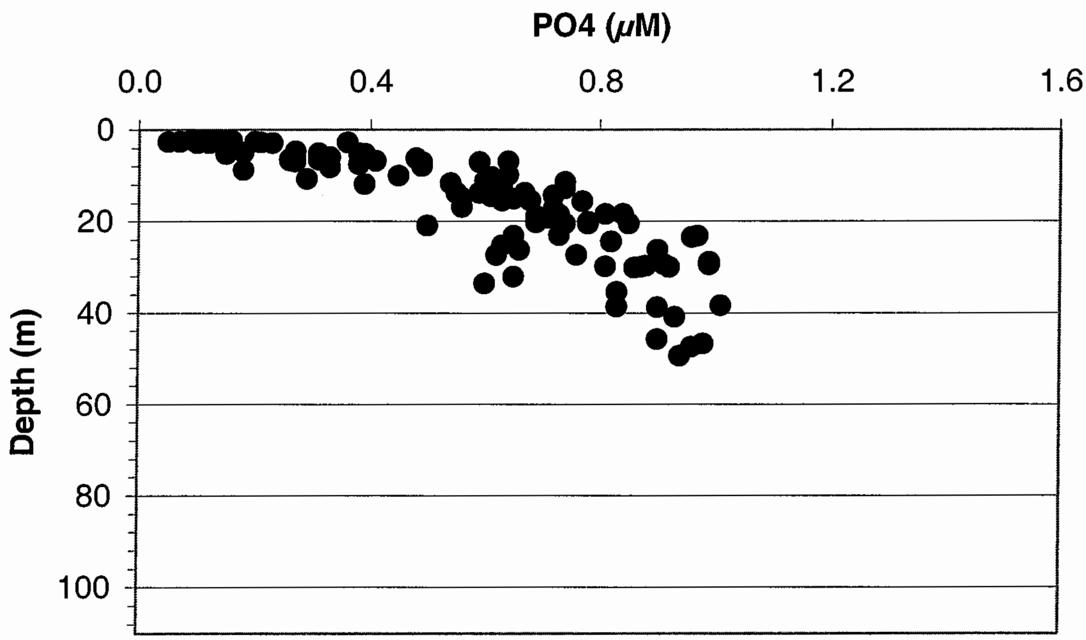


Figure D-2. Depth vs. Nutrient Plots for Nearfield Survey WN99A, (Aug 99)

(a)



(b)

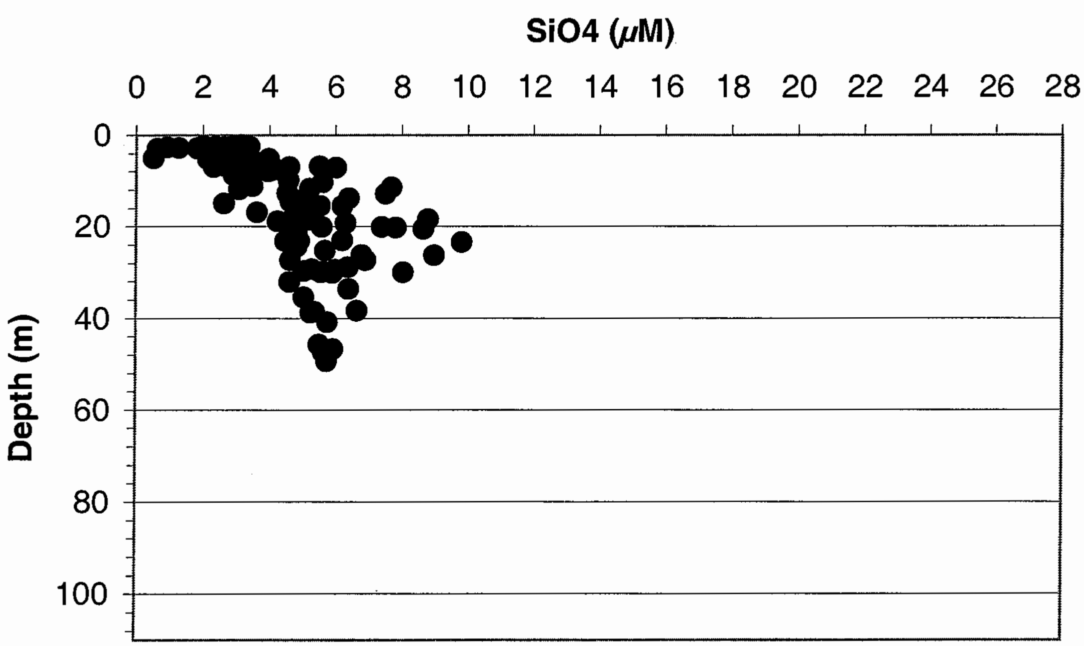
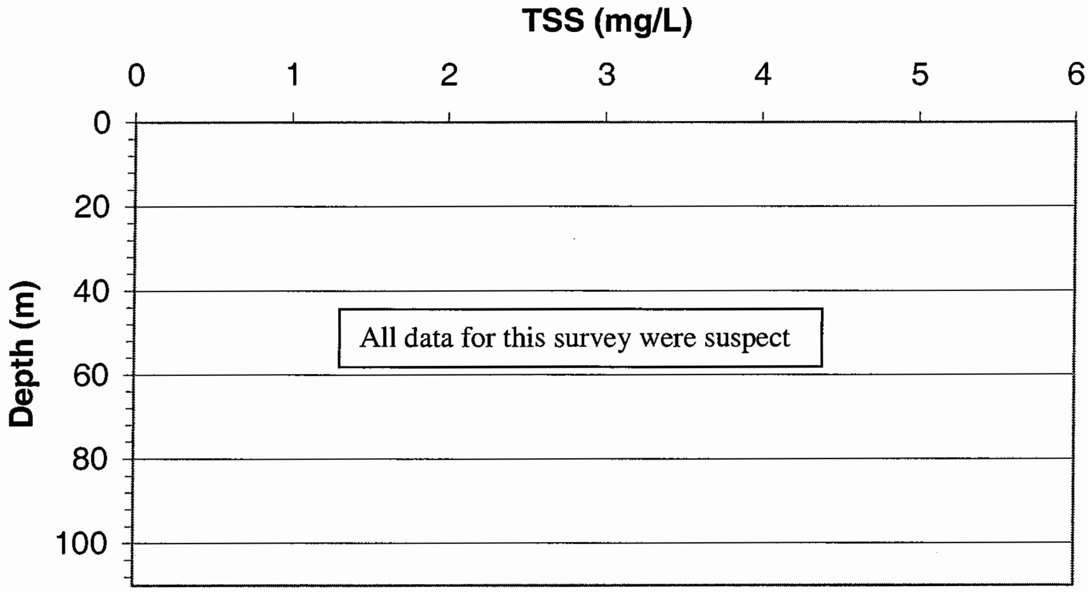


Figure D-3. Depth vs. Nutrient Plots for Nearfield Survey WN99A, (Aug 99)

(a)



(b)

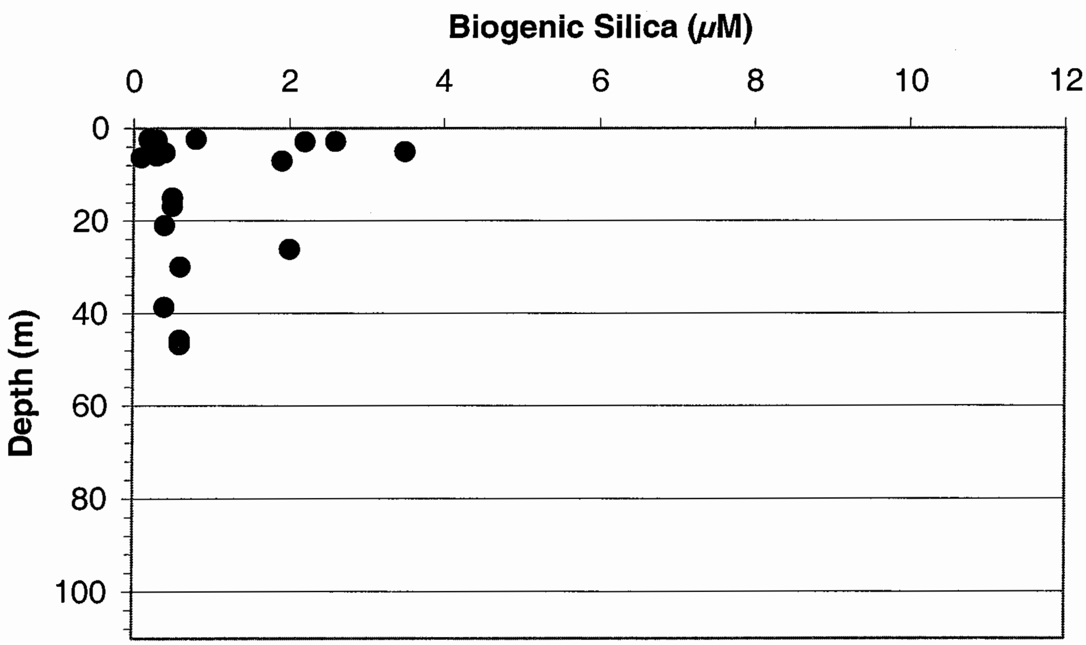


Figure D-4. Depth vs. Nutrient Plots for Nearfield Survey WN99A, (Aug 99)

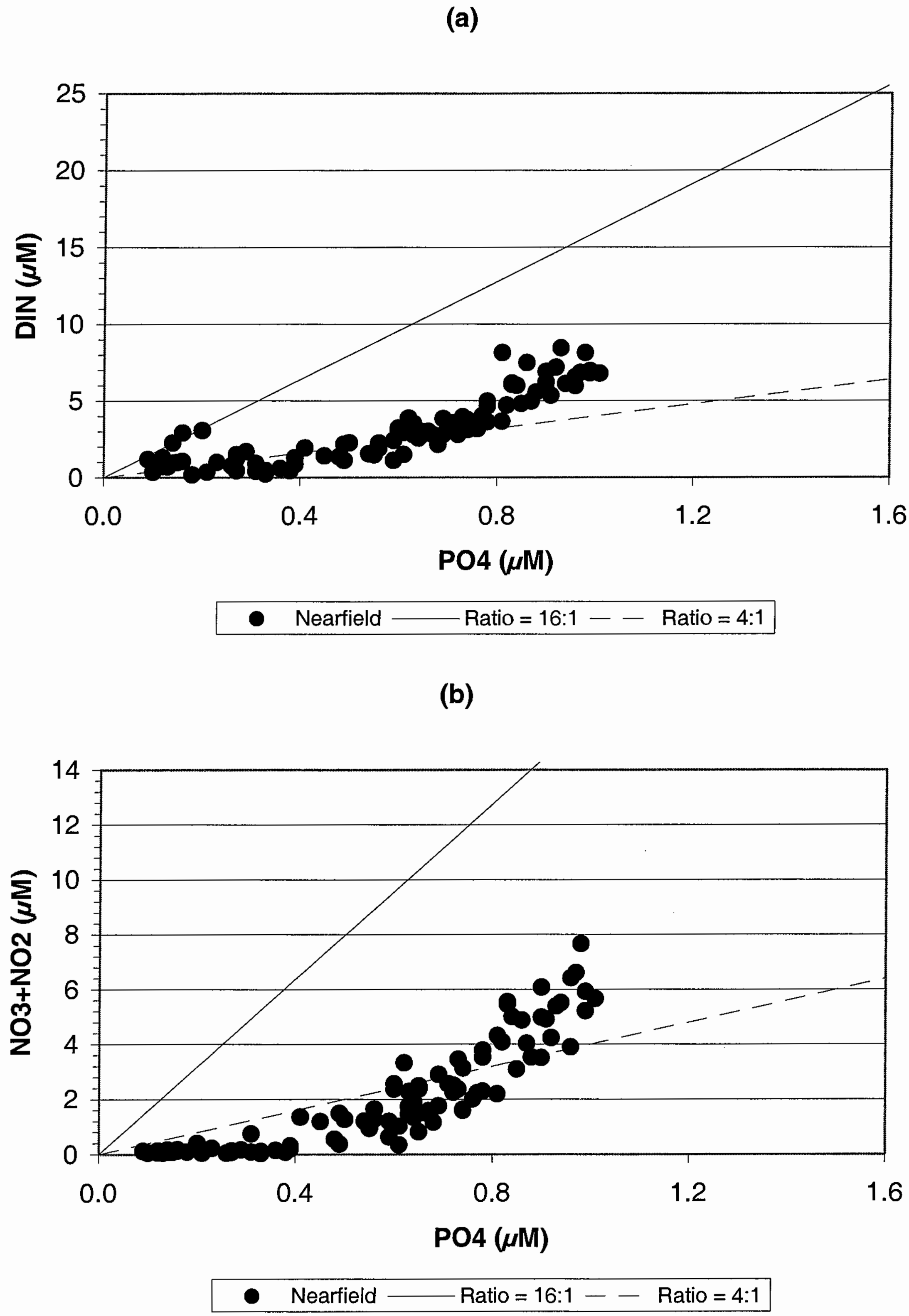
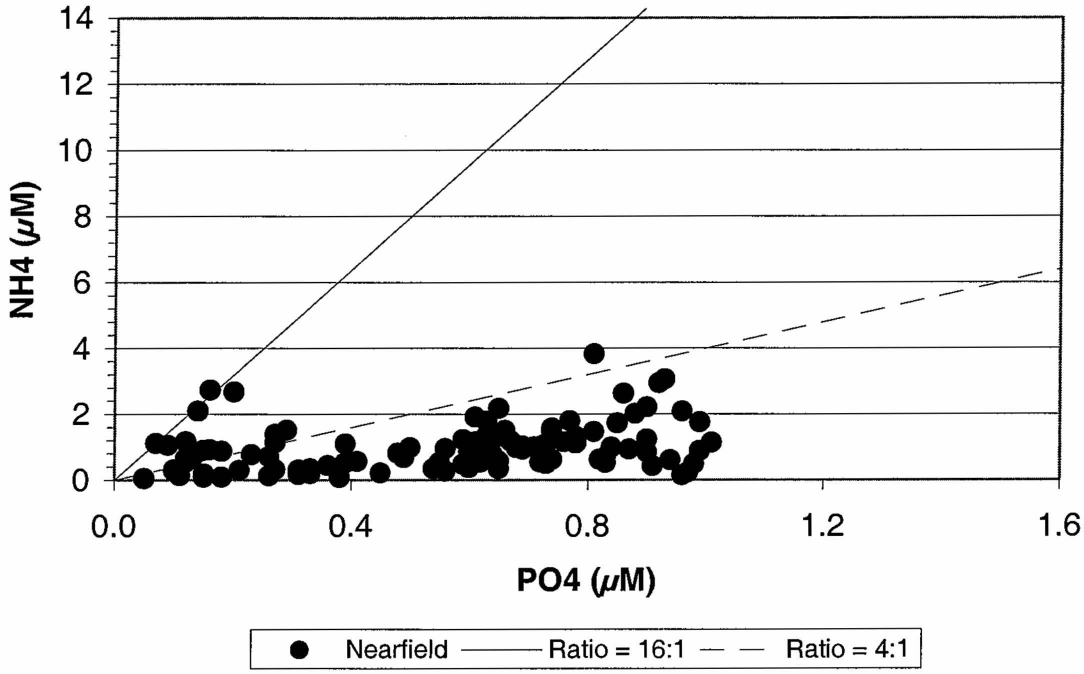


Figure D-5. Nutrient vs. Nutrient Plots for Nearfield Survey WN99A, (Aug 99)

(a)



(b)

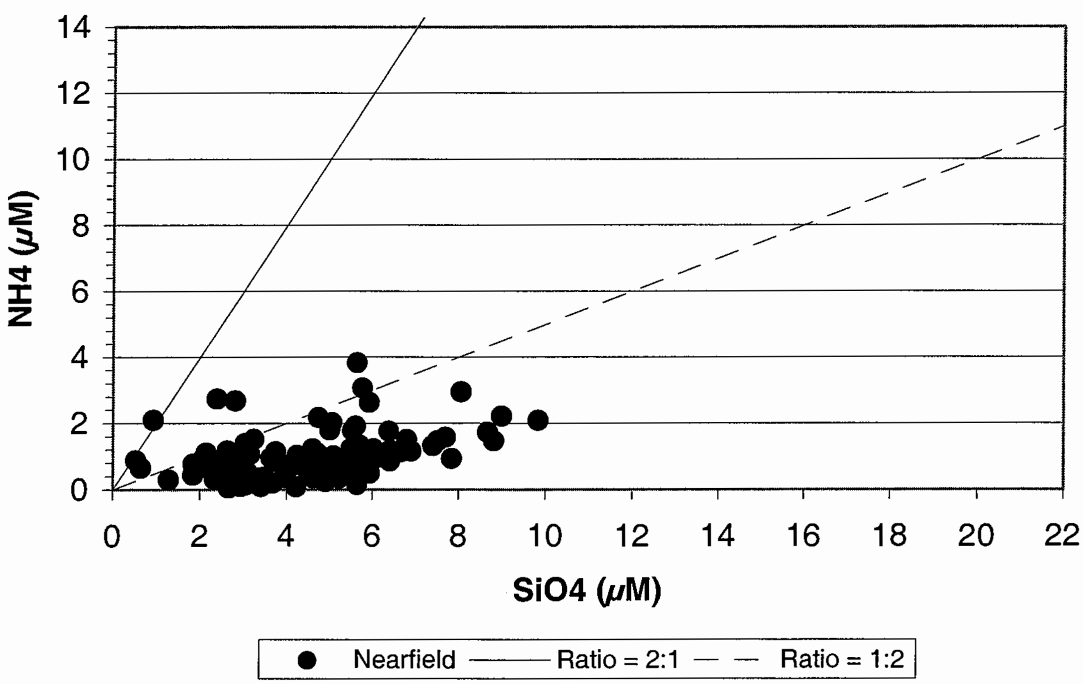
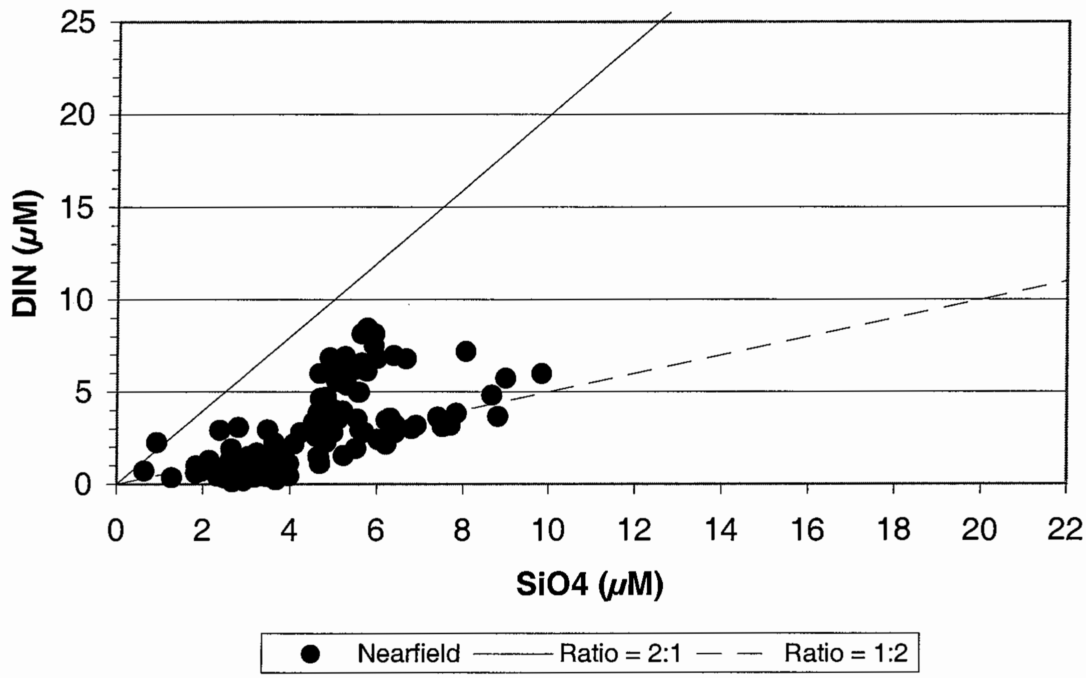


Figure D-6. Nutrient vs. Nutrient Plots for Nearfield Survey WN99A, (Aug 99)

(a)



(b)

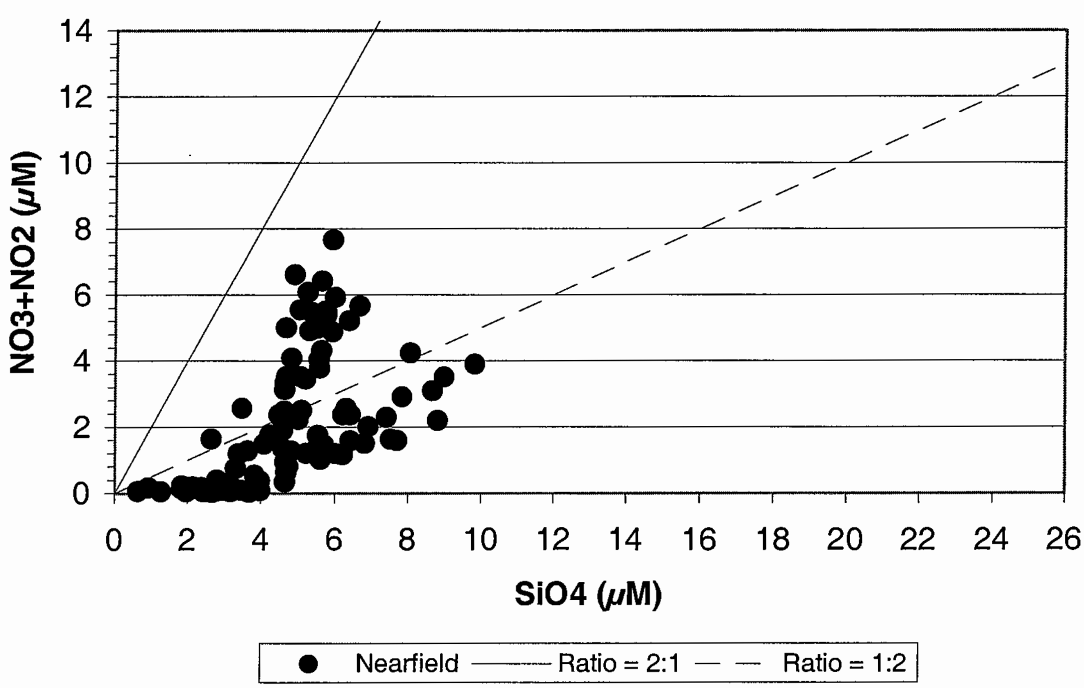
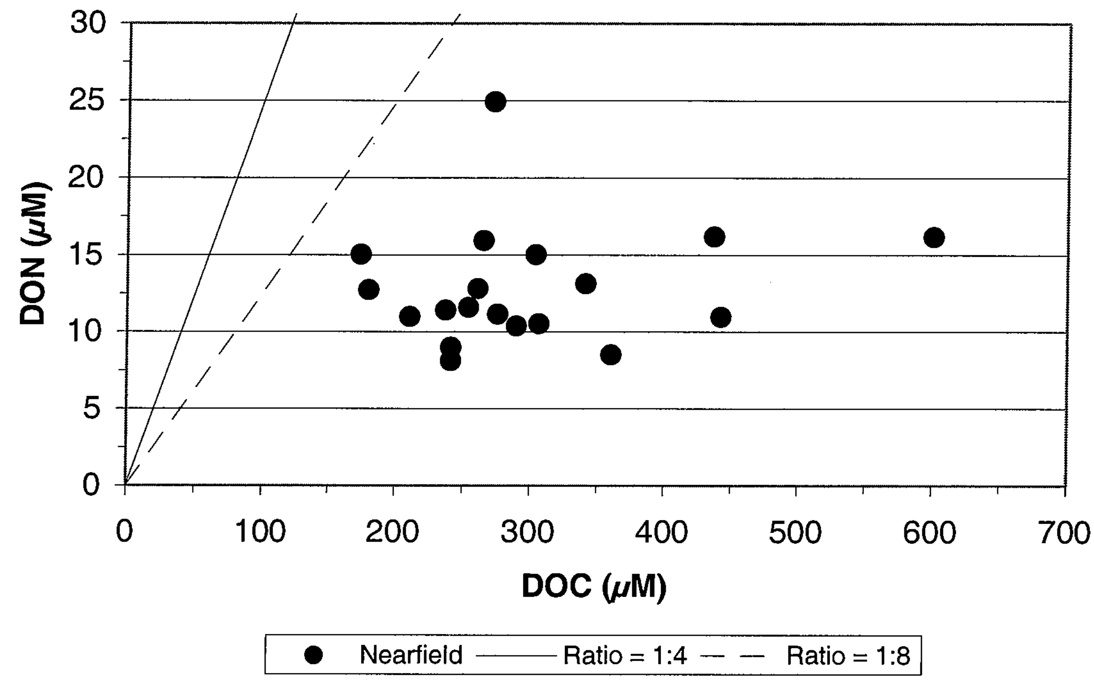


Figure D-7. Nutrient vs. Nutrient Plots for Nearfield Survey WN99A, (Aug 99)

(a)



(b)

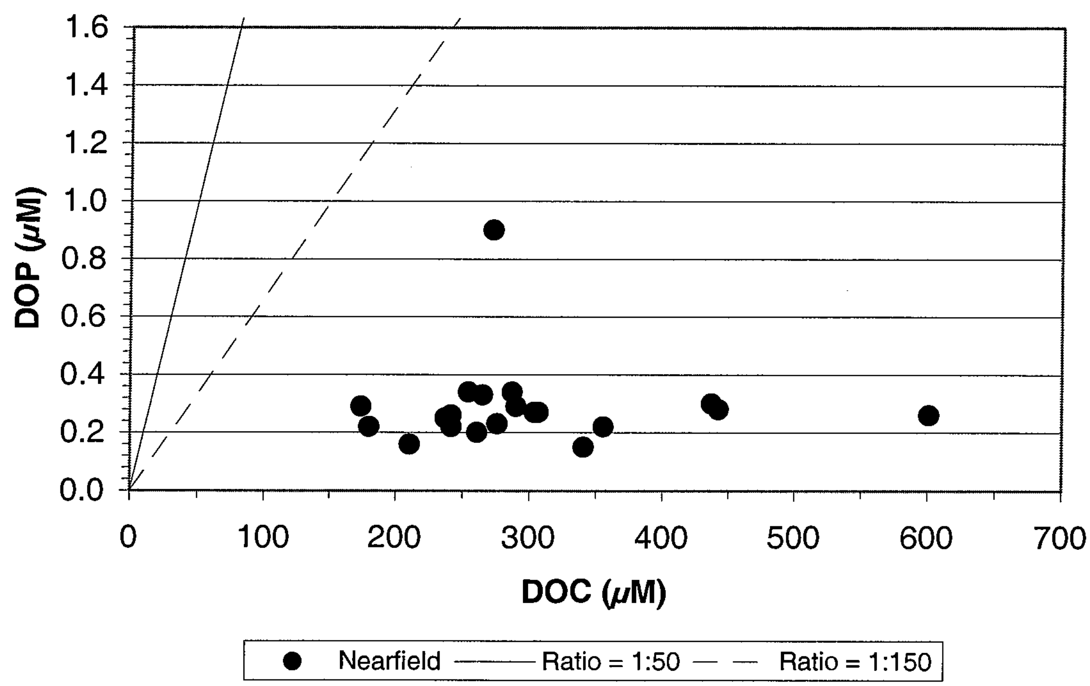
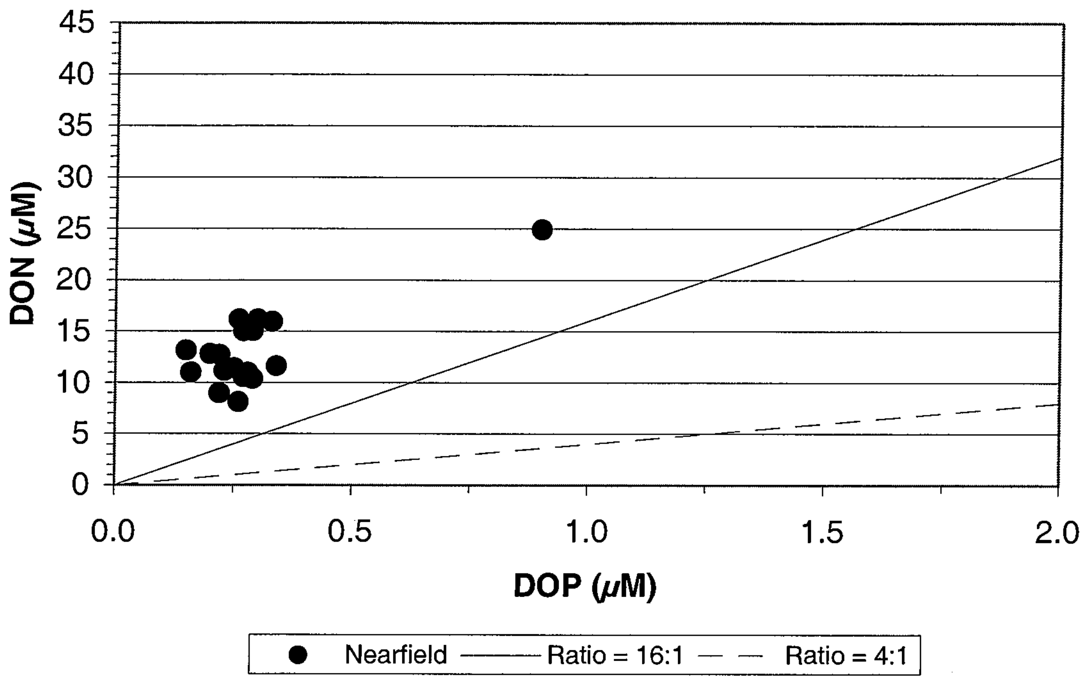


Figure D-8. Nutrient vs. Nutrient Plots for Nearfield Survey WN99A, (Aug 99)

(a)



(b)

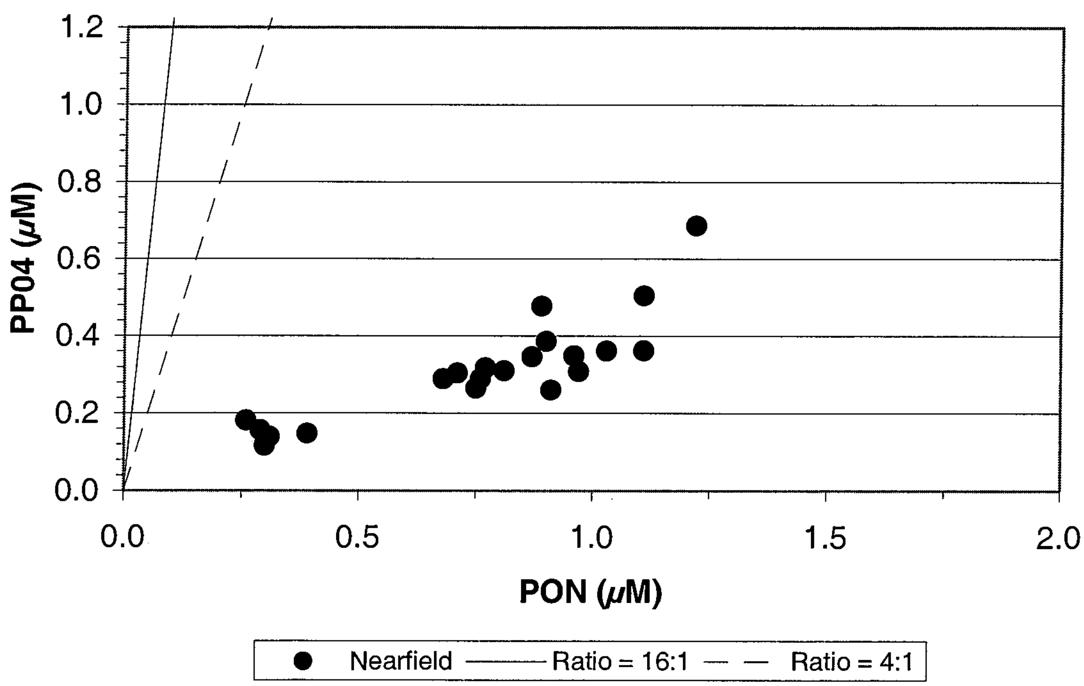
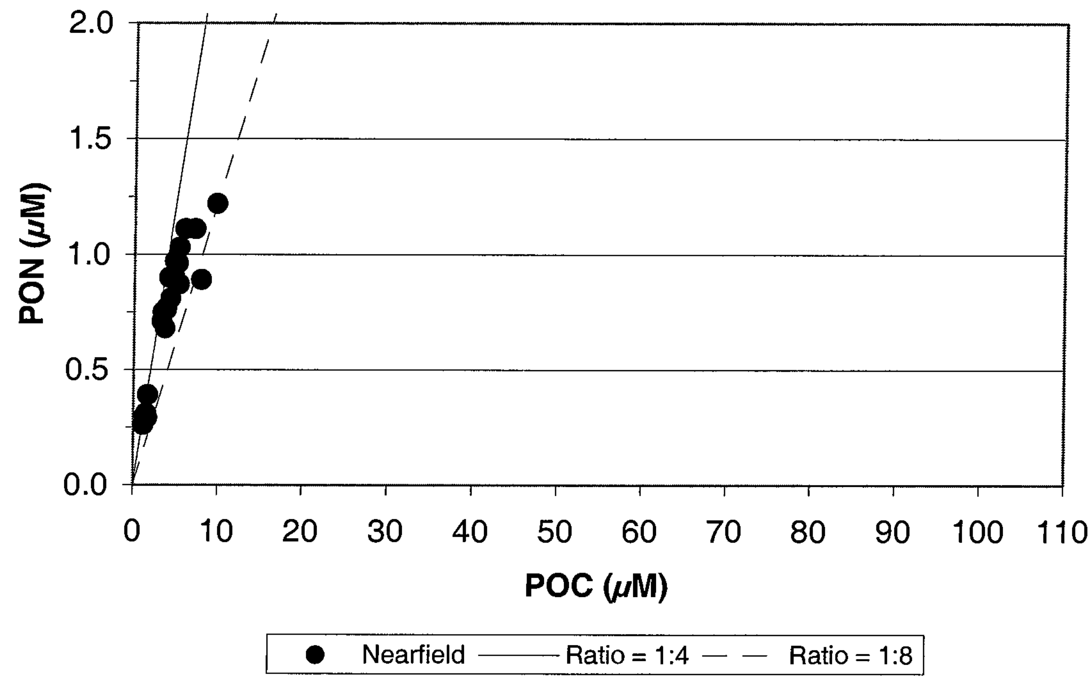


Figure D-9. Nutrient vs. Nutrient Plots for Nearfield Survey WN99A, (Aug 99)

(a)



(b)

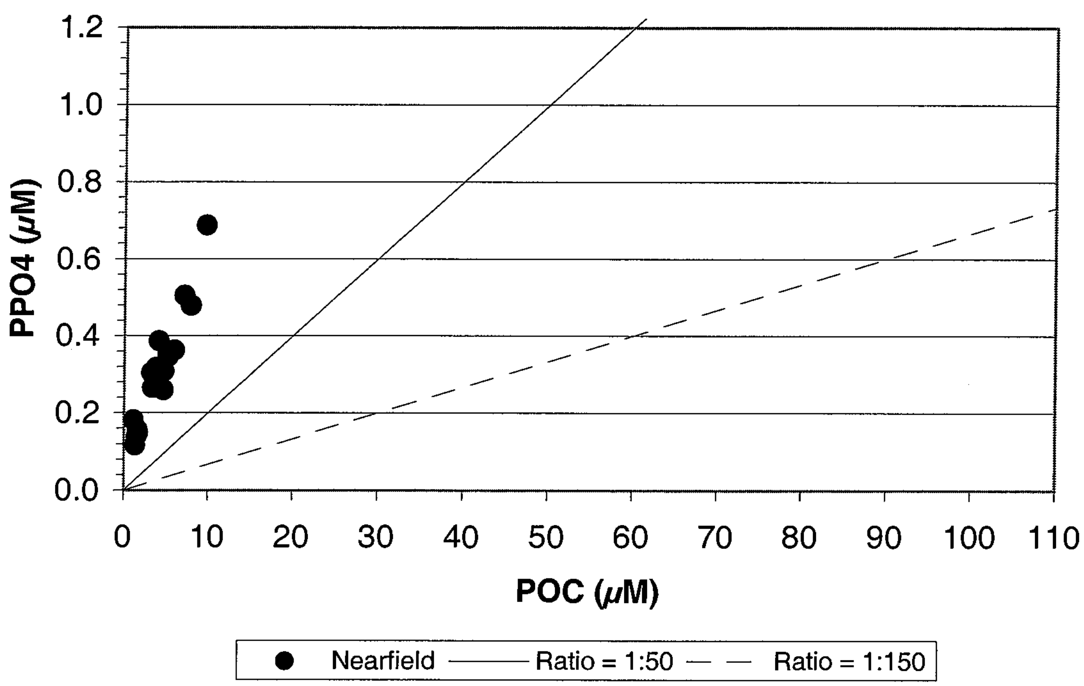
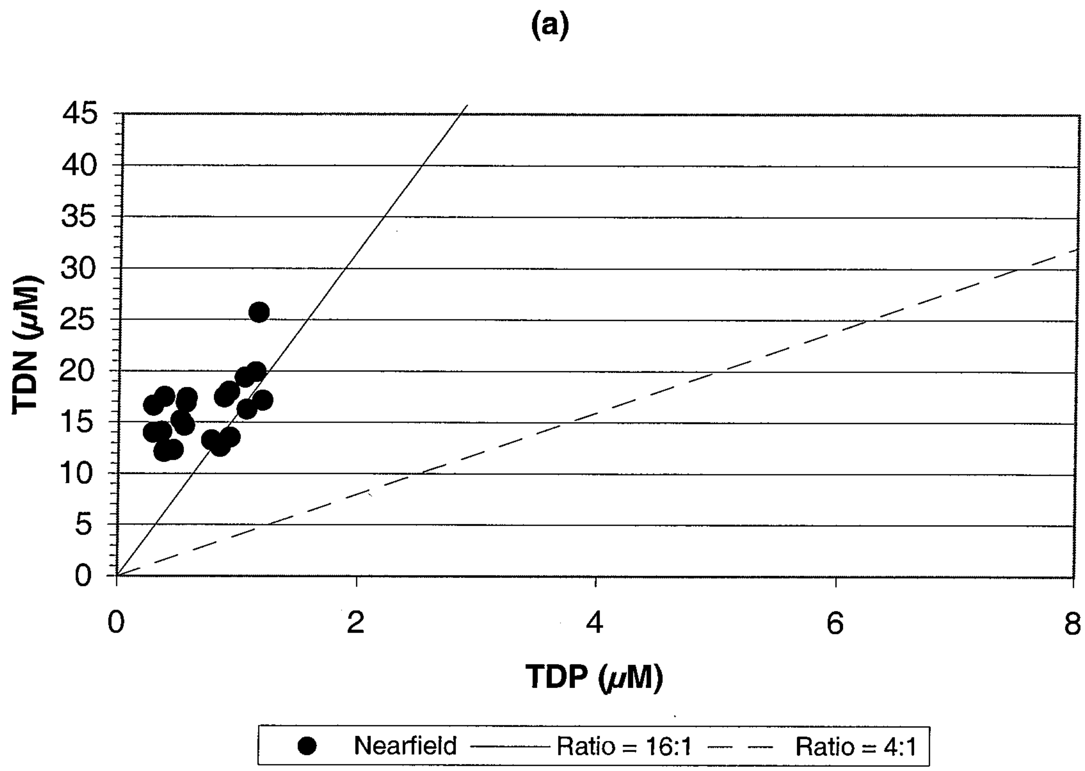


Figure D-10. Nutrient vs. Nutrient Plots for Nearfield Survey WN99A, (Aug 99)



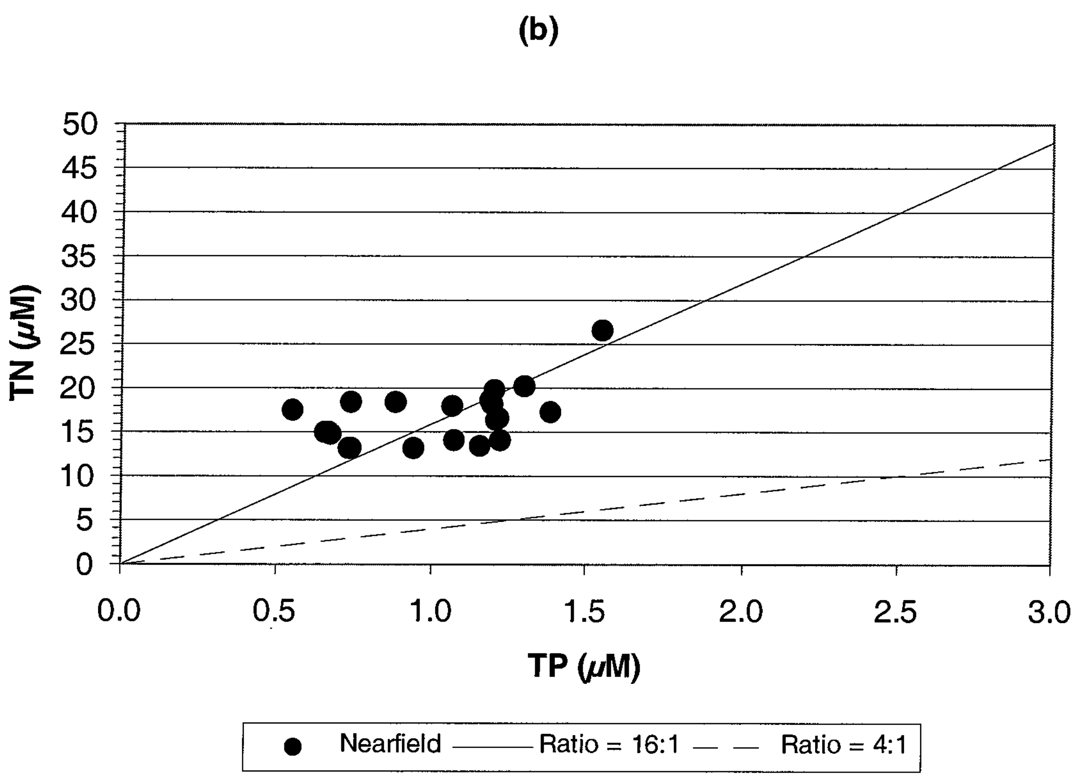
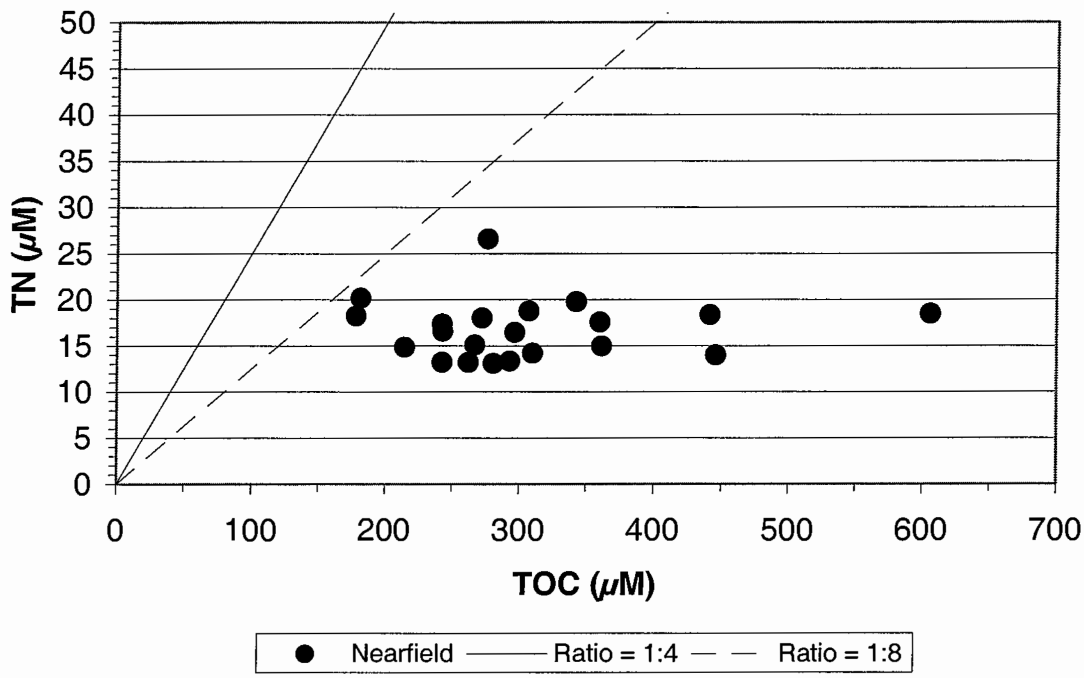


Figure D-11. Nutrient vs. Nutrient Plots for Nearfield Survey WN99A, (Aug 99)

(a)



(b)

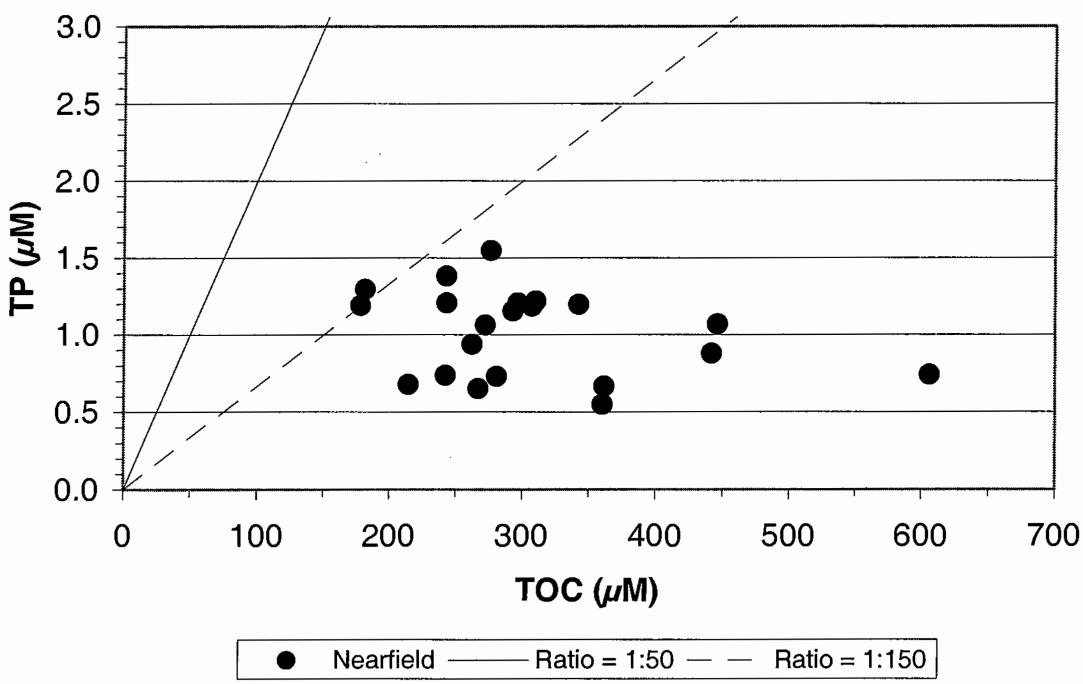


Figure D-12. Nutrient vs. Nutrient Plots for Nearfield Survey WN99A, (Aug 99)

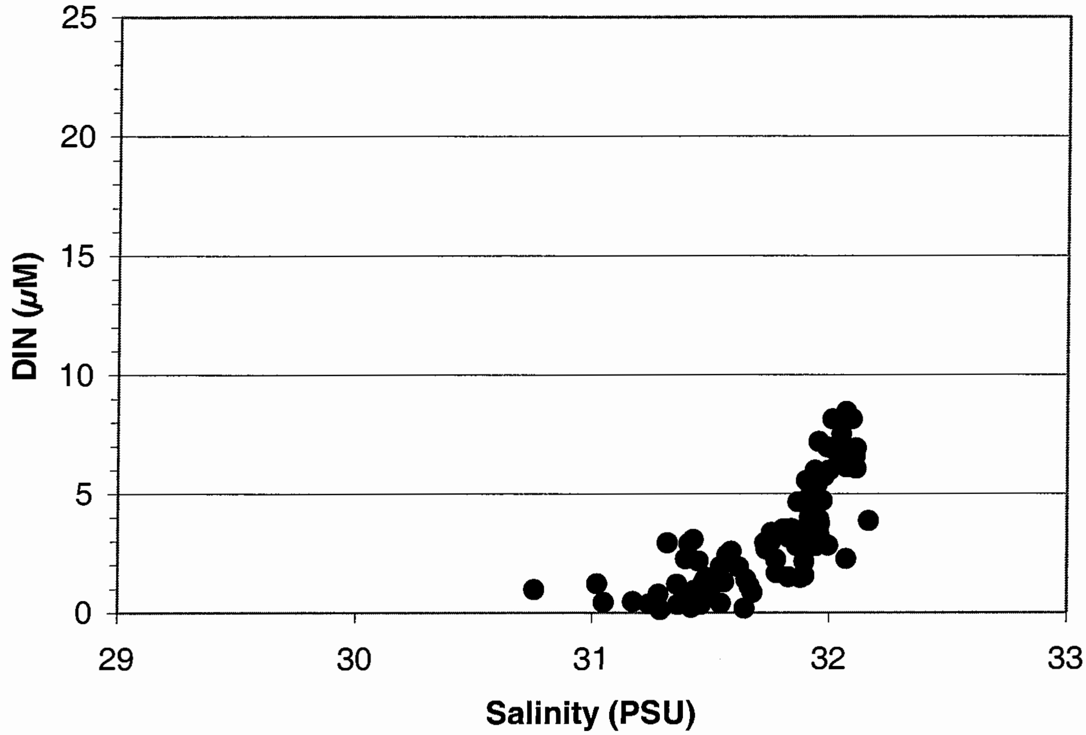
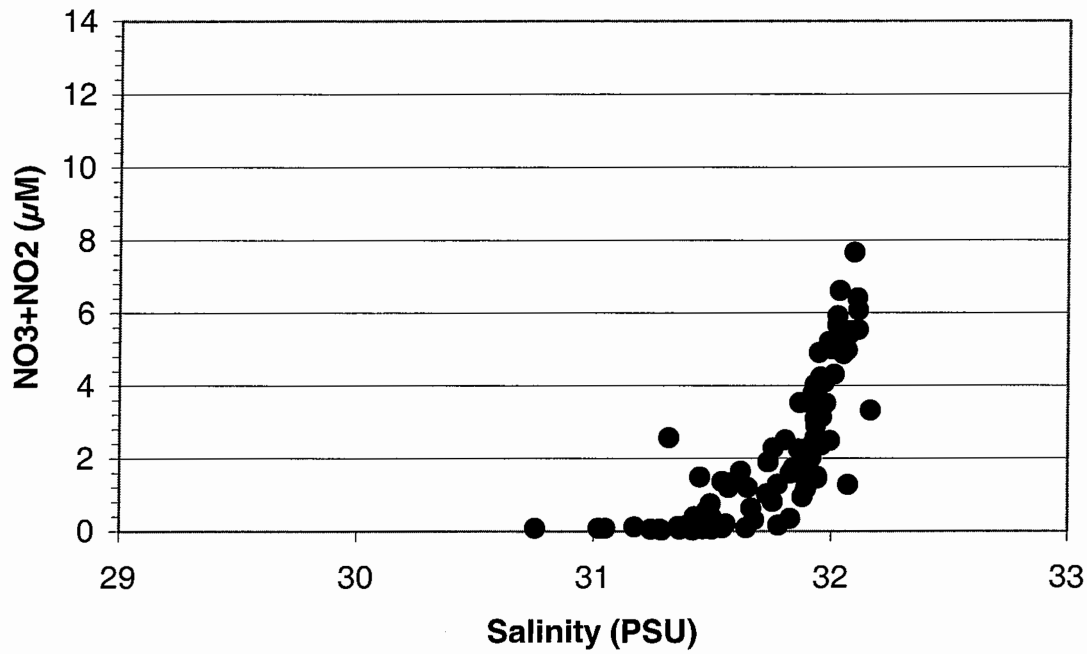


Figure D-13. Nutrient vs. Salinity Plots for Nearfield Survey WN99A, (Aug 99)

(a)



(b)

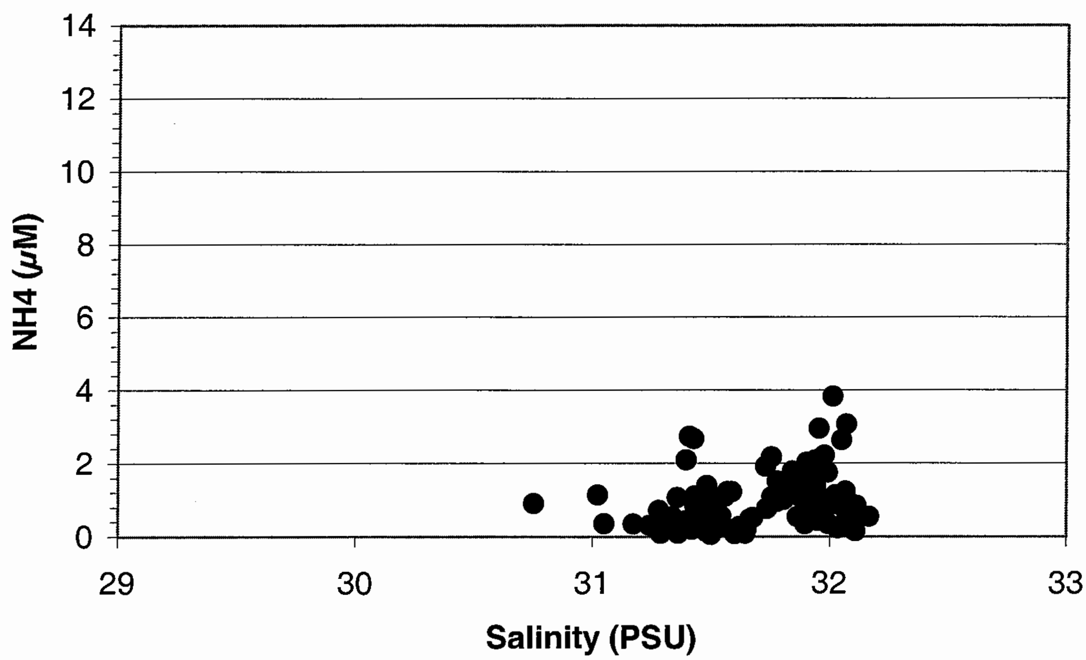
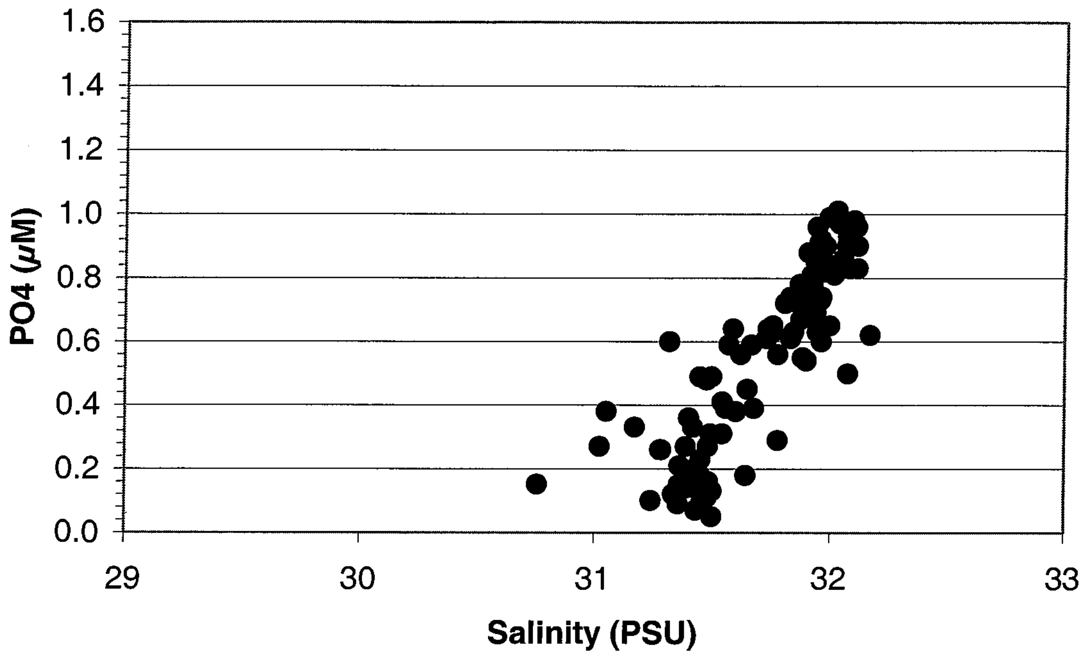


Figure D-14. Nutrient vs. Salinity Plots for Nearfield Survey WN99A, (Aug 99)

(a)



(b)

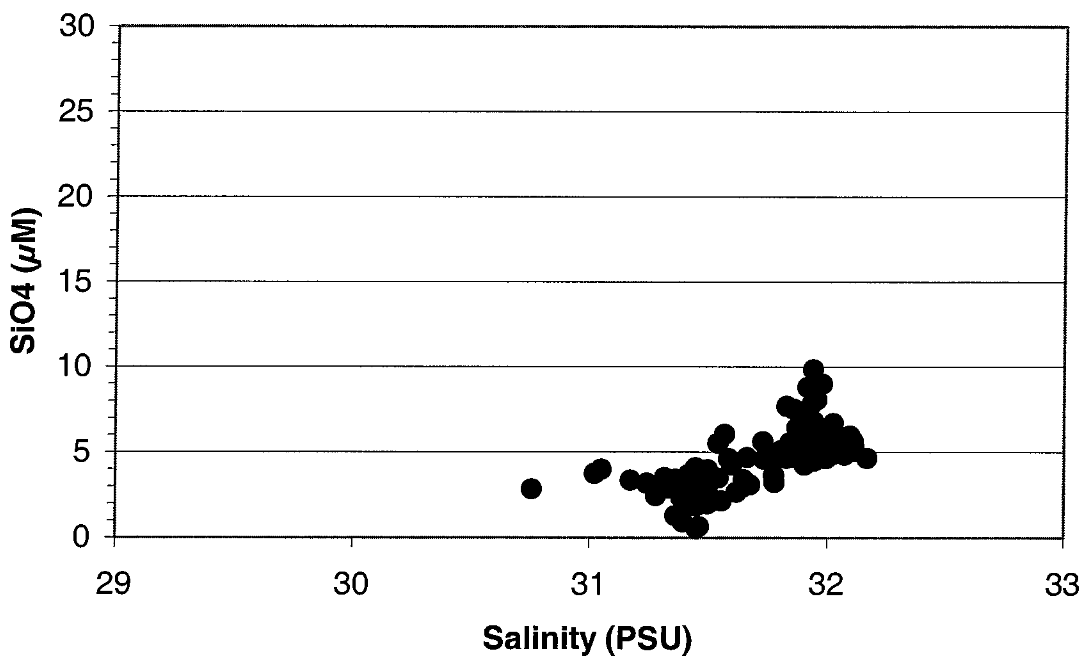


Figure D-15. Nutrient vs. Salinity Plots for Nearfield Survey WN99A, (Aug 99)

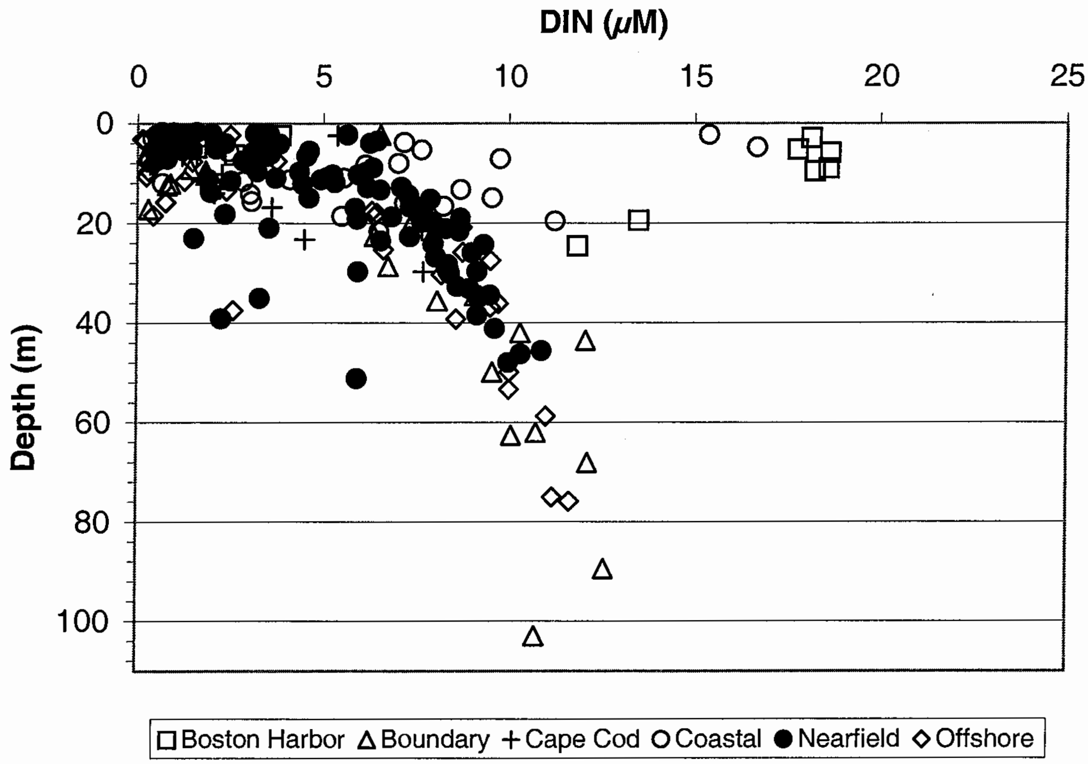
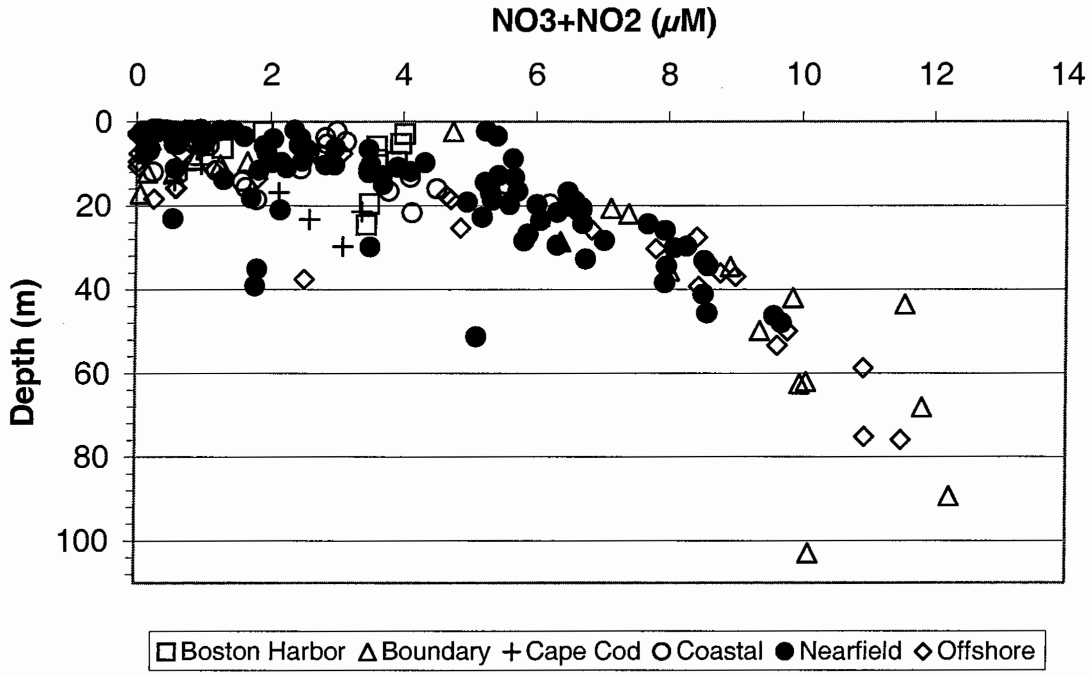


Figure D-16. Depth vs. Nutrient Plots for Farfield Survey WF99B, (Aug 99)

(a)



(b)

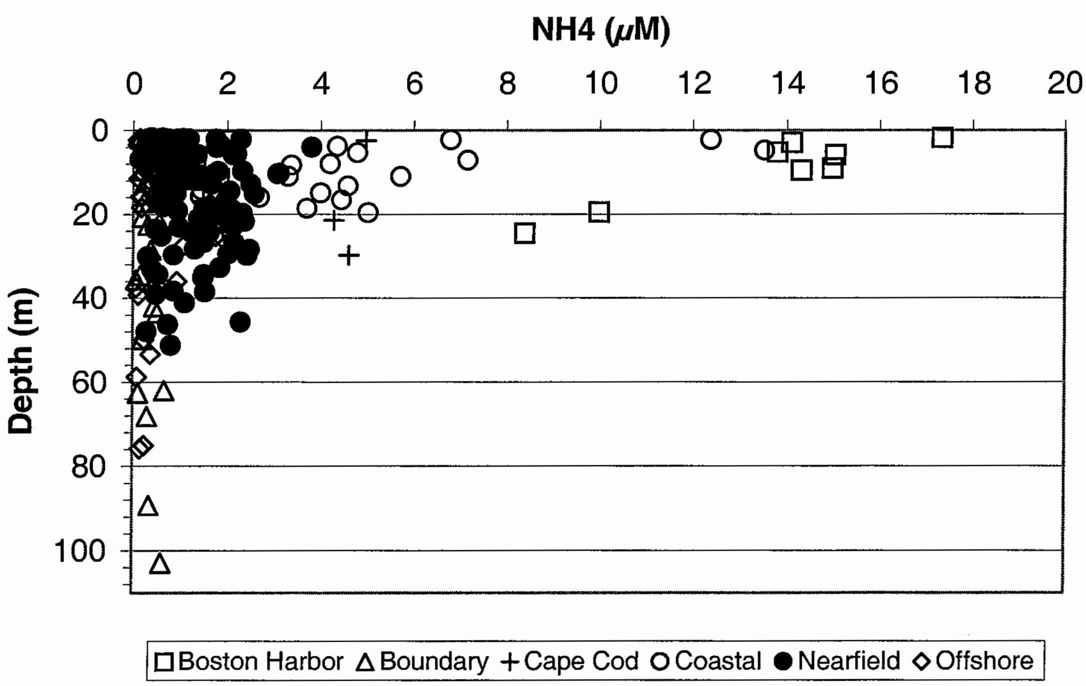
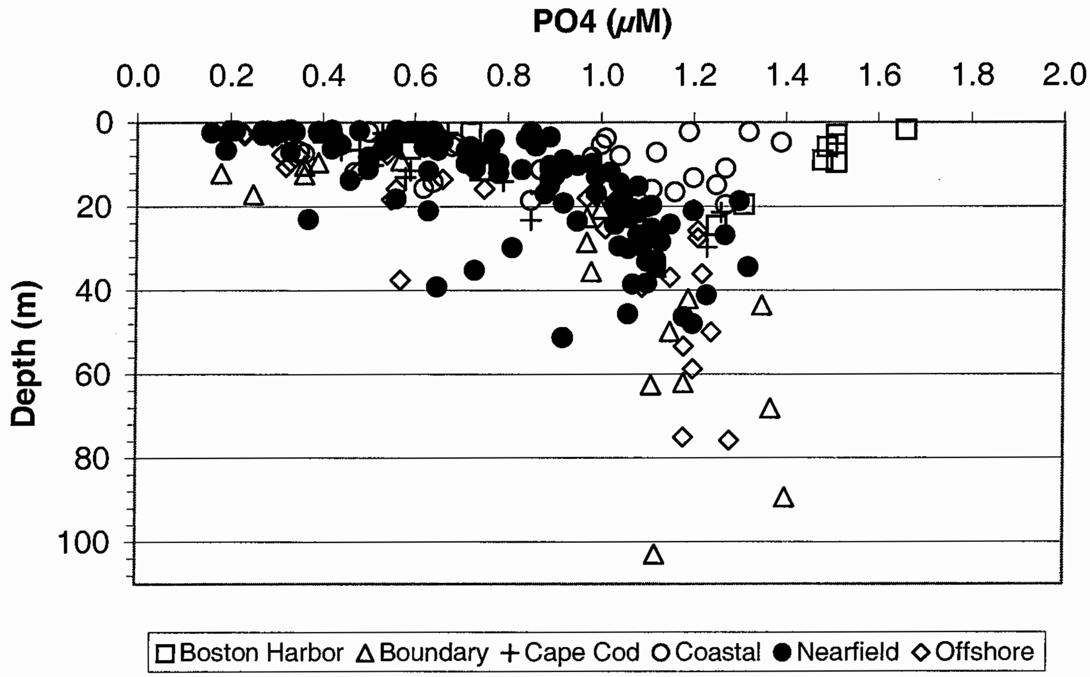


Figure D-17. Depth vs. Nutrient Plots for Farfield Survey WF99B, (Aug 99)

(a)



(b)

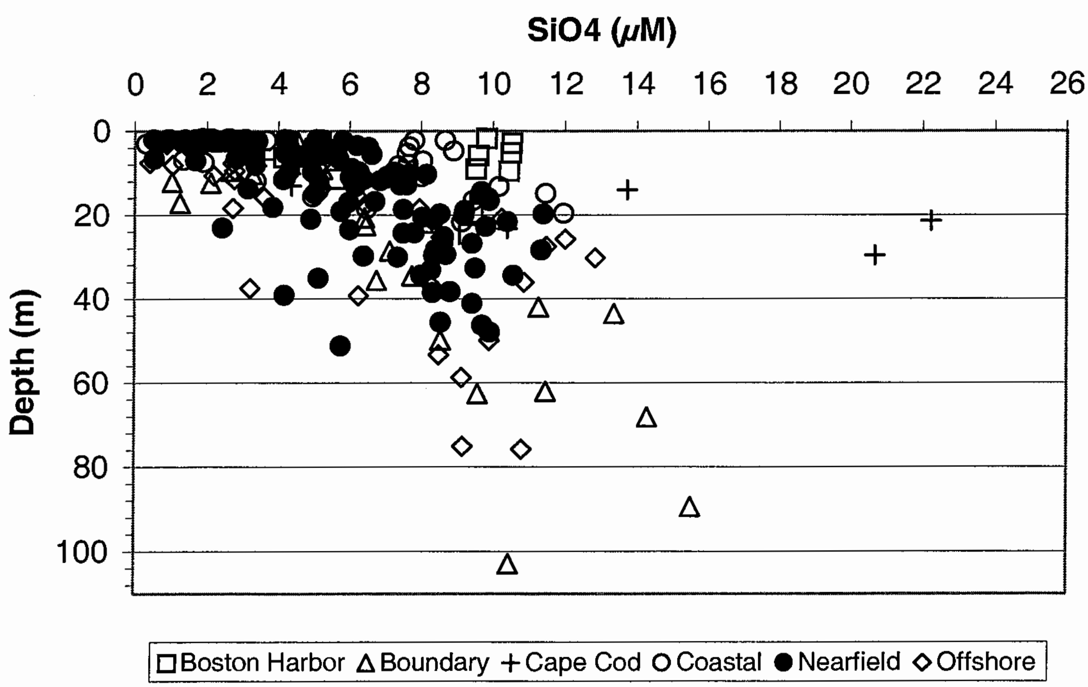
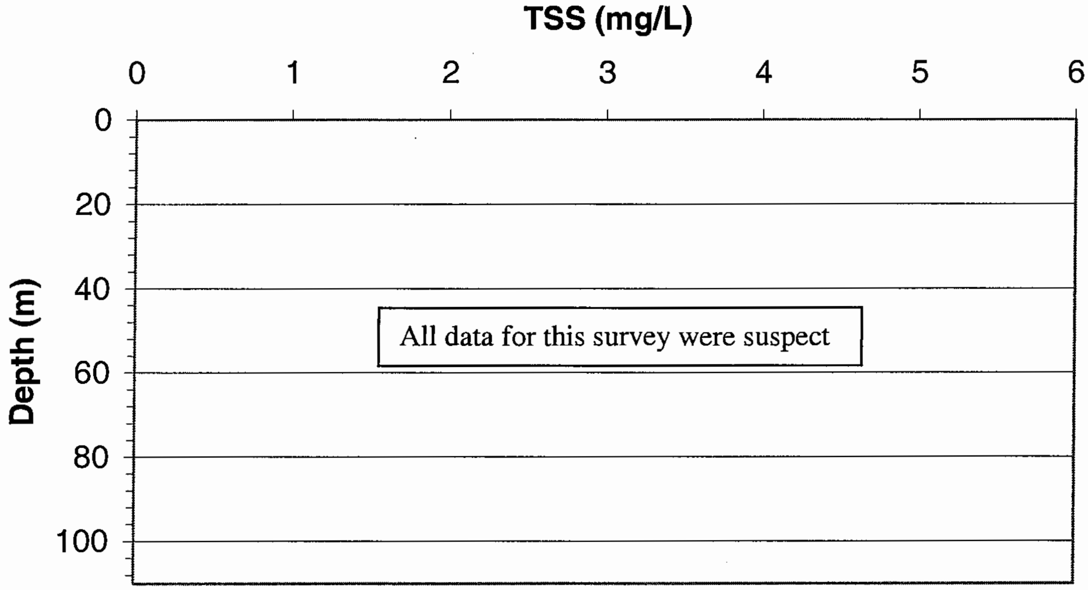


Figure D-18. Depth vs. Nutrient Plots for Farfield Survey WF99B, (Aug 99)

(a)



(b)

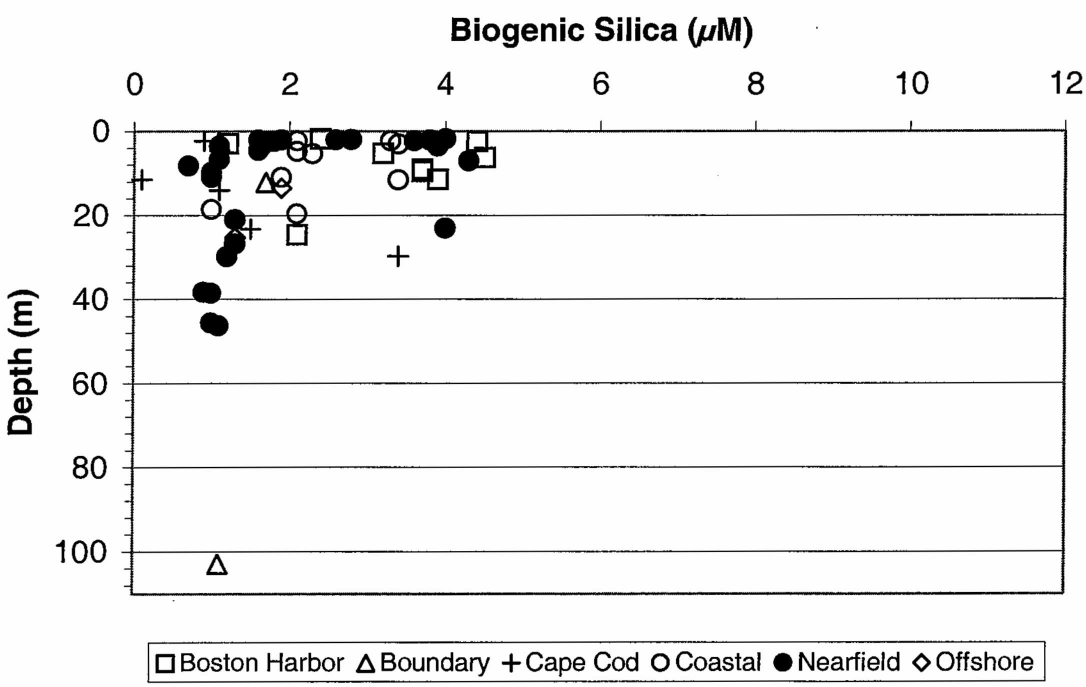
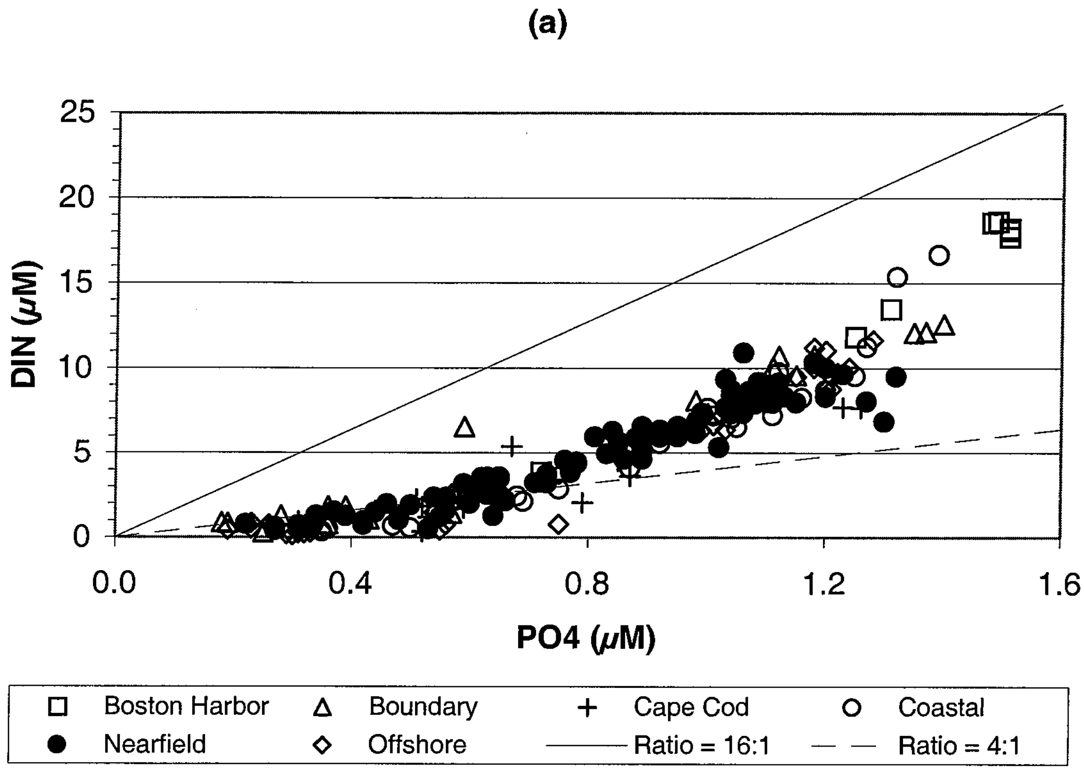


Figure D-19. Depth vs. Nutrient Plots for Farfield Survey WF99B, (Aug 99)



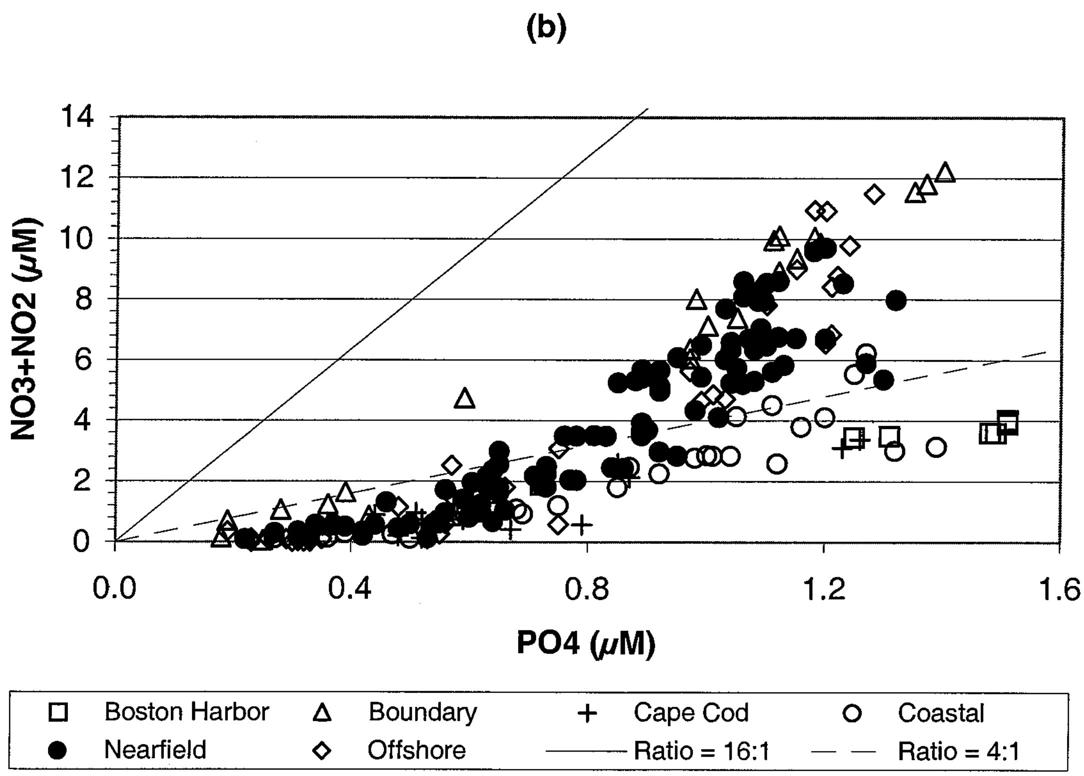
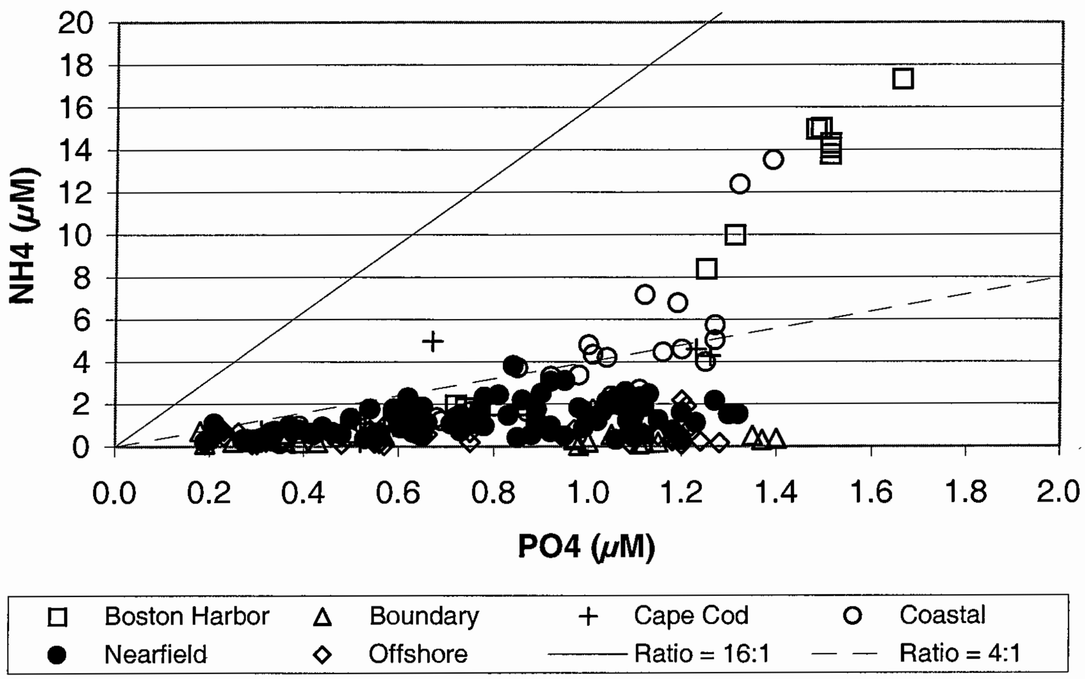


Figure D-20. Nutrient vs. Nutrient Plots for Farfield Survey WF99B, (Aug 99)

(a)



(b)

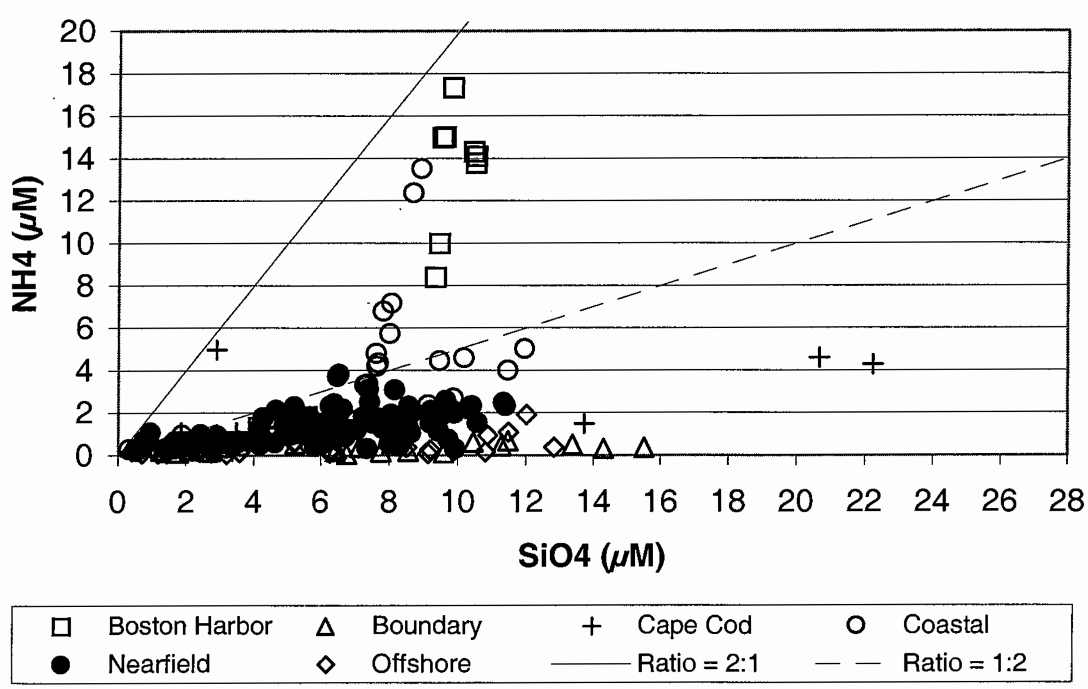
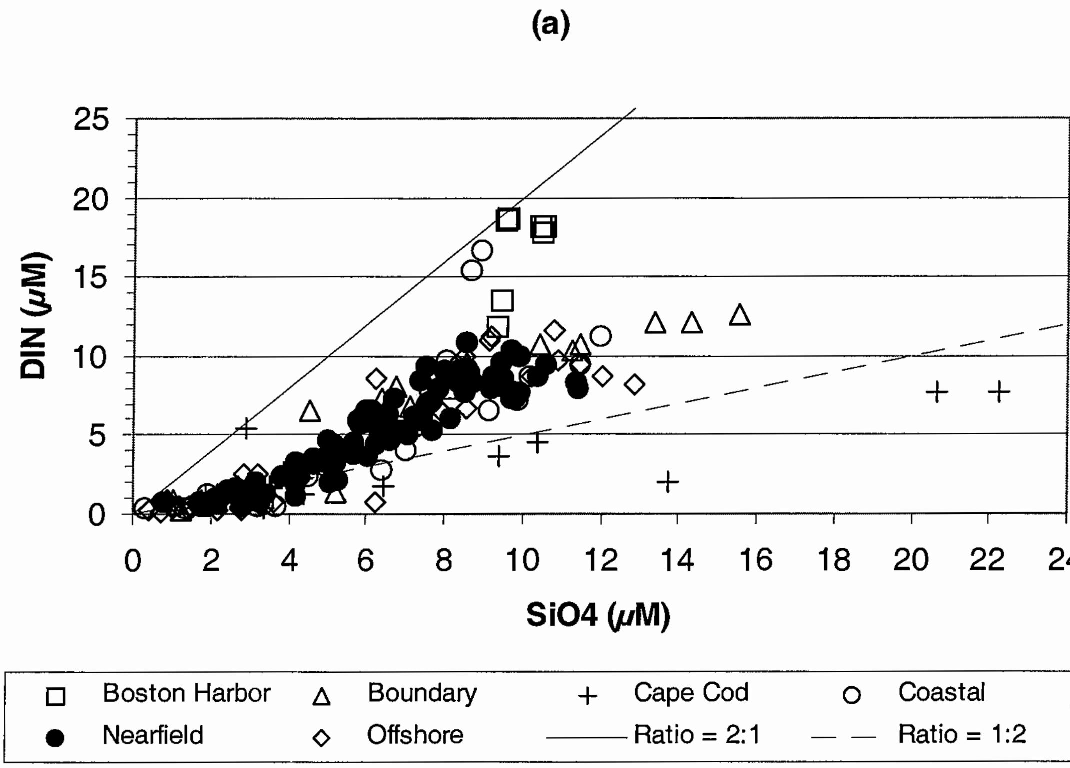


Figure D-21. Nutrient vs. Nutrient Plots for Farfield Survey WF99B, (Aug 99)



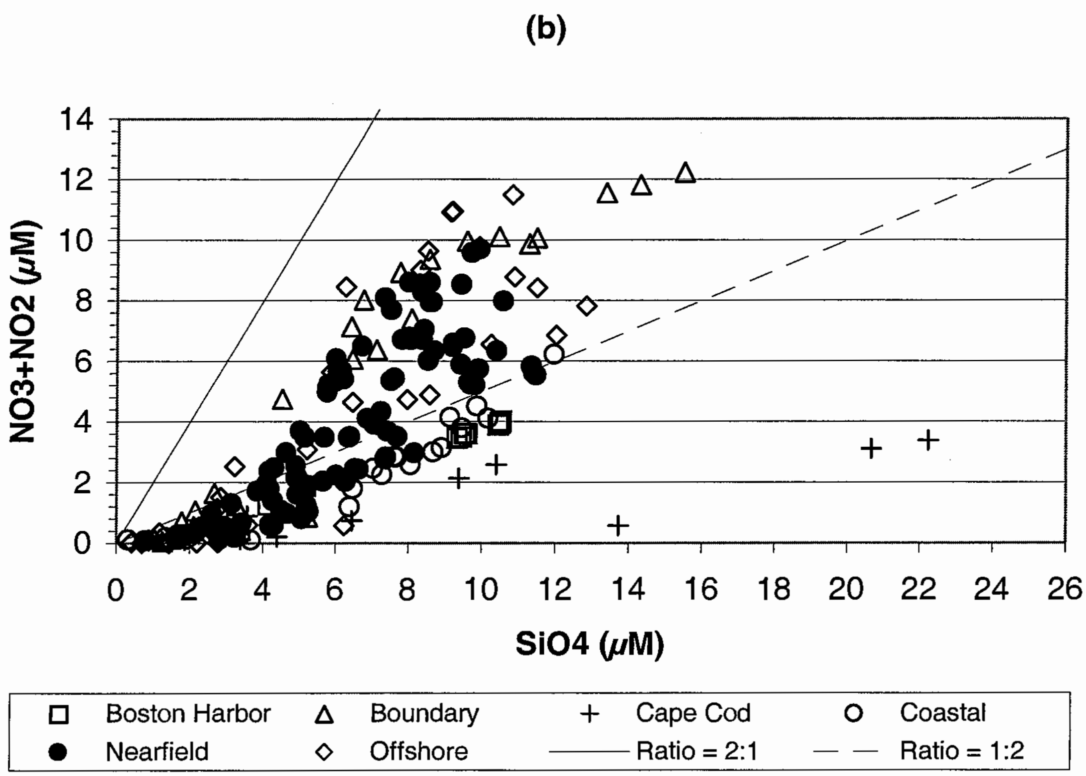
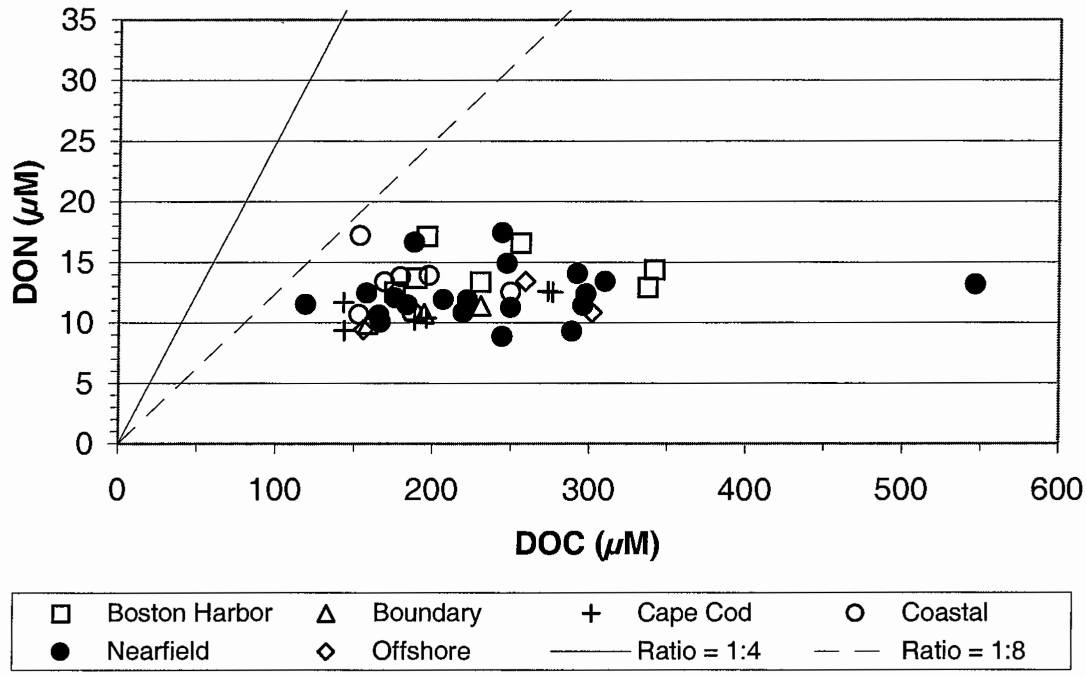


Figure D-22. Nutrient vs. Nutrient Plots for Farfield Survey WF99B, (Aug 99)

(a)



(b)

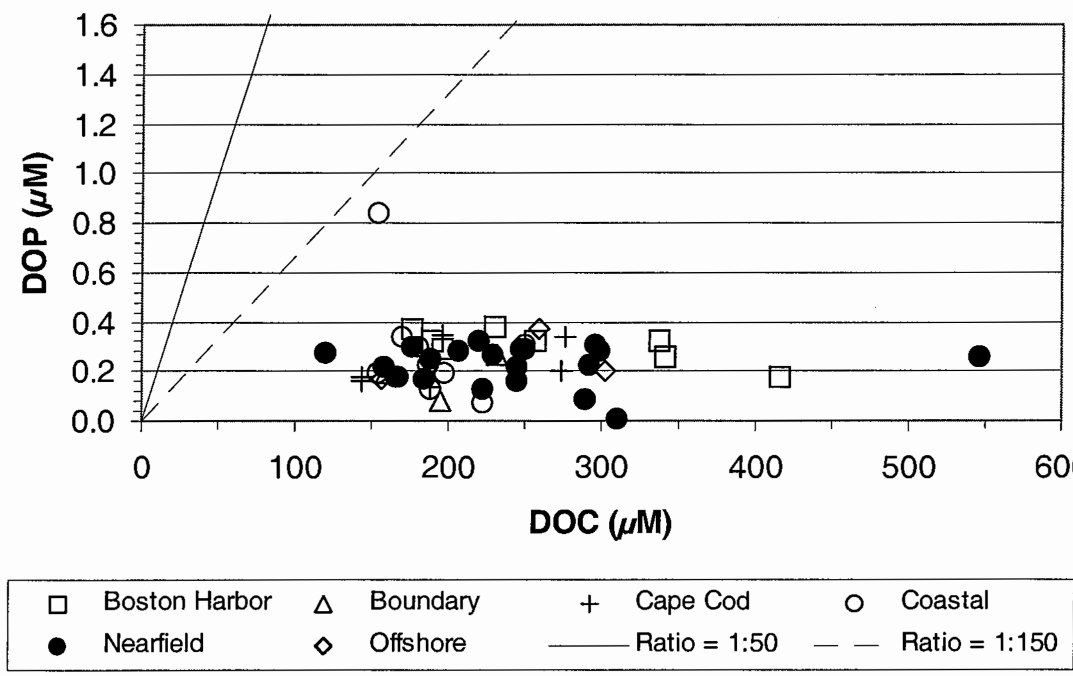
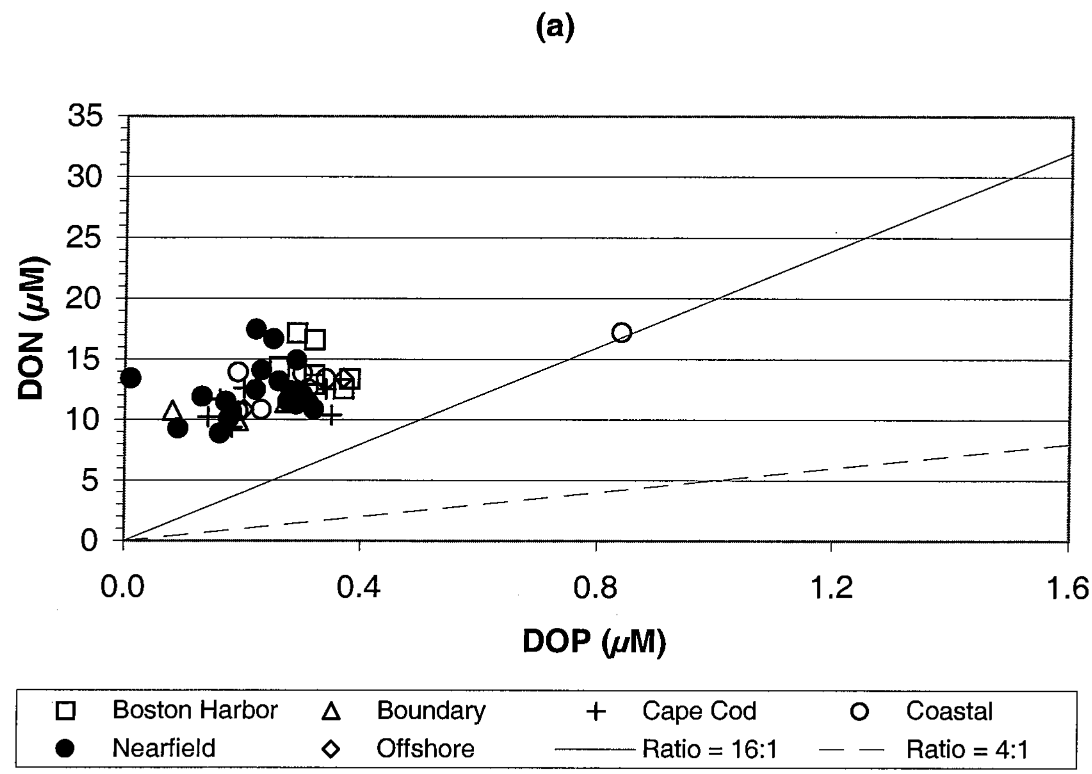


Figure D-23. Nutrient vs. Nutrient Plots for Farfield Survey WF99B, (Aug 99)



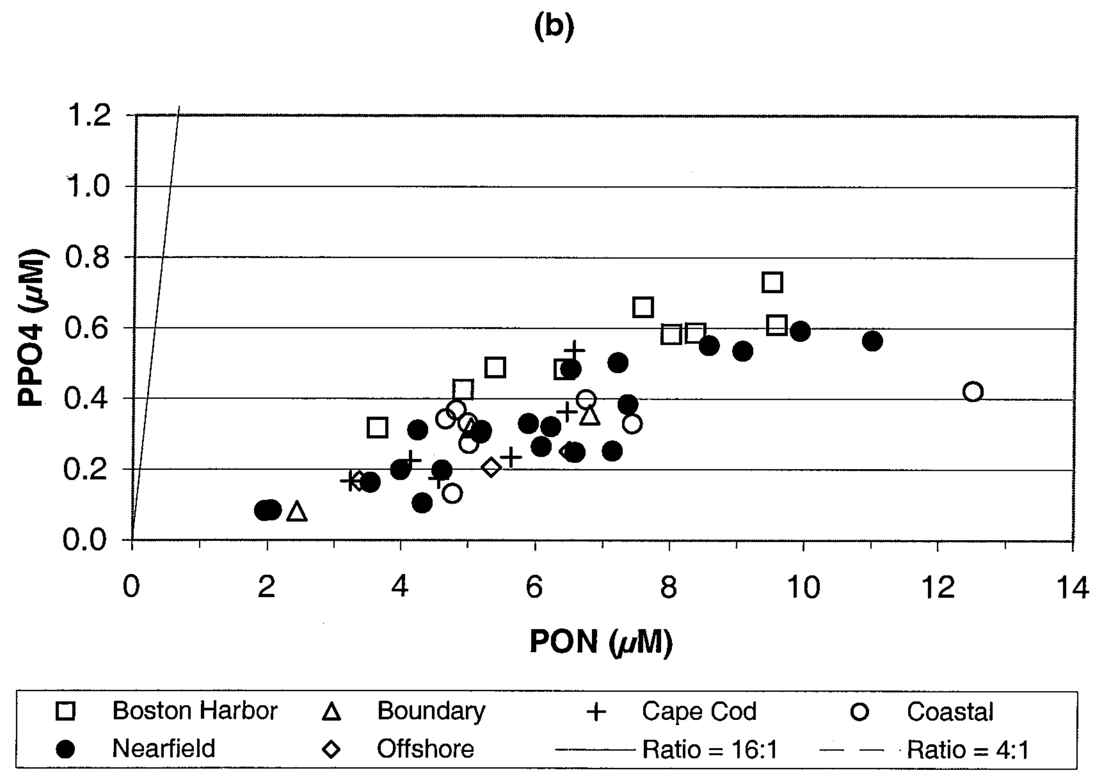


Figure D-24. Nutrient vs. Nutrient Plots for Farfield Survey WF99B, (Aug 99)

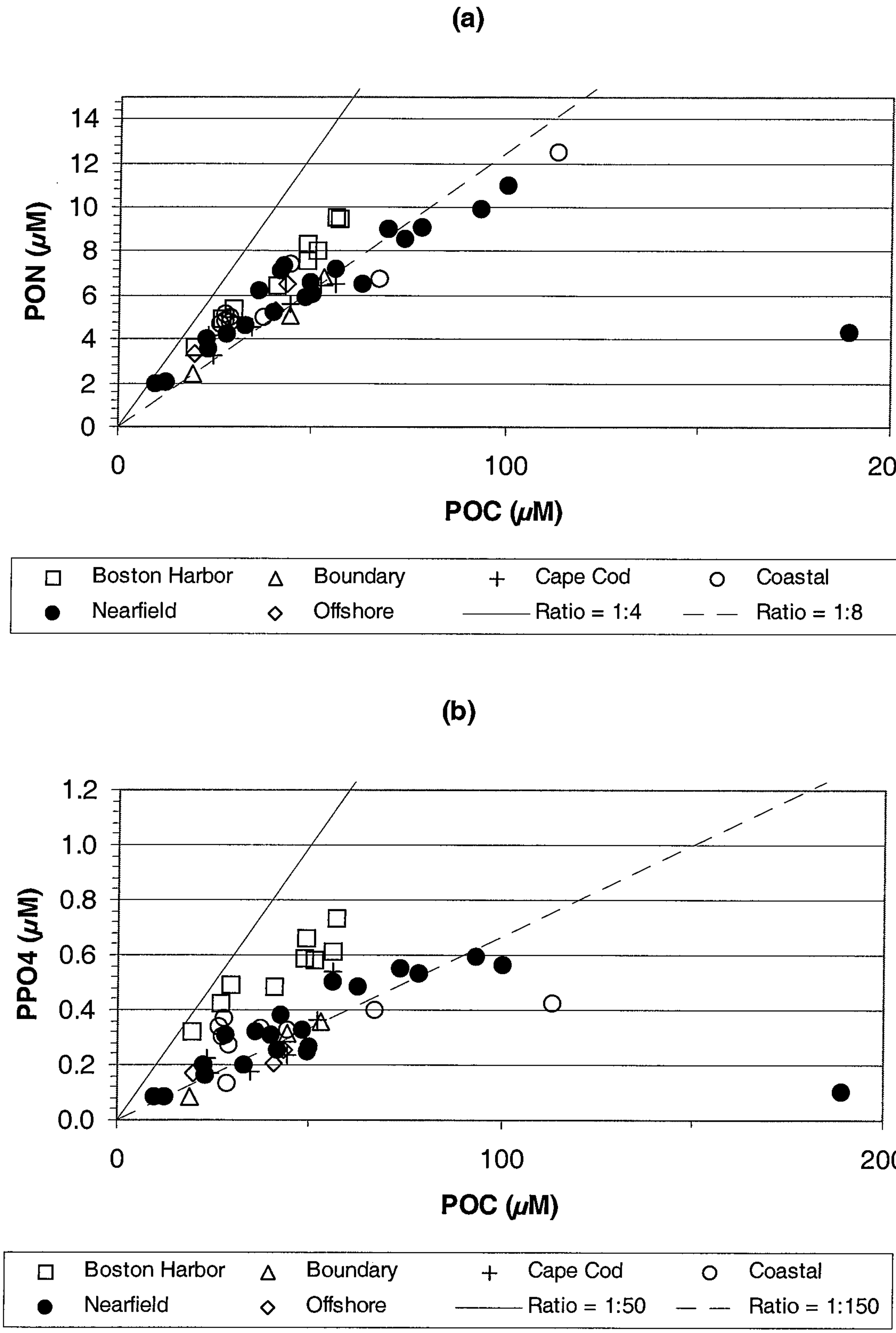
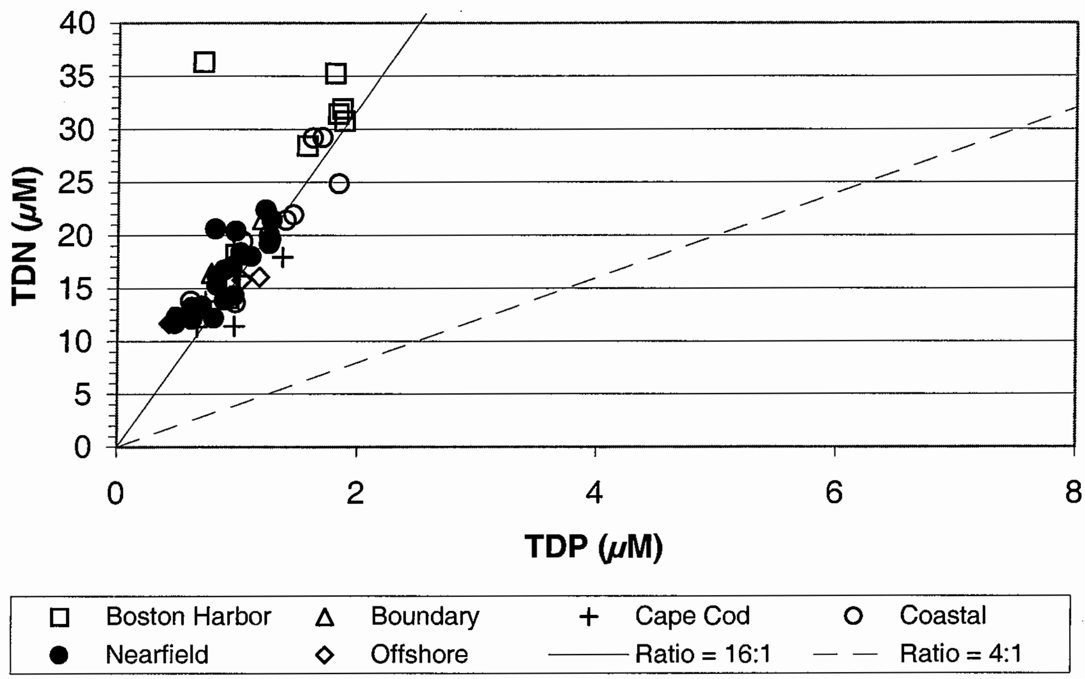


Figure D-25. Nutrient vs. Nutrient Plots for Farfield Survey WF99B, (Aug 99)

(a)



(b)

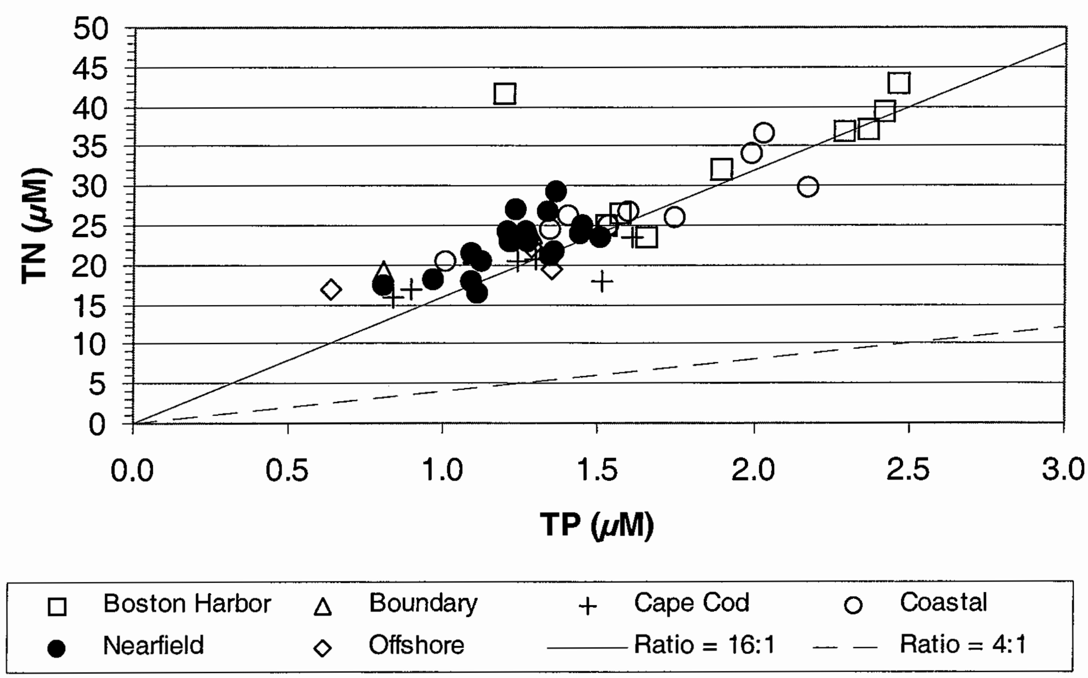
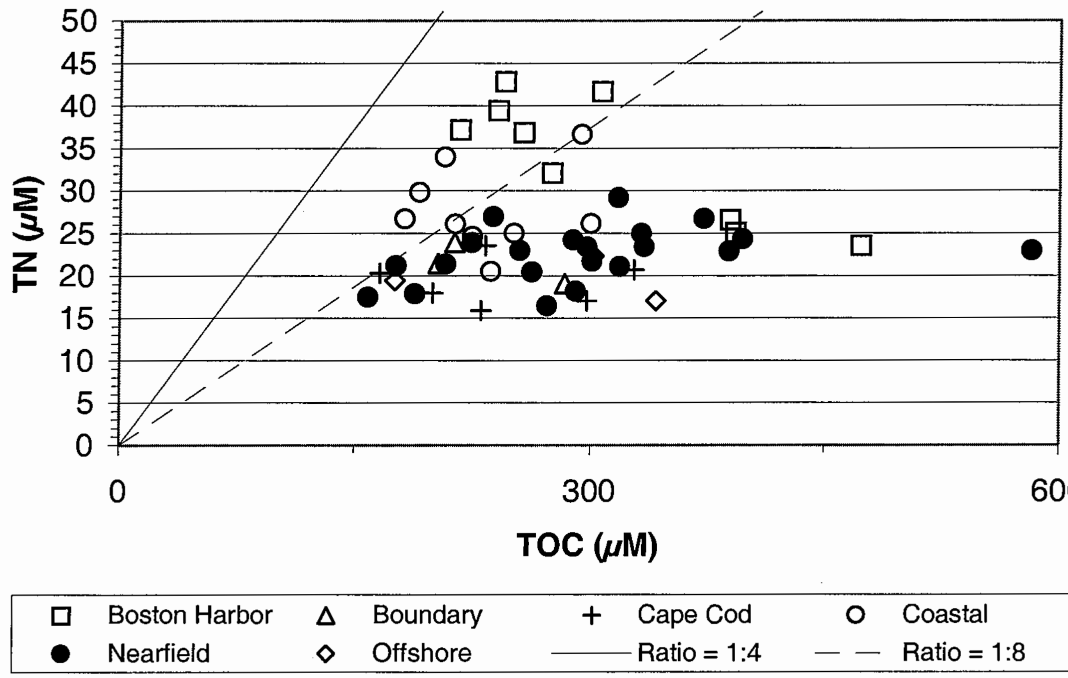


Figure D-26. Nutrient vs. Nutrient Plots for Farfield Survey WF99B, (Aug 99)

(a)



(b)

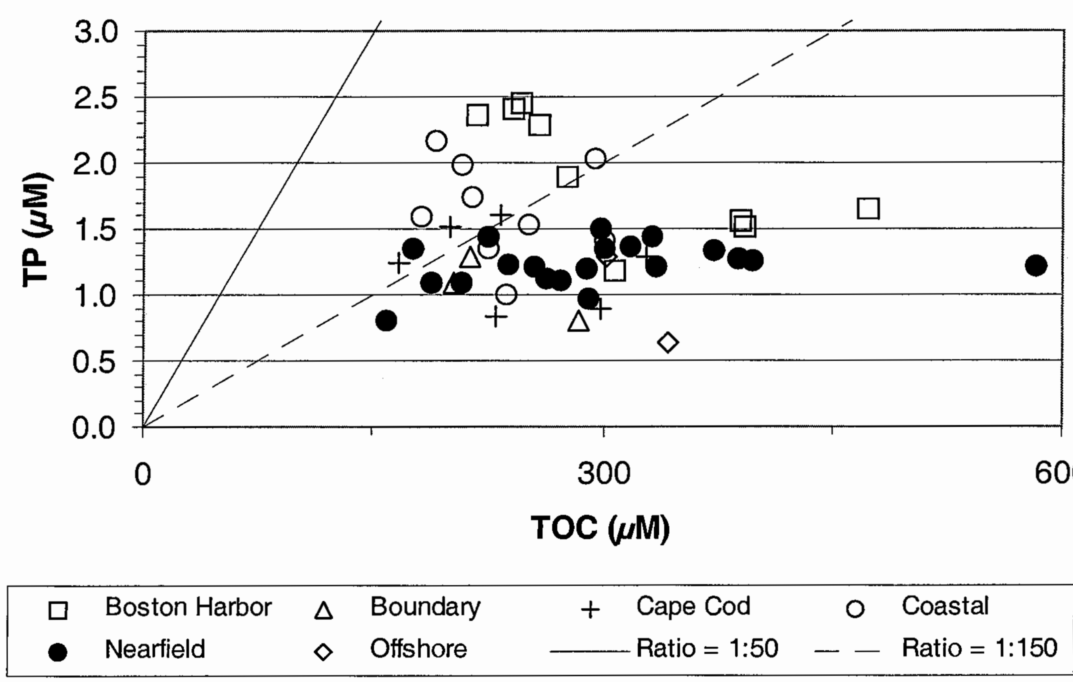


Figure D-27. Nutrient vs. Nutrient Plots for Farfield Survey WF99B, (Aug 99)

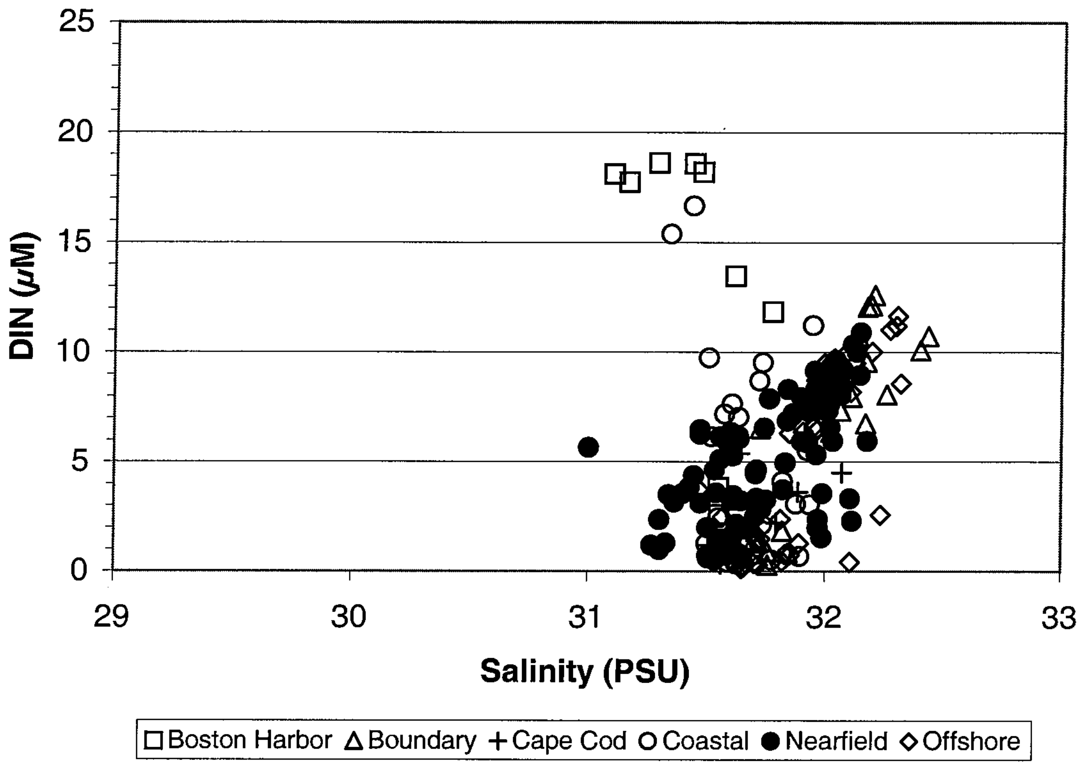
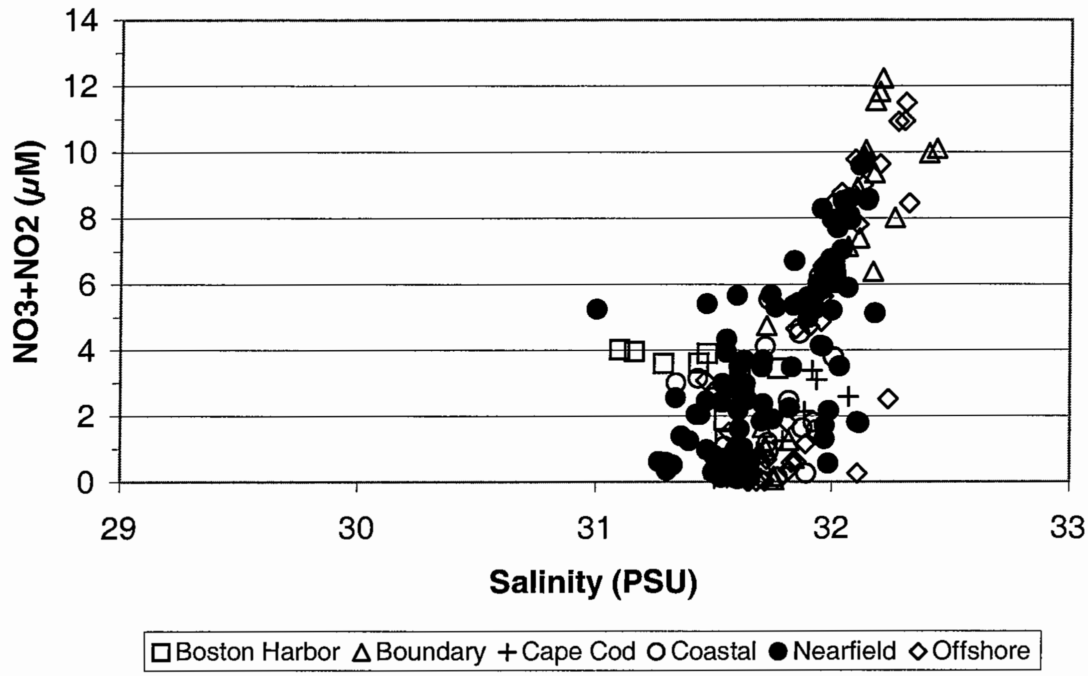


Figure D-28. Nutrient vs. Salinity Plots for Farfield Survey WF99B, (Aug 99)

(a)



(b)

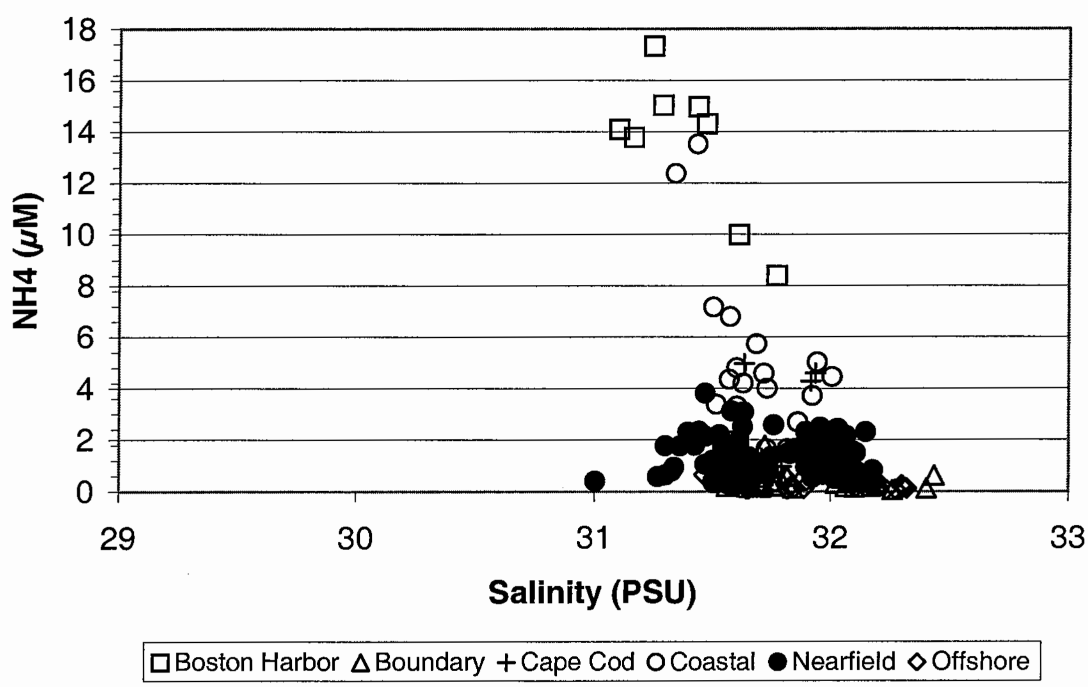


Figure D-29. Nutrient vs. Salinity Plots for Farfield Survey WF99B, (Aug 99)

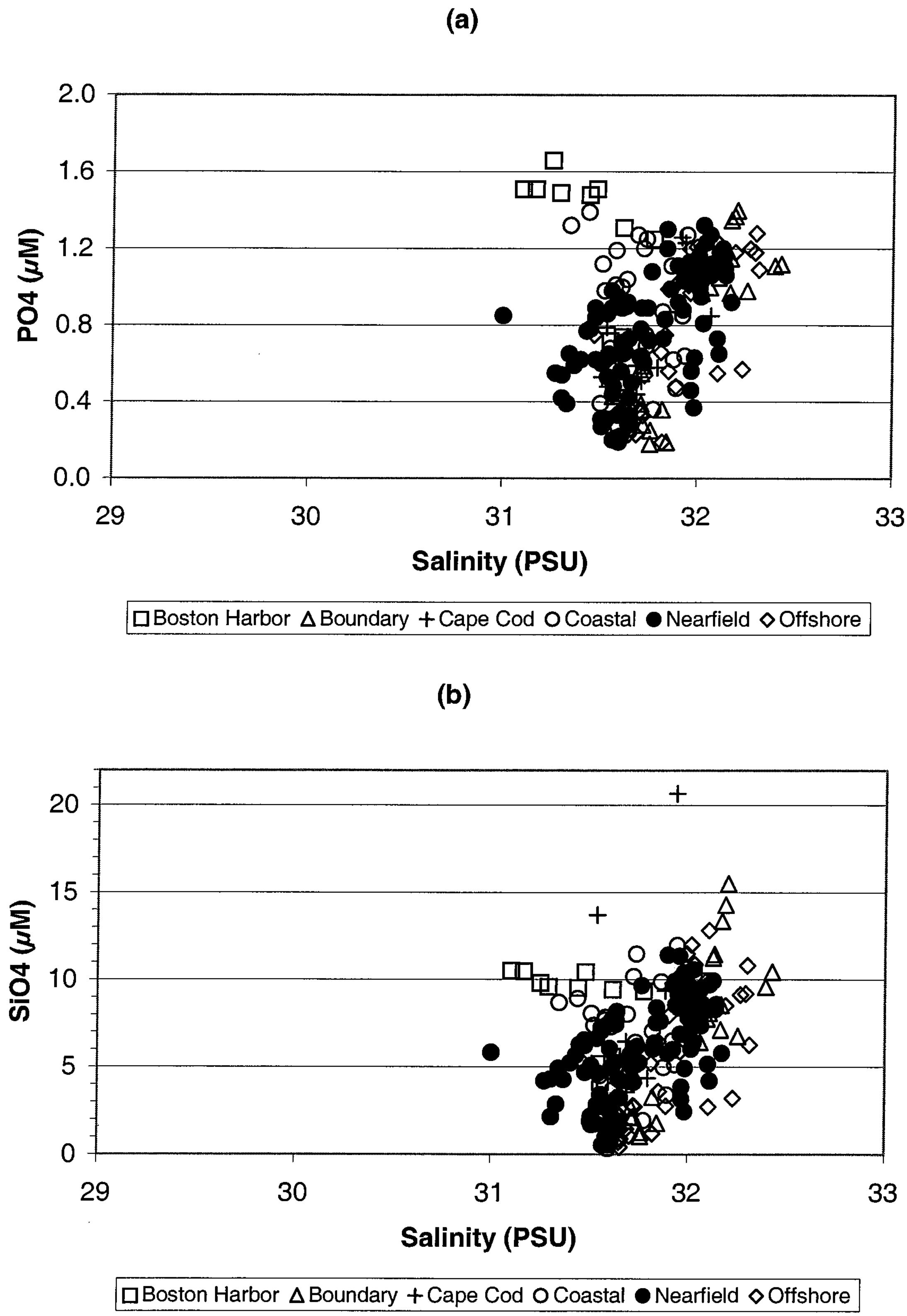


Figure D-30. Nutrient vs. Salinity Plots for Farfield Survey WF99B, (Aug 99)

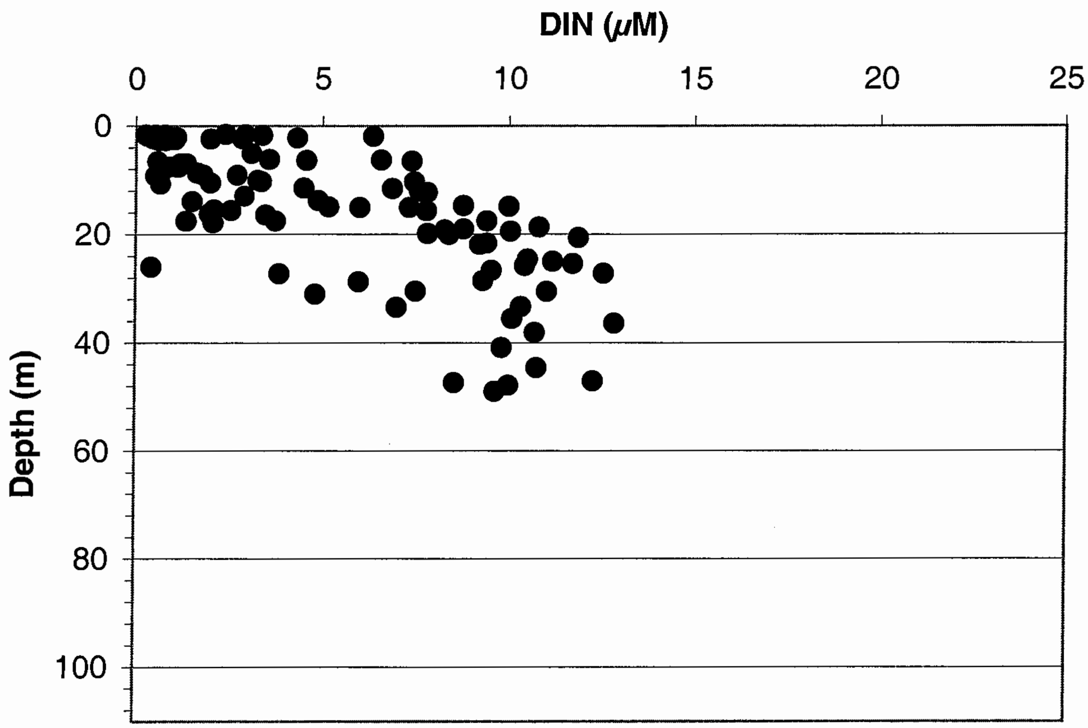
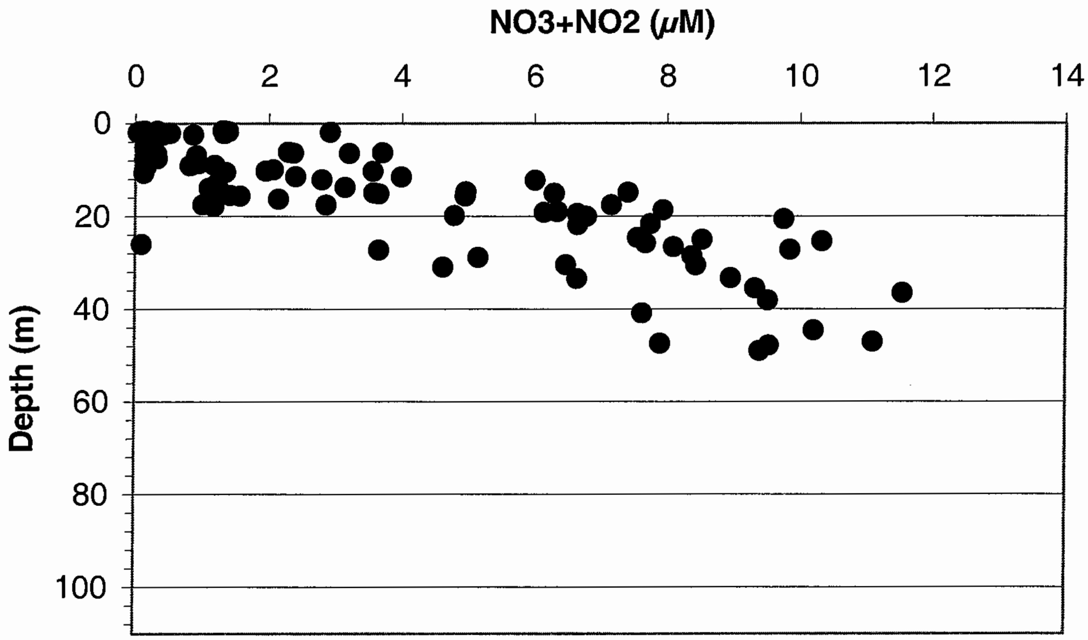


Figure D-31. Depth vs. Nutrient Plots for Nearfield Survey WN99C, (Sep 99)

(a)



(b)

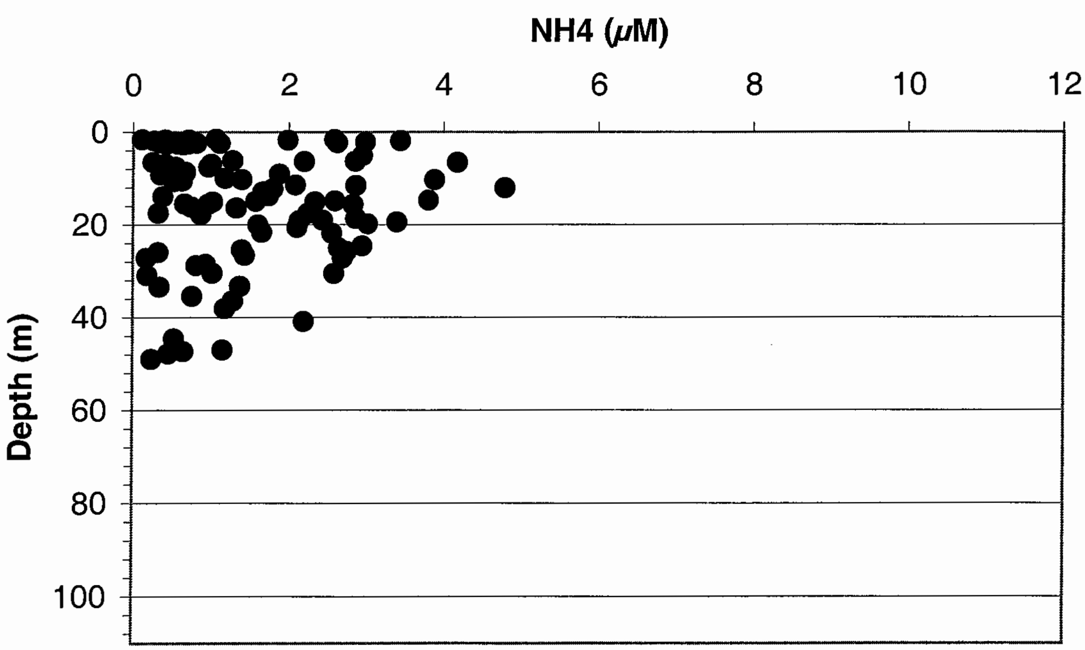
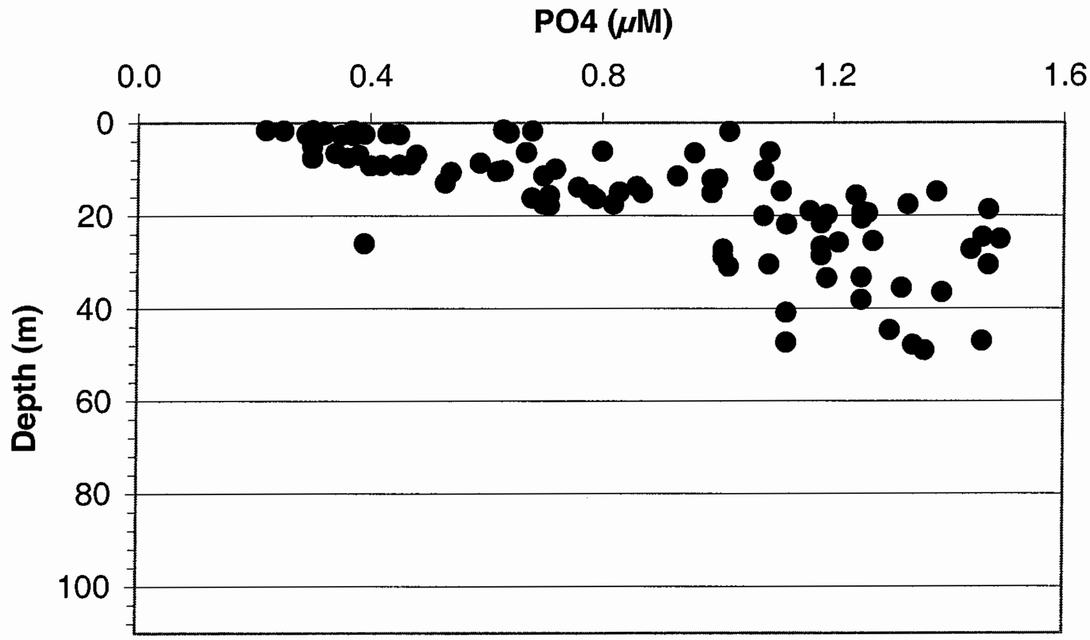


Figure D-32. Depth vs. Nutrient Plots for Nearfield Survey WN99C, (Sep 99)

(a)



(b)

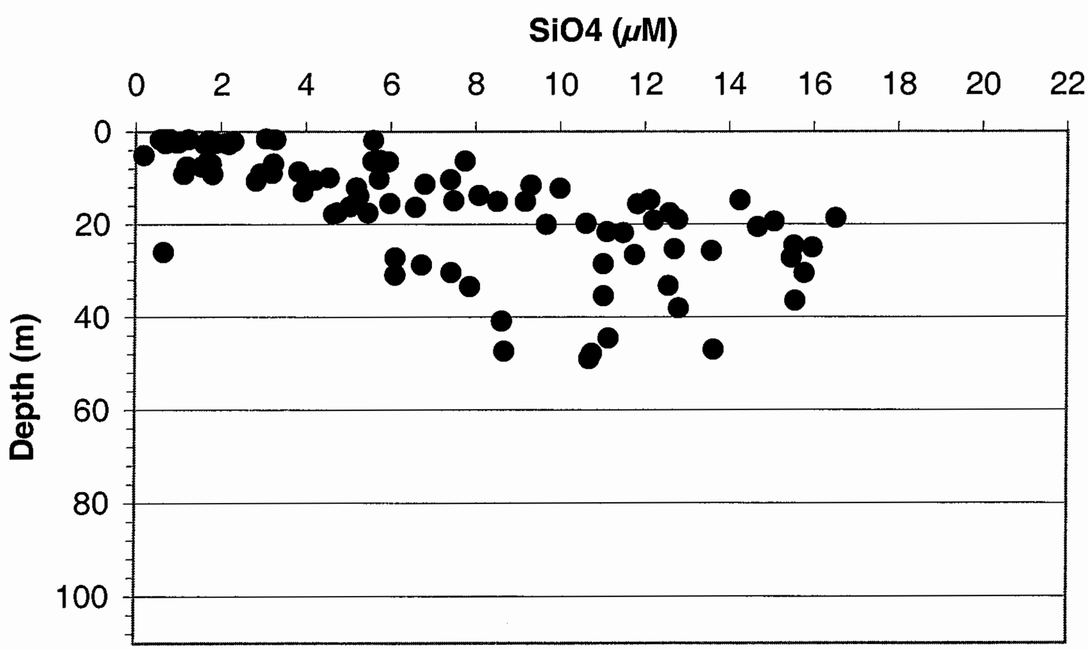
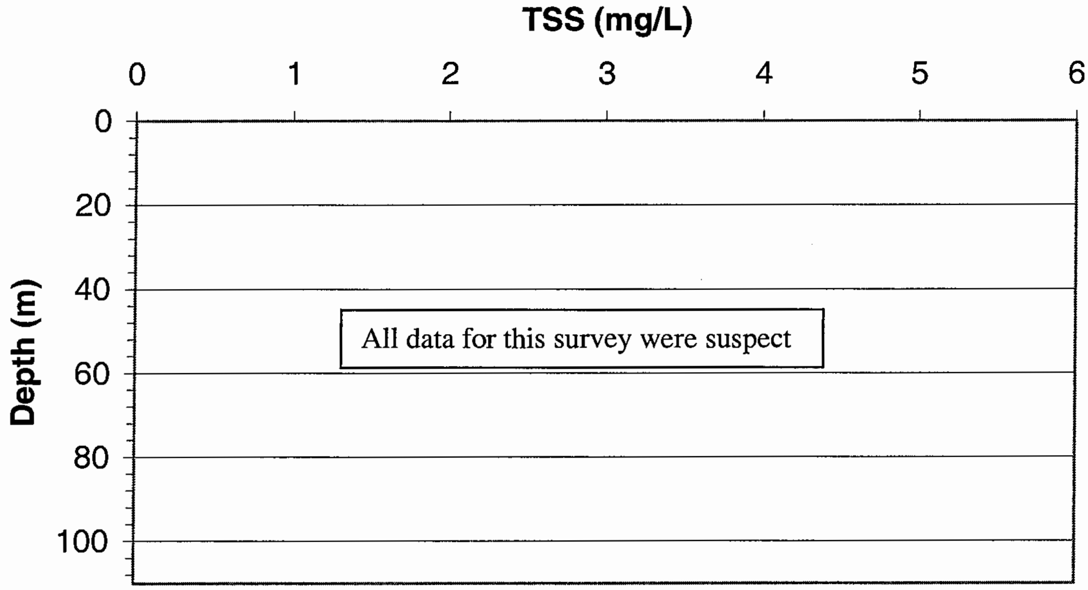


Figure D-33. Depth vs. Nutrient Plots for Nearfield Survey WN99C, (Sep 99)

(a)



(b)

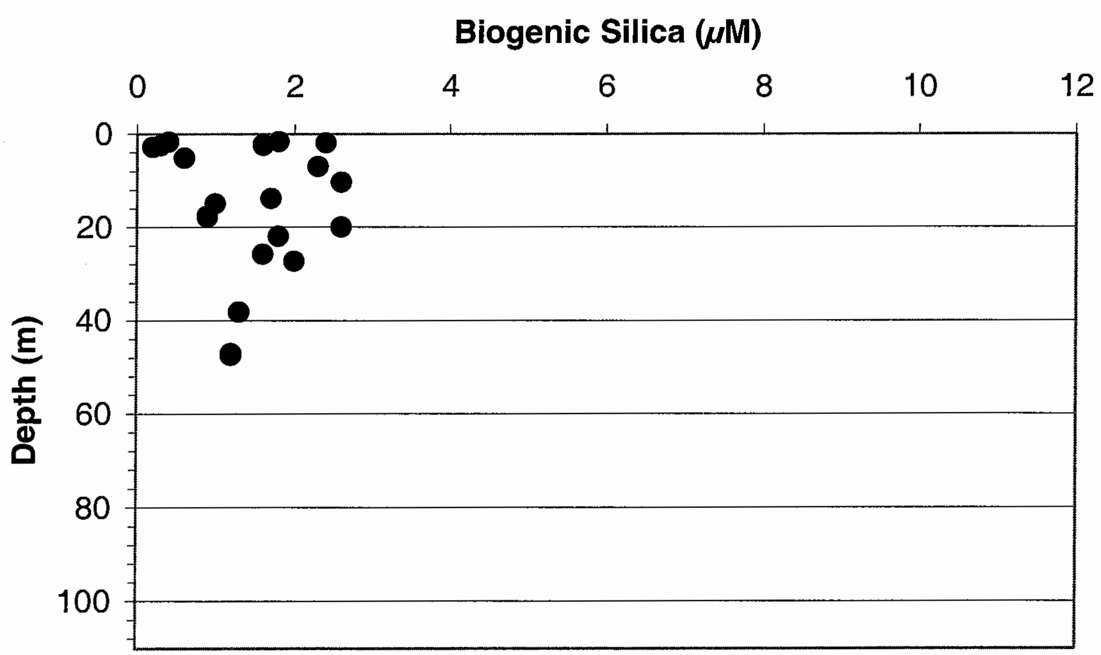
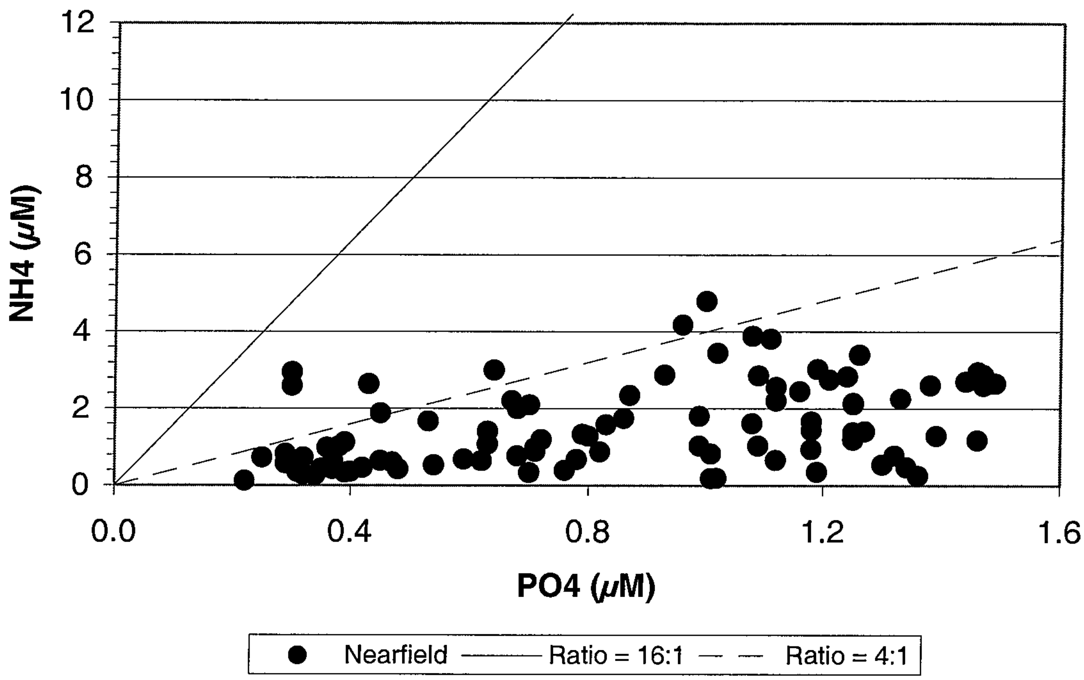


Figure D-34. Depth vs. Nutrient Plots for Nearfield Survey WN99C, (Sep 99)

(a)



(b)

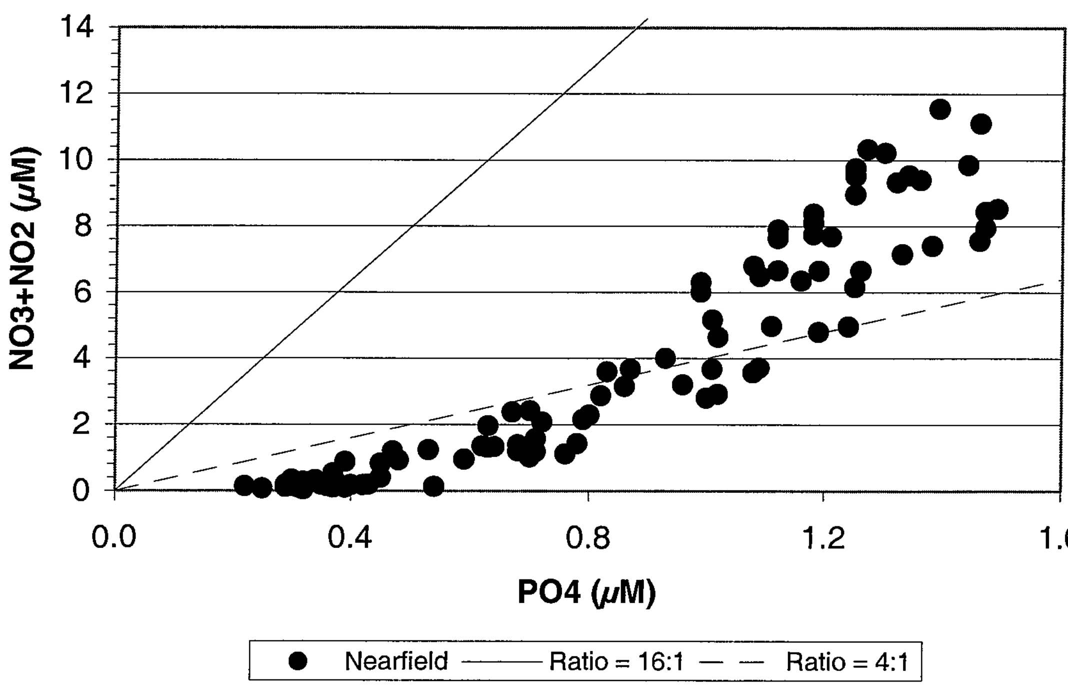
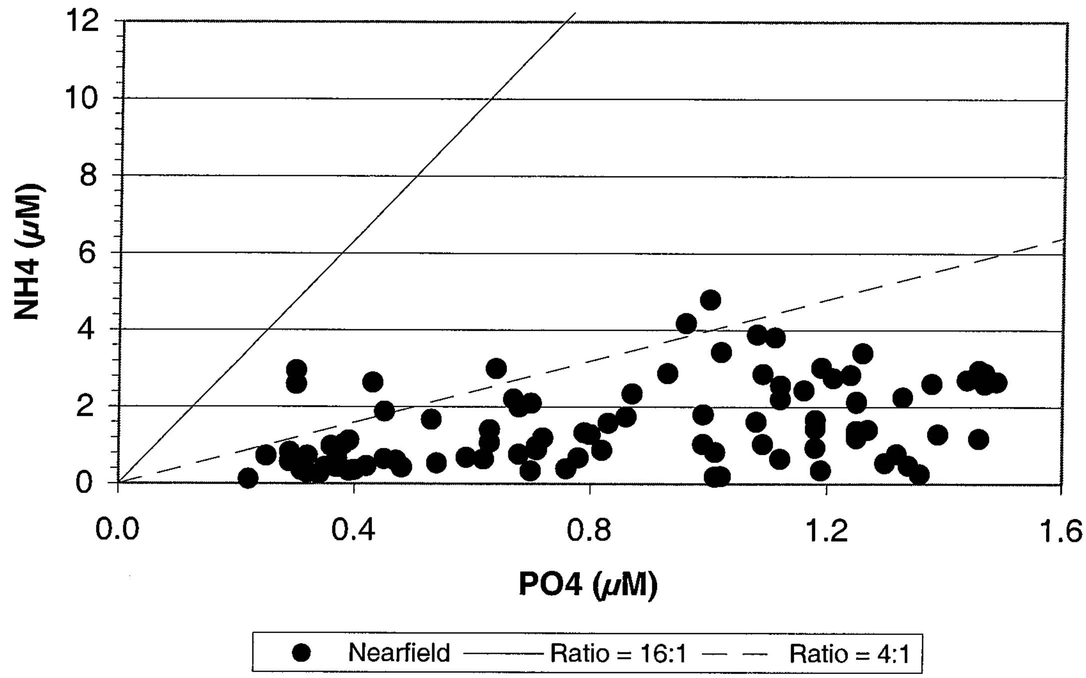


Figure D-35. Nutrient vs. Nutrient Plots for Nearfield Survey WN99C, (Sep 99)

(a)



(b)

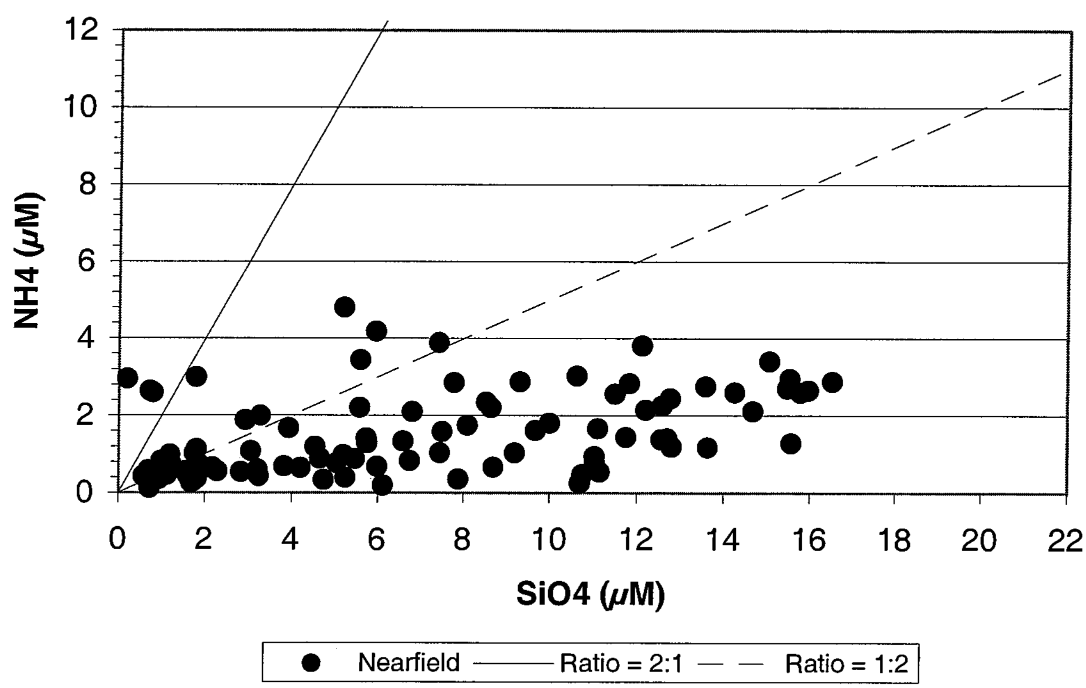
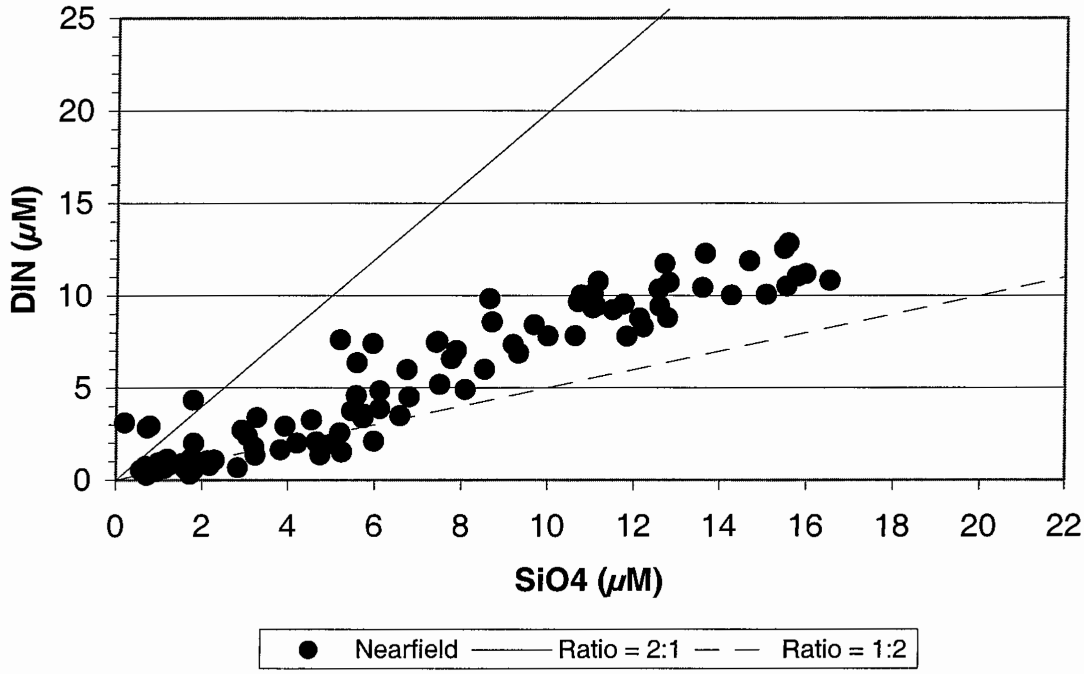


Figure D-36. Nutrient vs. Nutrient Plots for Nearfield Survey WN99C, (Sep 99)

(a)



(b)

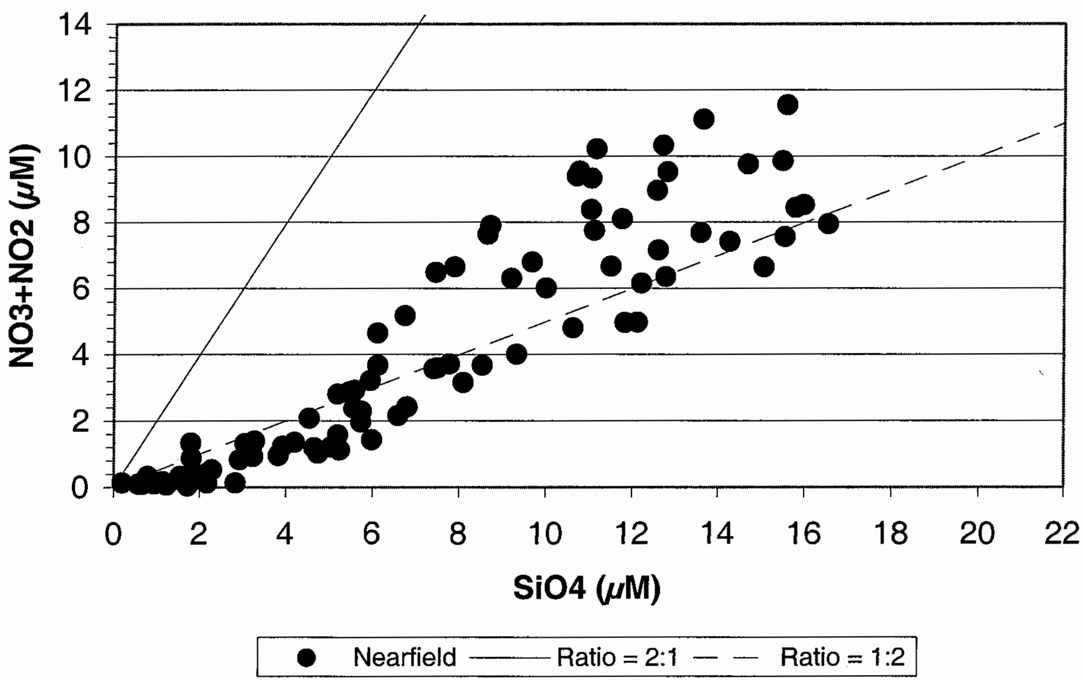
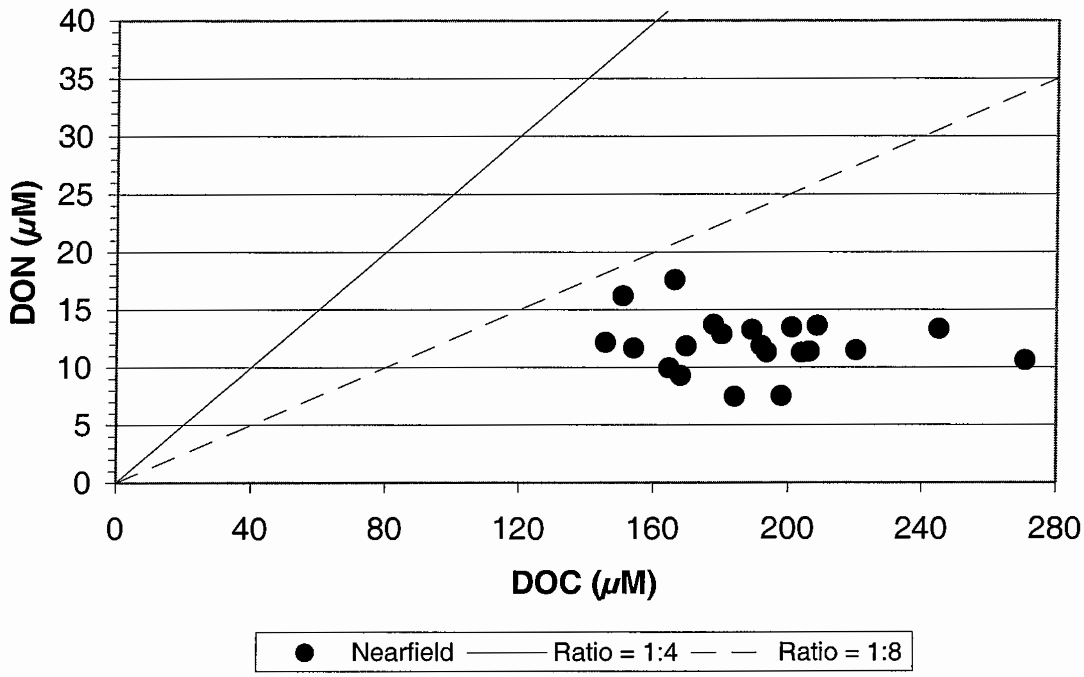


Figure D-37. Nutrient vs. Nutrient Plots for Nearfield Survey WN99C, (Sep 99)

(a)



(b)

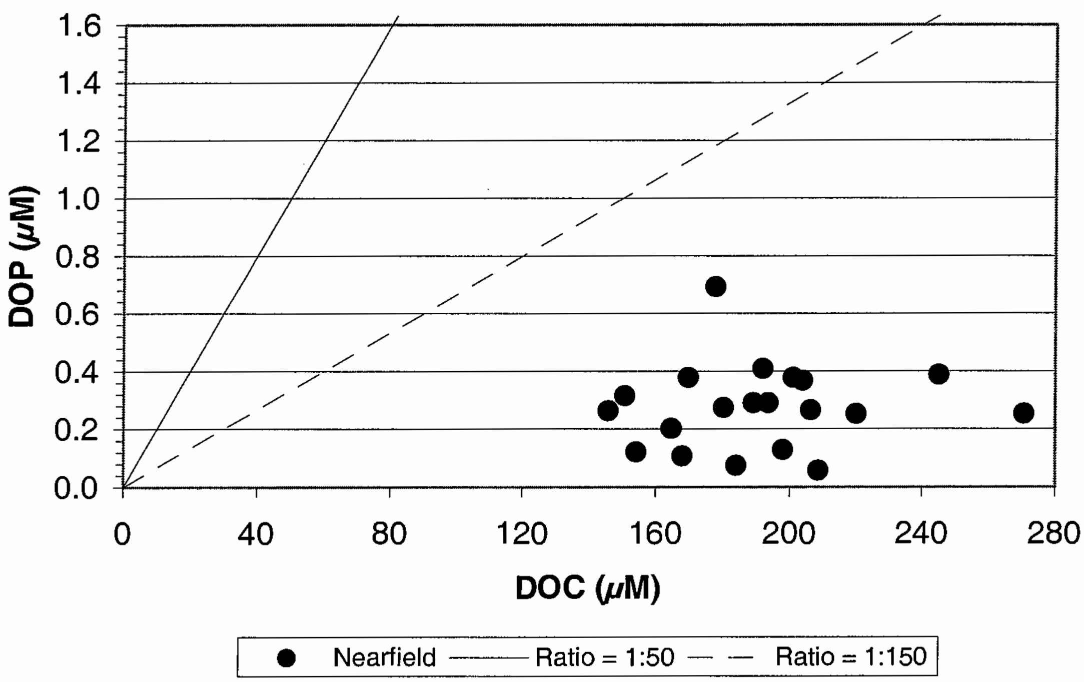
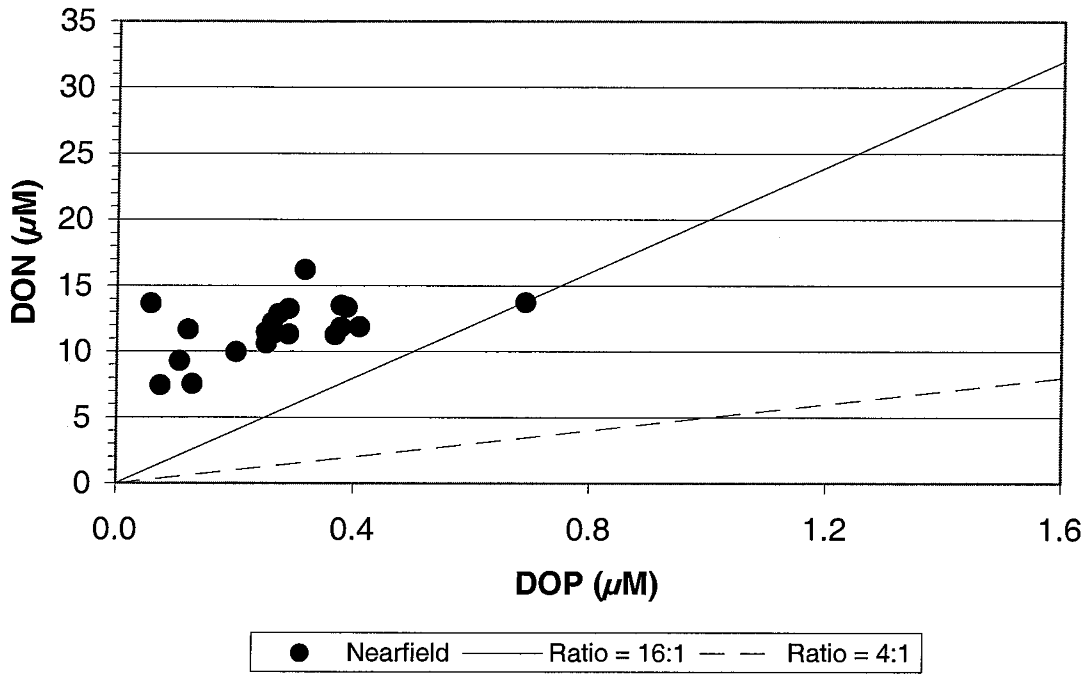


Figure D-38. Nutrient vs. Nutrient Plots for Nearfield Survey WN99C, (Sep 99)

(a)



(b)

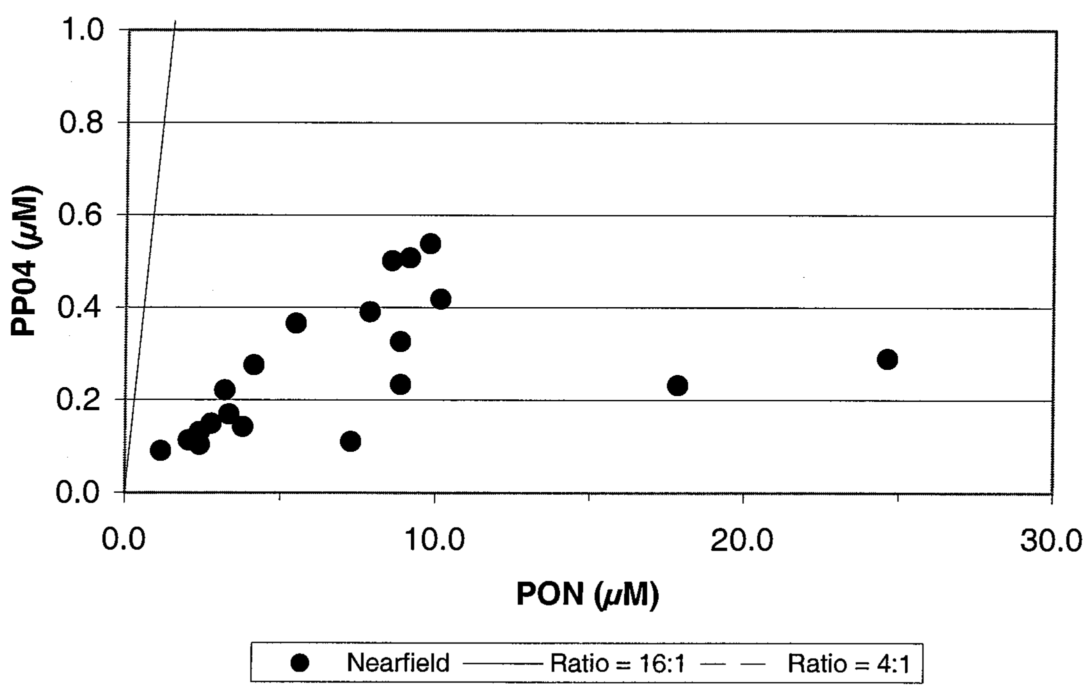
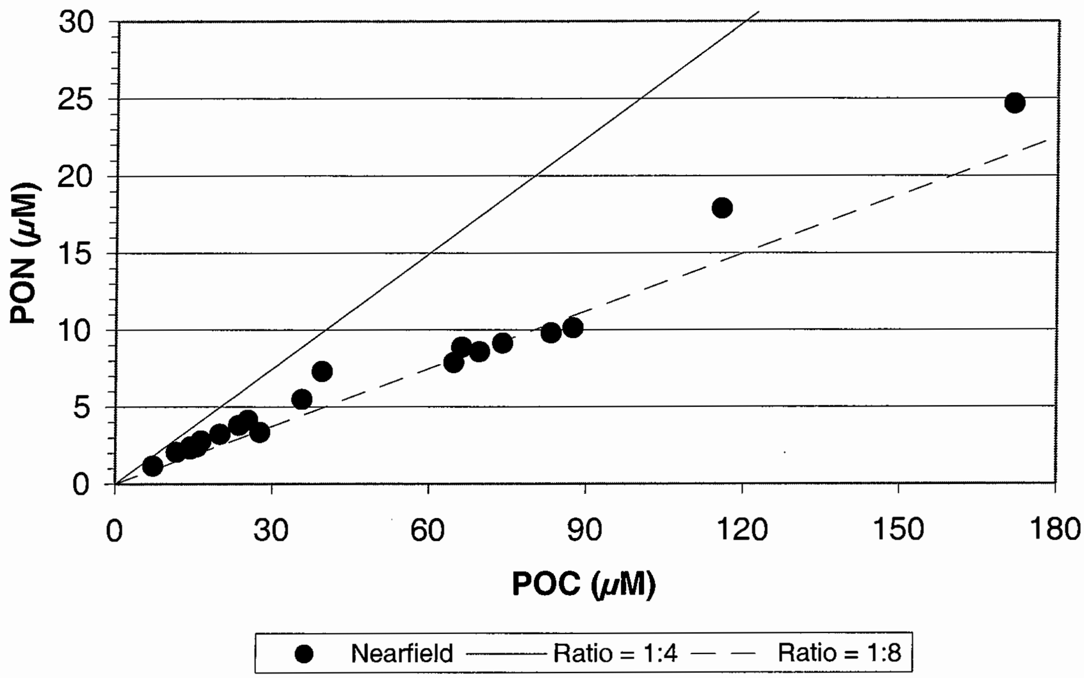


Figure D-39. Nutrient vs. Nutrient Plots for Nearfield Survey WN99C, (Sep 99)

(a)



(b)

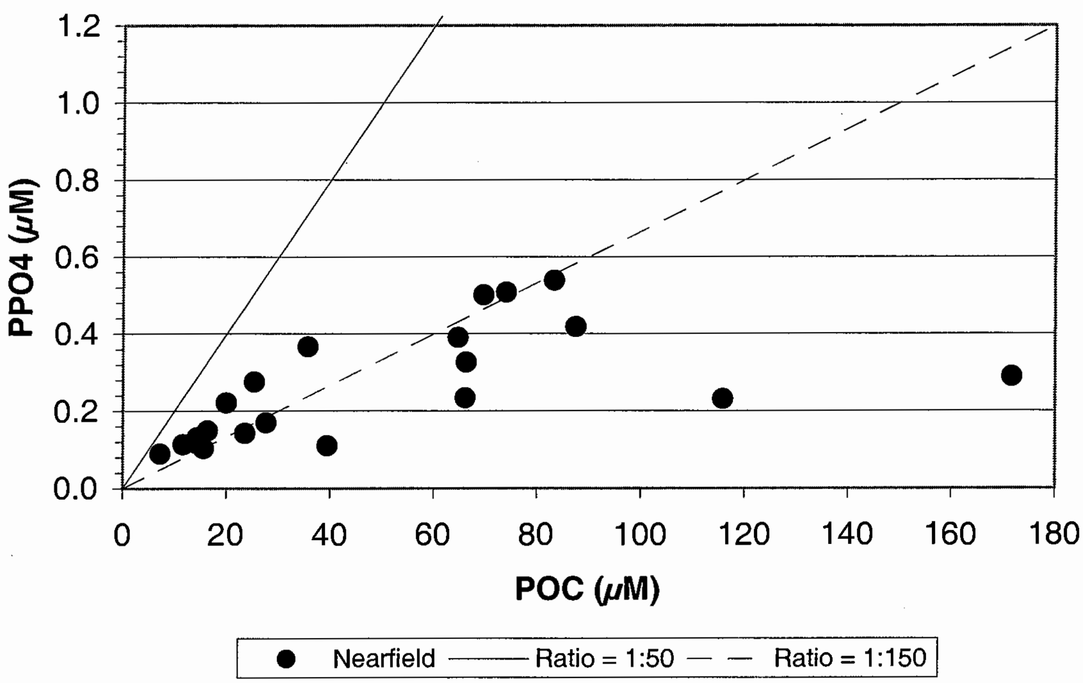
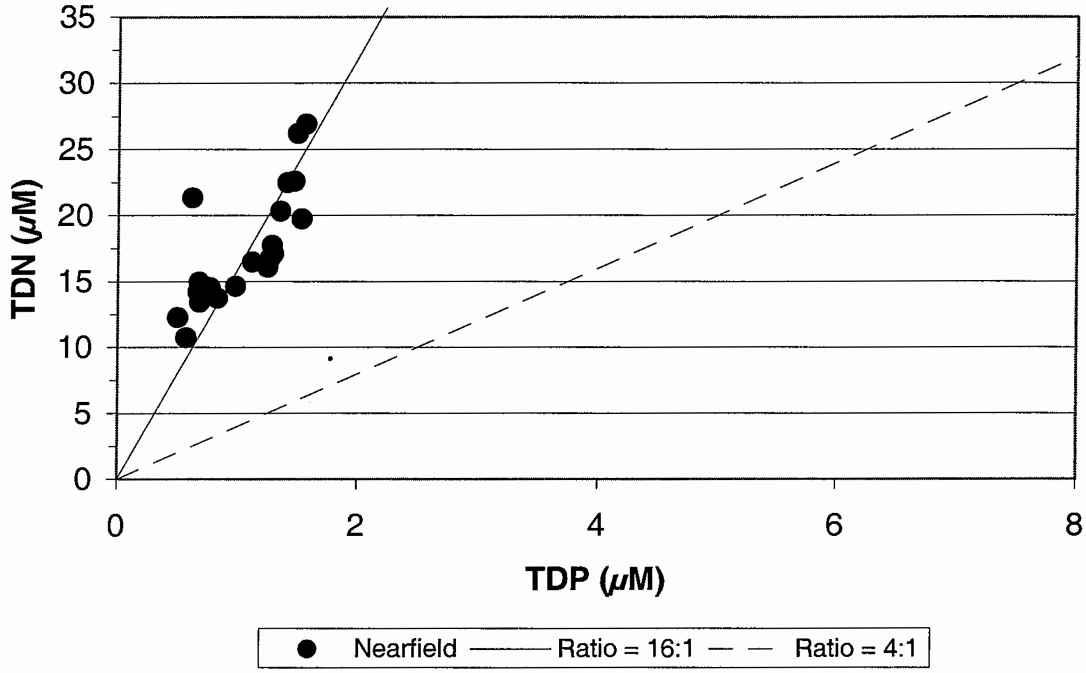


Figure D-40. Nutrient vs. Nutrient Plots for Nearfield Survey WN99C, (Sep 99)

(a)



(b)

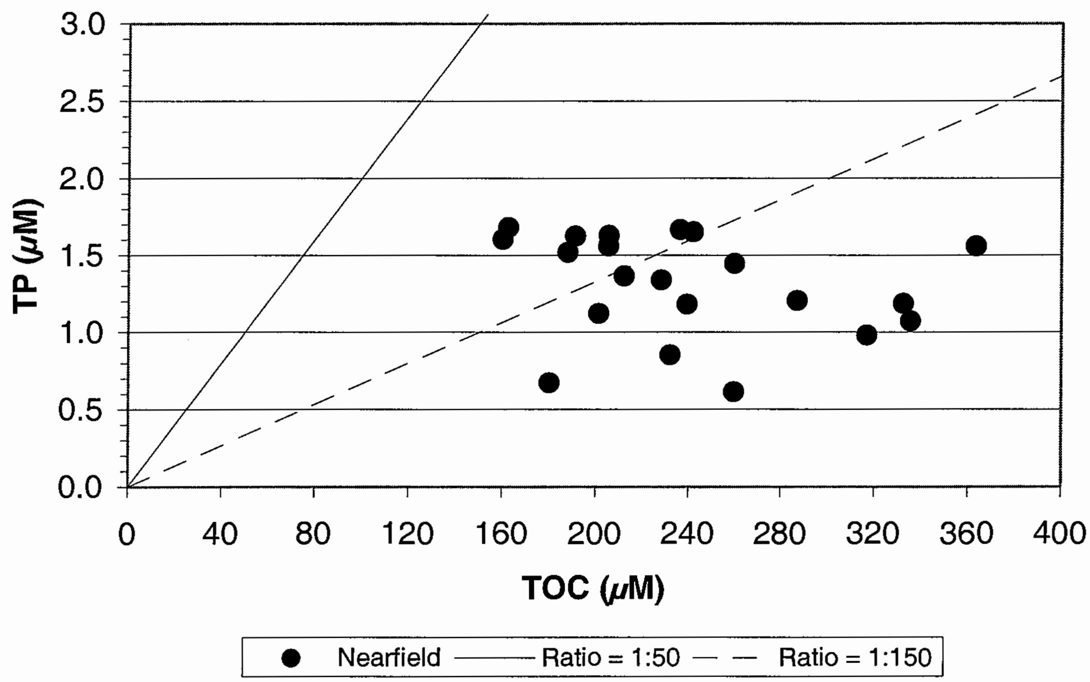
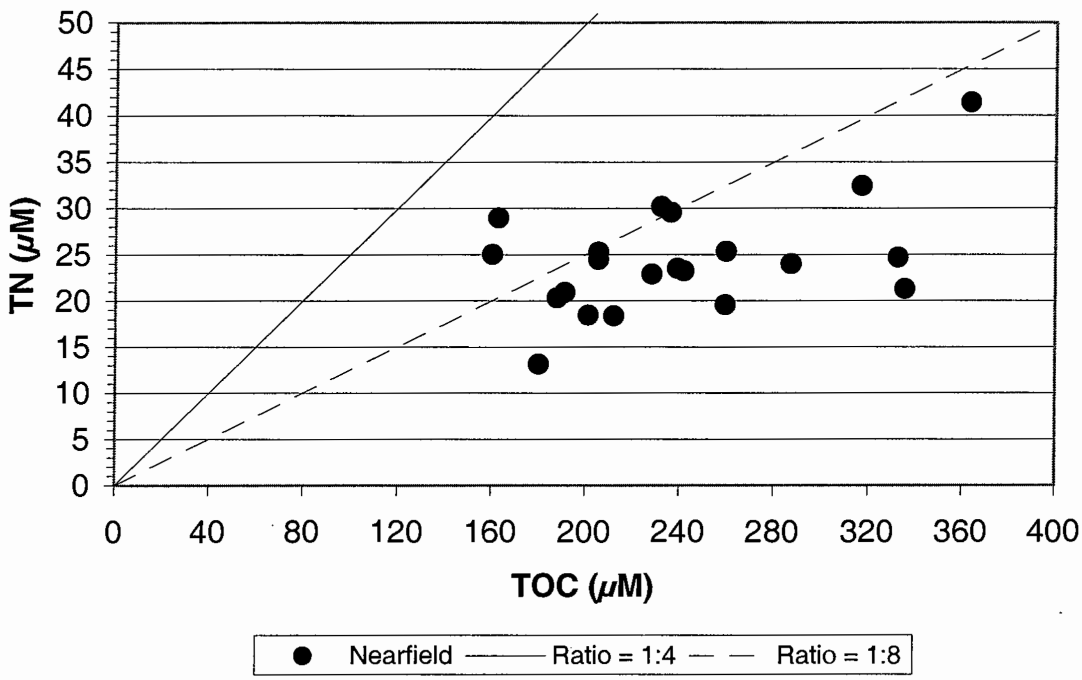


Figure D-41. Nutrient vs. Nutrient Plots for Nearfield Survey WN99C, (Sep 99)

(a)



(b)

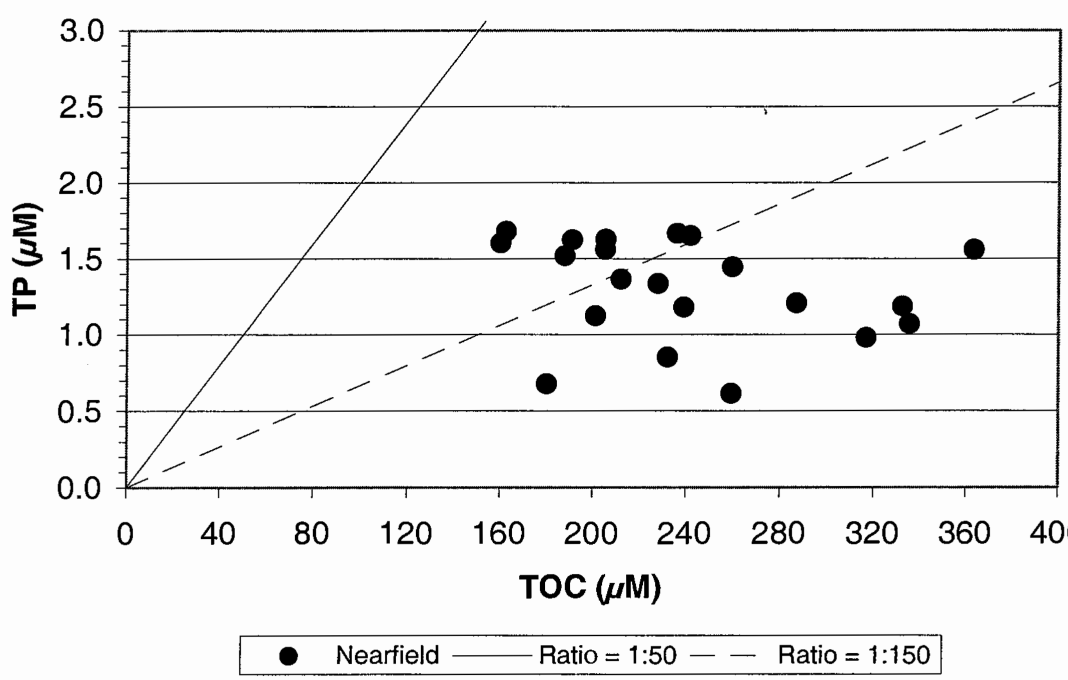


Figure D-42. Nutrient vs. Nutrient Plots for Nearfield Survey WN99C, (Sep 99)

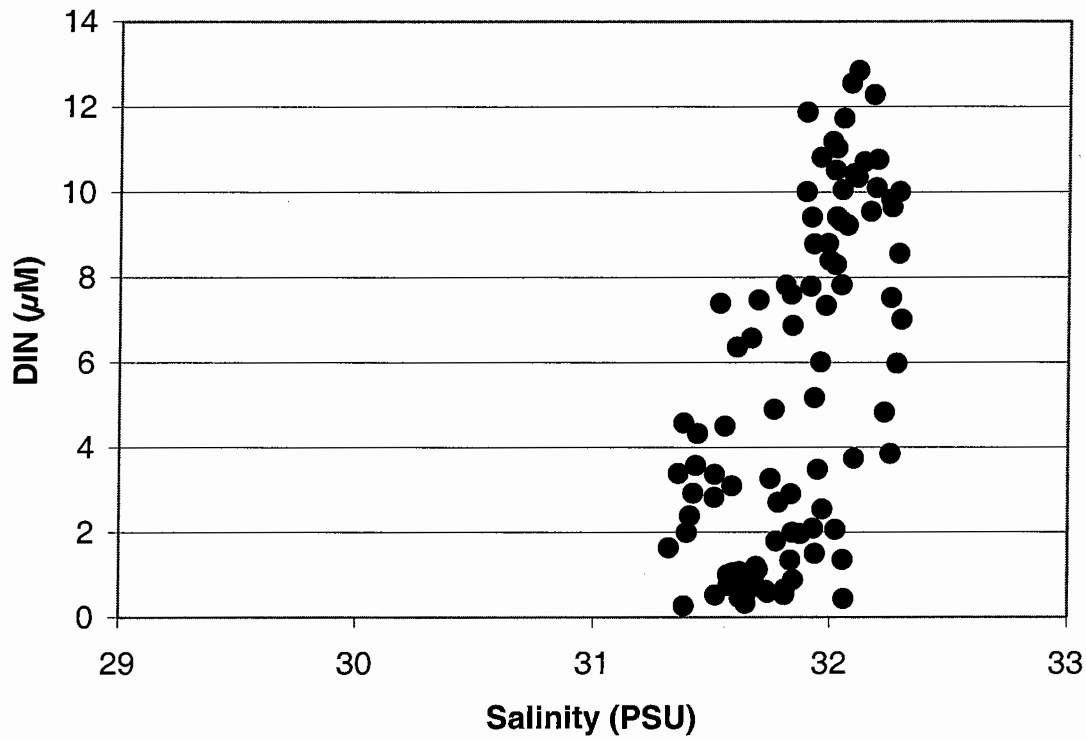
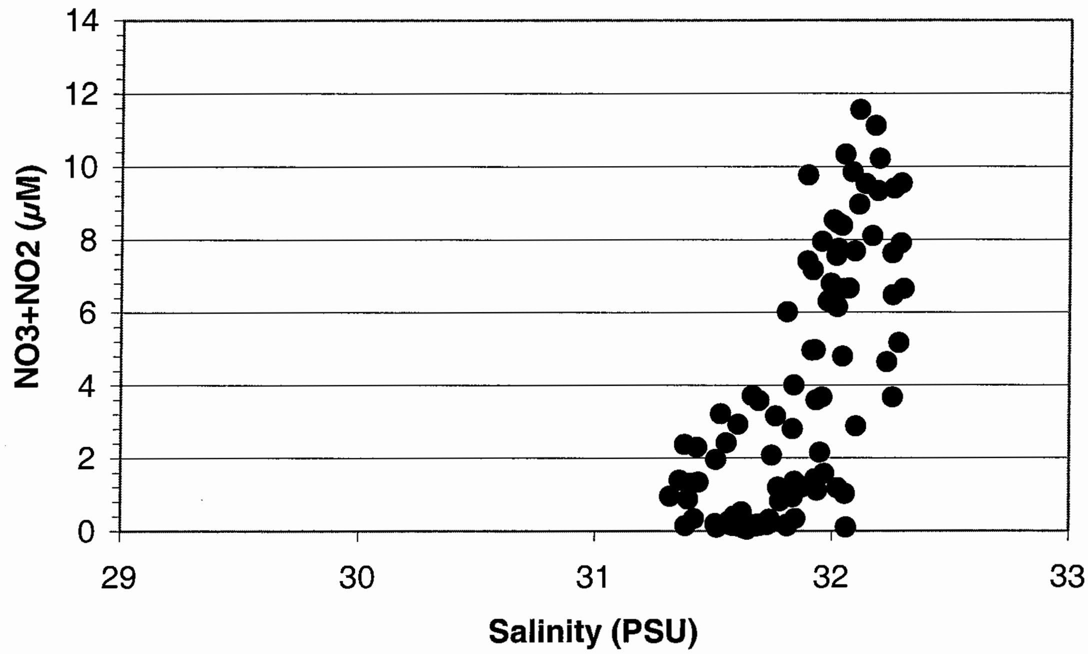


Figure D-43. Nutrient vs. Salinity Plots for Nearfield Survey WN99C, (Sep 99)

(a)



(b)

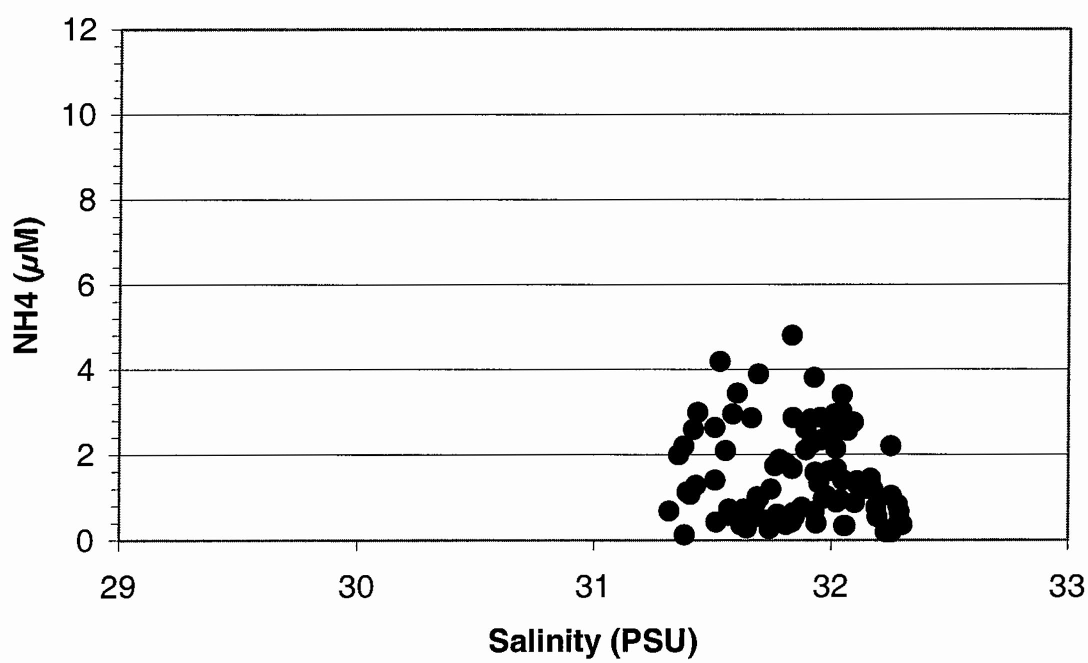
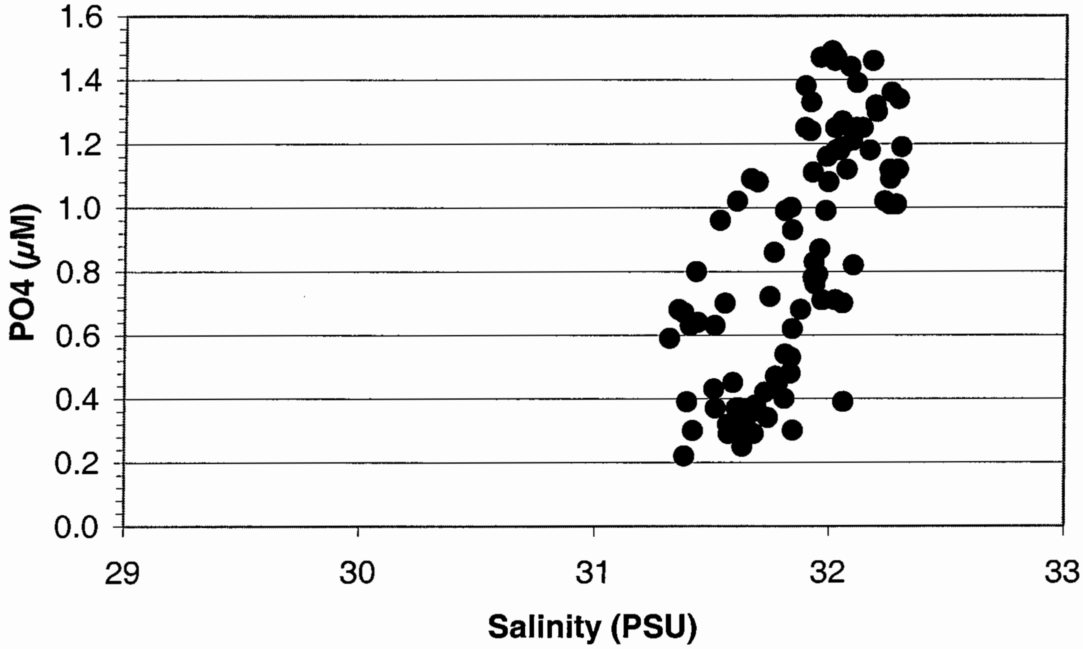


Figure D-44. Nutrient vs. Salinity Plots for Nearfield Survey WN99C, (Sep 99)

(a)



(b)

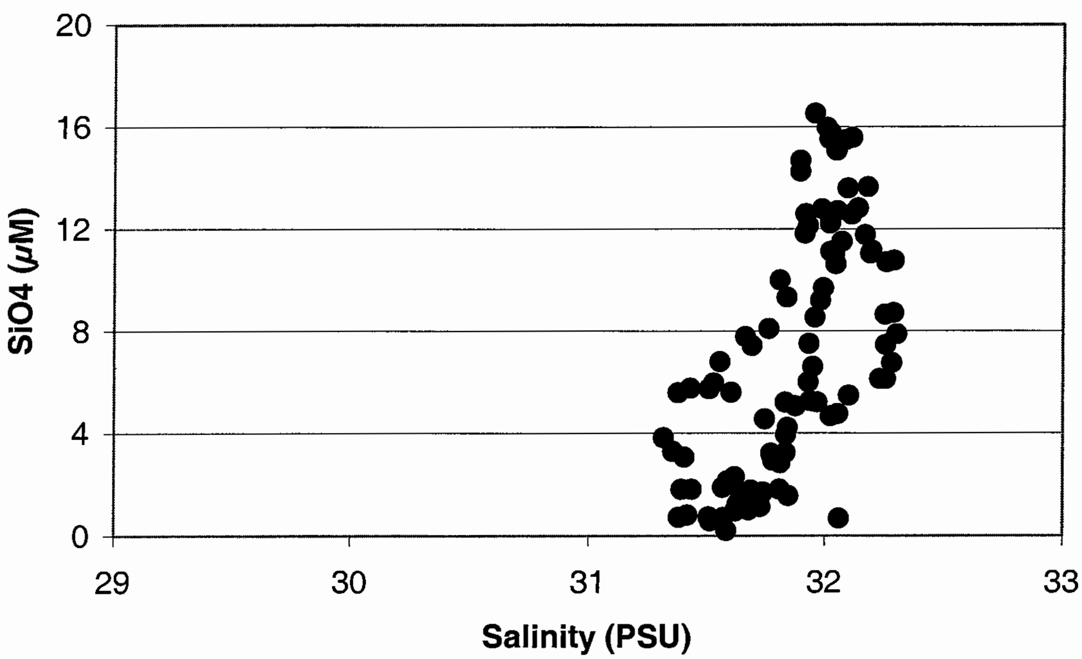


Figure D-45. Nutrient vs. Salinity Plots for Nearfield Survey WN99C, (Sep 99)

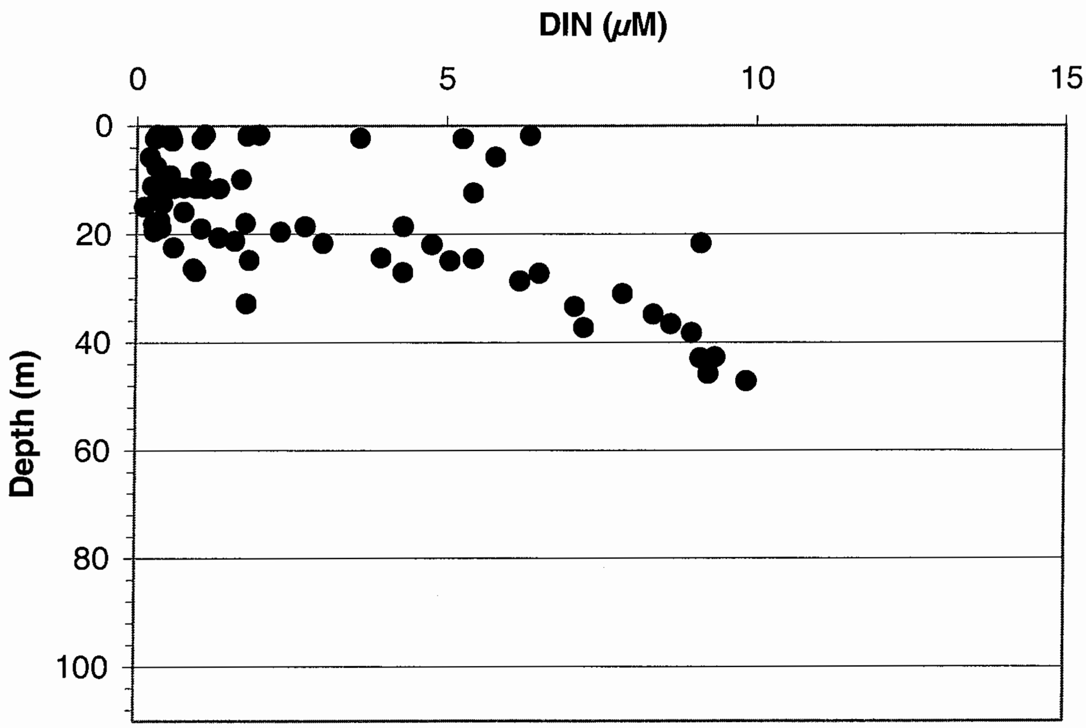
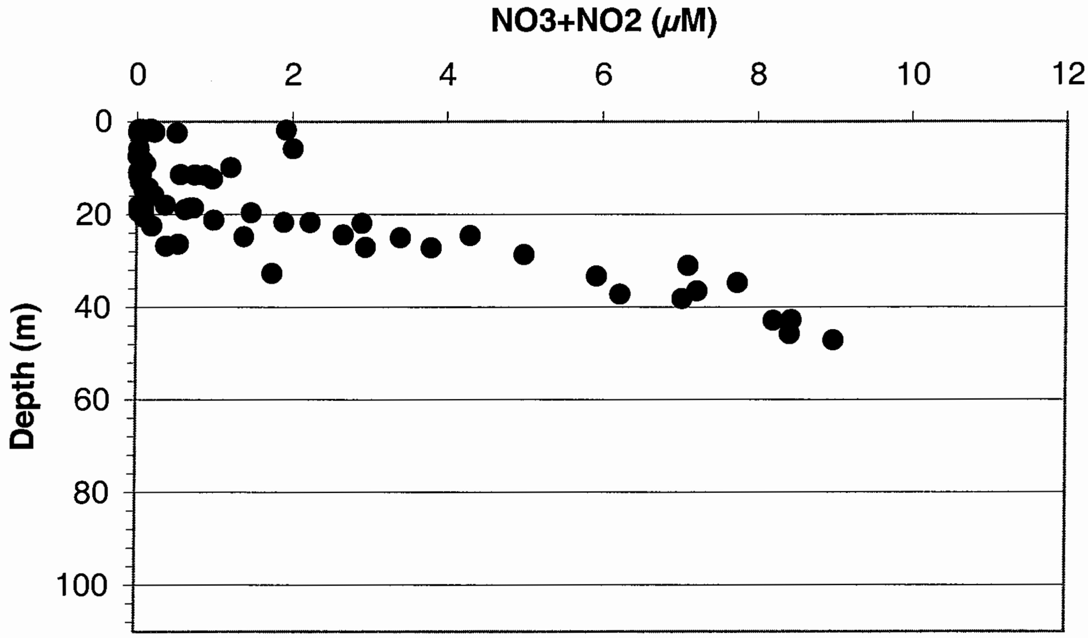


Figure D-46. Depth vs. Nutrient Plots for Nearfield Survey WN99D, (Sep 99)

(a)



(b)

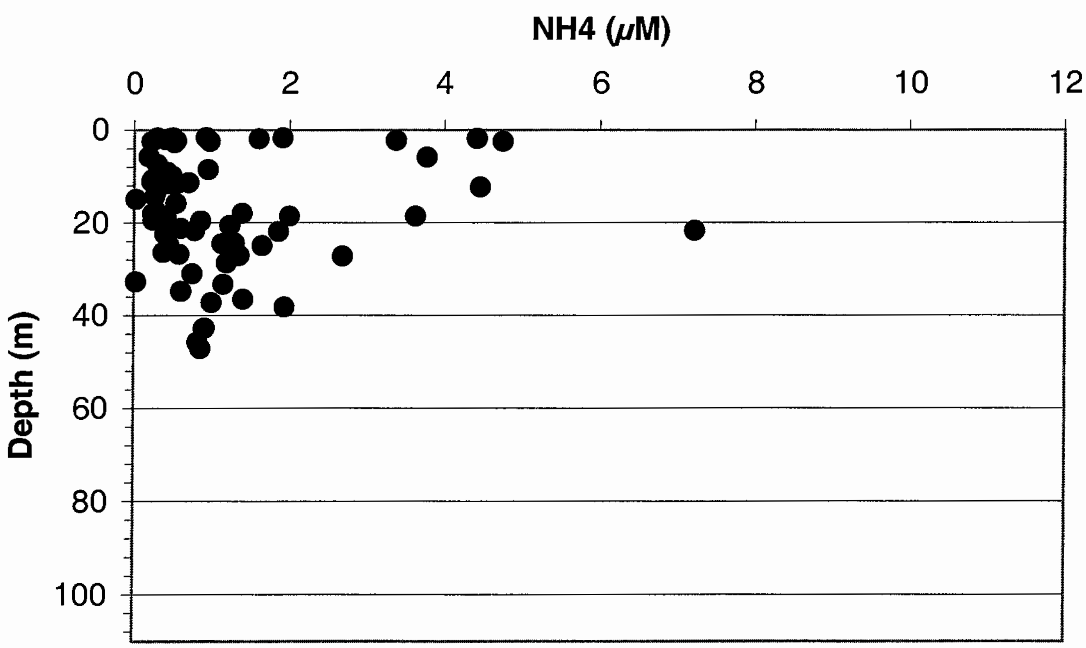
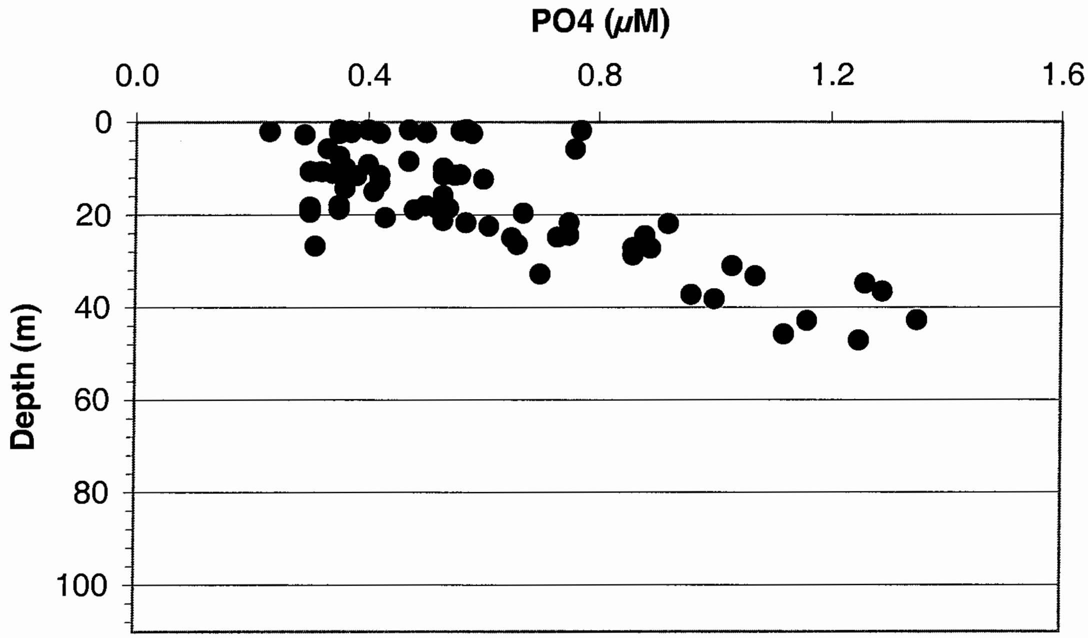


Figure D-47. Depth vs. Nutrient Plots for Nearfield Survey WN99D, (Sep 99)

(a)



(b)

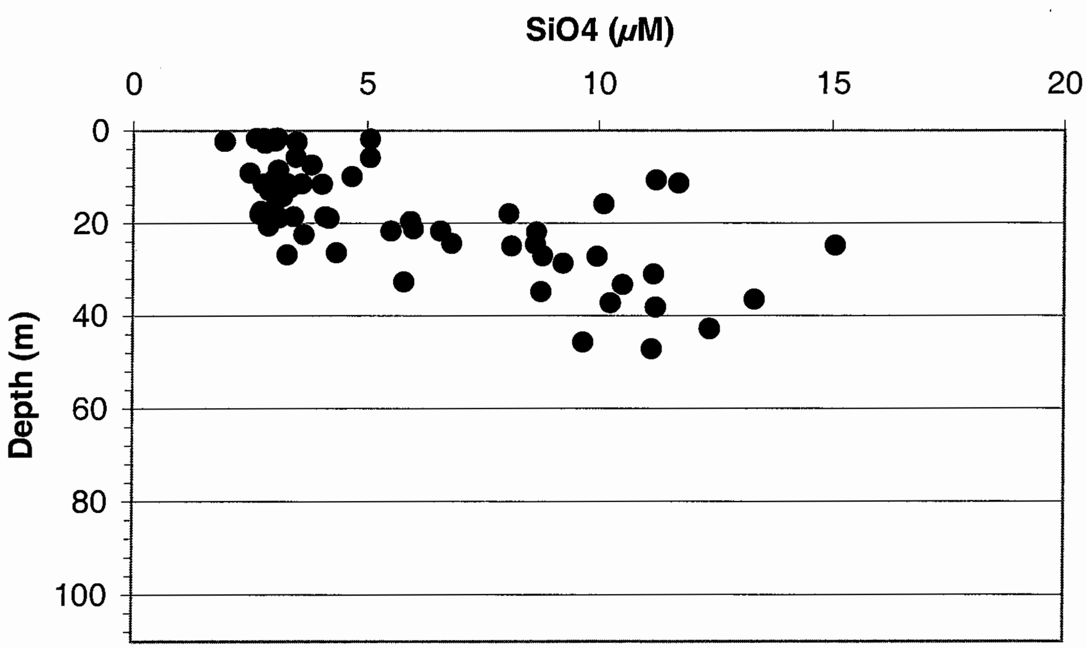
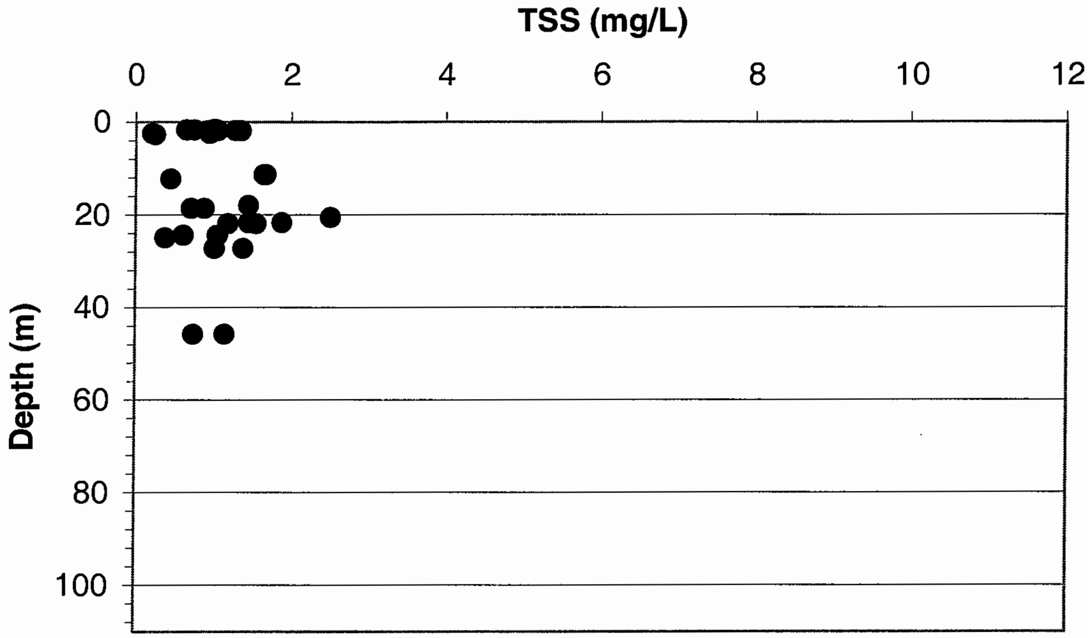


Figure D-48. Depth vs. Nutrient Plots for Nearfield Survey WN99D, (Sep 99)

(a)



(b)

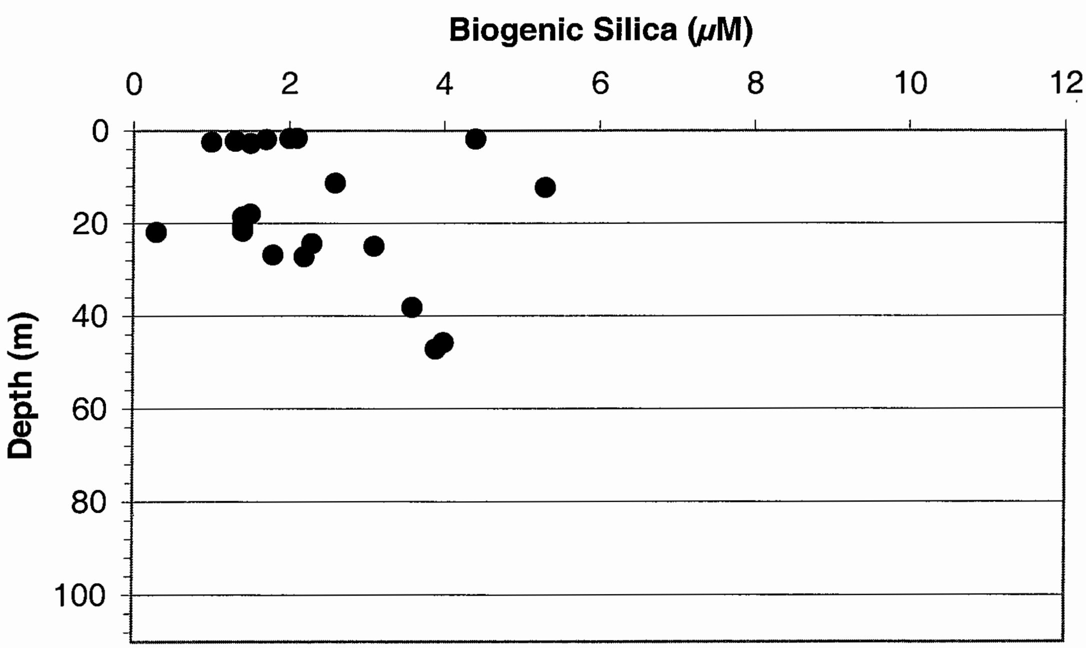
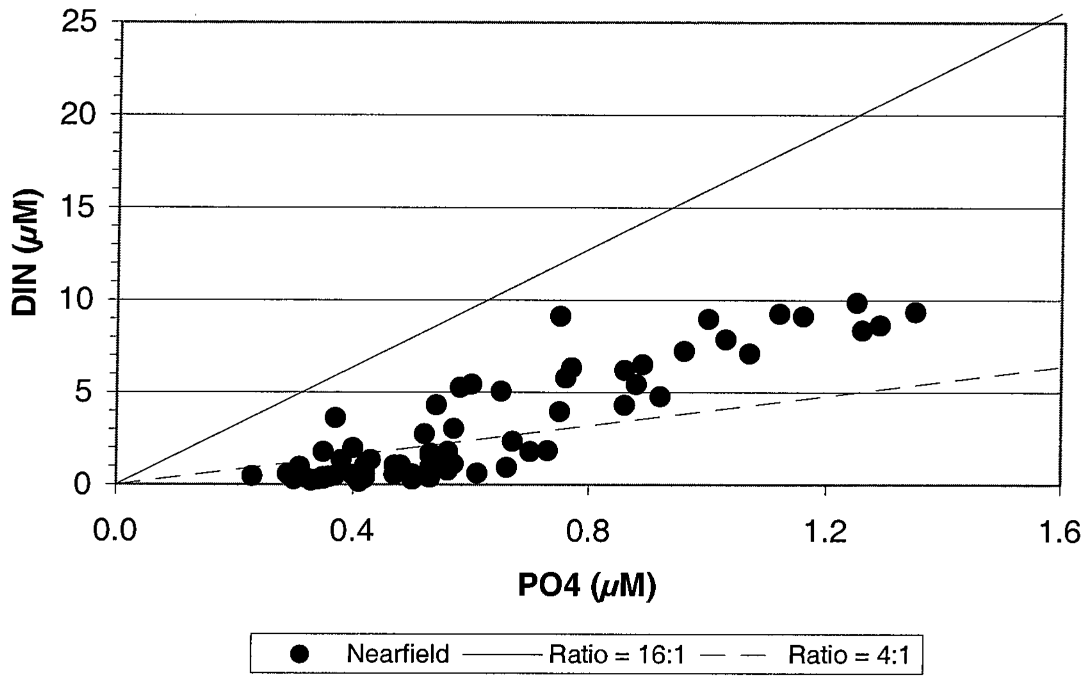


Figure D-49. Depth vs. Nutrient Plots for Nearfield Survey WN99D, (Sep 99)

(a)



(b)

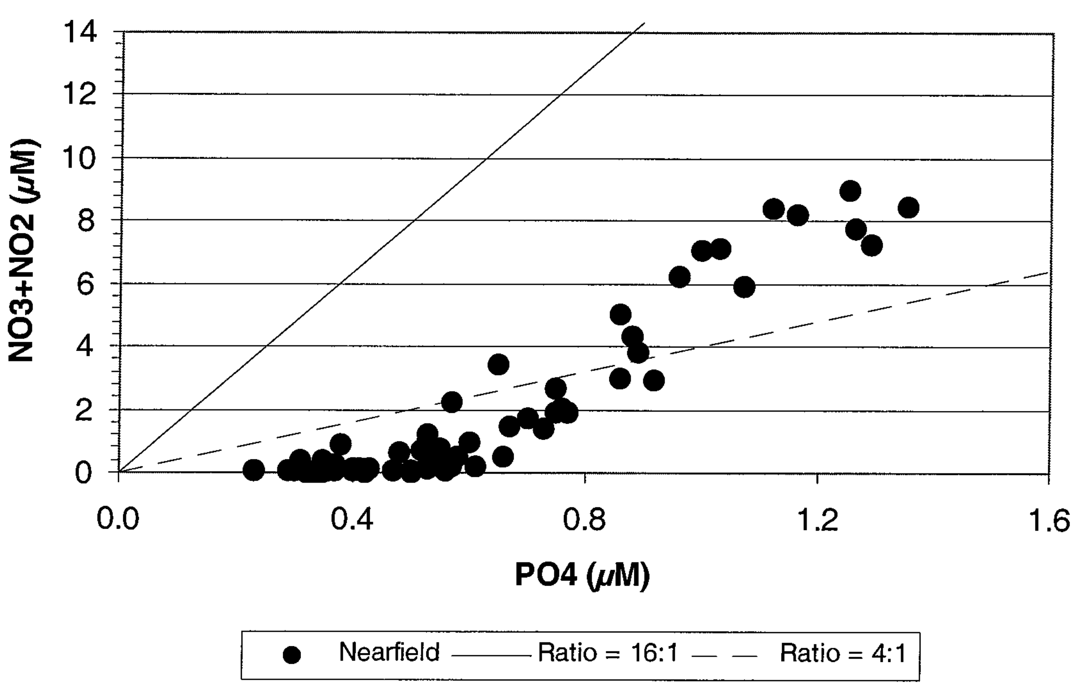
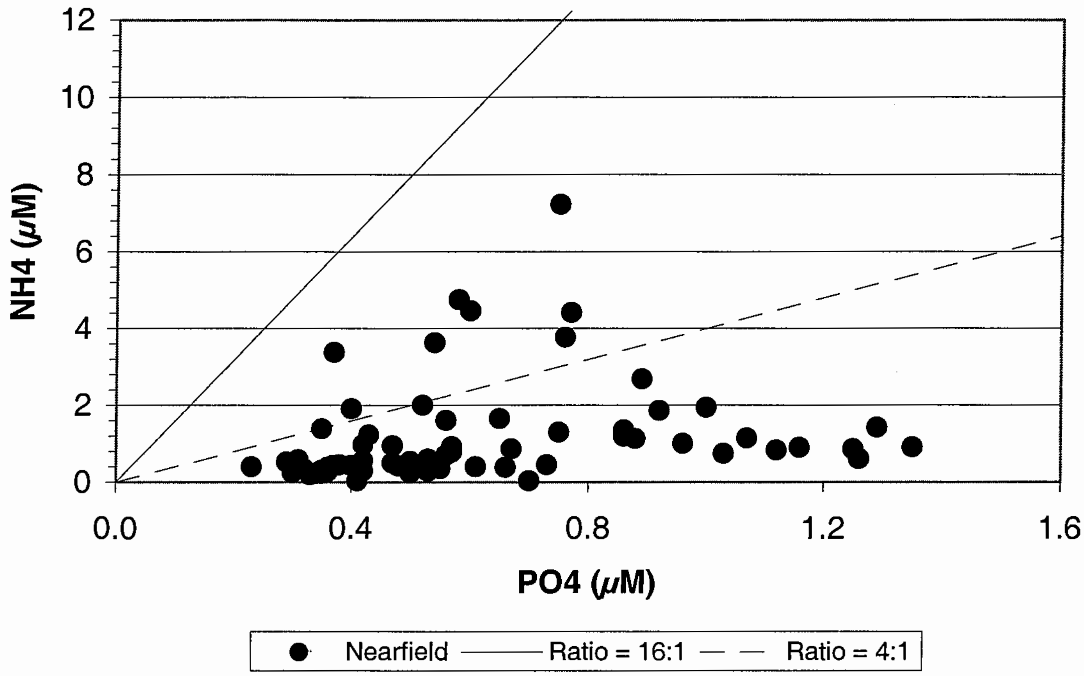


Figure D-50. Nutrient vs. Nutrient Plots for Nearfield Survey WN99D, (Sep 99)

(a)



(b)

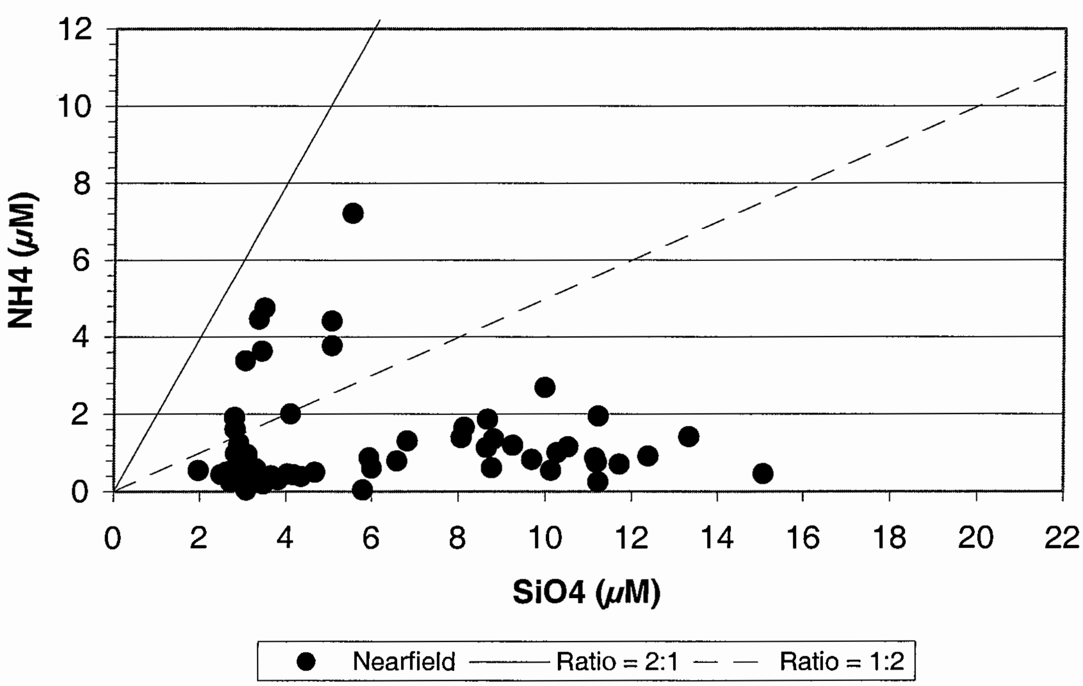
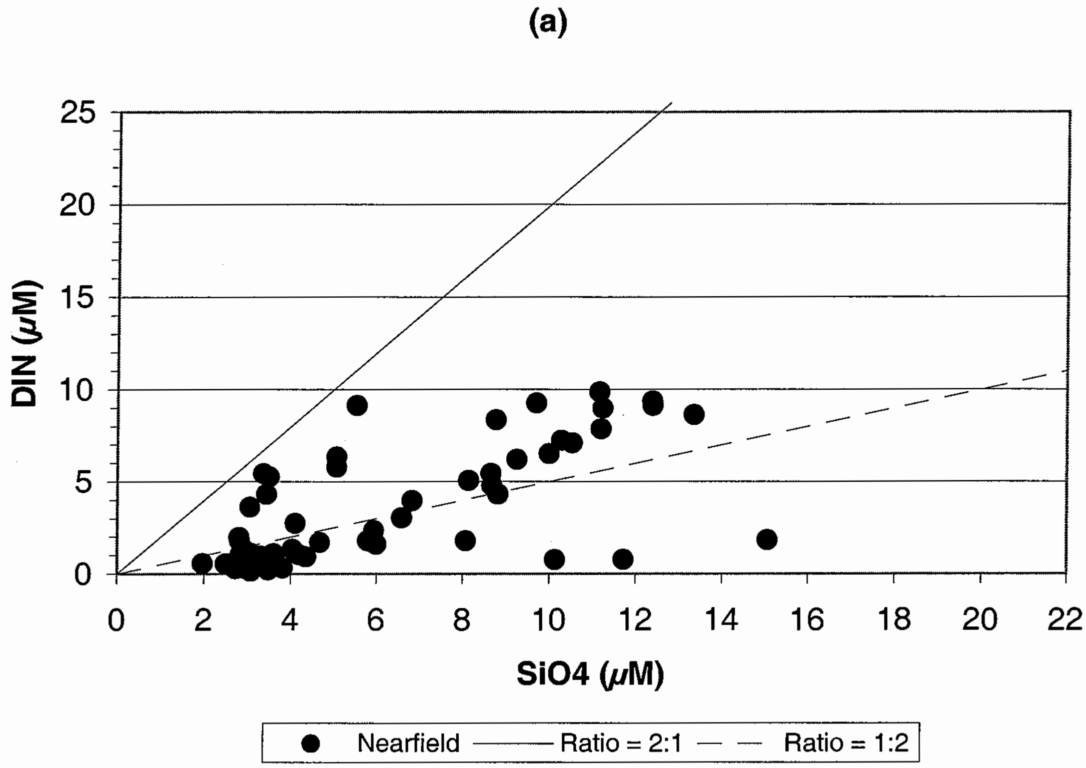


Figure D-51. Nutrient vs. Nutrient Plots for Nearfield Survey WN99D, (Sep 99)



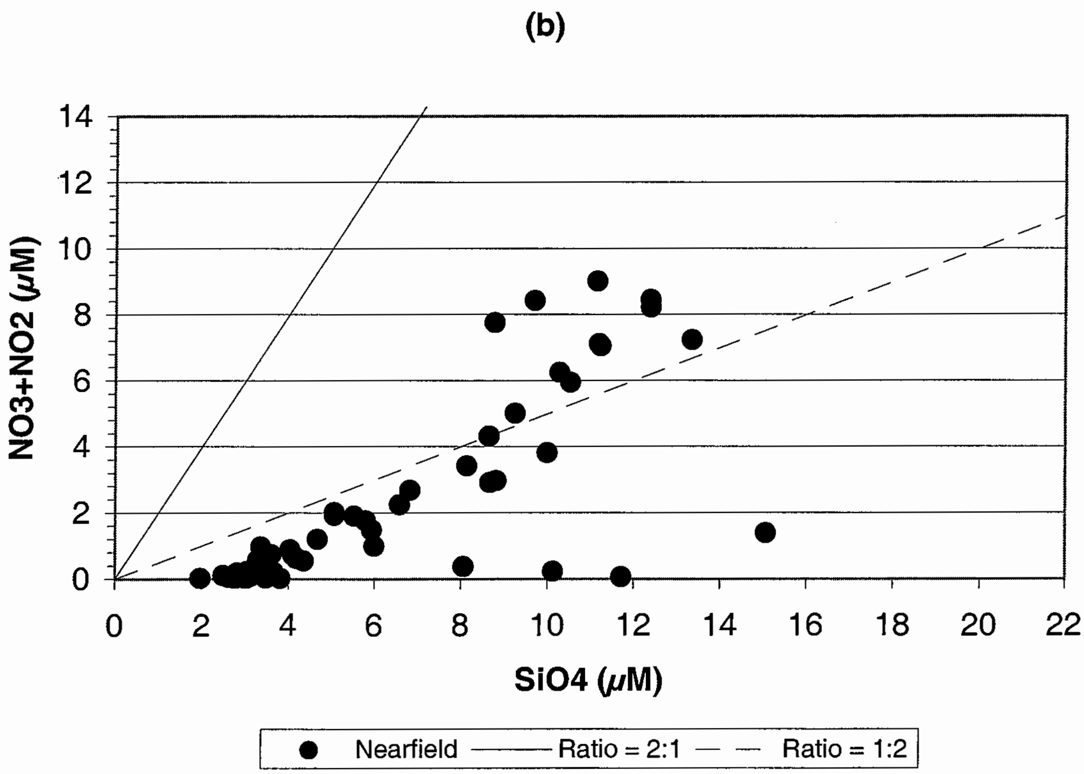
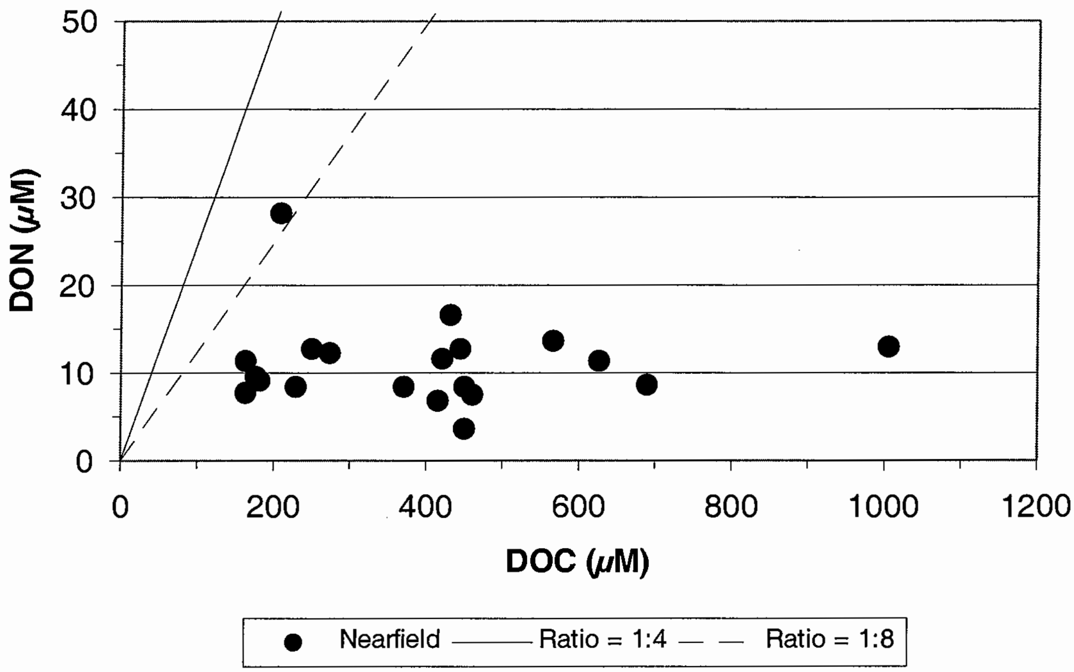


Figure D-52. Nutrient vs. Nutrient Plots for Nearfield Survey WN99D, (Sep 99)

(a)



(b)

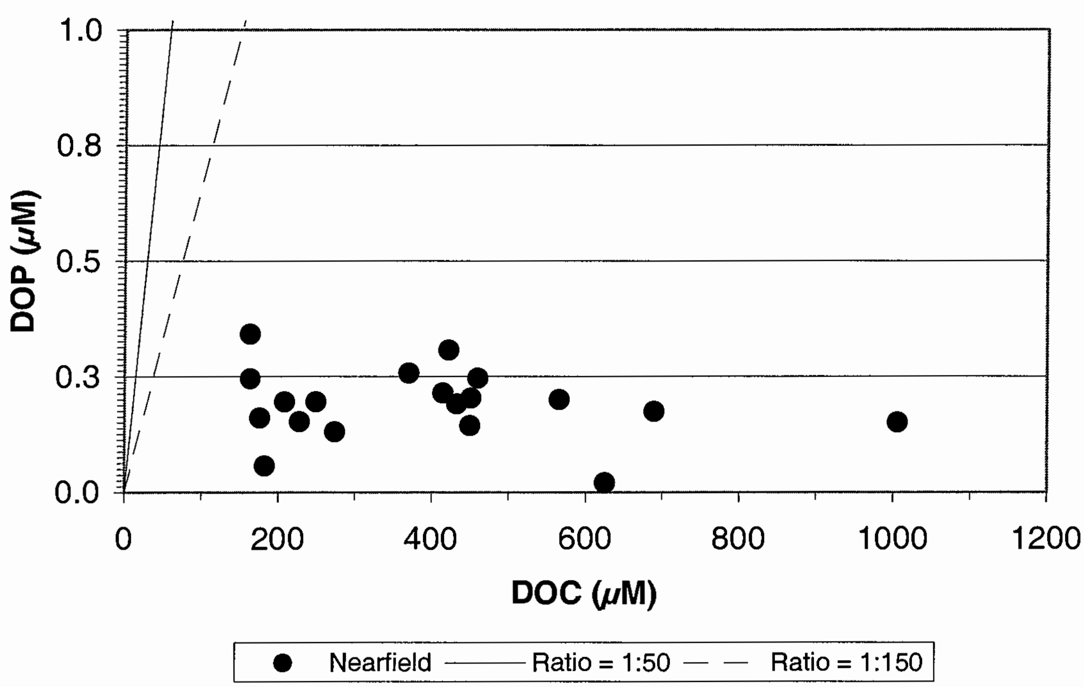
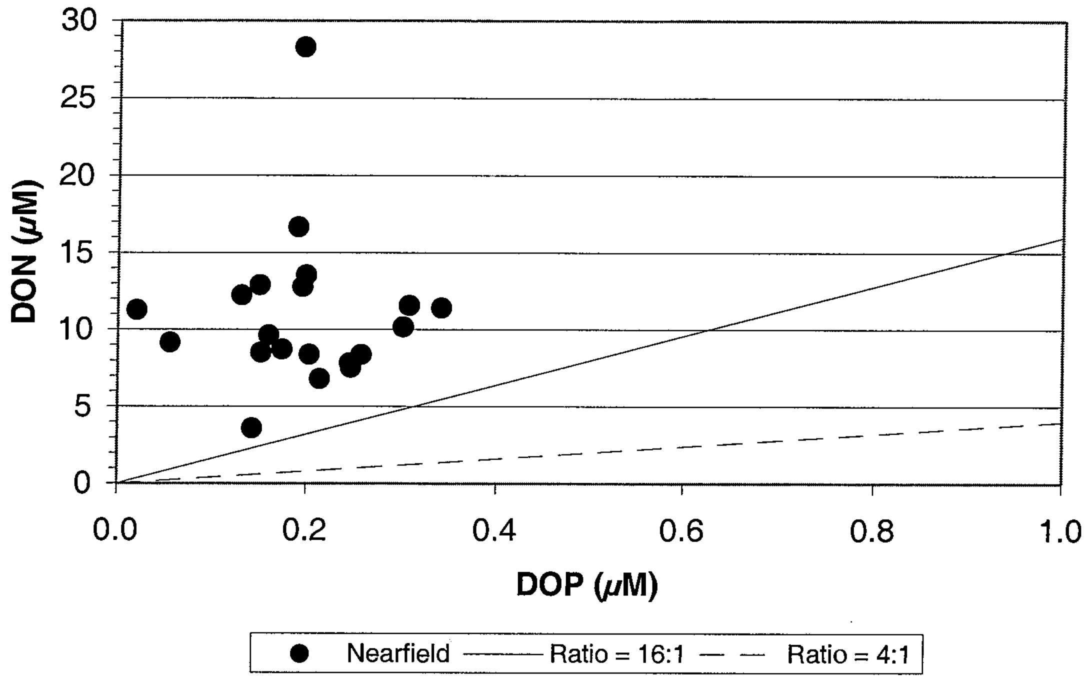


Figure D-53. Nutrient vs. Nutrient Plots for Nearfield Survey WN99D, (Sep 99)

(a)



(b)

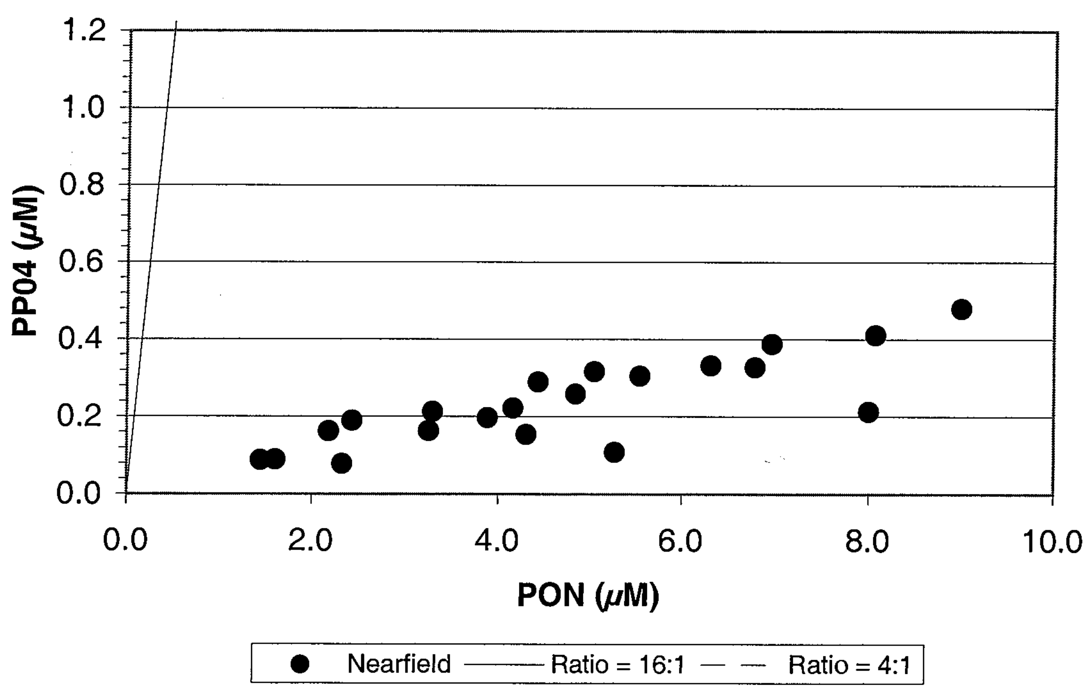
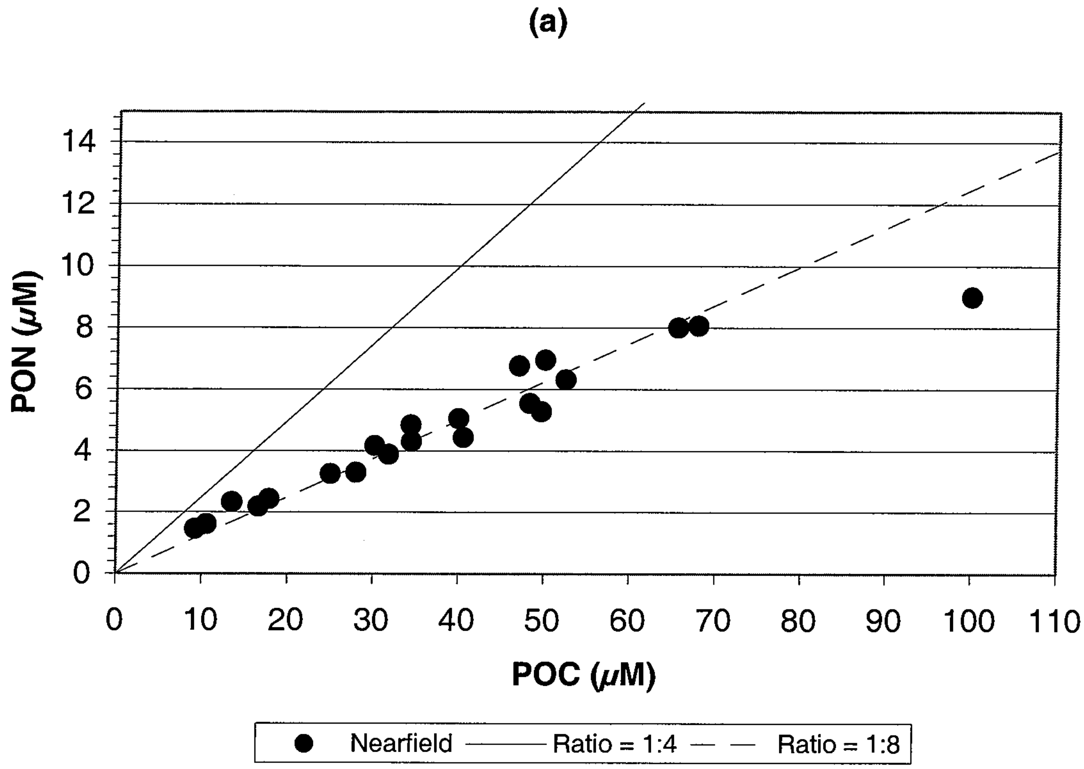


Figure D-54. Nutrient vs. Nutrient Plots for Nearfield Survey WN99D, (Sep 99)



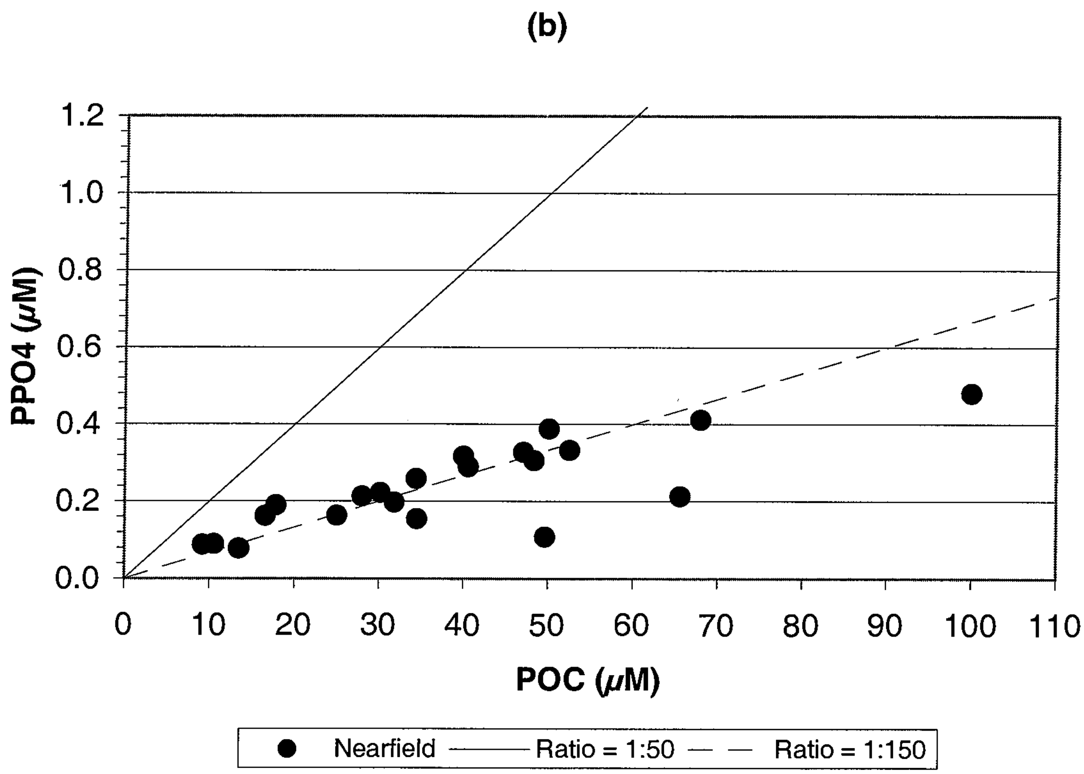
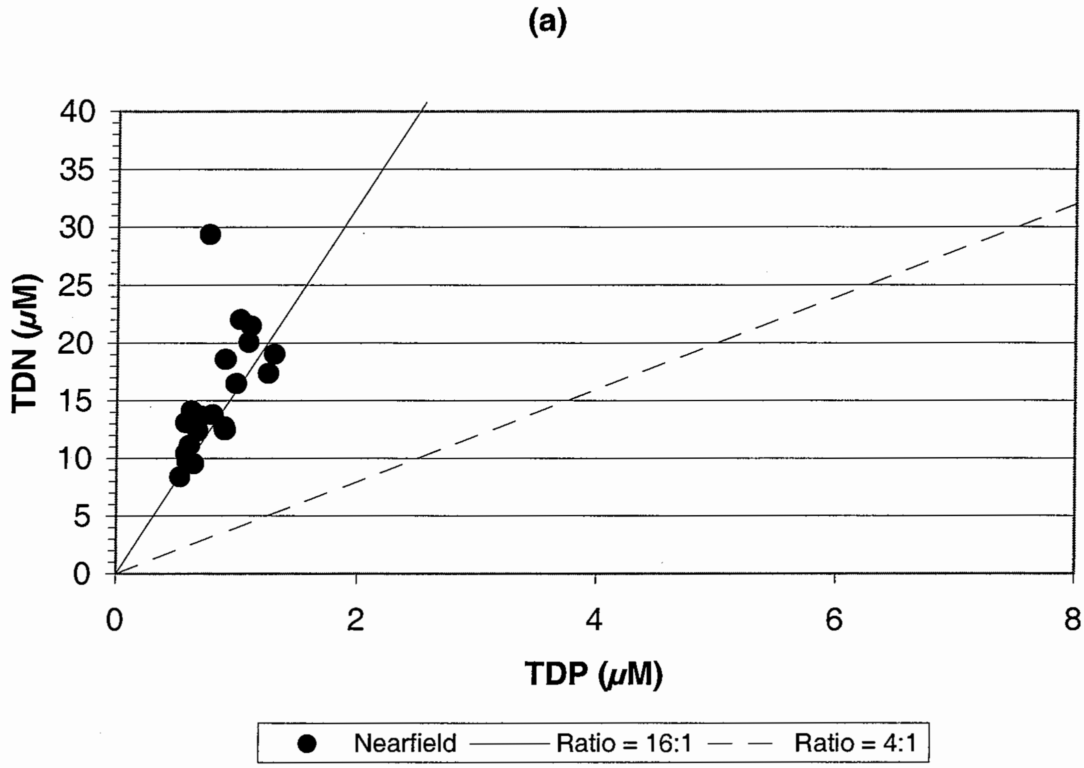


Figure D-55. Nutrient vs. Nutrient Plots for Nearfield Survey WN99D, (Sep 99)



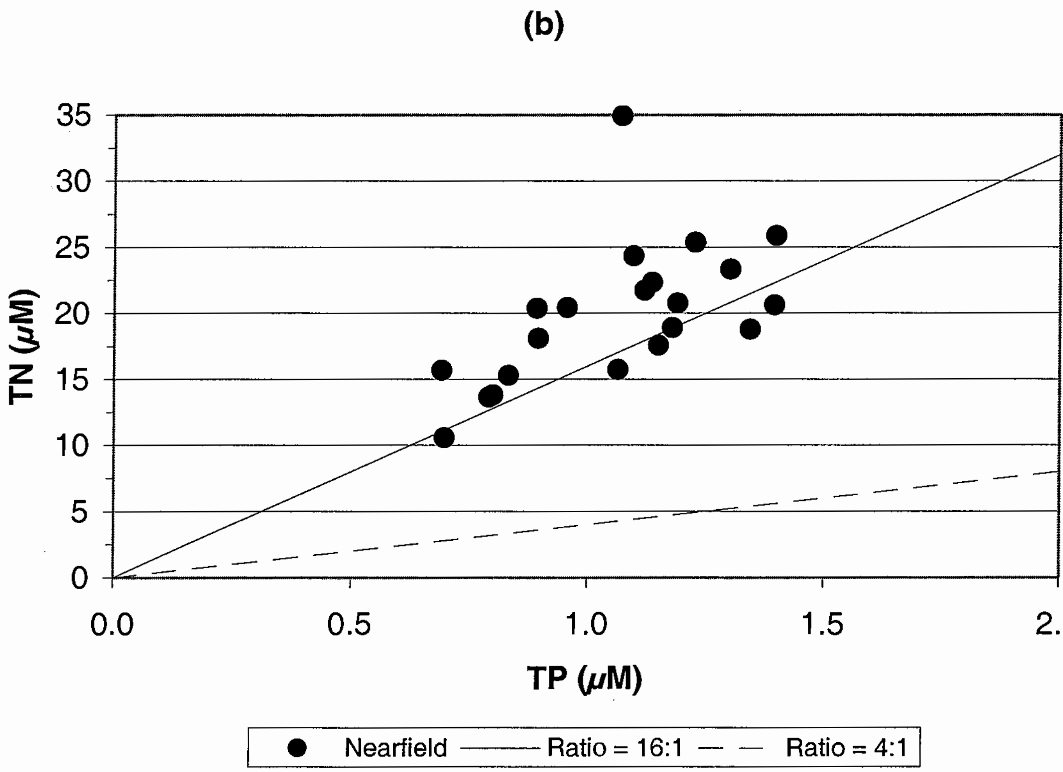
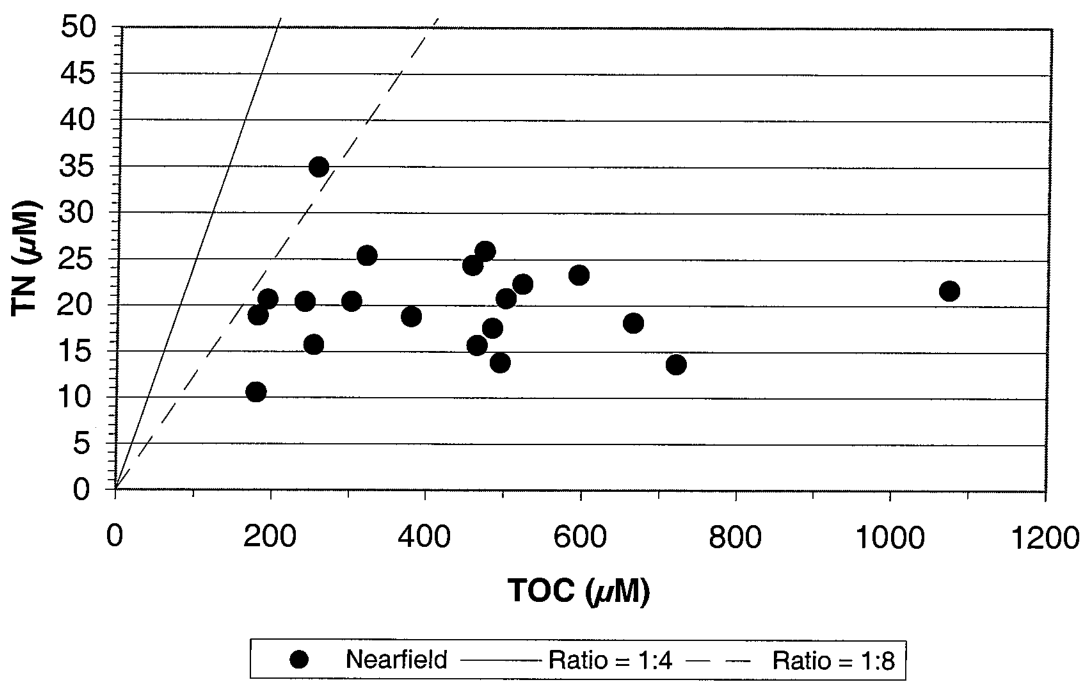


Figure D-56. Nutrient vs. Nutrient Plots for Nearfield Survey WN99D, (Sep 99)

(a)



(b)

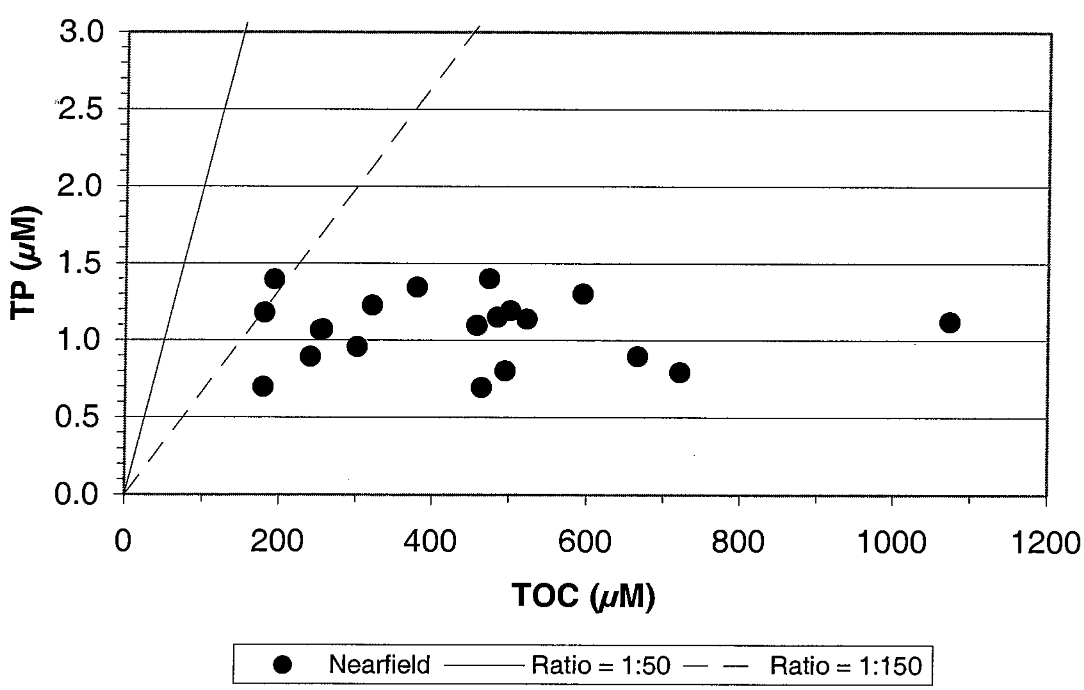


Figure D-57. Nutrient vs. Nutrient Plots for Nearfield Survey WN99D, (Sep 99)

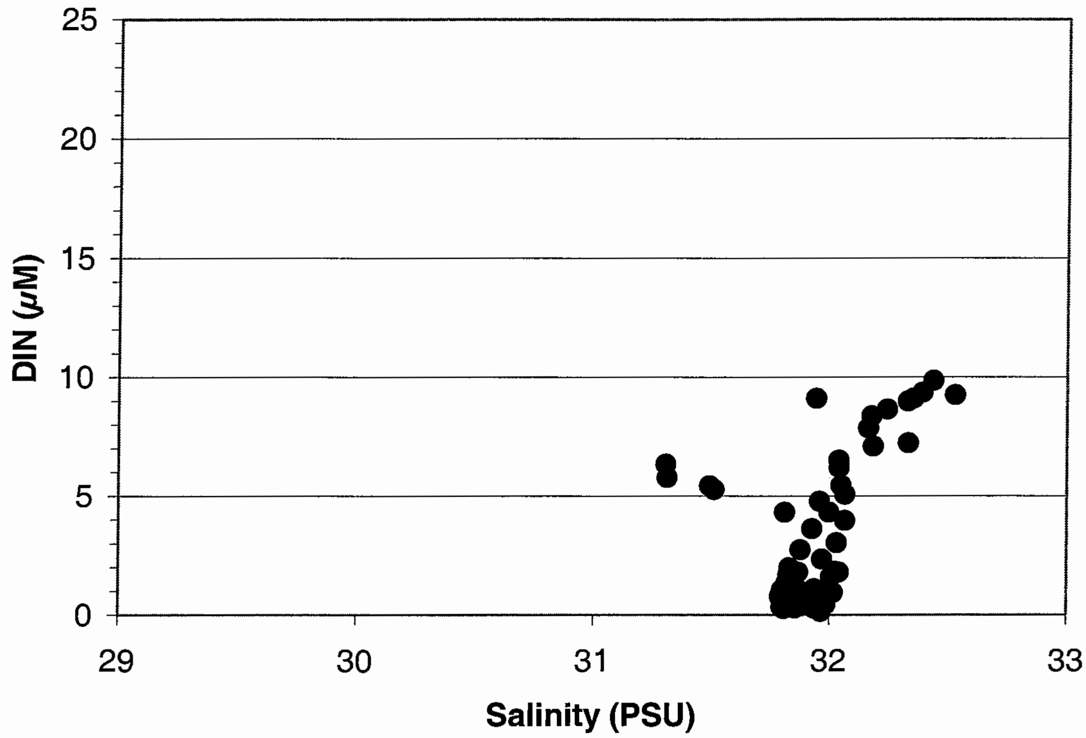
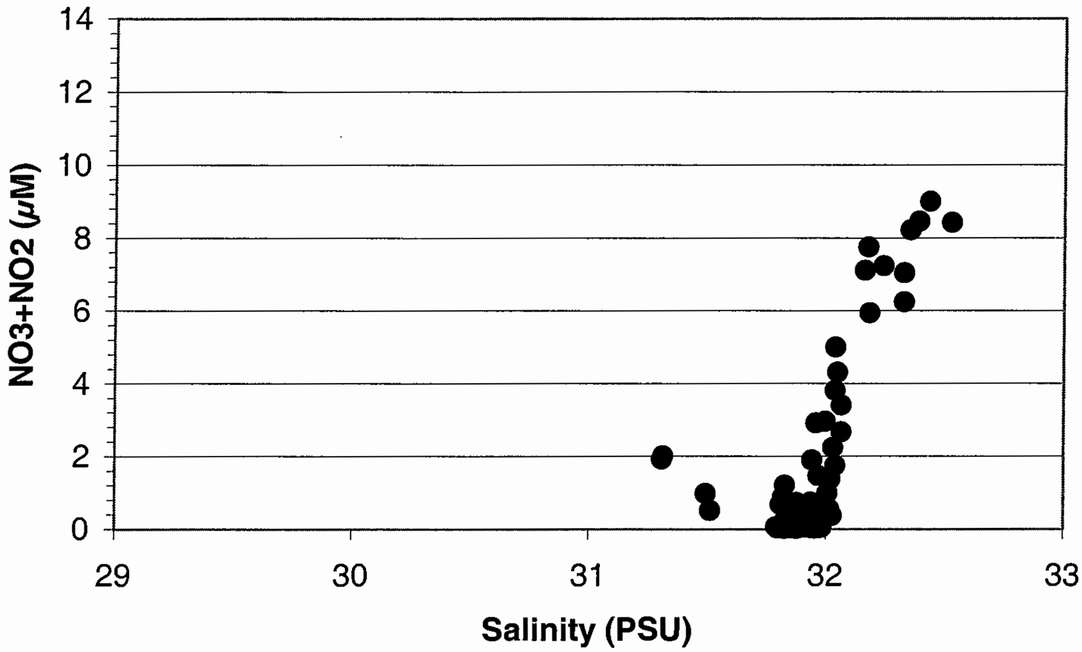


Figure D-58. Nutrient vs. Salinity Plots for Nearfield Survey WN99D, (Sep 99)

(a)



(b)

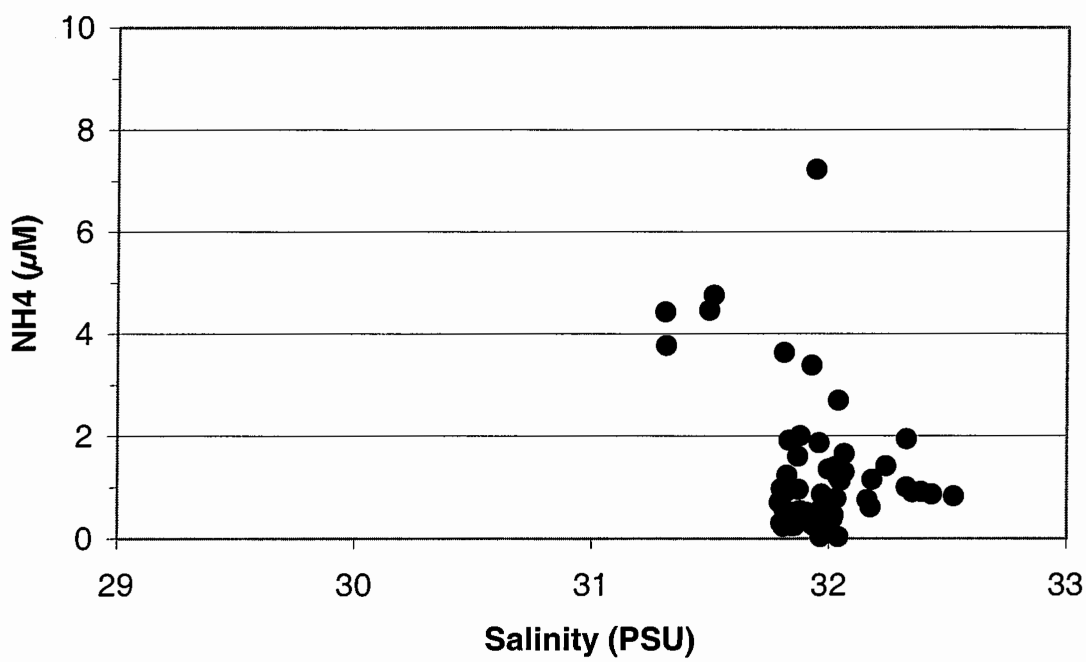
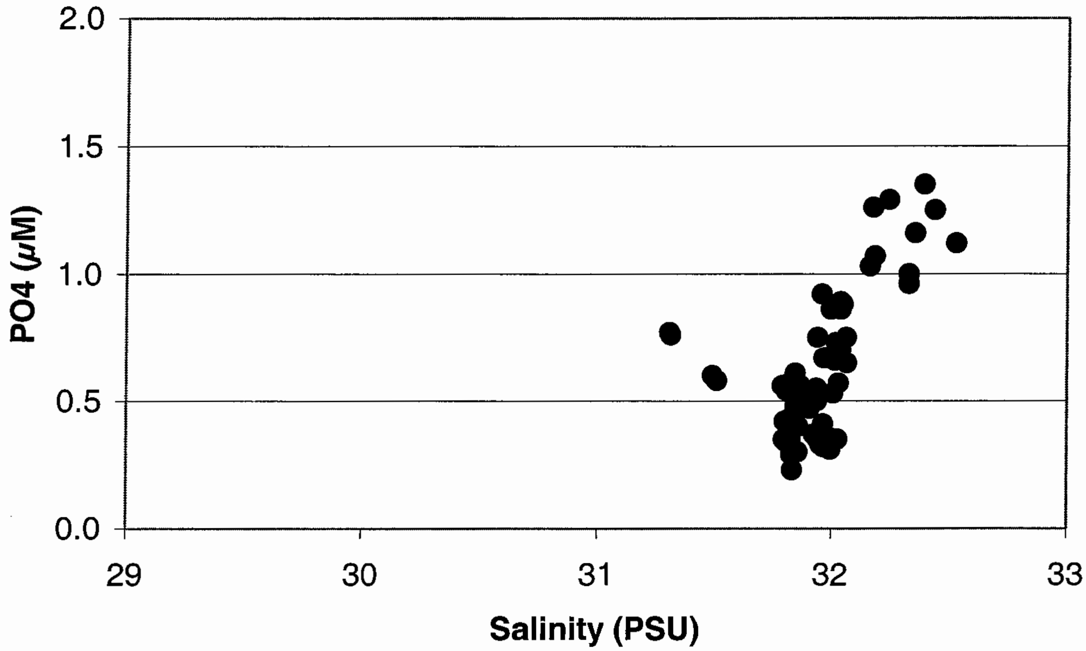


Figure D-59. Nutrient vs. Salinity Plots for Nearfield Survey WN99D, (Sep 99)

(a)



(b)

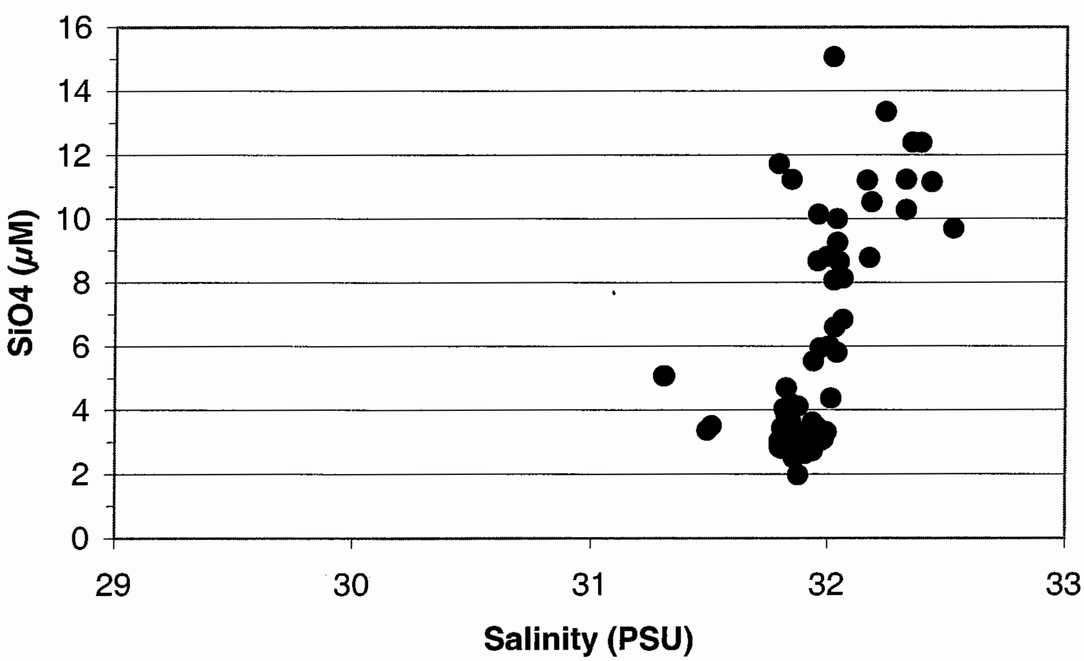


Figure D-60. Nutrient vs. Salinity Plots for Nearfield Survey WN99D, (Sep 99)

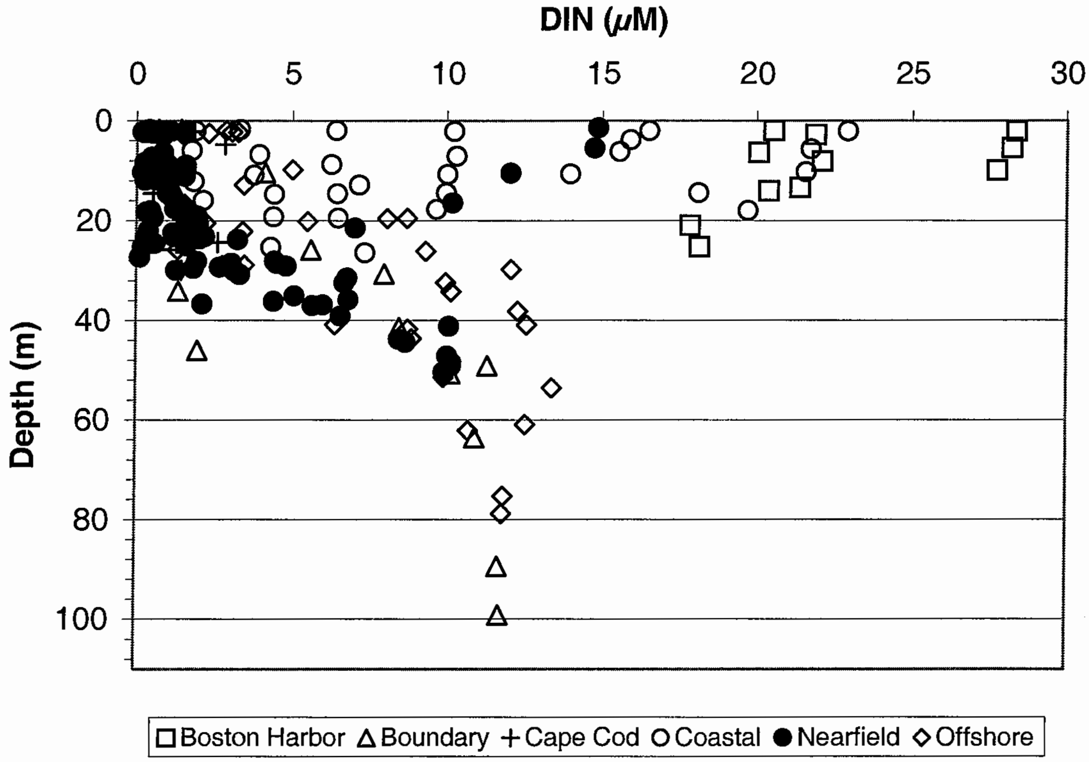
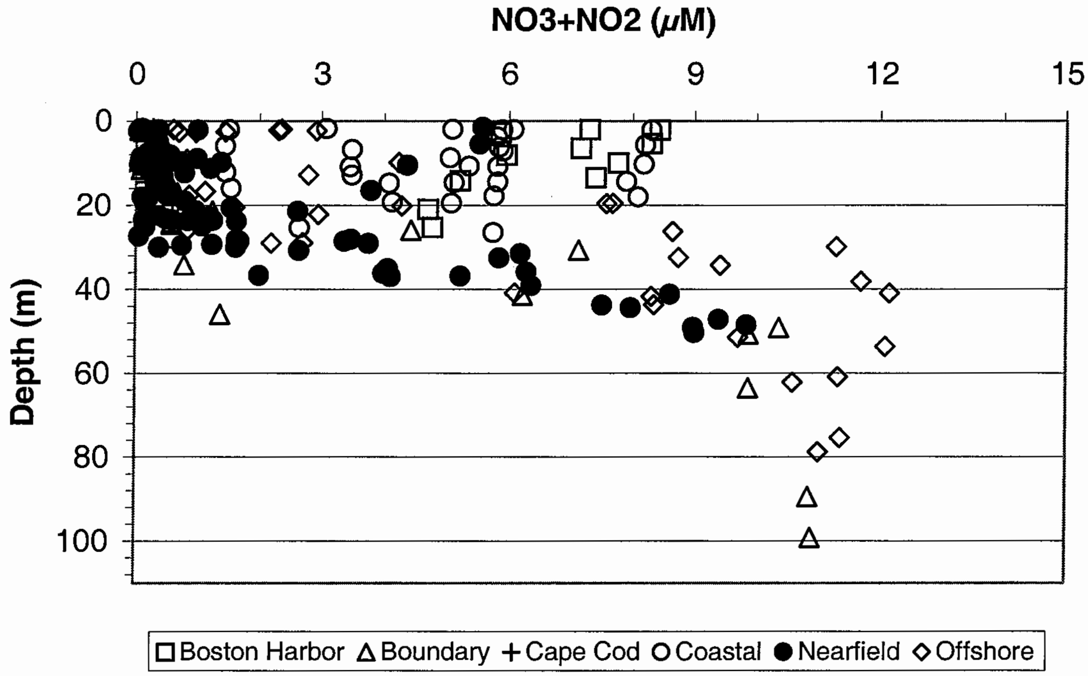


Figure D-61. Depth vs. Nutrient Plots for Farfield Survey WF99E, (Oct 99)

(a)



(b)

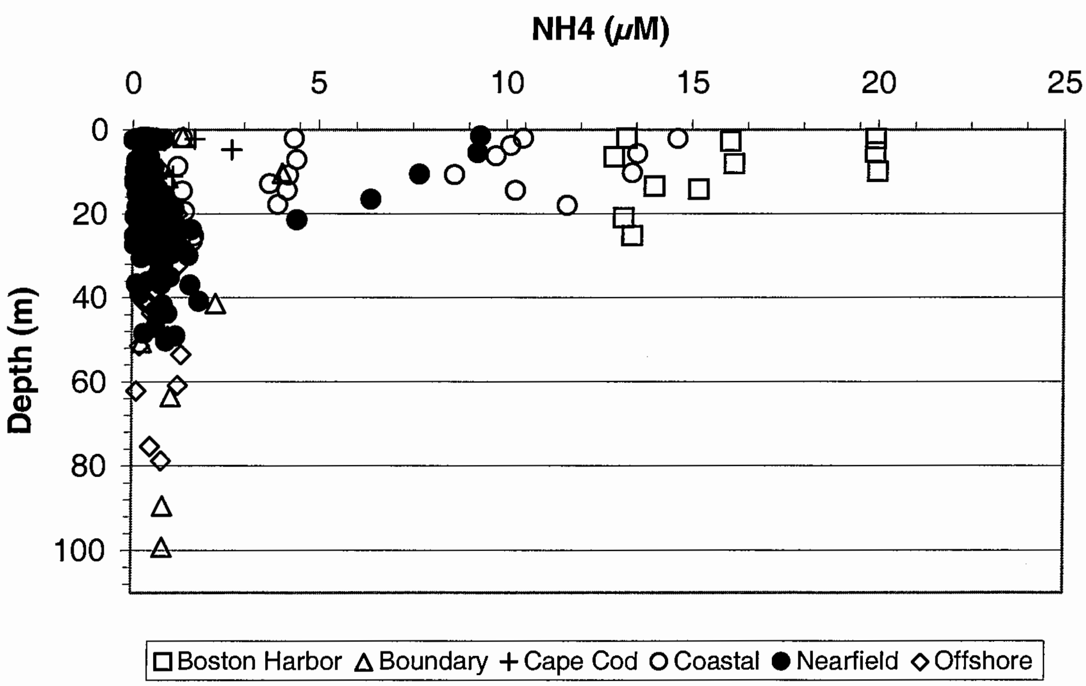
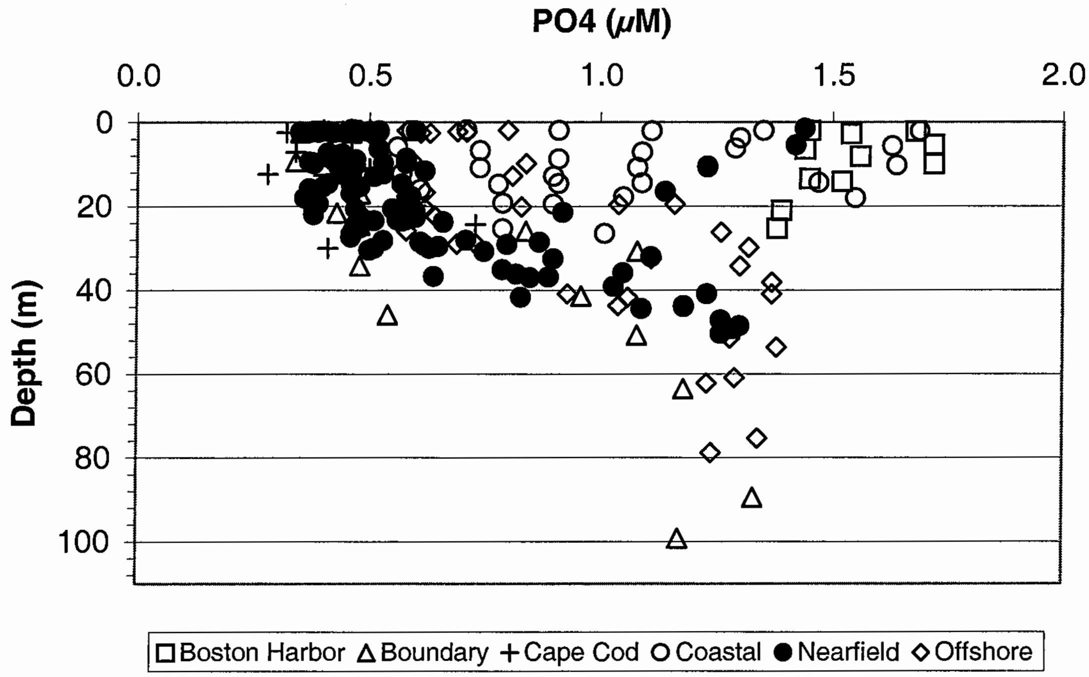


Figure D-62. Depth vs. Nutrient Plots for Farfield Survey WF99E, (Oct 99)

(a)



(b)

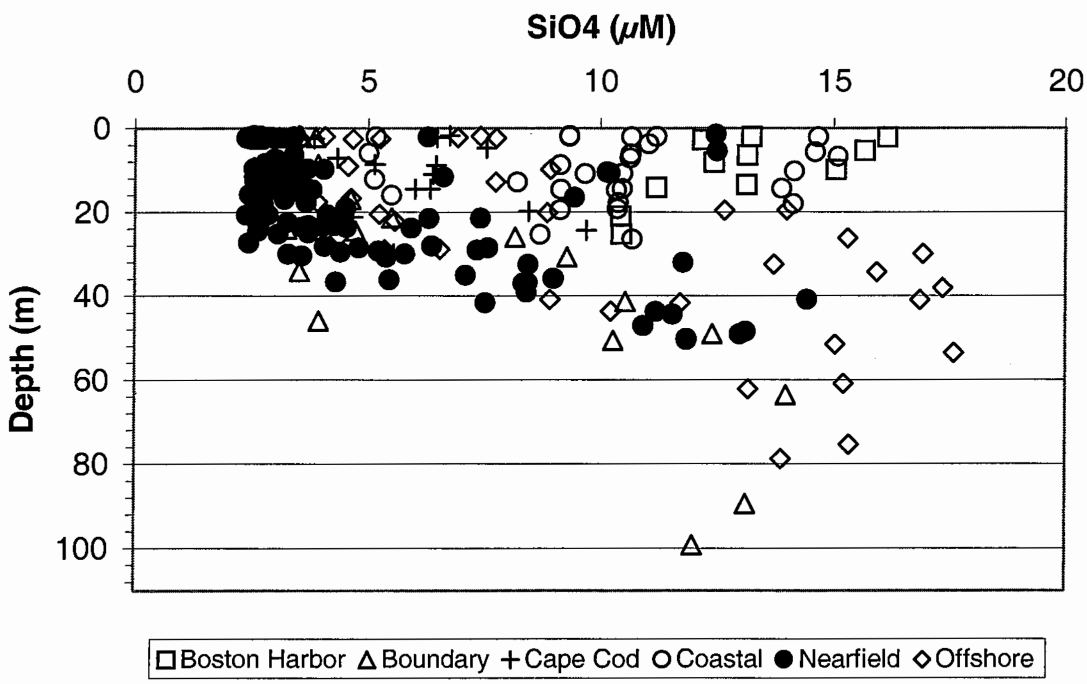
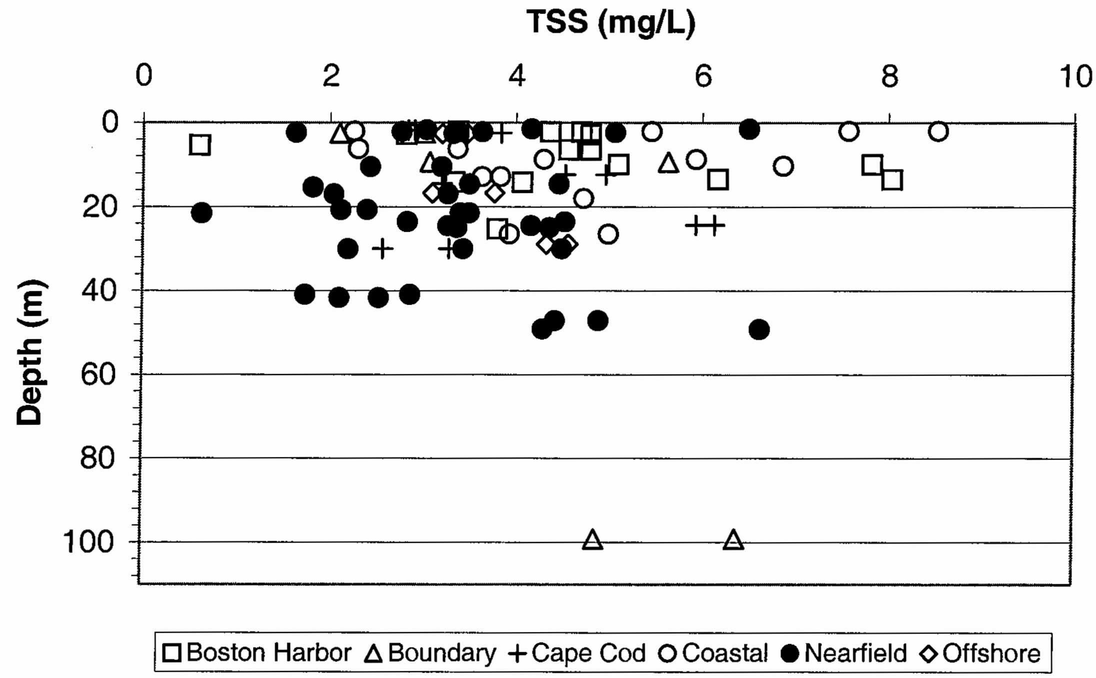


Figure D-63. Depth vs. Nutrient Plots for Farfield Survey WF99E, (Oct 99)

(a)



(b)

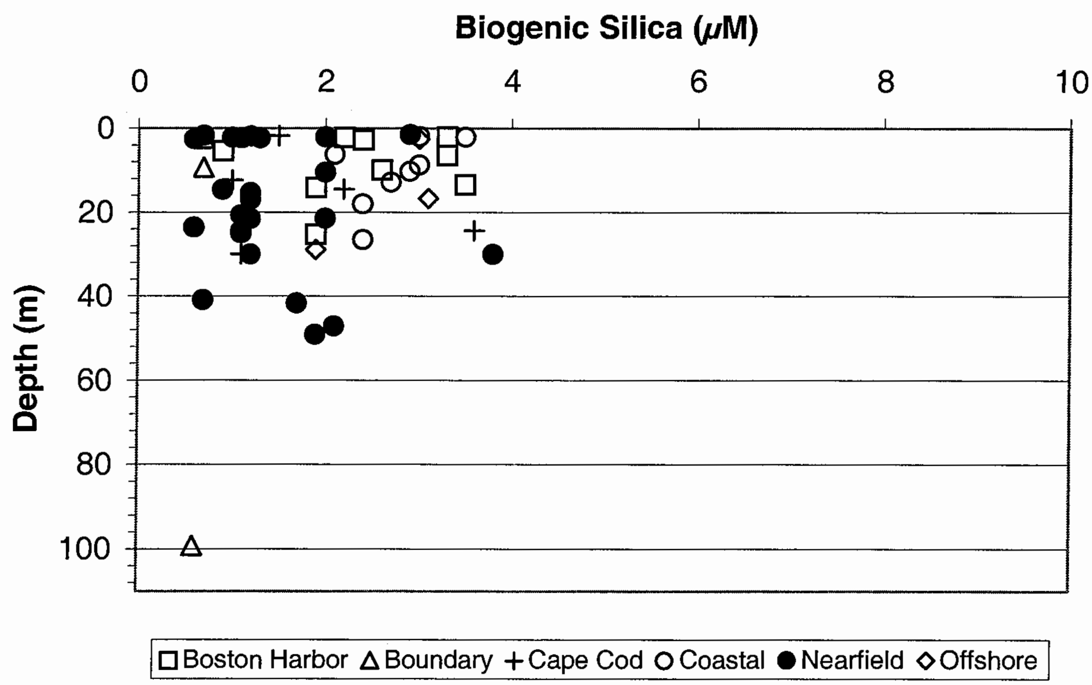
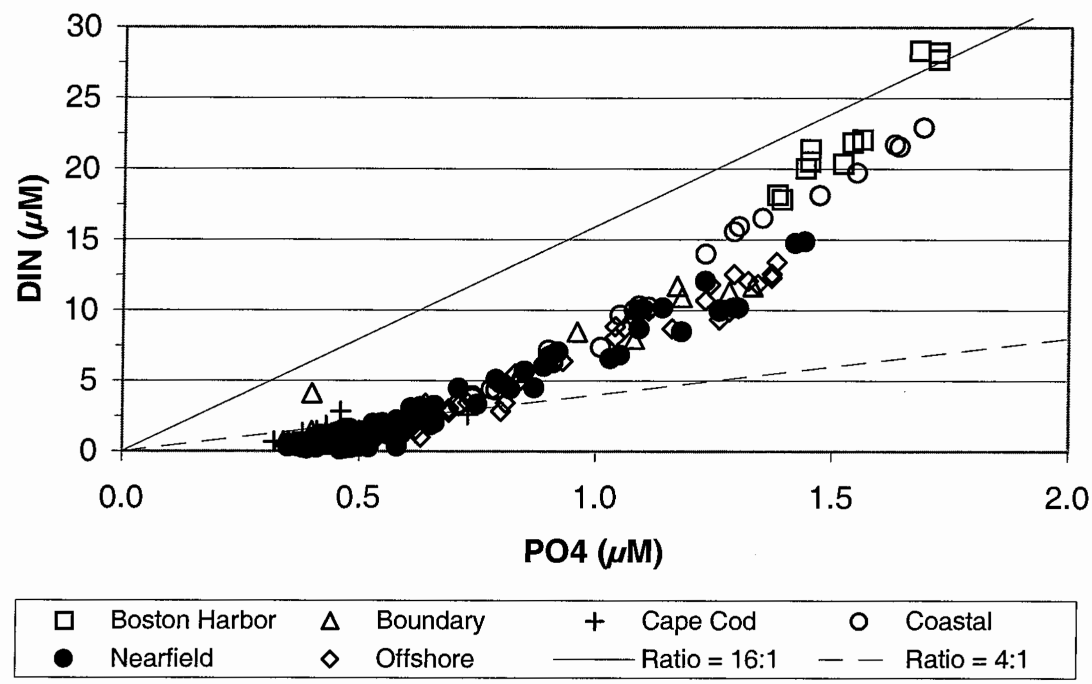


Figure D-64. Depth vs. Nutrient Plots for Farfield Survey WF99E, (Oct 99)

(a)



(b)

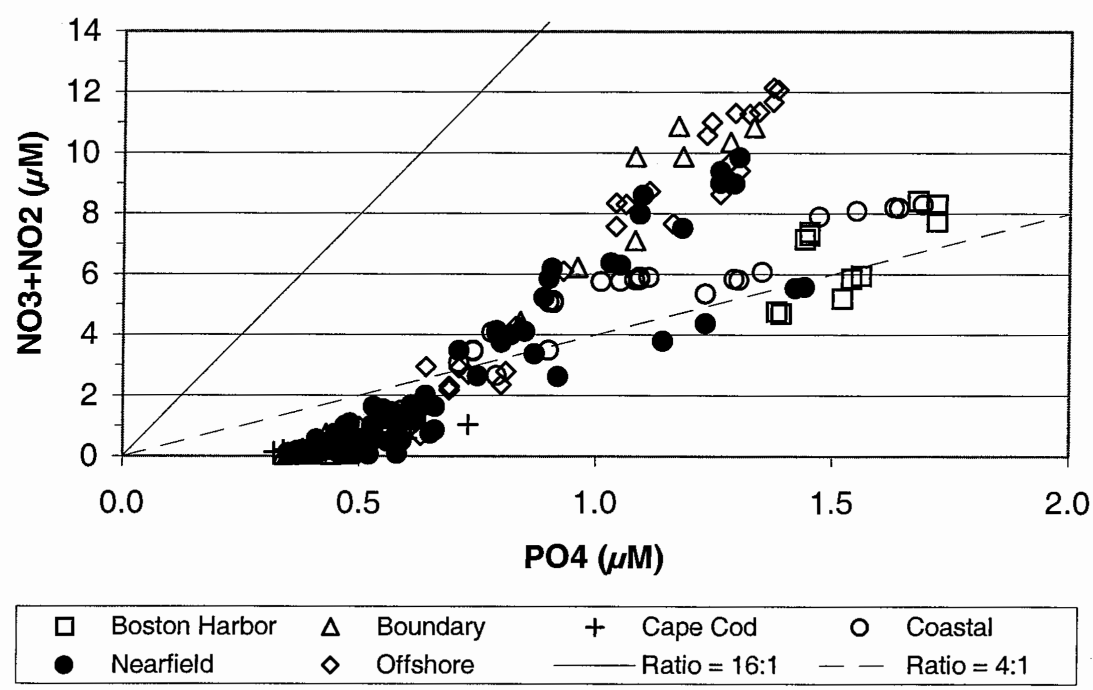
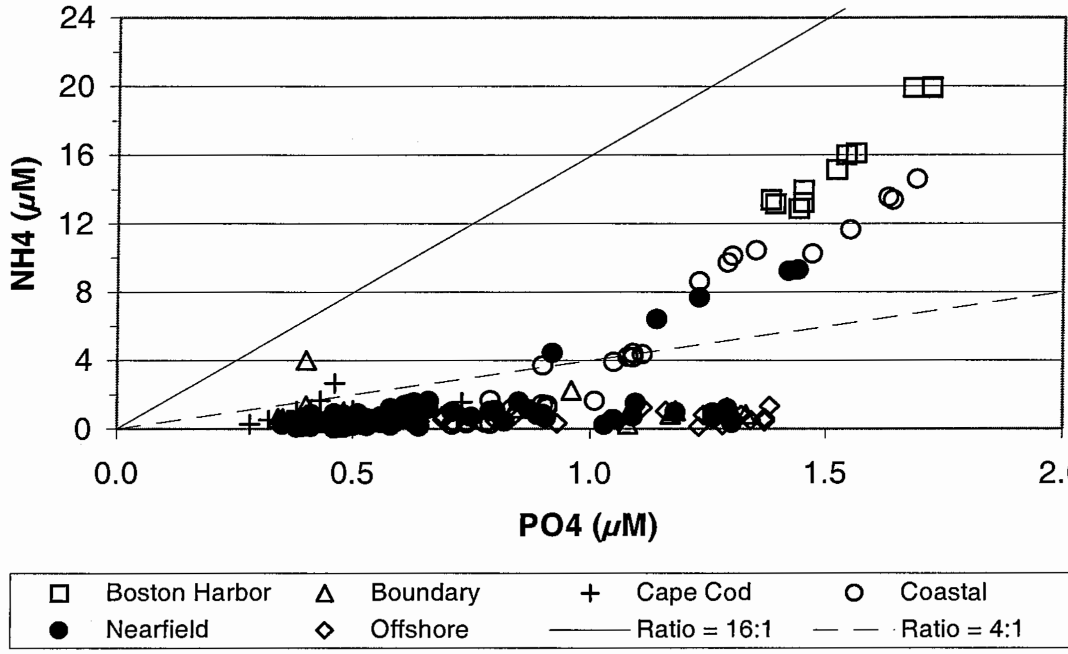


Figure D-65. Nutrient vs. Nutrient Plots for Farfield Survey WF99E, (Oct 99)

(a)



(b)

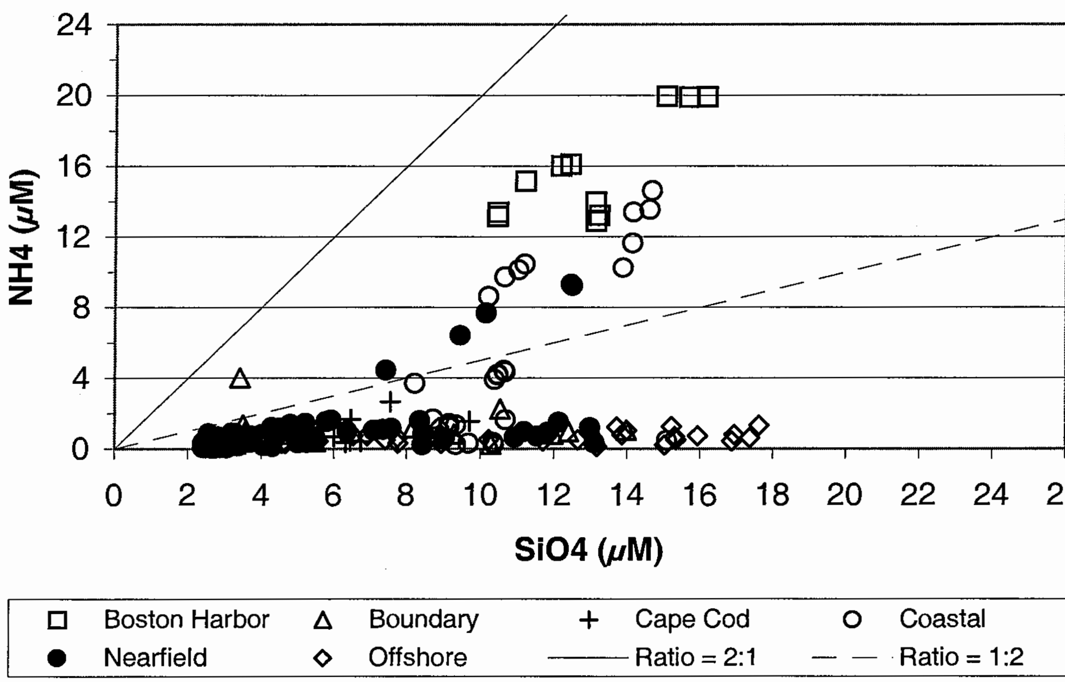


Figure D-66. Nutrient vs. Nutrient Plots for Farfield Survey WF99E, (Oct 99)

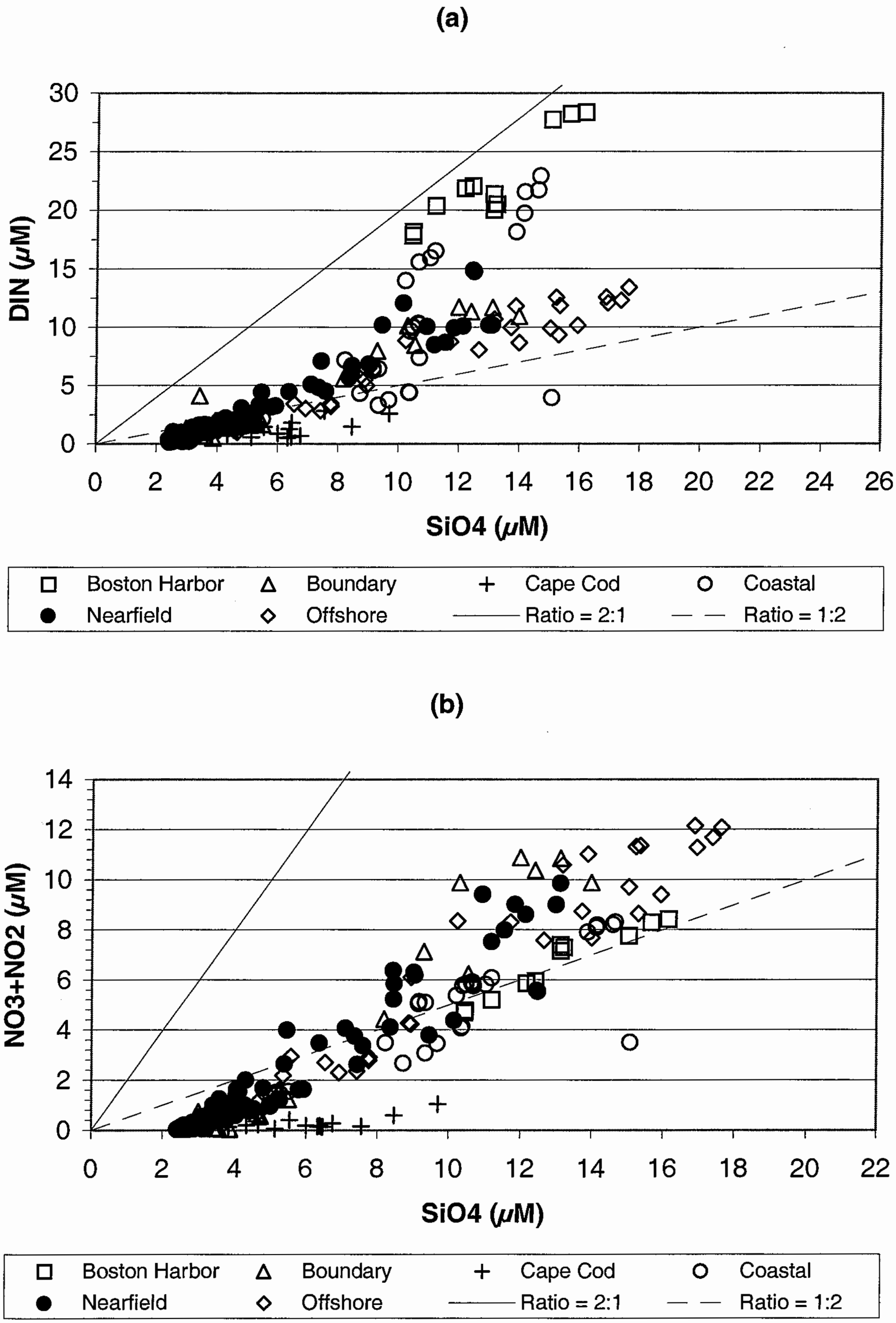
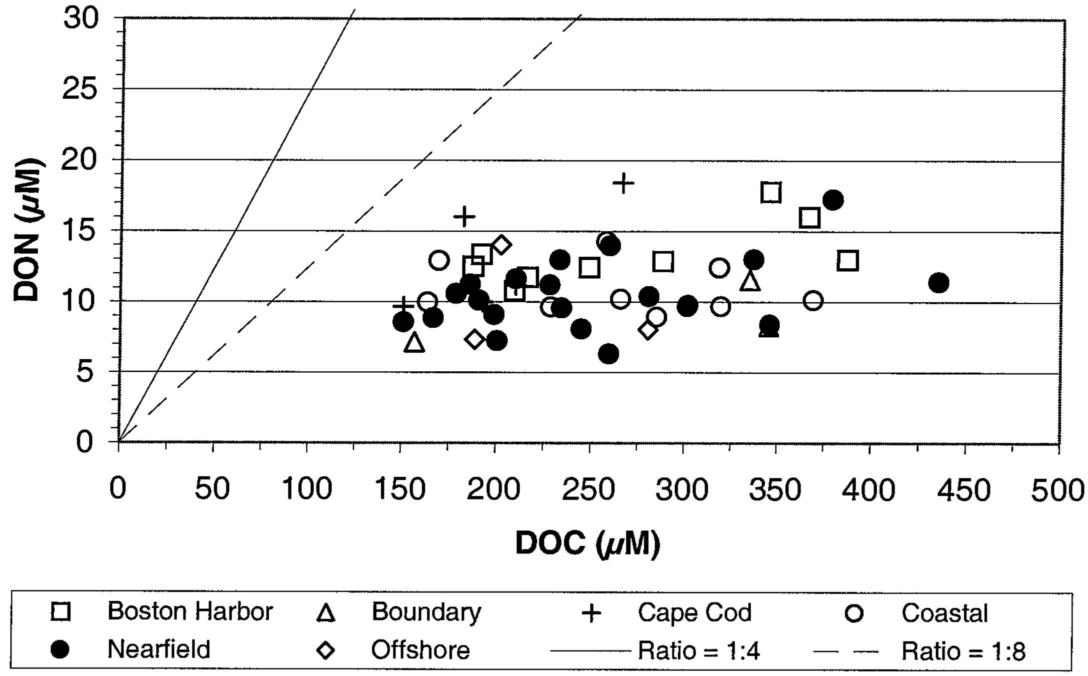


Figure D-67. Nutrient vs. Nutrient Plots for Farfield Survey WF99E, (Oct 99)

(a)



(b)

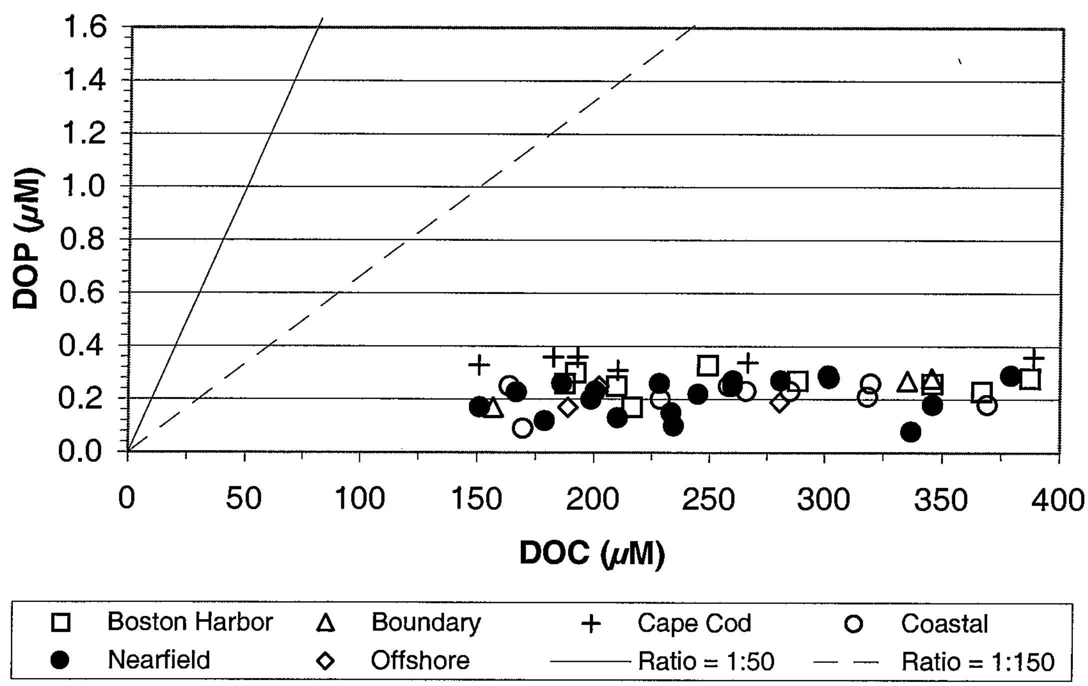
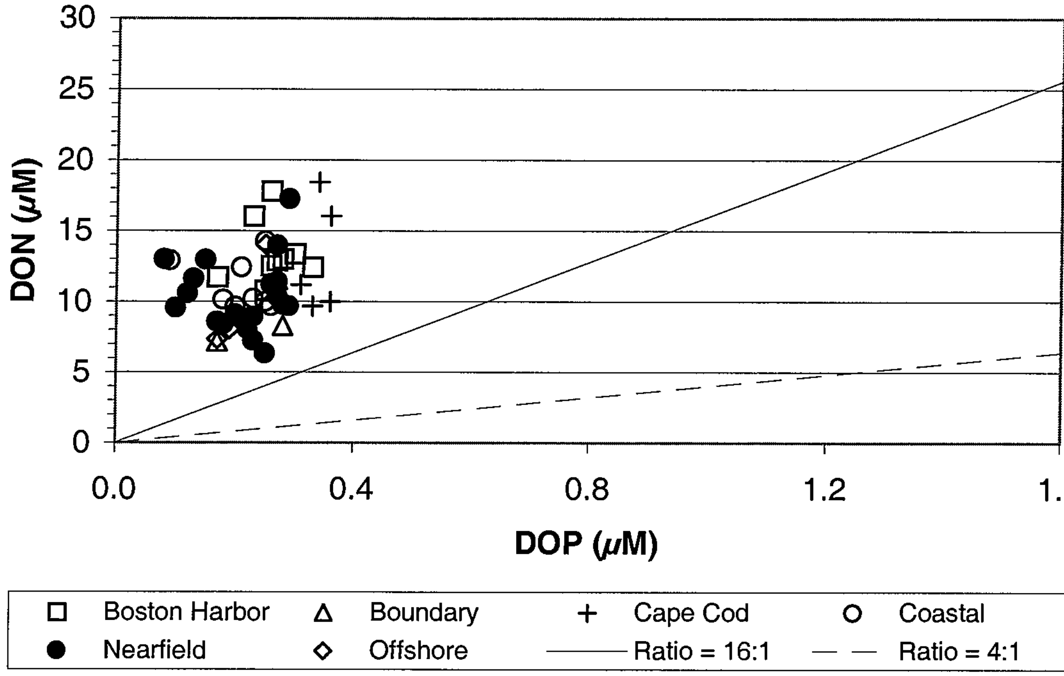


Figure D-68. Nutrient vs. Nutrient Plots for Farfield Survey WF99E, (Oct 99)

(a)



(b)

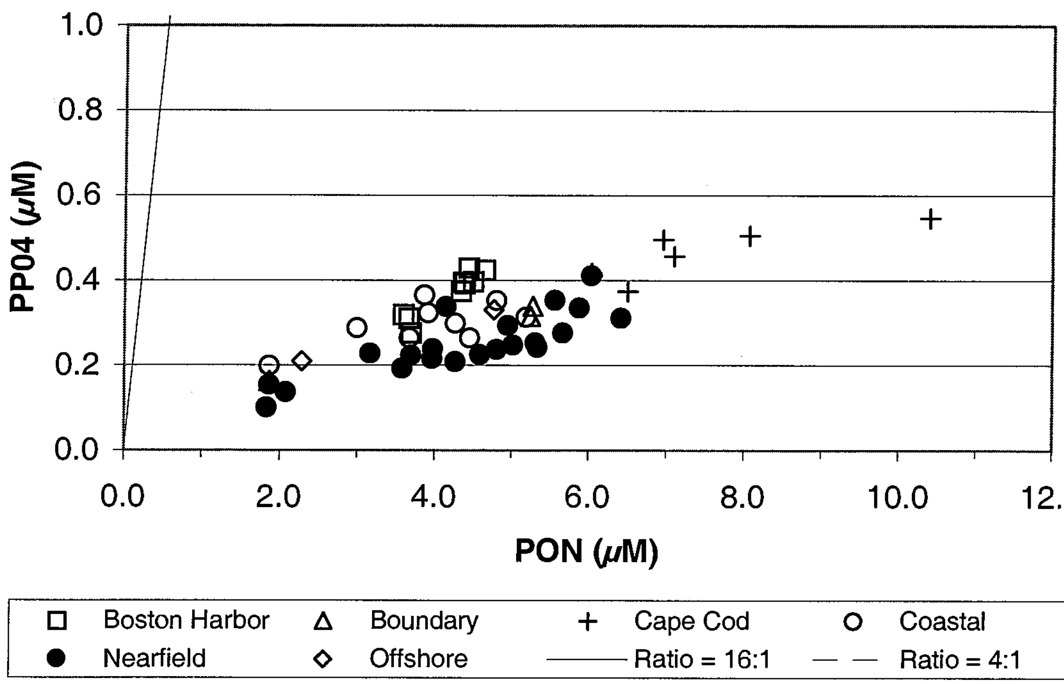
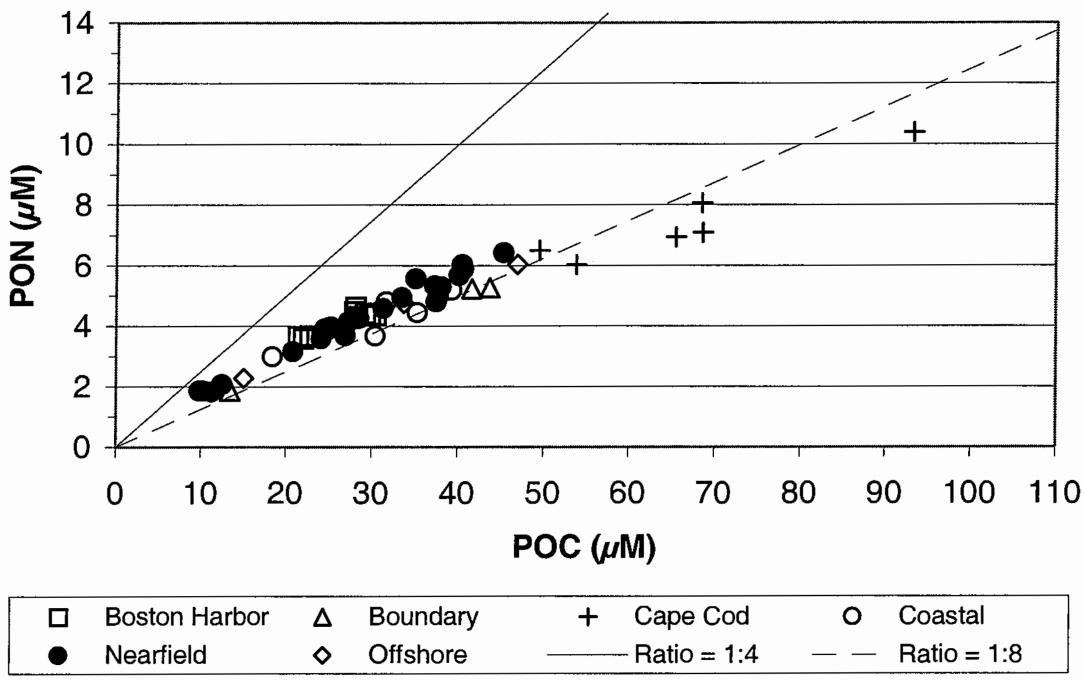


Figure D-69. Nutrient vs. Nutrient Plots for Farfield Survey WF99E, (Oct 99)

(a)



(b)

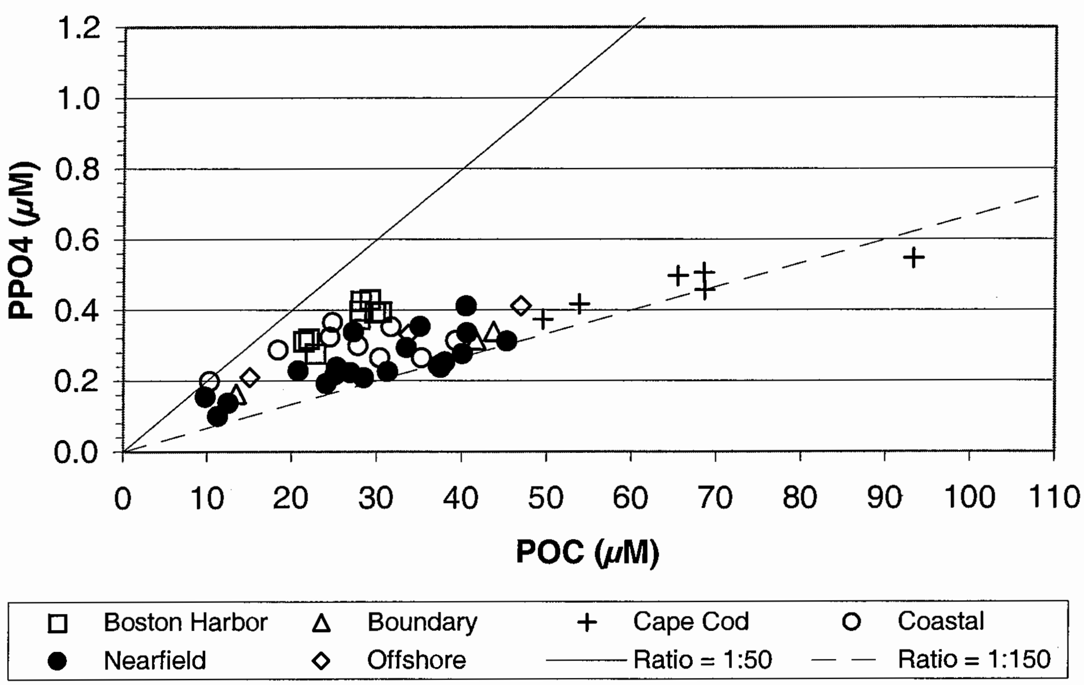
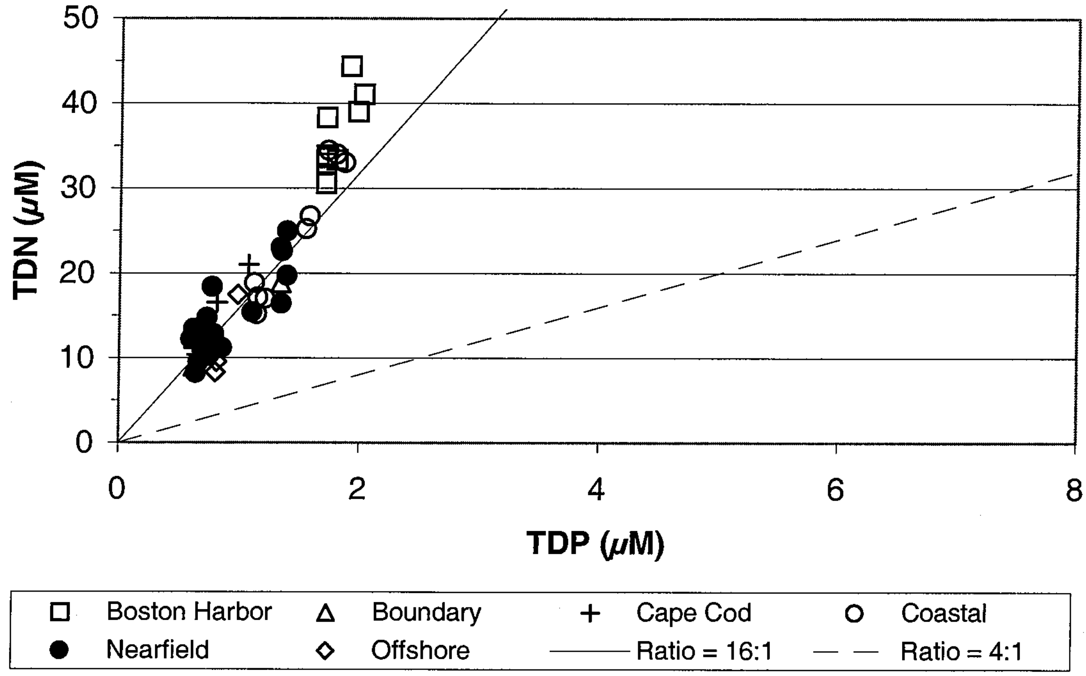


Figure D-70. Nutrient vs. Nutrient Plots for Farfield Survey WF99E, (Oct 99)

(a)



(b)

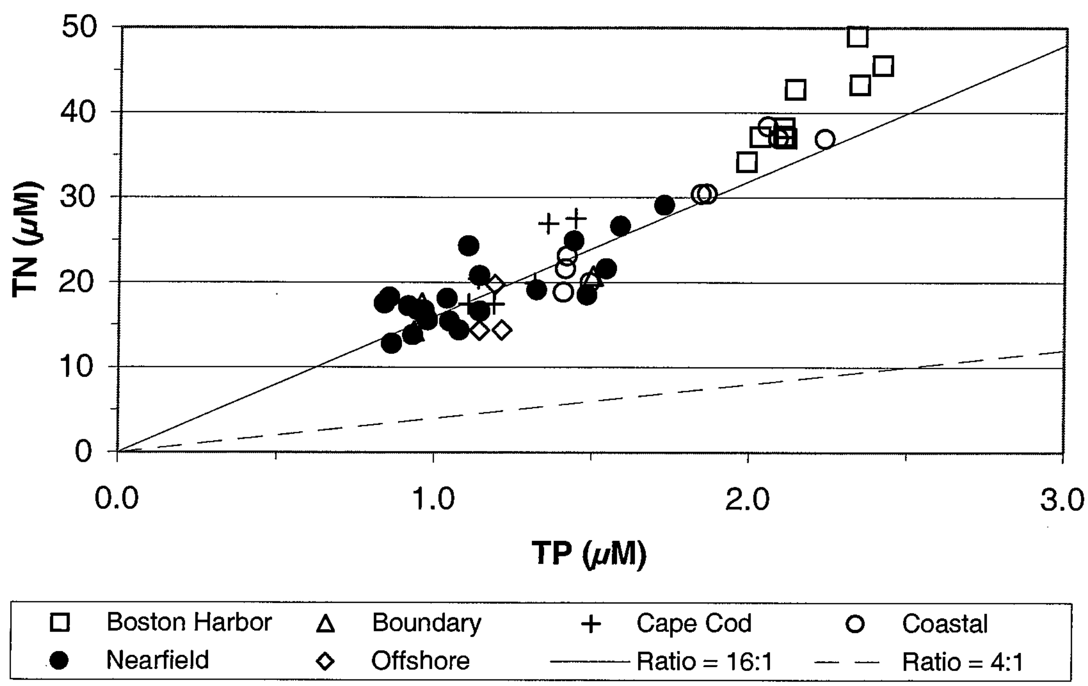
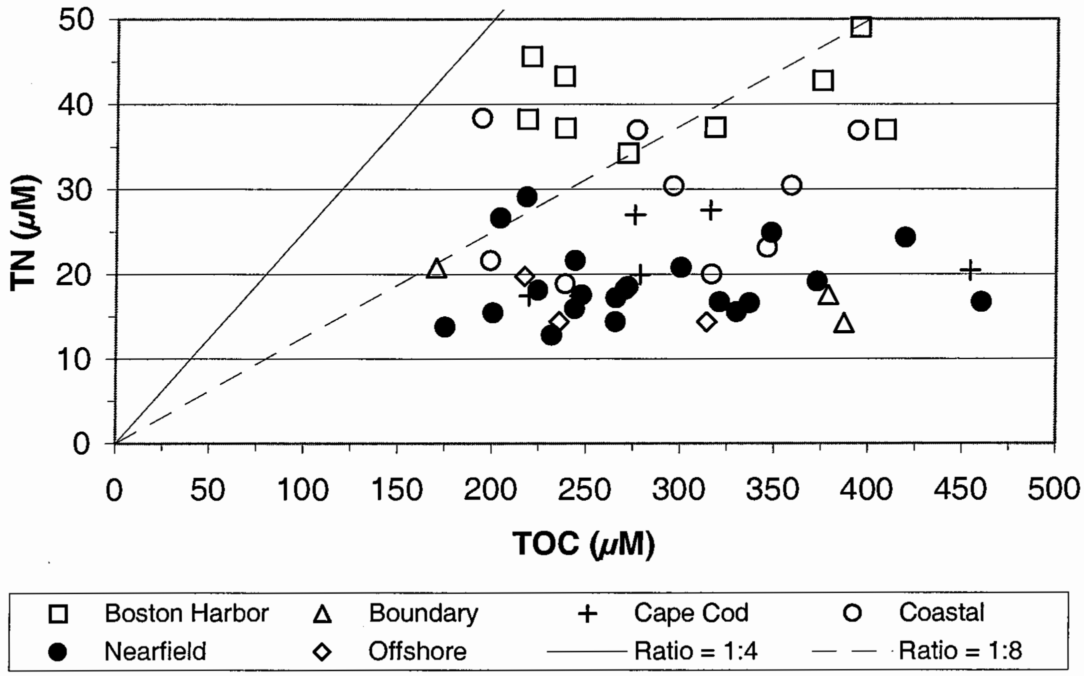


Figure D-71. Nutrient vs. Nutrient Plots for Farfield Survey WF99E, (Oct 99)

(a)



(b)

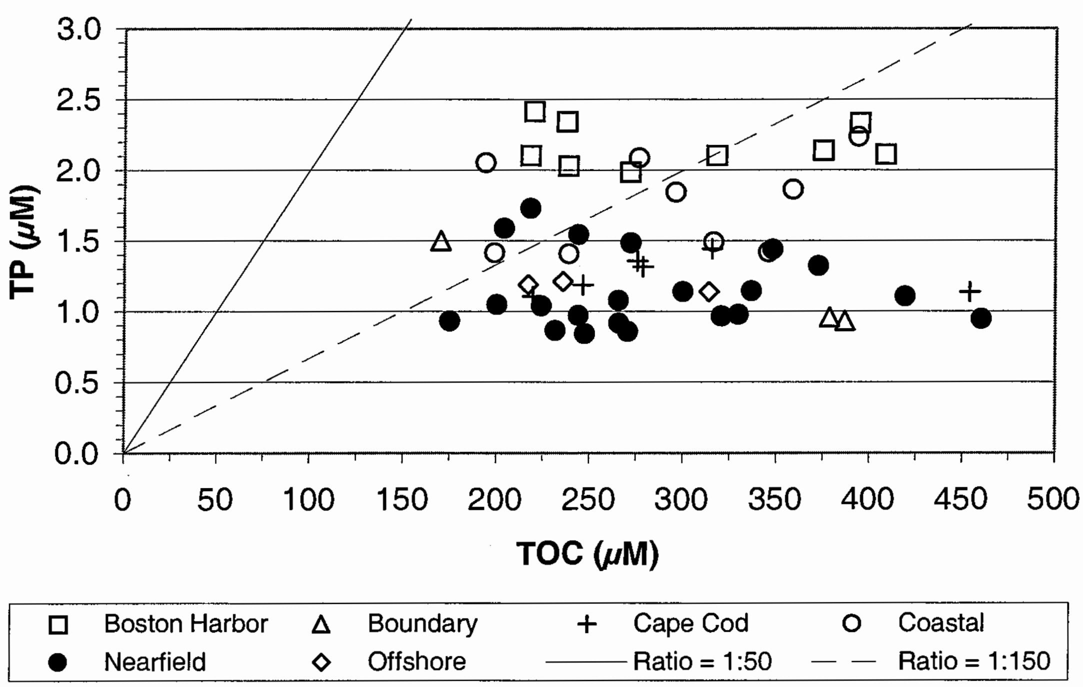


Figure D-72. Nutrient vs. Nutrient Plots for Farfield Survey WF99E, (Oct 99)

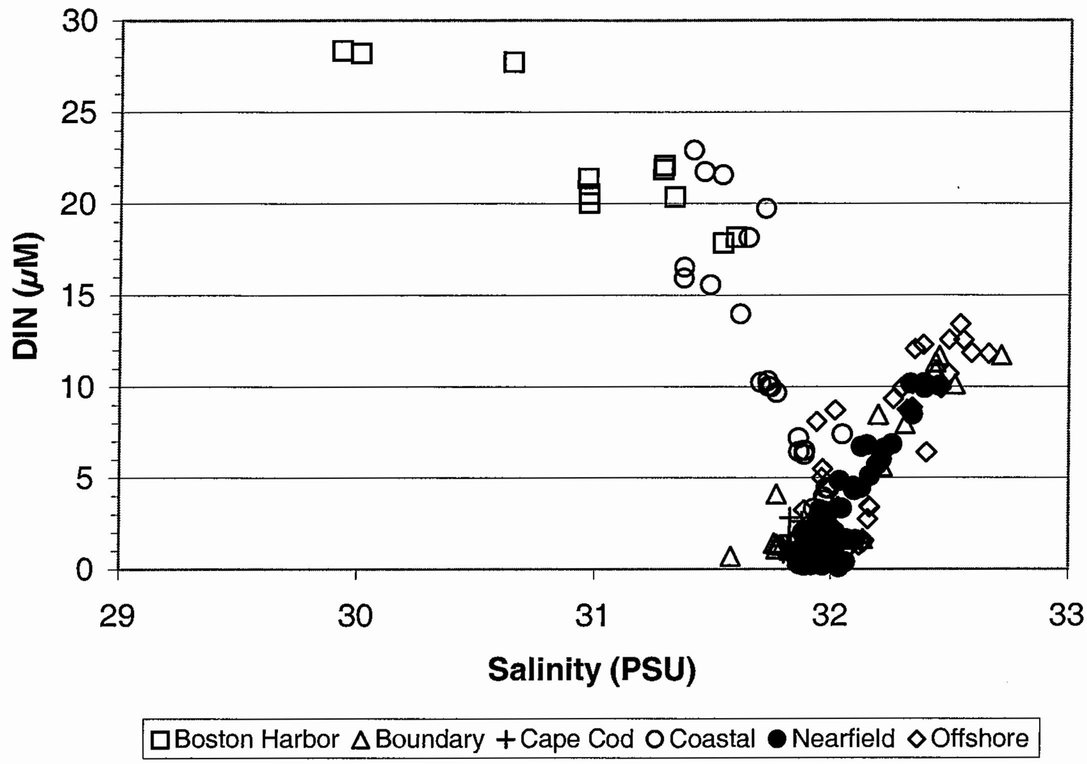
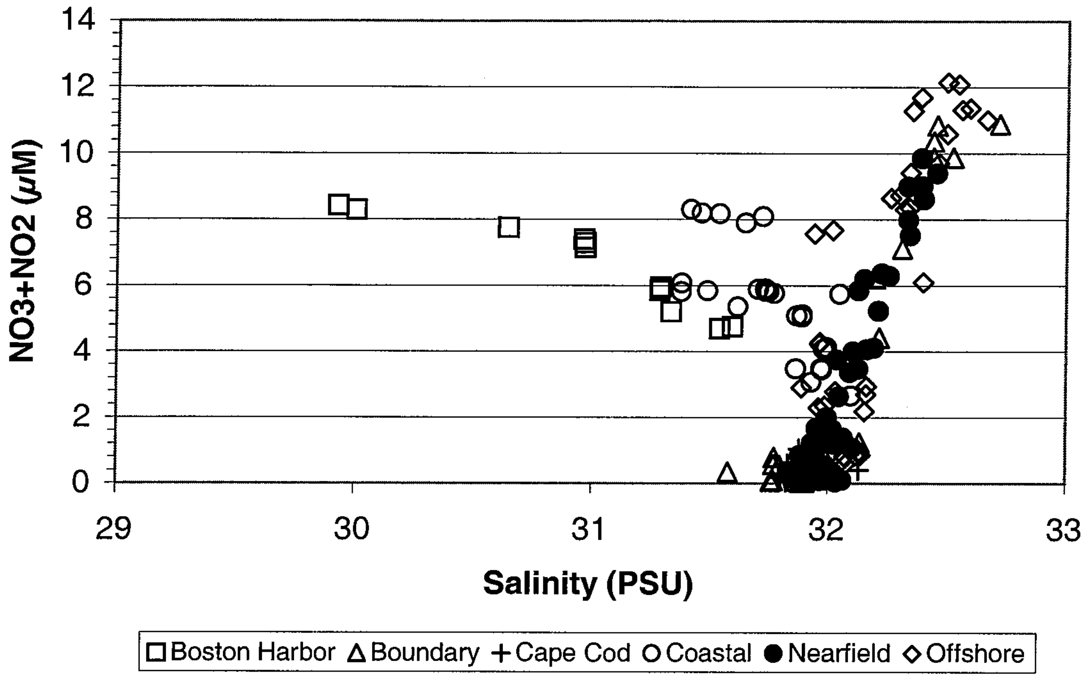


Figure D-73. Nutrient vs. Salinity Plots for Farfield Survey WF99E, (Oct 99)

(a)



(b)

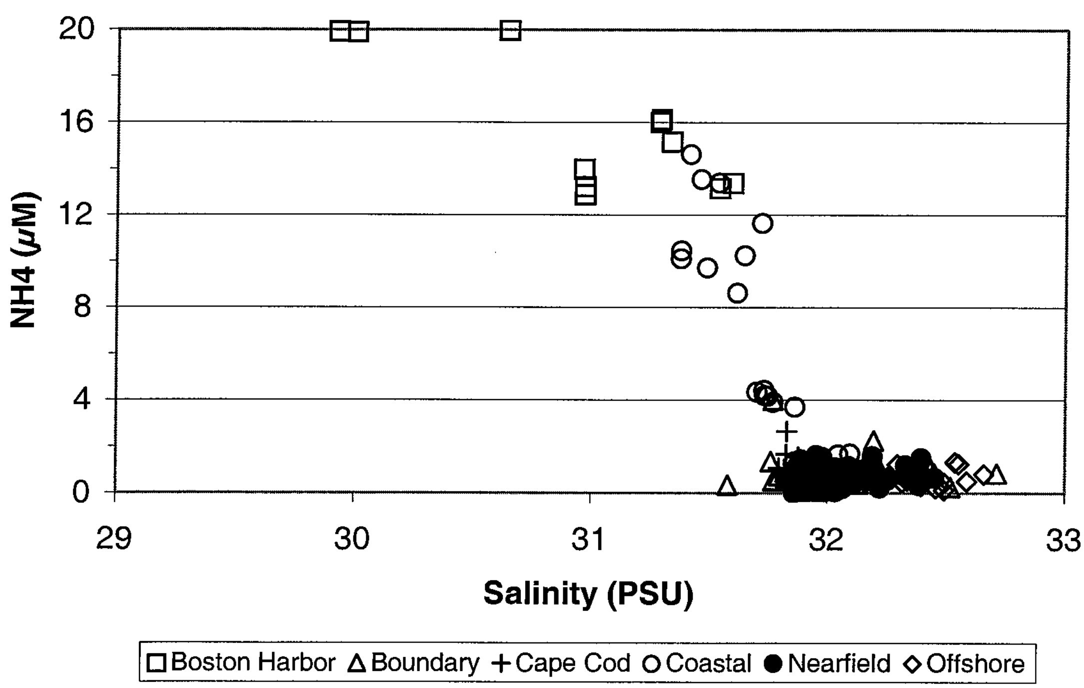
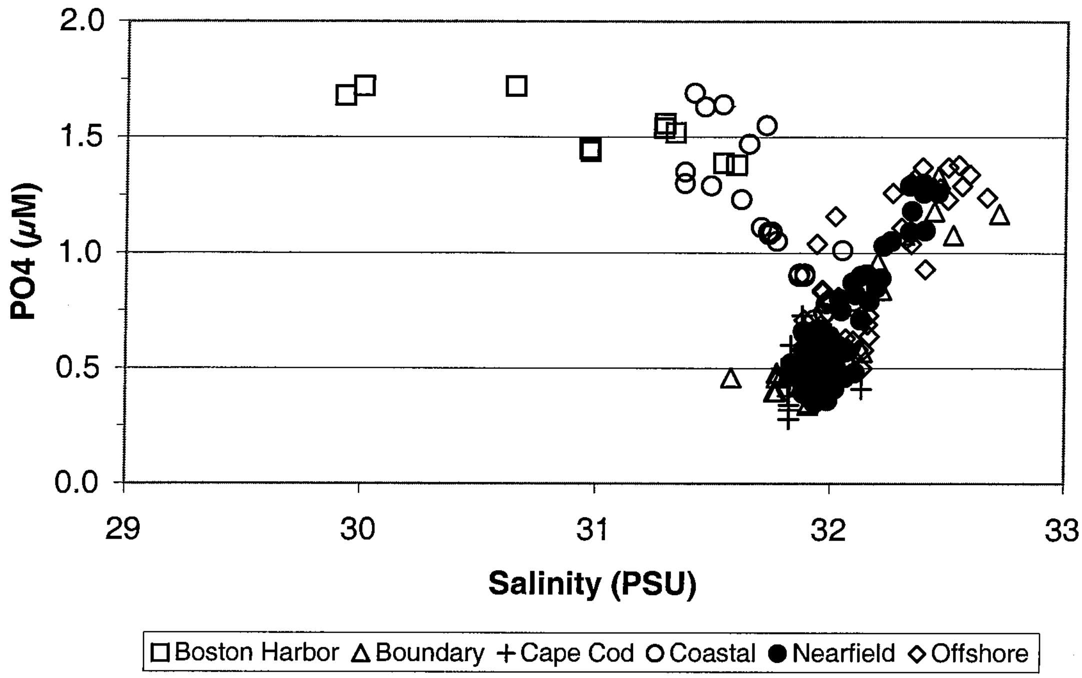


Figure D-74. Nutrient vs. Salinity Plots for Farfield Survey WF99E, (Oct 99)

(a)



(b)

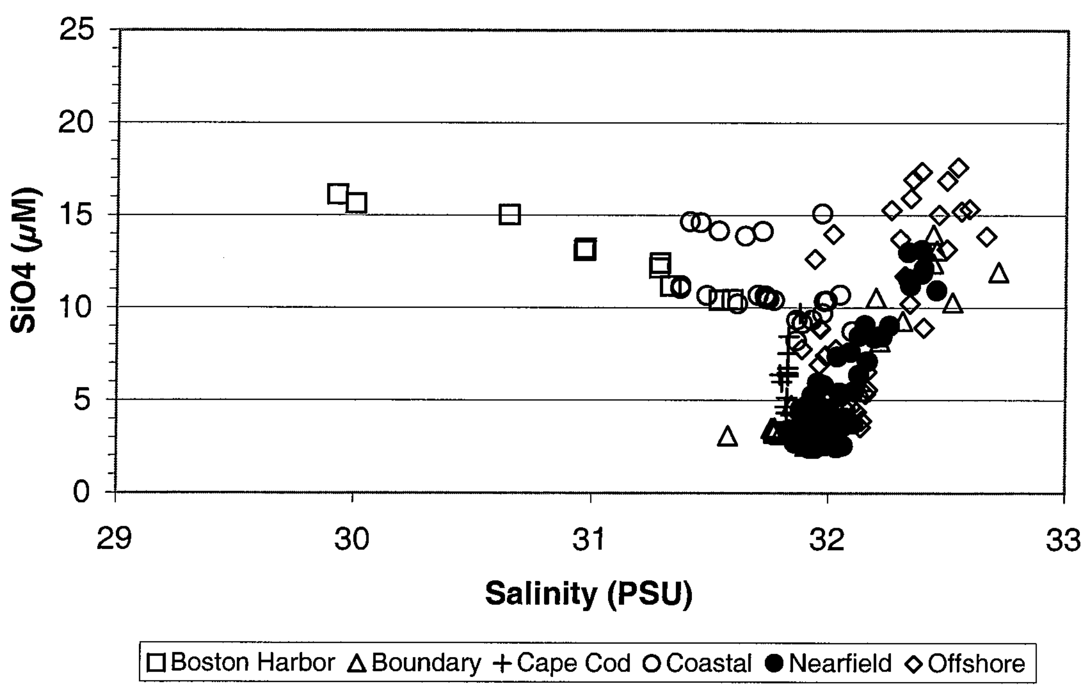


Figure D-75. Nutrient vs. Salinity Plots for Farfield Survey WF99E, (Oct 99)

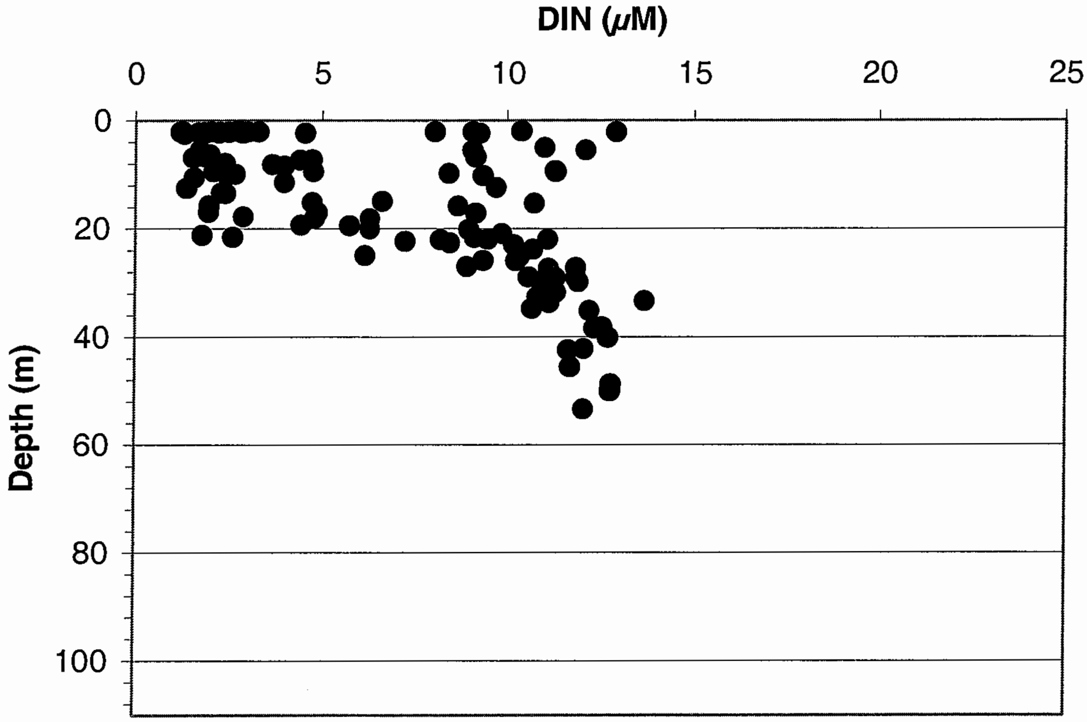
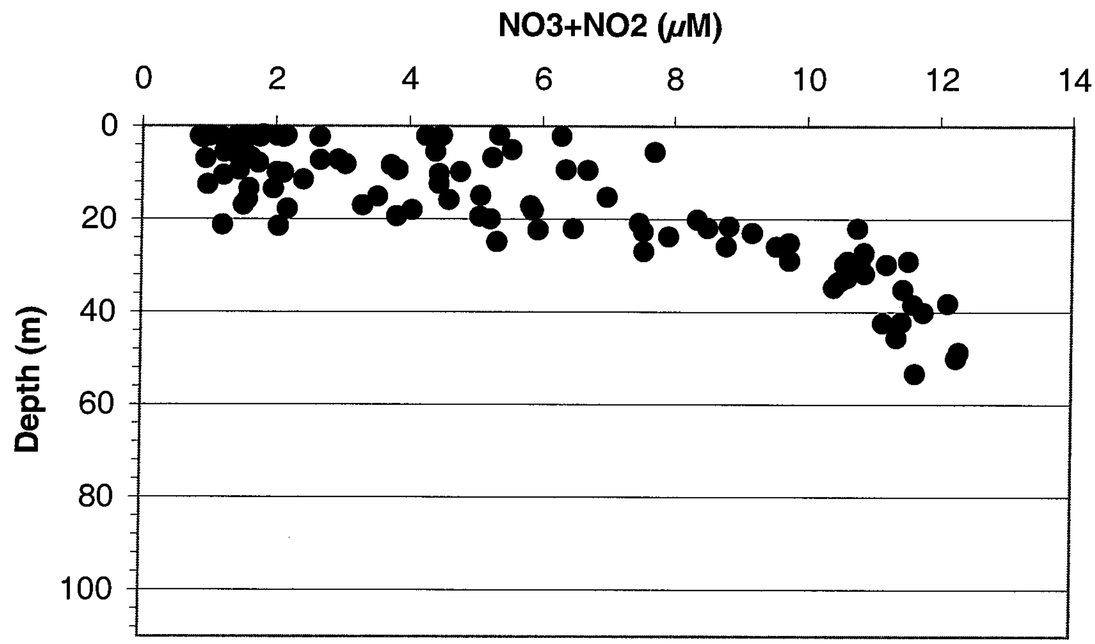


Figure D-76. Depth vs. Nutrient Plots for Nearfield Survey WN99F, (Oct 99)

(a)



(b)

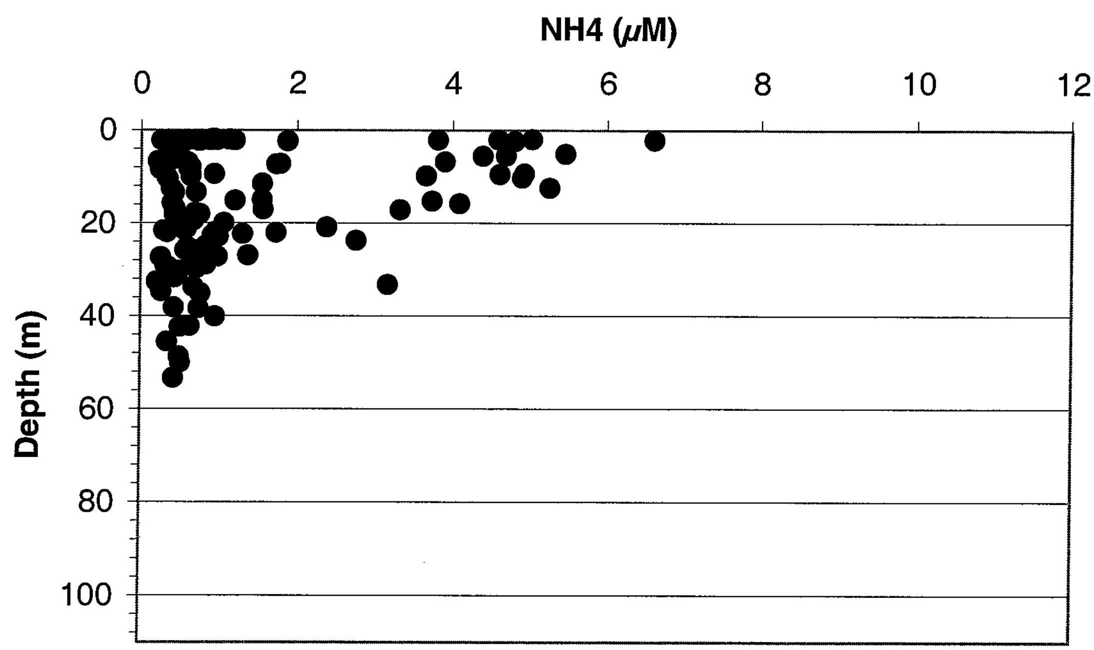
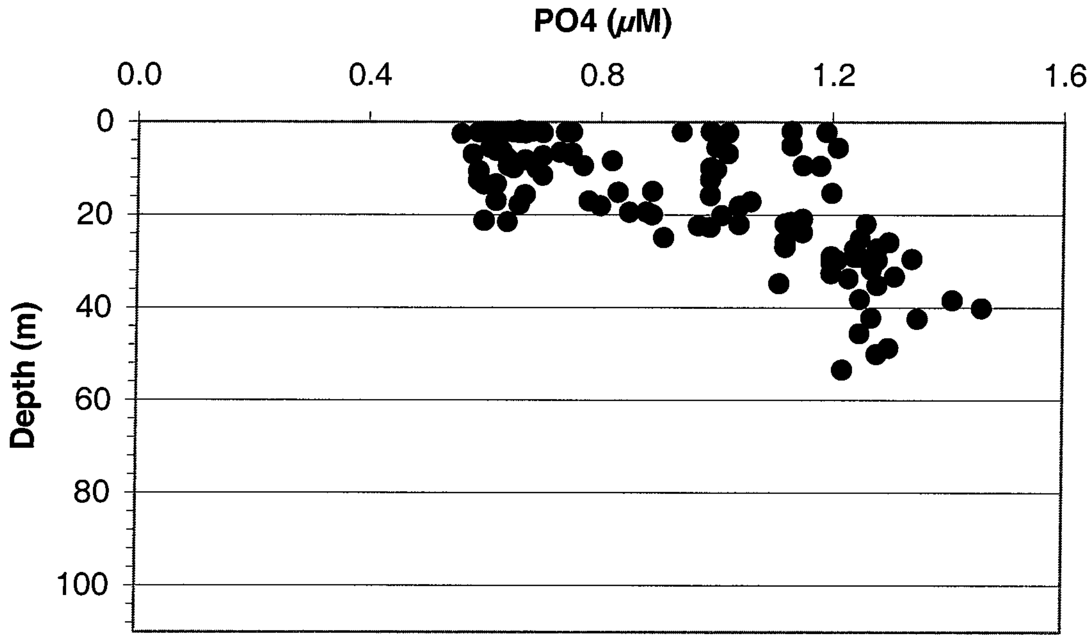


Figure D-77. Depth vs. Nutrient Plots for Nearfield Survey WN99F, (Oct 99)

(a)



(b)

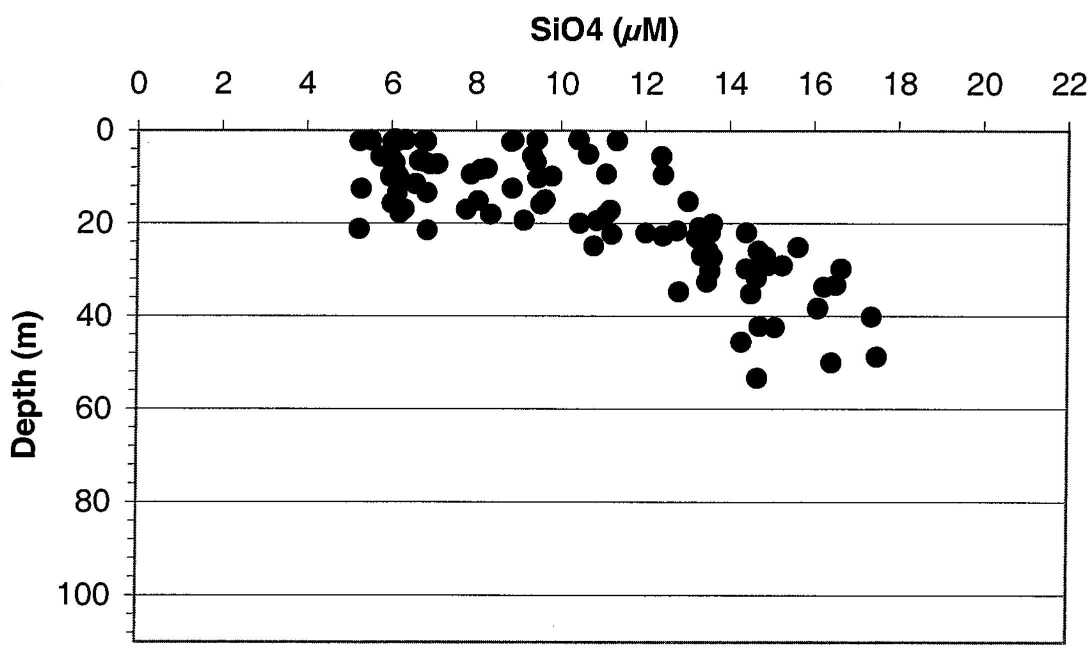
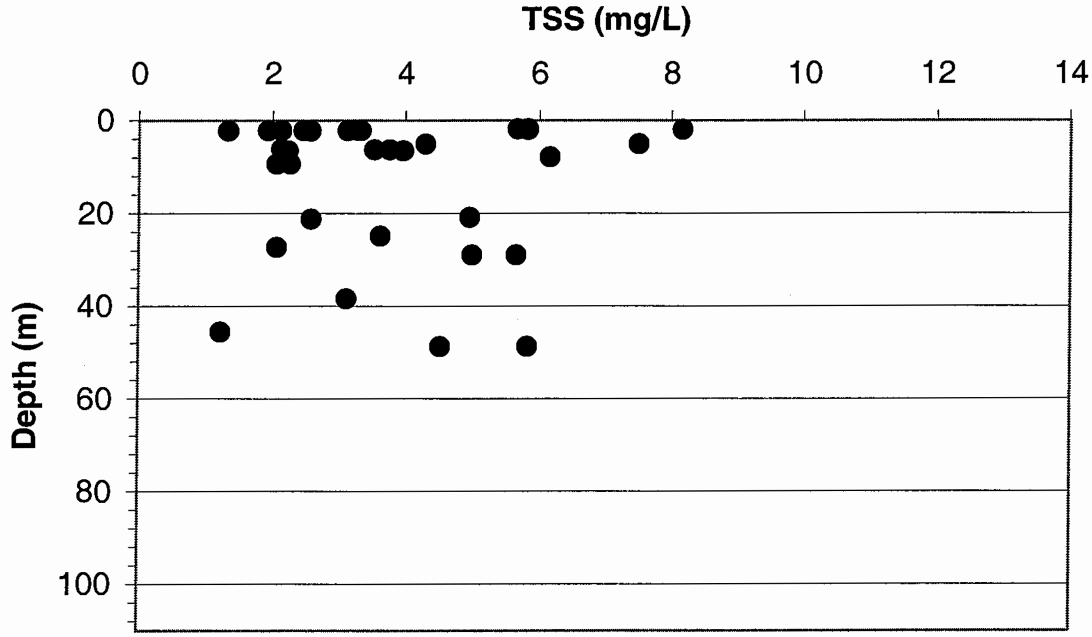


Figure D-78. Depth vs. Nutrient Plots for Nearfield Survey WN99F, (Oct 99)

(a)



(b)

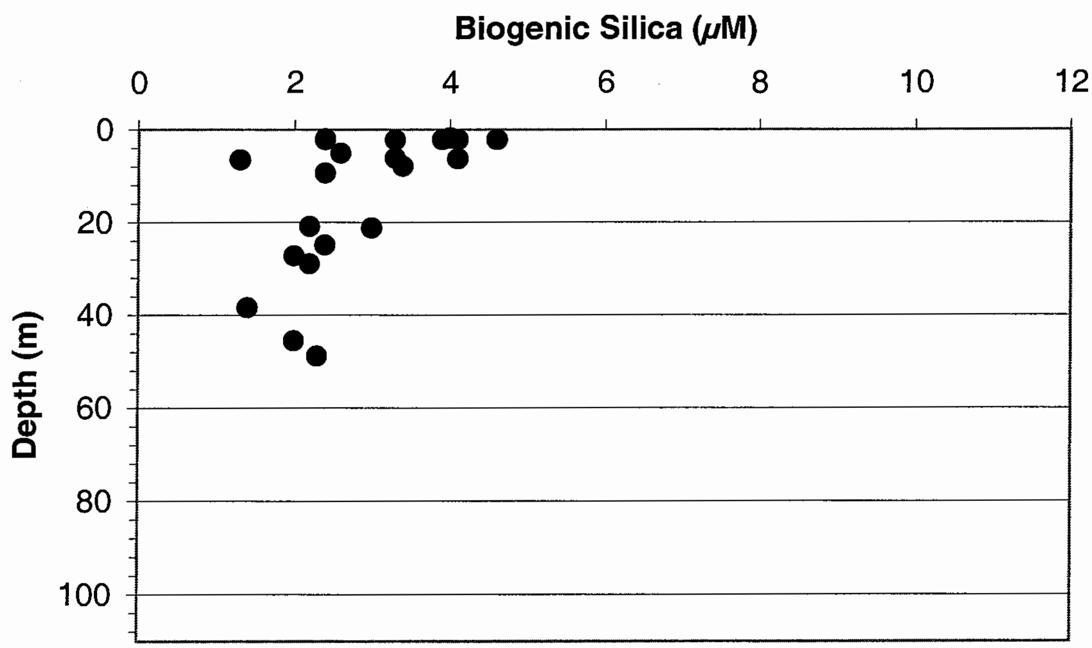
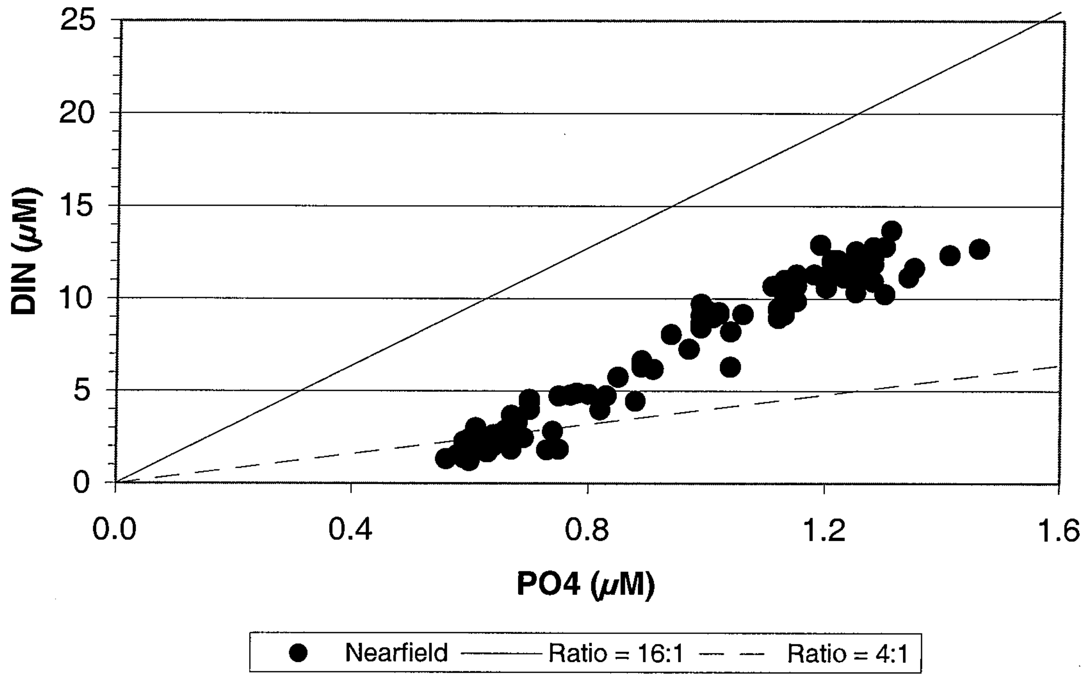


Figure D-79. Depth vs. Nutrient Plots for Nearfield Survey WN99F, (Oct 99)

(a)



(b)

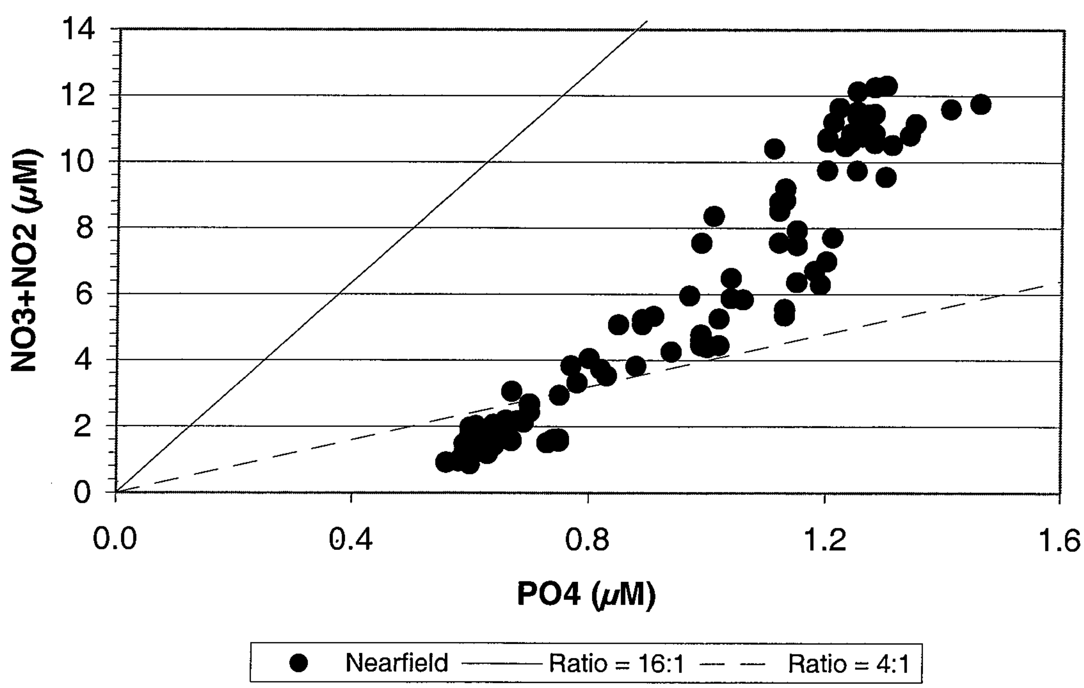
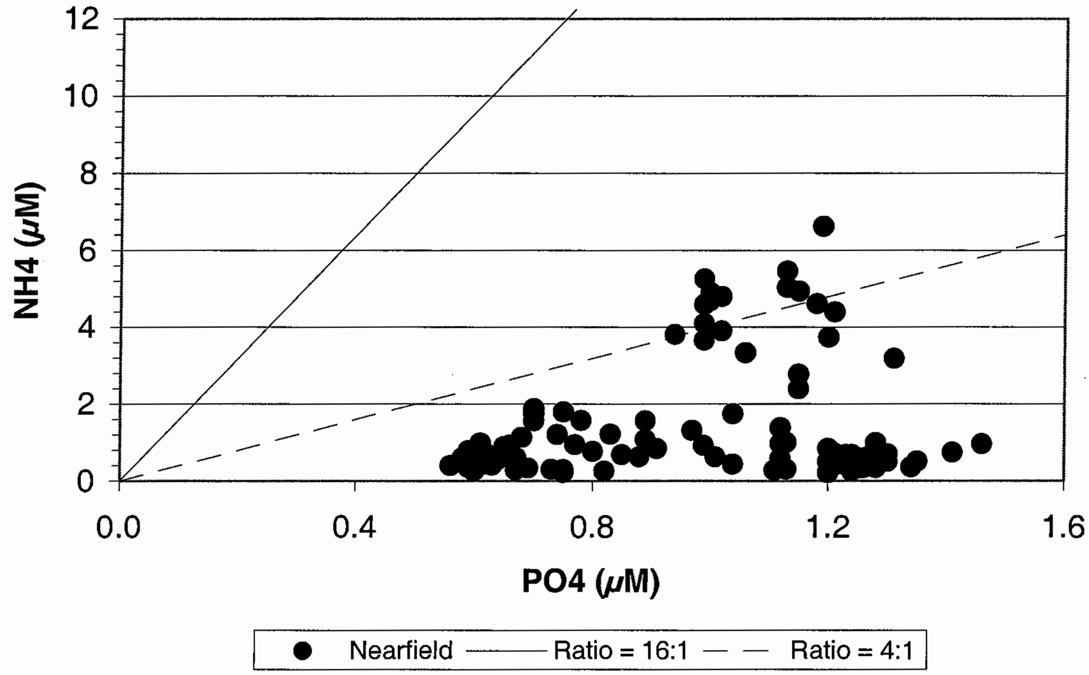


Figure D-80. Nutrient vs. Nutrient Plots for Nearfield Survey WN99F, (Oct 99)

(a)



(b)

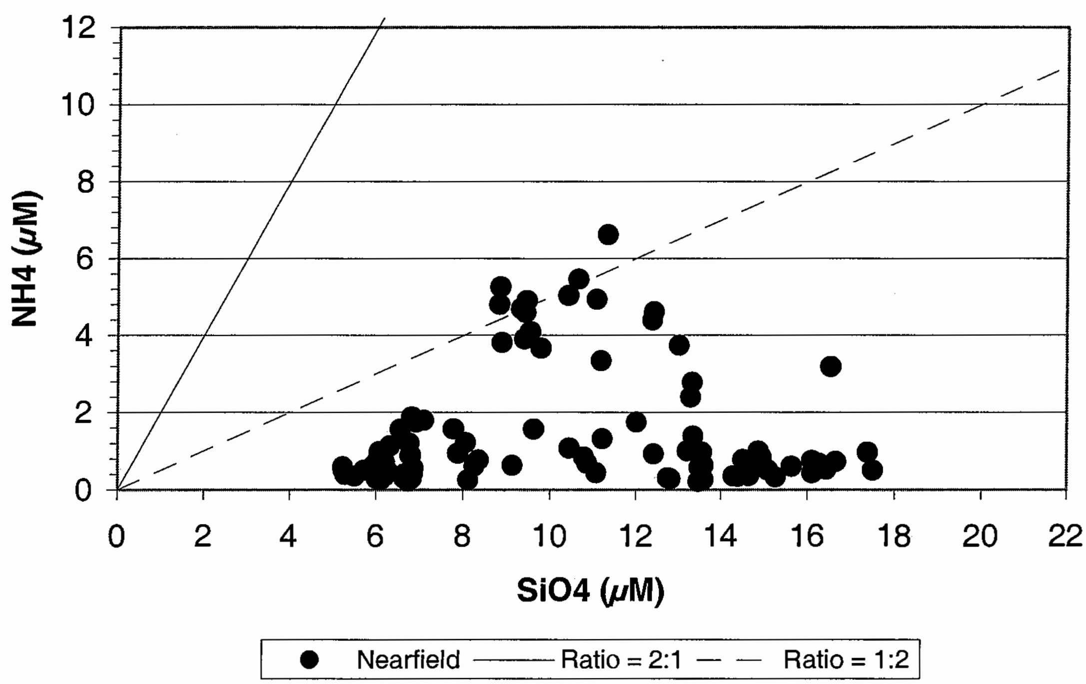
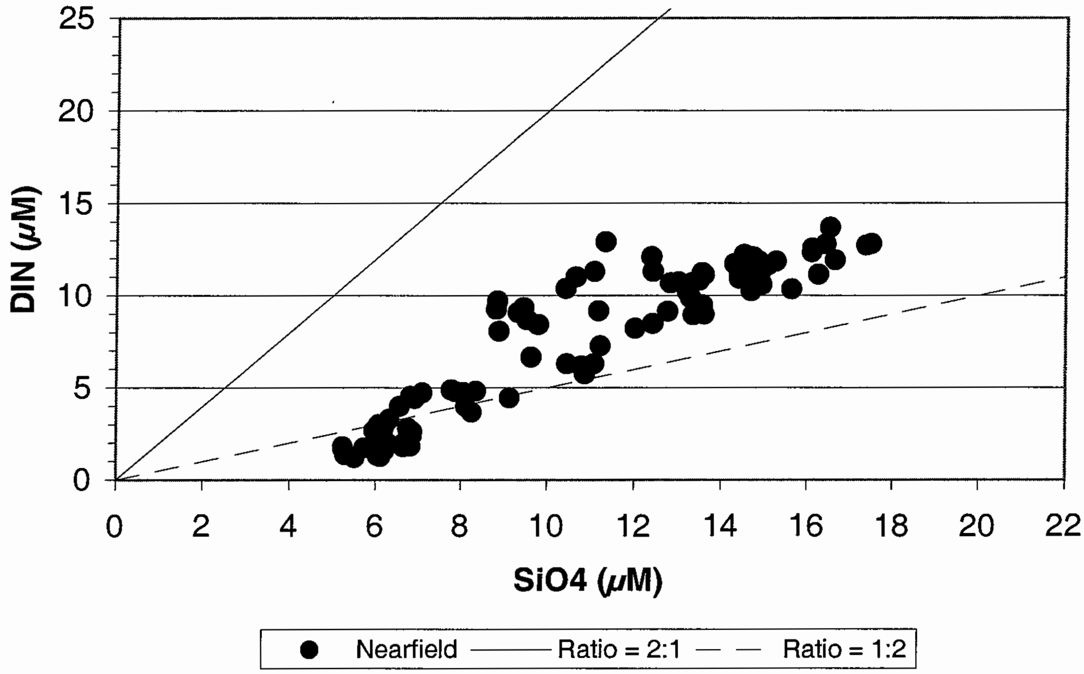


Figure D-81. Nutrient vs. Nutrient Plots for Nearfield Survey WN99F, (Oct 99)

(a)



(b)

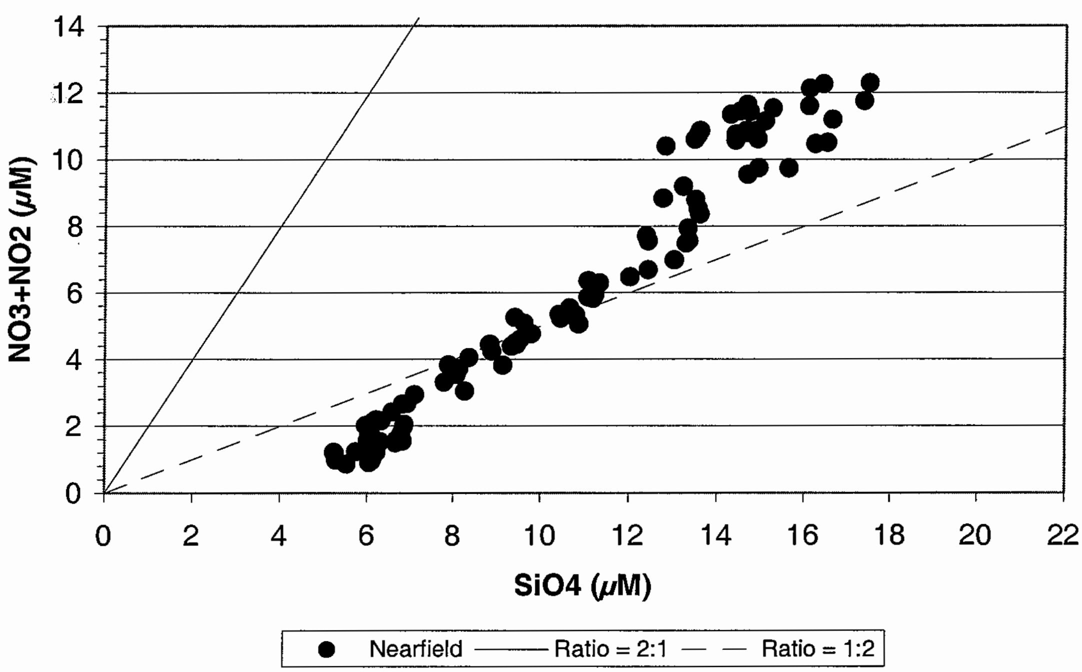
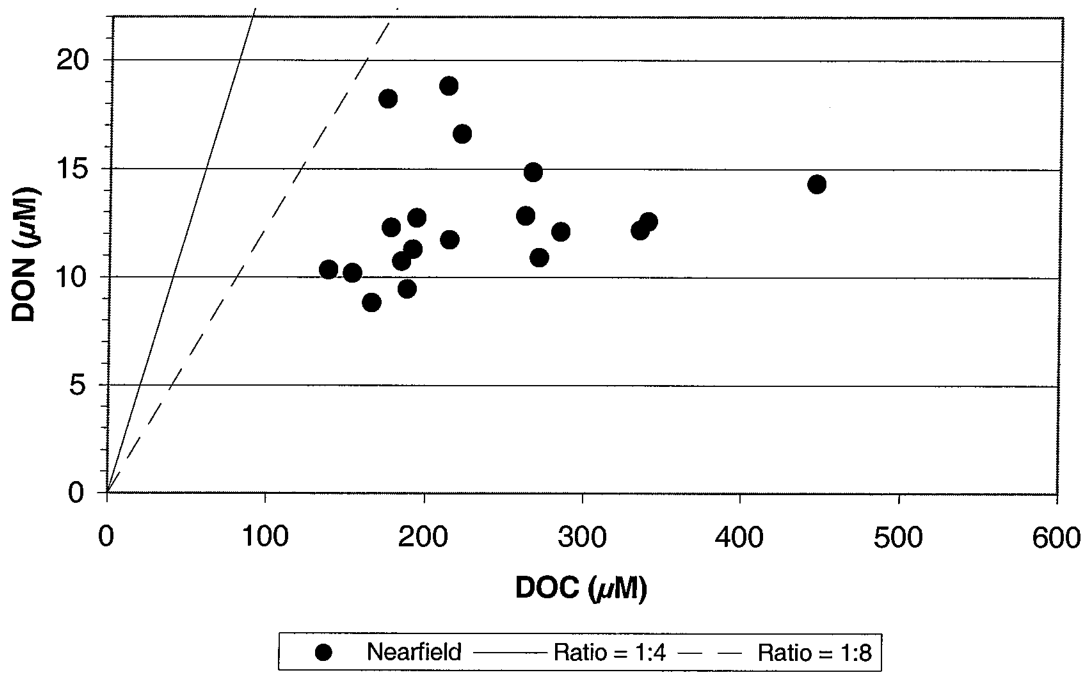


Figure D-82. Nutrient vs. Nutrient Plots for Nearfield Survey WN99F, (Oct 99)

(a)



(b)

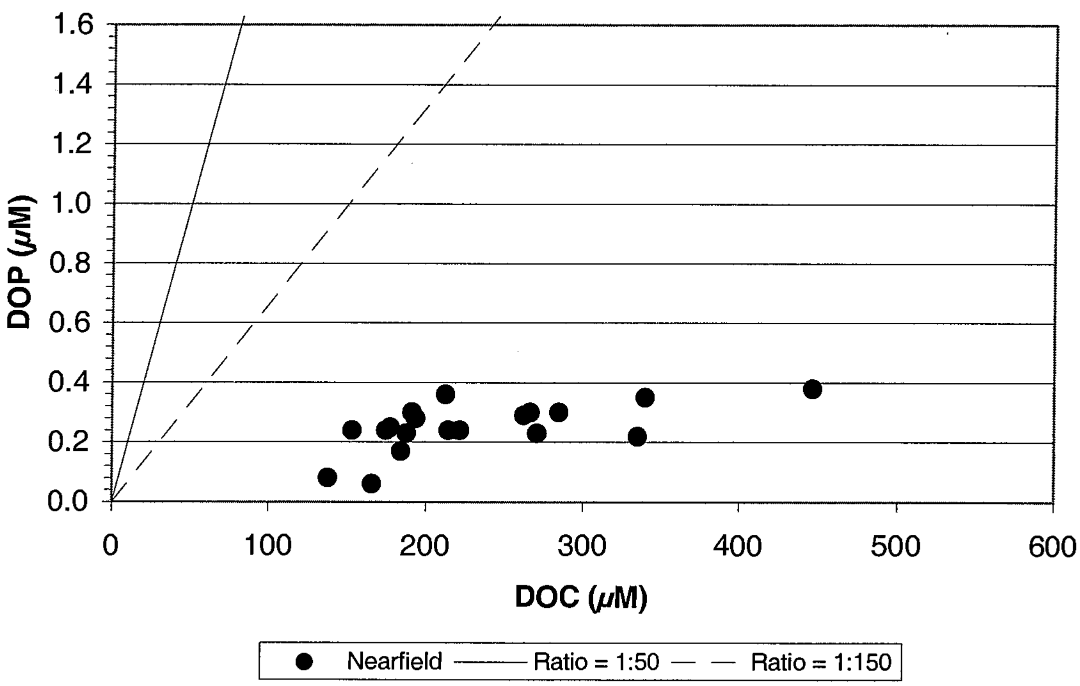
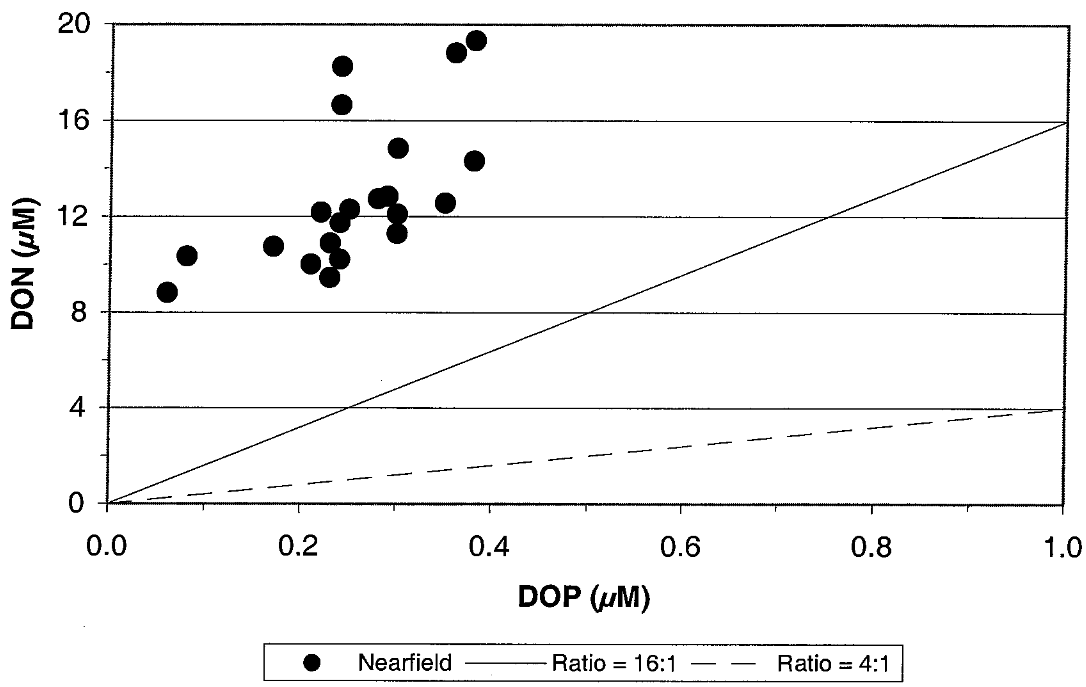


Figure D-83. Nutrient vs. Nutrient Plots for Nearfield Survey WN99F, (Oct 99)

(a)



(b)

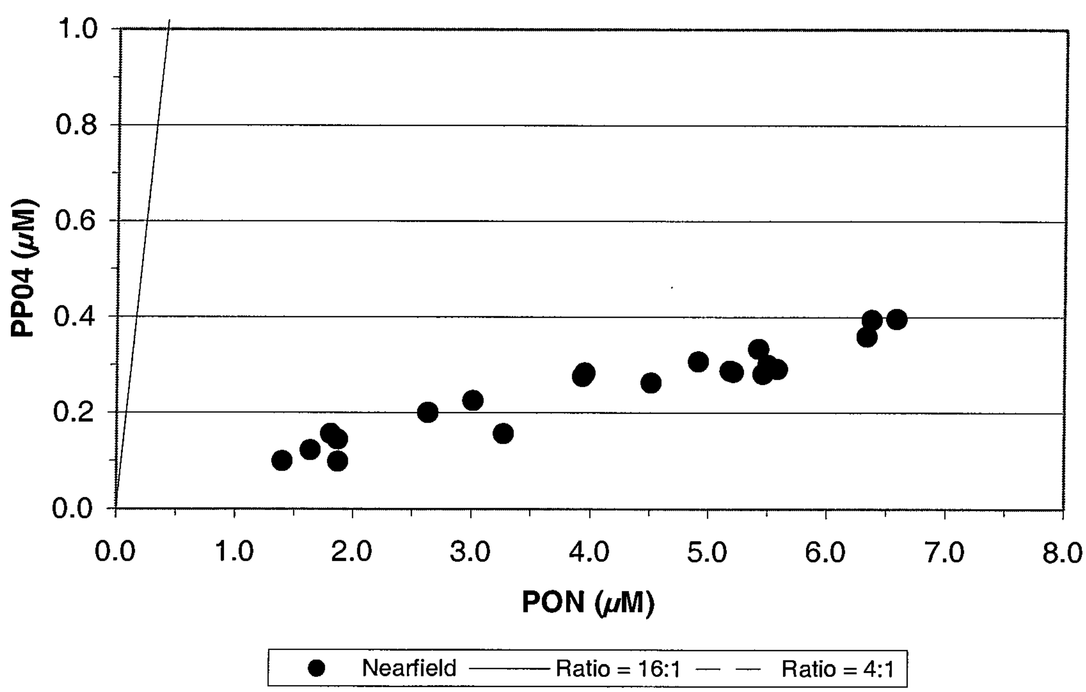
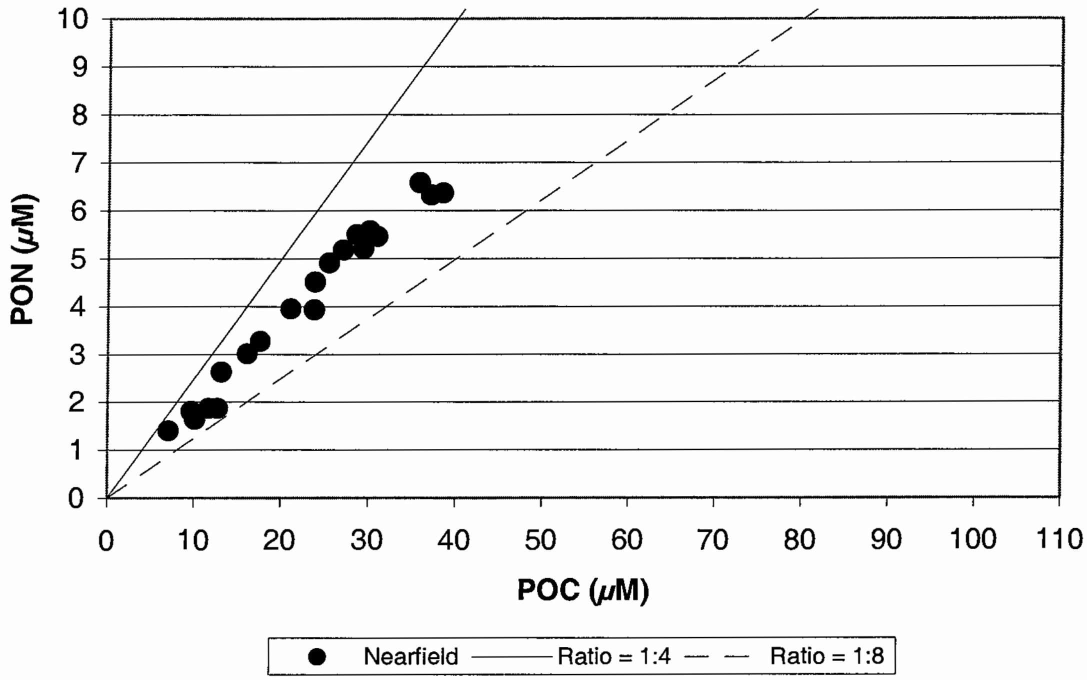


Figure D-84. Nutrient vs. Nutrient Plots for Nearfield Survey WN99F, (Oct 99)

(a)



(b)

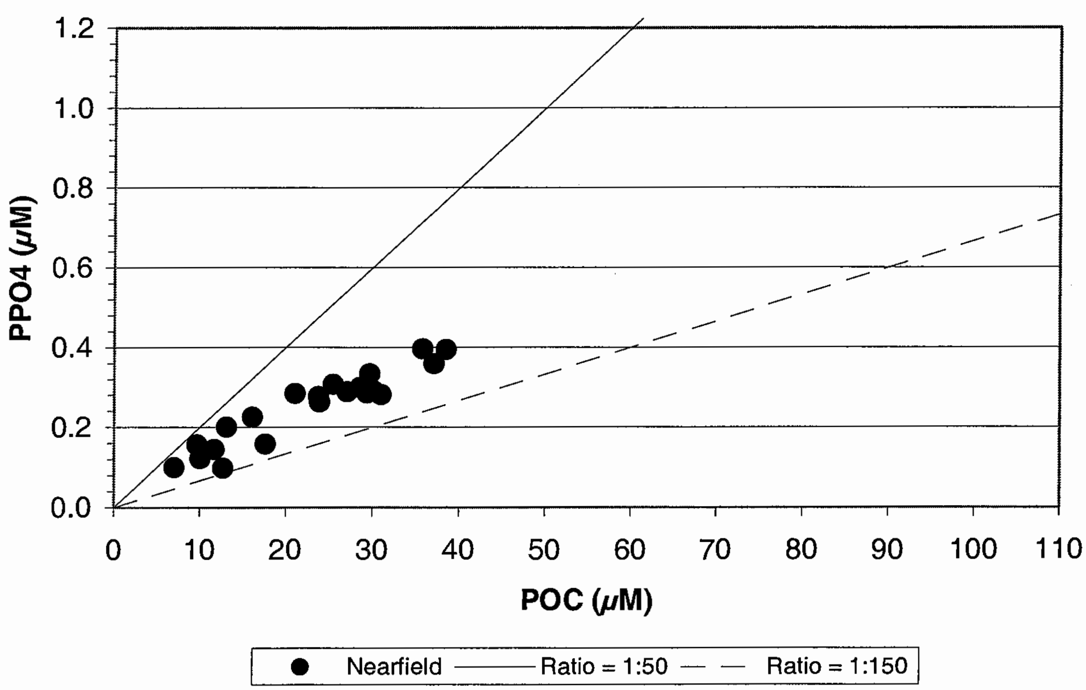
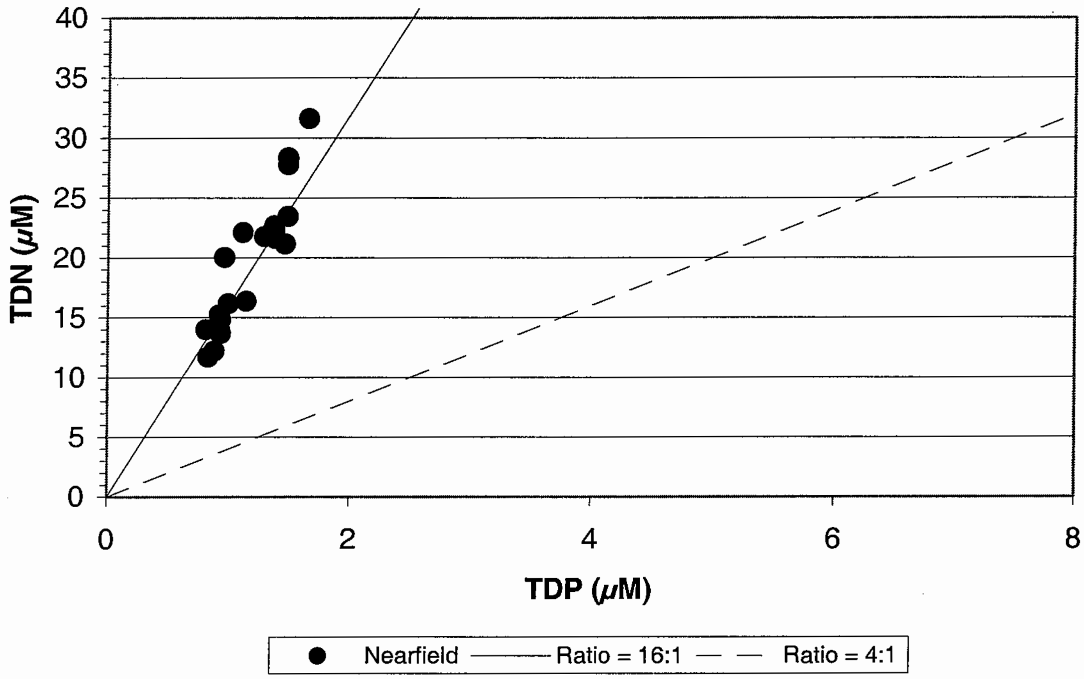


Figure D-85. Nutrient vs. Nutrient Plots for Nearfield Survey WN99F, (Oct 99)

(a)



(b)

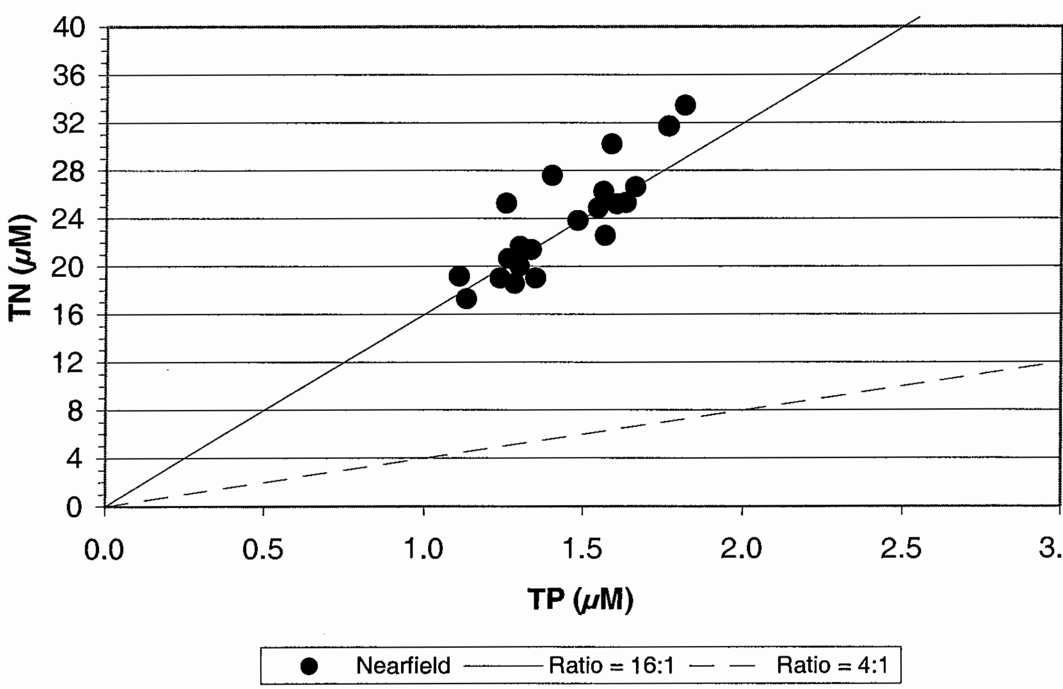
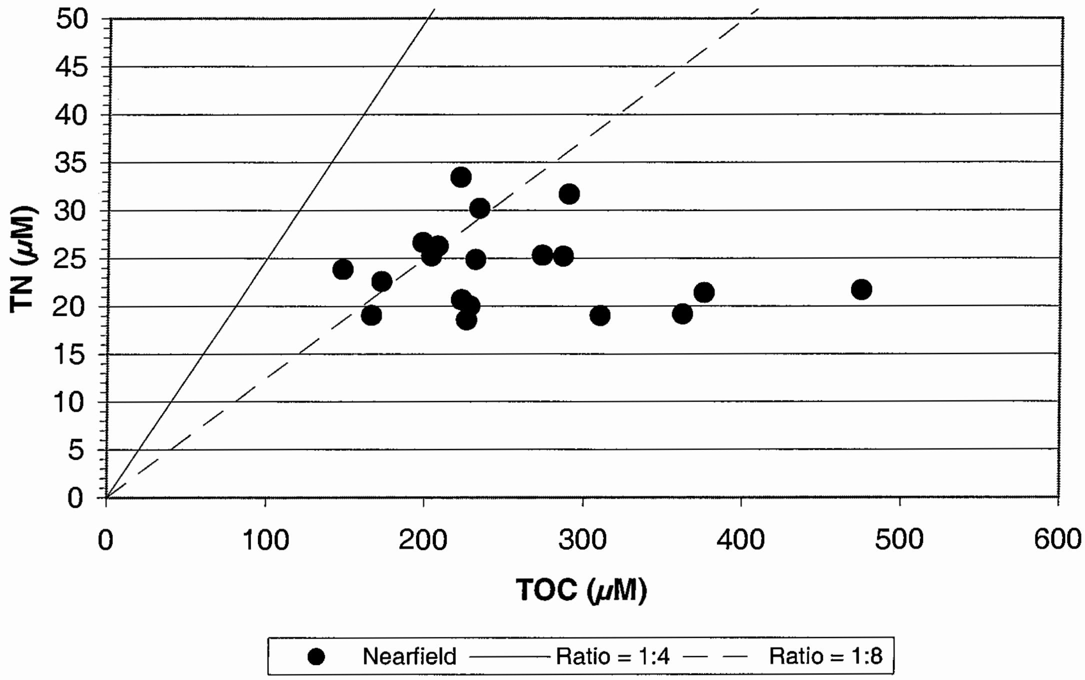


Figure D-86. Nutrient vs. Nutrient Plots for Nearfield Survey WN99F, (Oct 99)

(a)



(b)

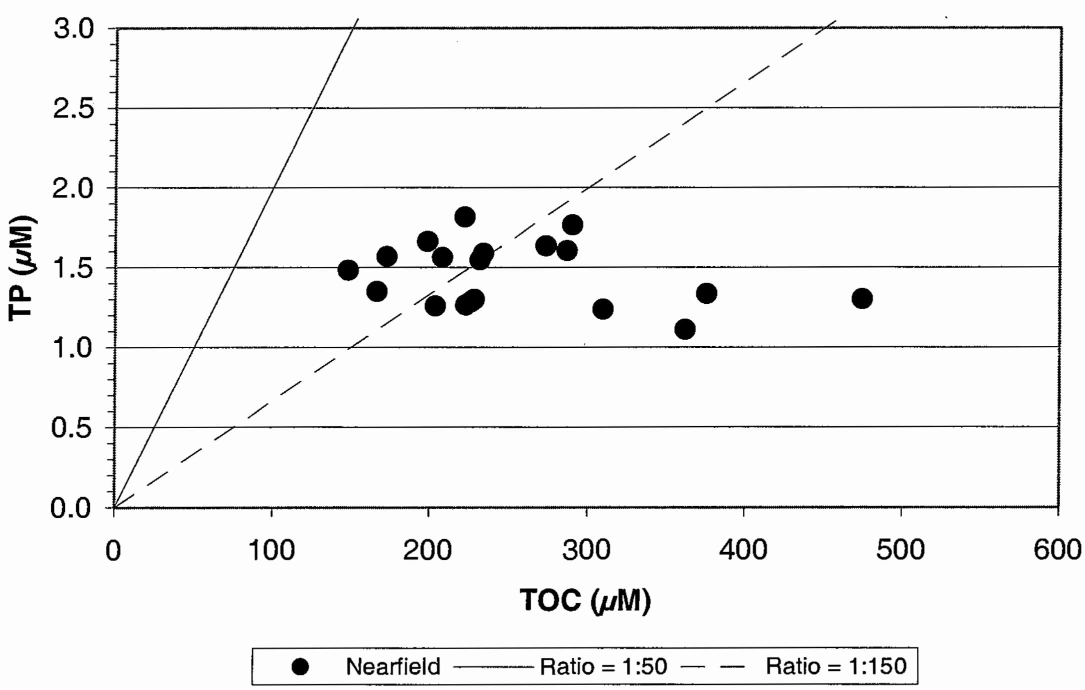


Figure D-87. Nutrient vs. Nutrient Plots for Nearfield Survey WN99F, (Oct 99)

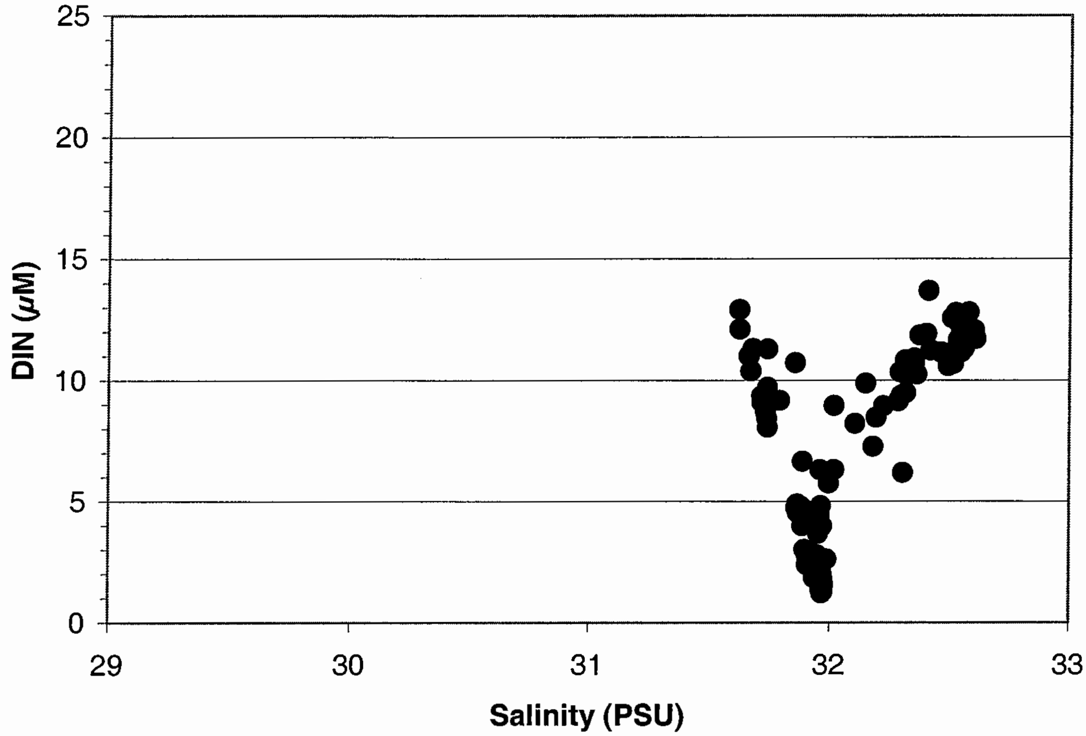


Figure D-88. Nutrient vs. Salinity Plots for Nearfield Survey WN99F, (Oct 99)

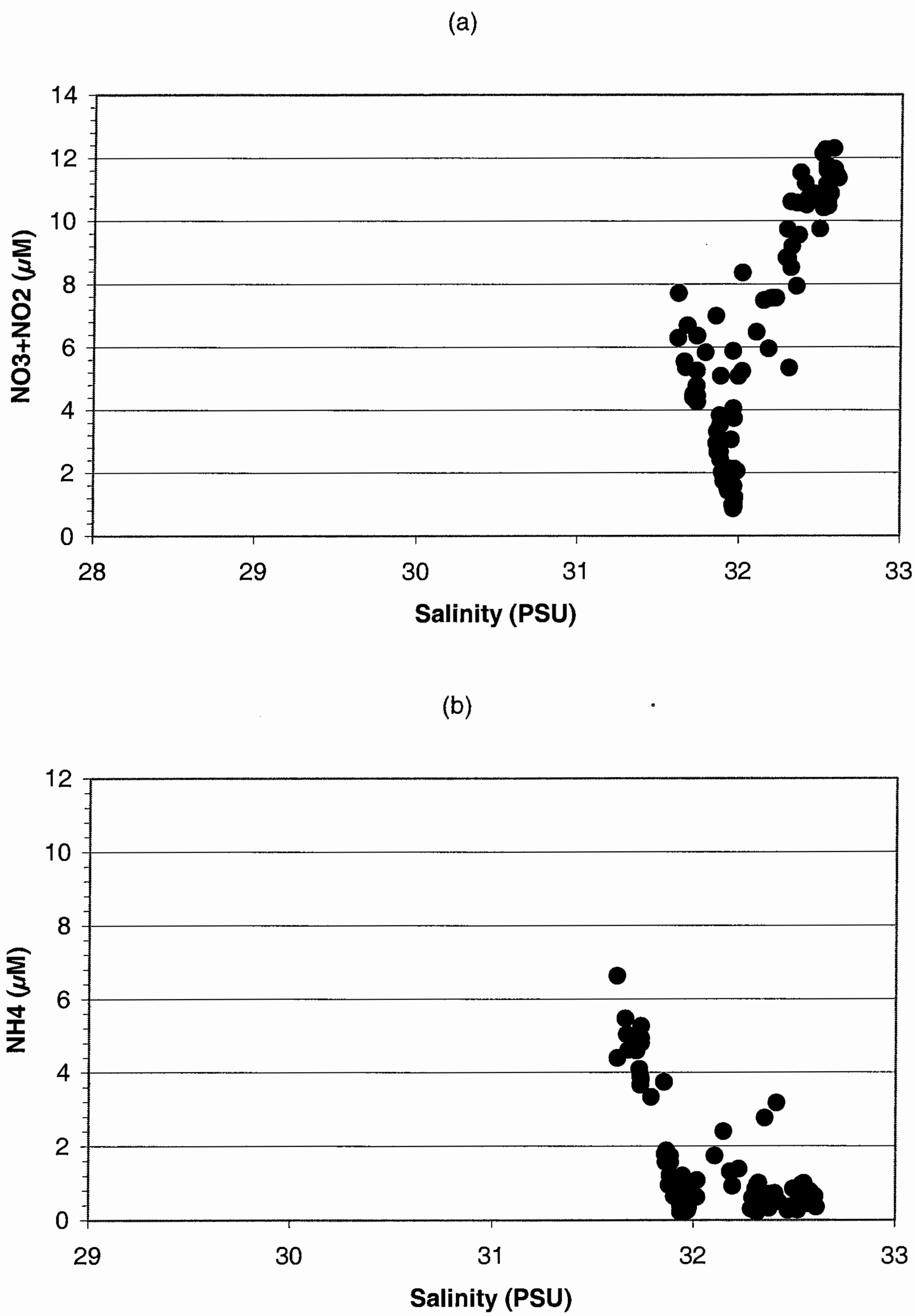
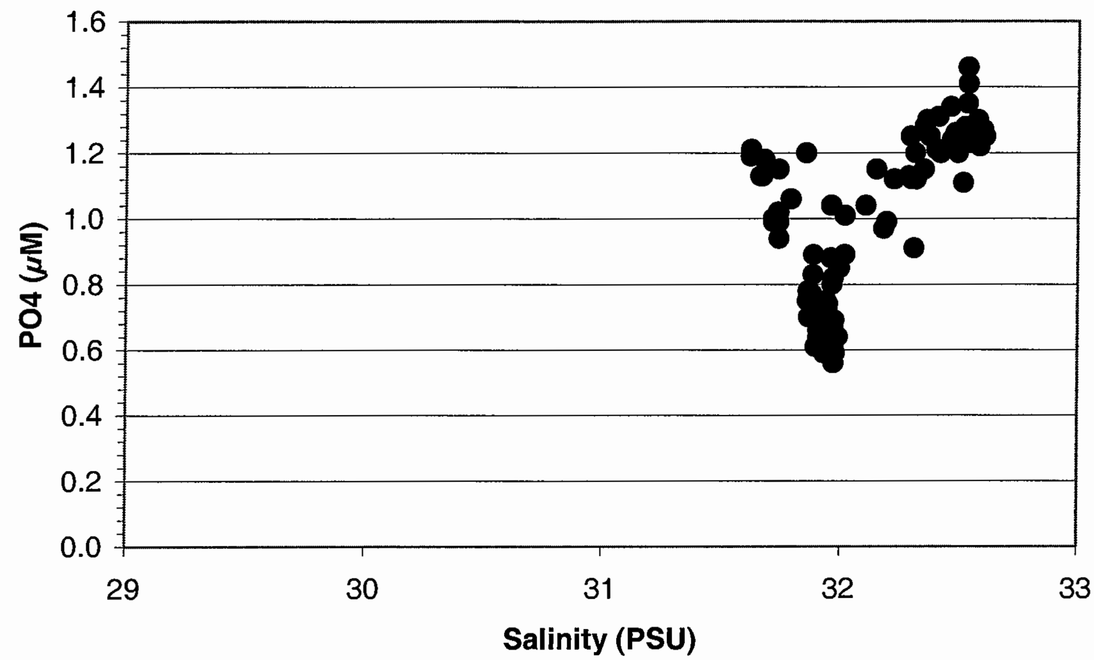


Figure D-89. Nutrient vs. Salinity Plots for Nearfield Survey WN99F, (Oct 99)

(a)



(b)

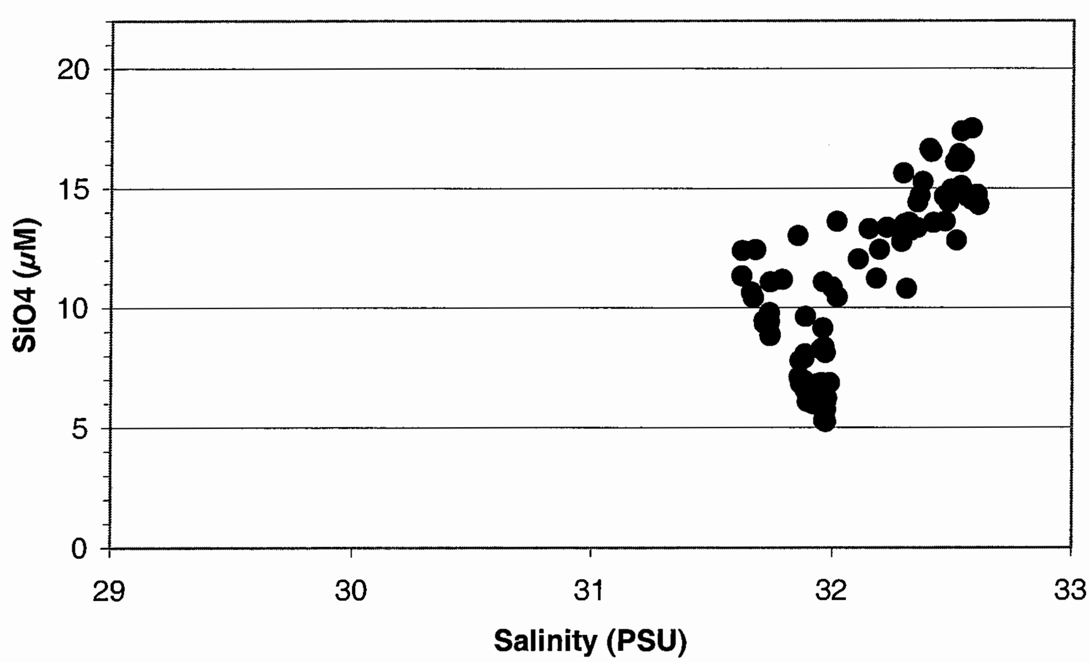


Figure D-90. Nutrient vs. Salinity Plots for Nearfield Survey WN99F, (Oct 99)

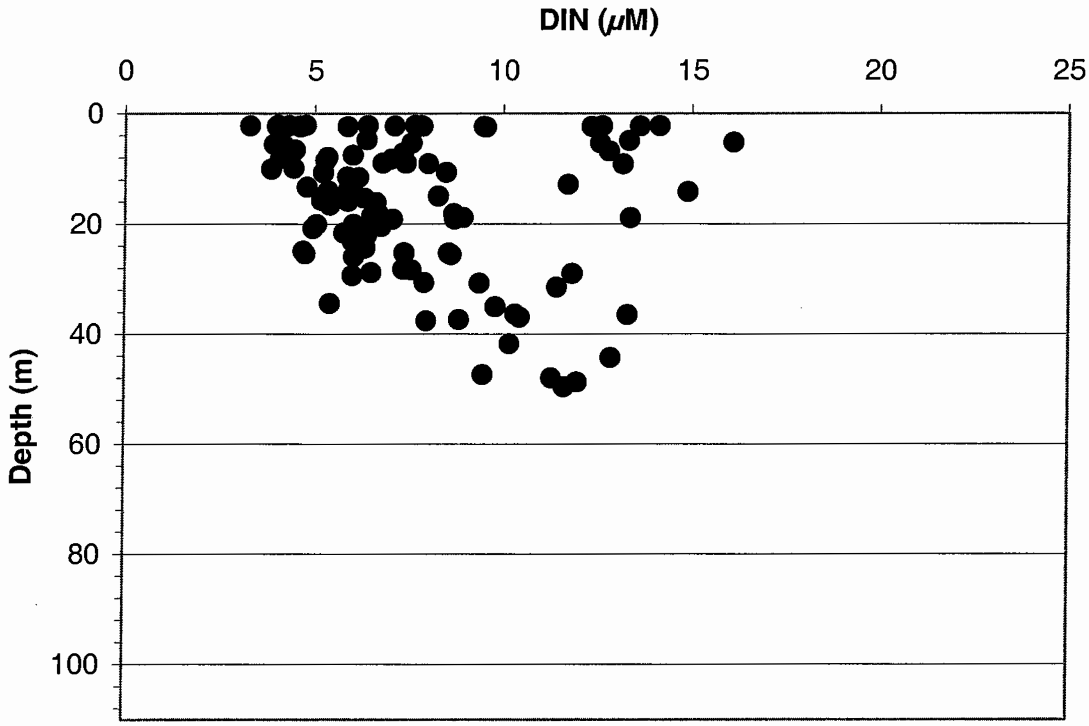
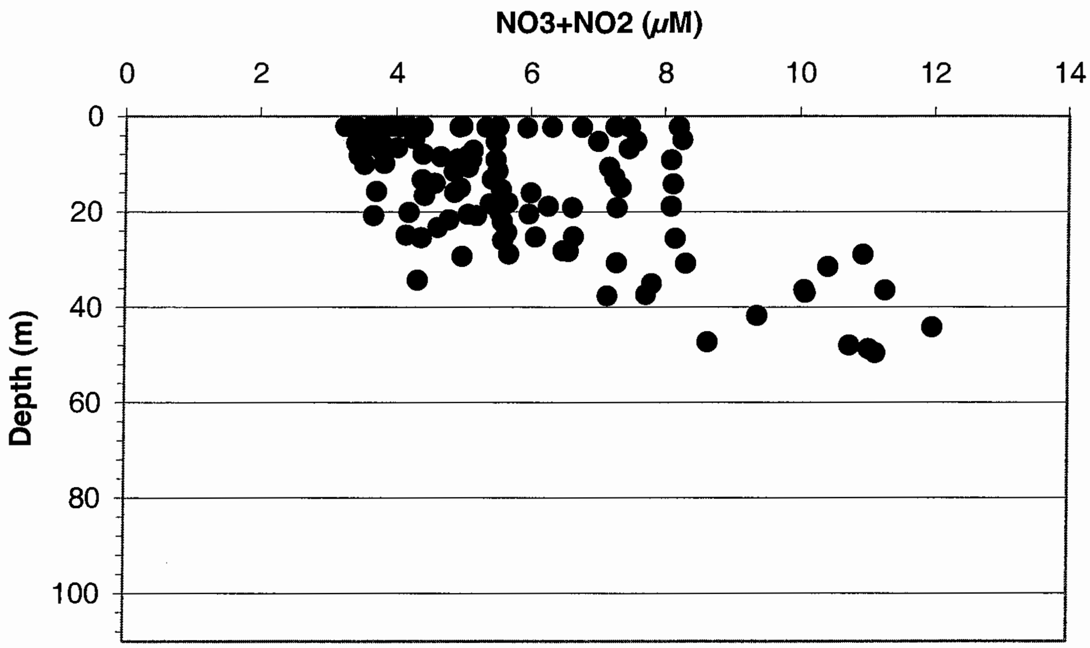


Figure D-91. Depth vs. Nutrient Plots for Nearfield Survey WN99G, (Nov 99)

(a)



(b)

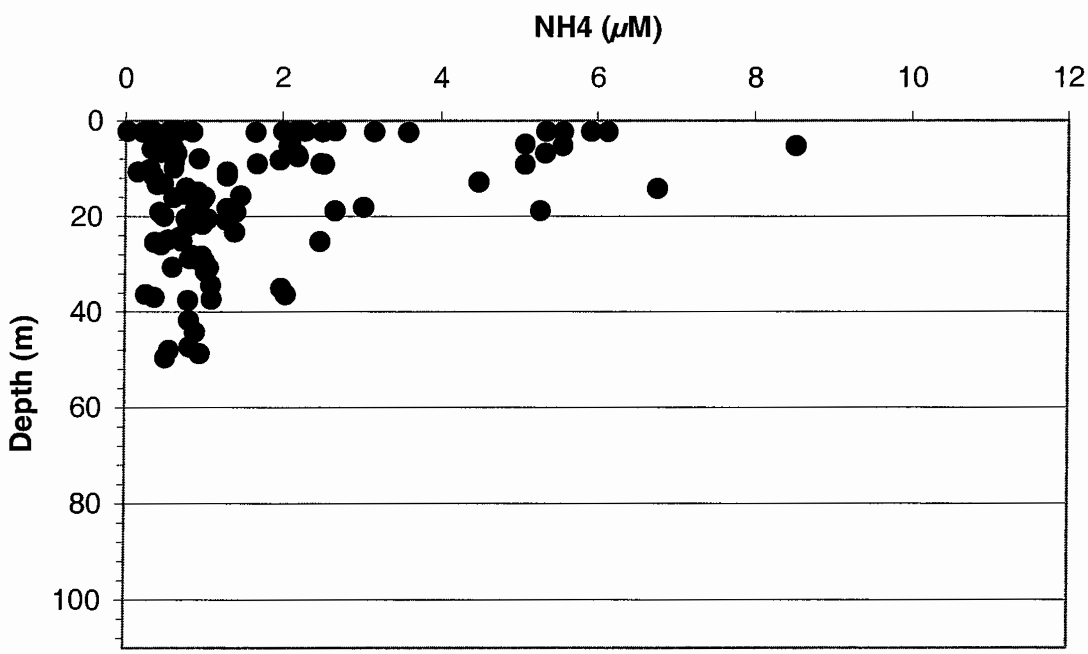
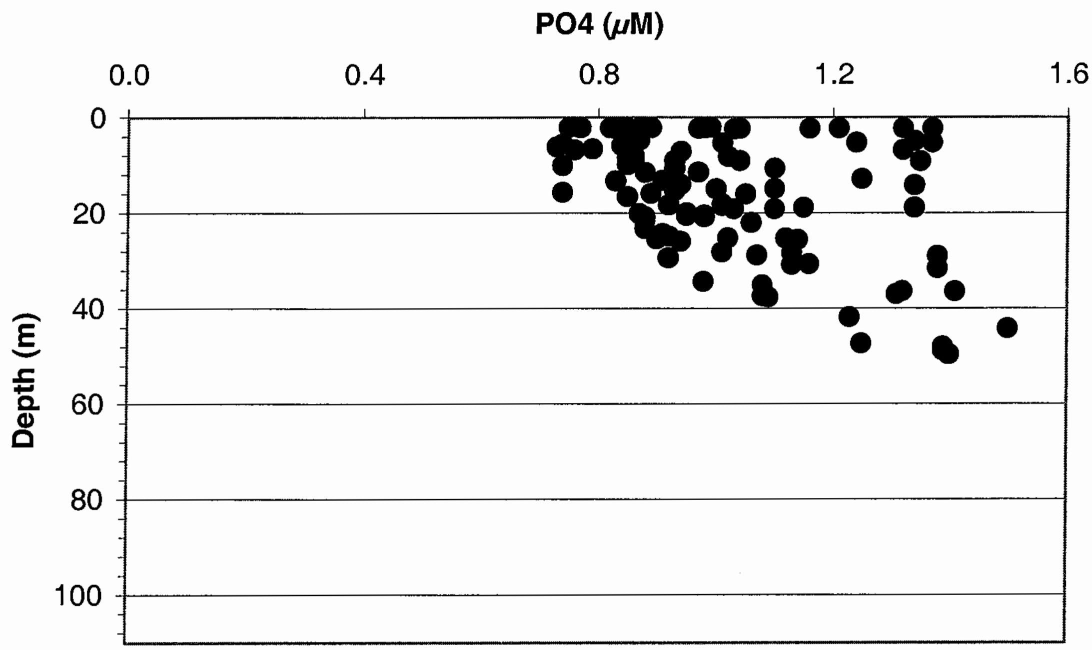


Figure D-92. Depth vs. Nutrient Plots for Nearfield Survey WN99G, (Nov 99)

(a)



(b)

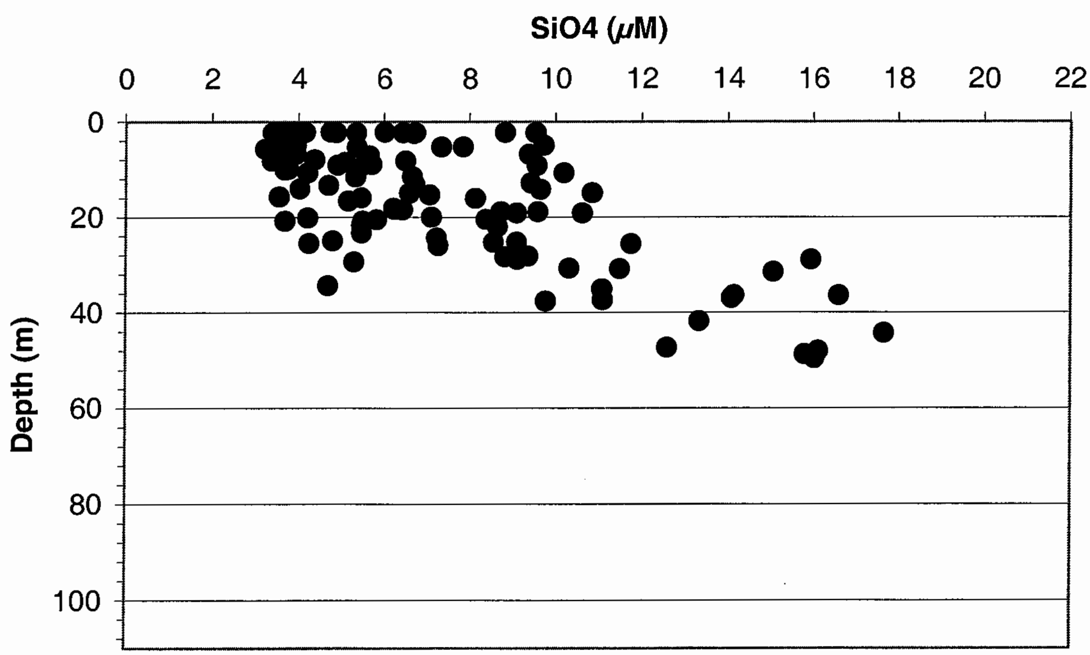
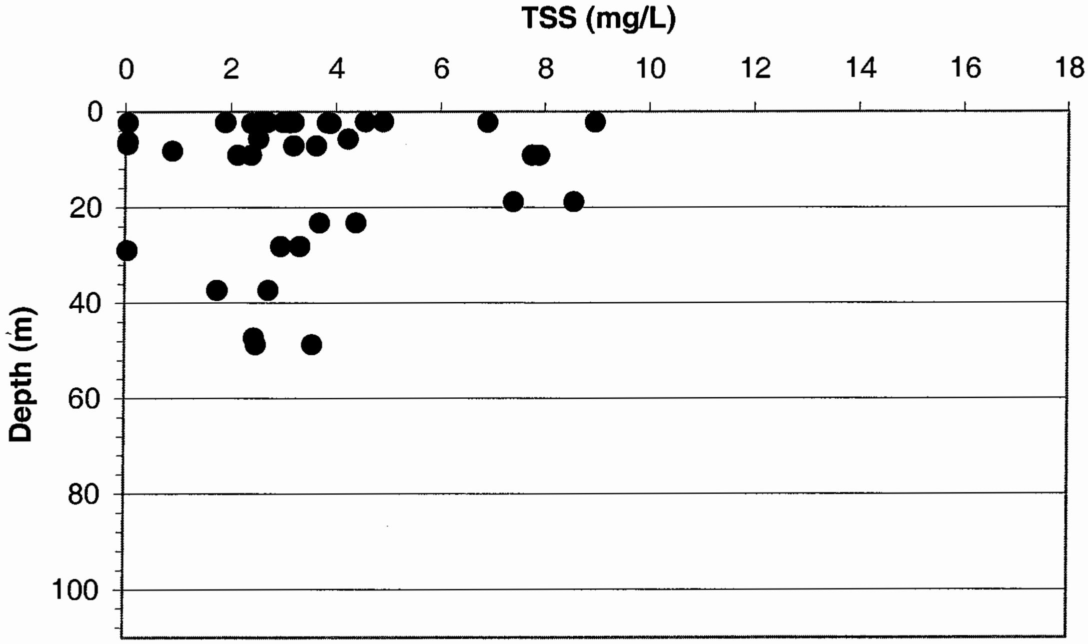


Figure D-93. Depth vs. Nutrient Plots for Nearfield Survey WN99G, (Nov 99)

(a)



(b)

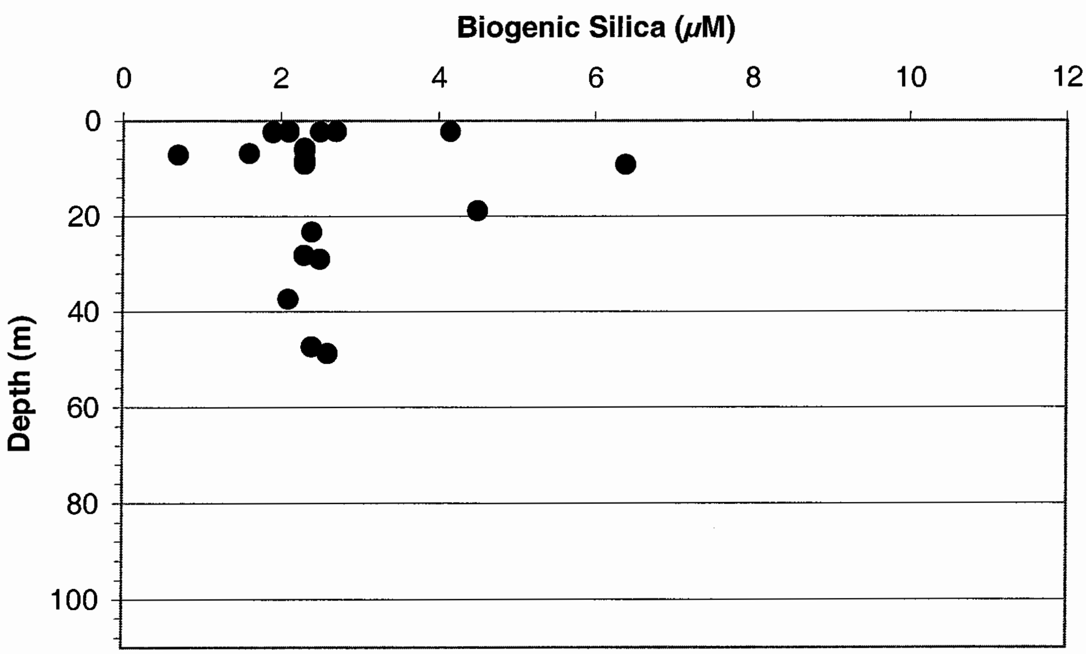
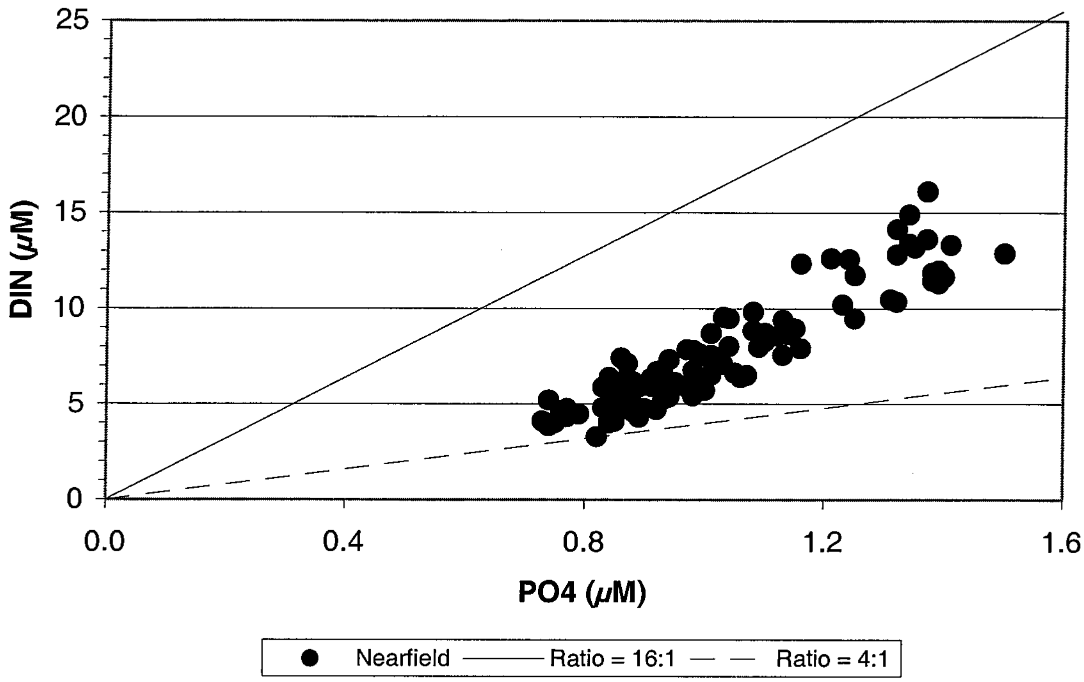


Figure D-94. Depth vs. Nutrient Plots for Nearfield Survey WN99G, (Nov 99)

(a)



(b)

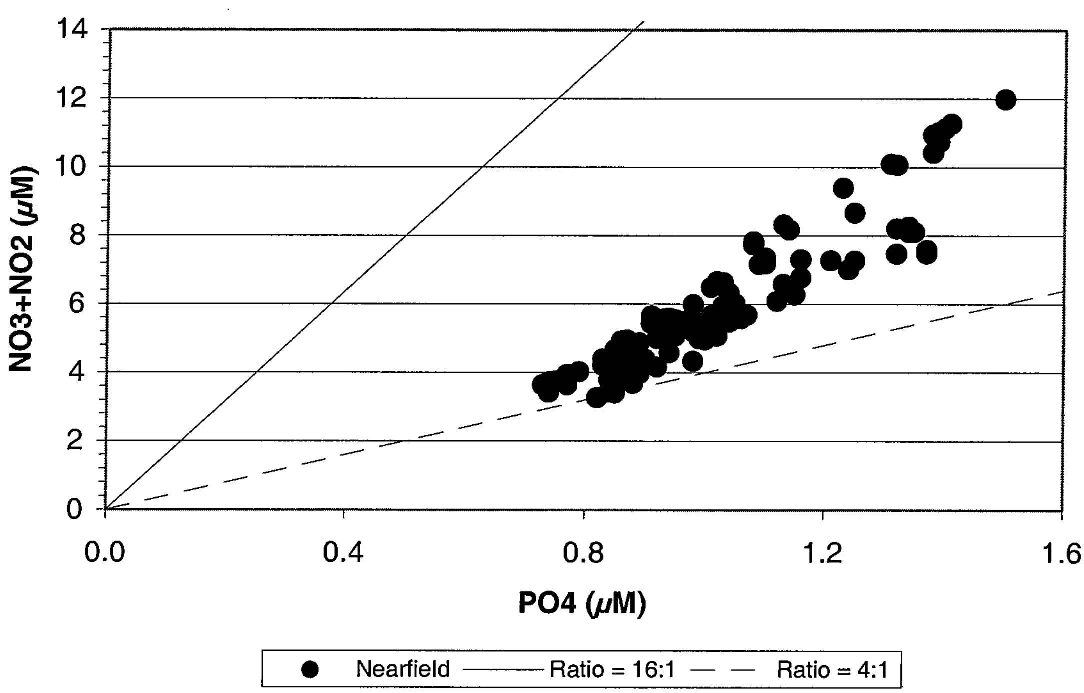
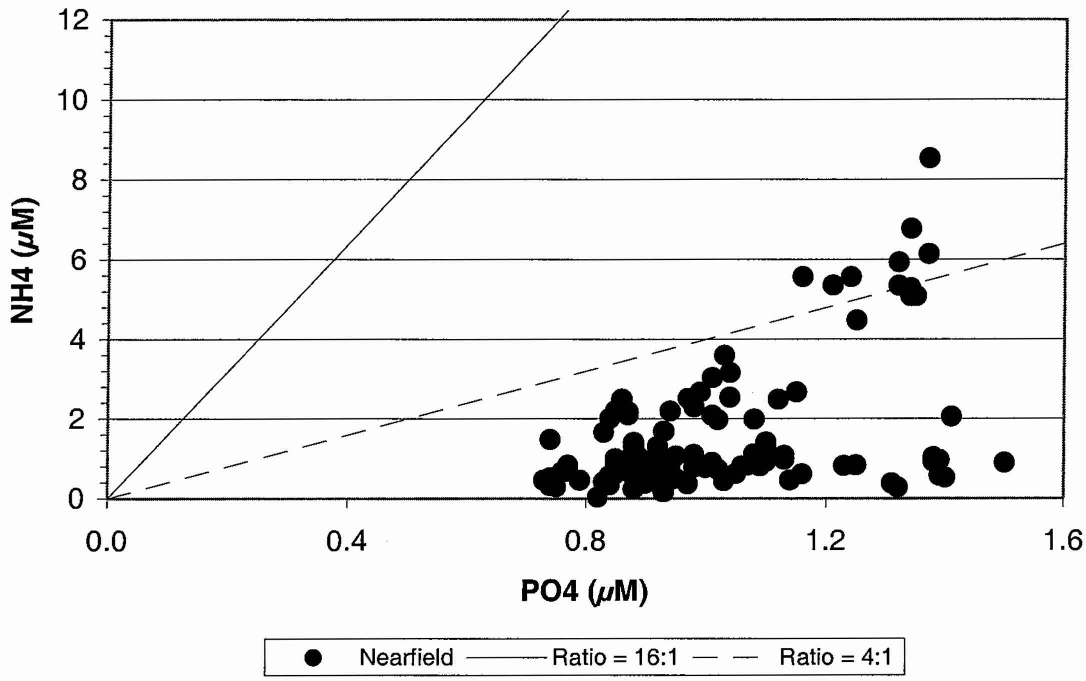


Figure D-95. Nutrient vs. Nutrient Plots for Nearfield Survey WN99G, (Nov 99)

(a)



(b)

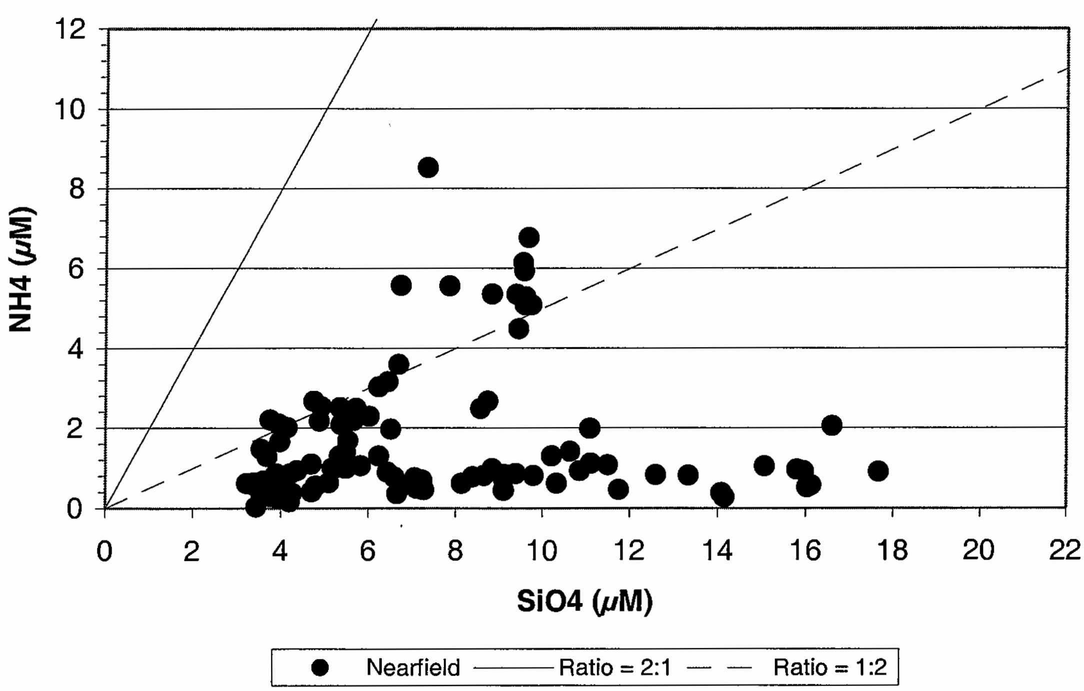
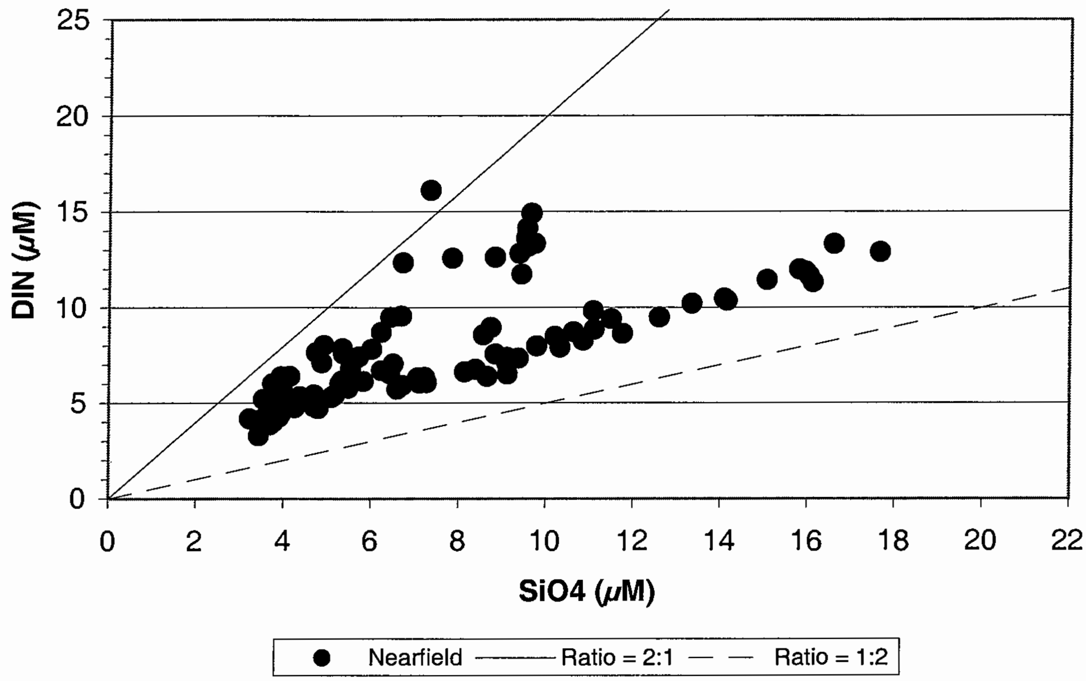


Figure D-96. Nutrient vs. Nutrient Plots for Nearfield Survey WN99G, (Nov 99)

(a)



(b)

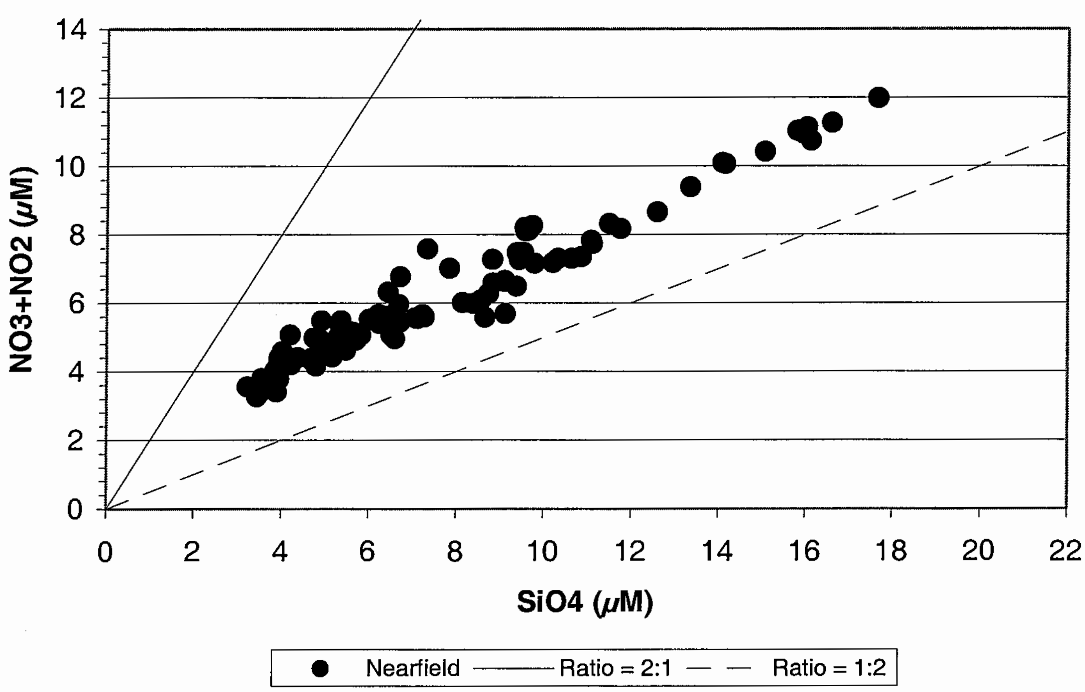
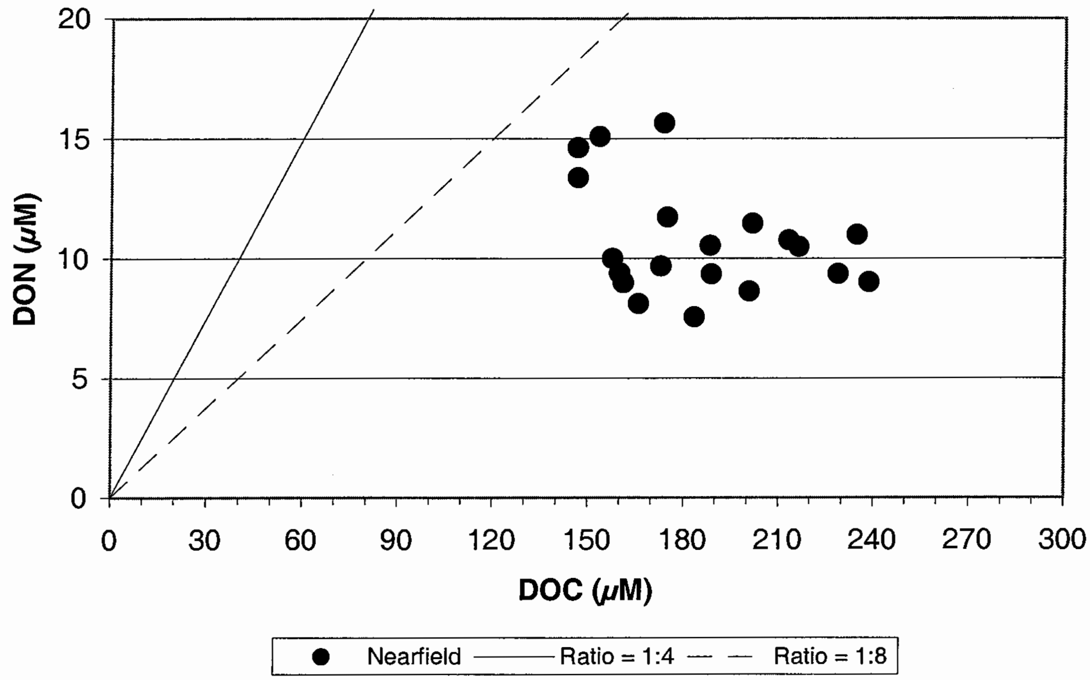


Figure D-97. Nutrient vs. Nutrient Plots for Nearfield Survey WN99G, (Nov 99)

(a)



(b)

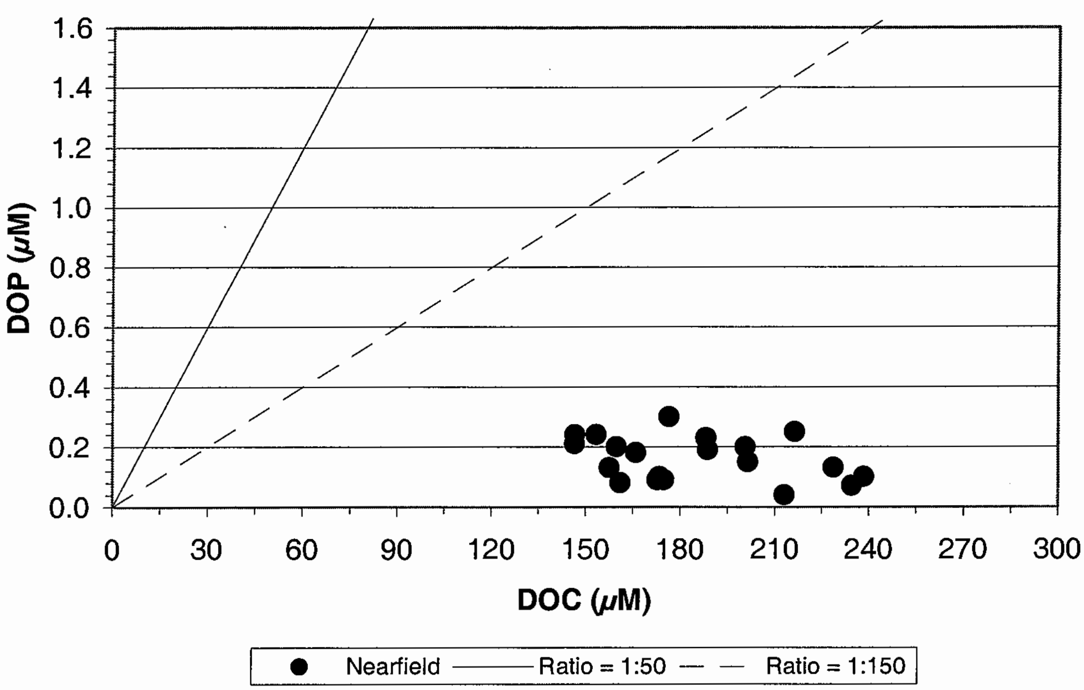
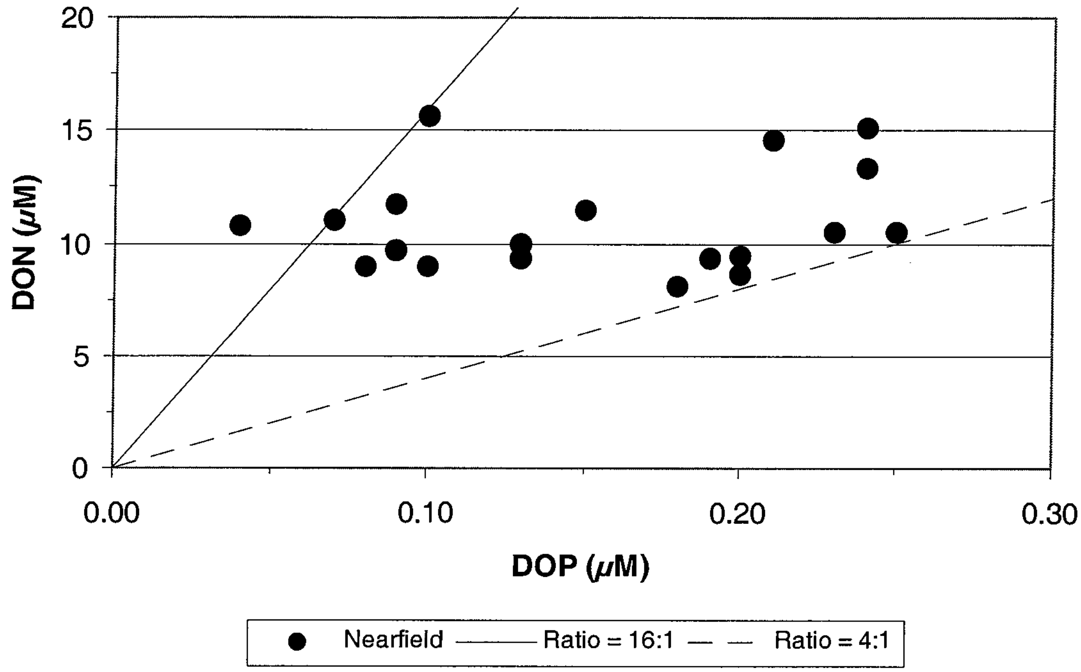


Figure D-98. Nutrient vs. Nutrient Plots for Nearfield Survey WN99G, (Nov 99)

(a)



(b)

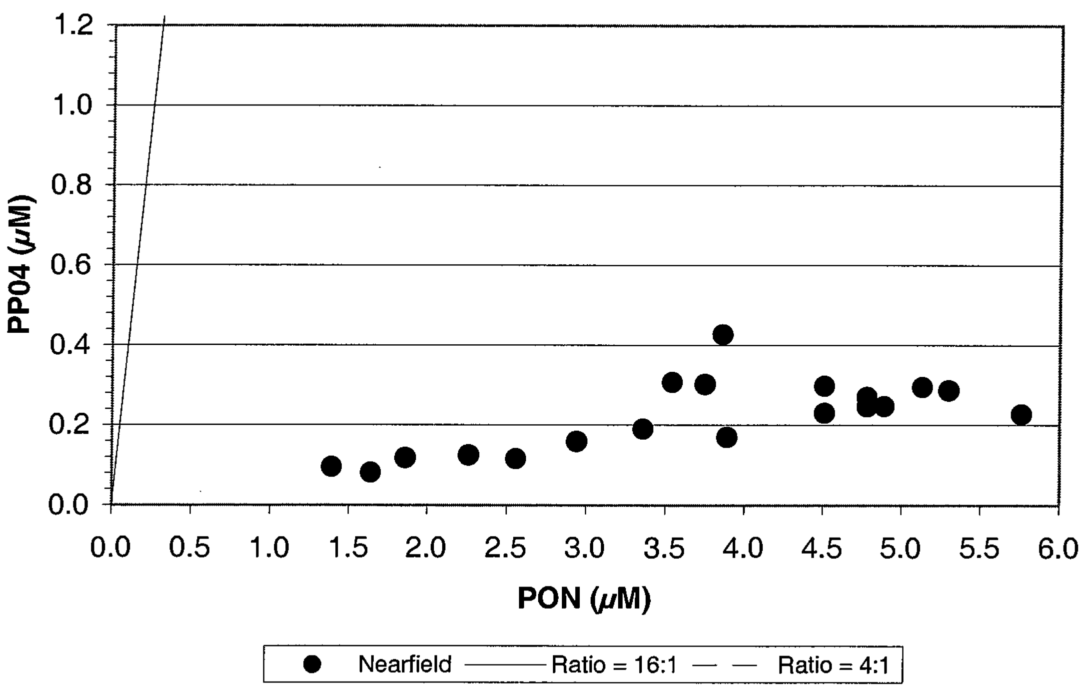
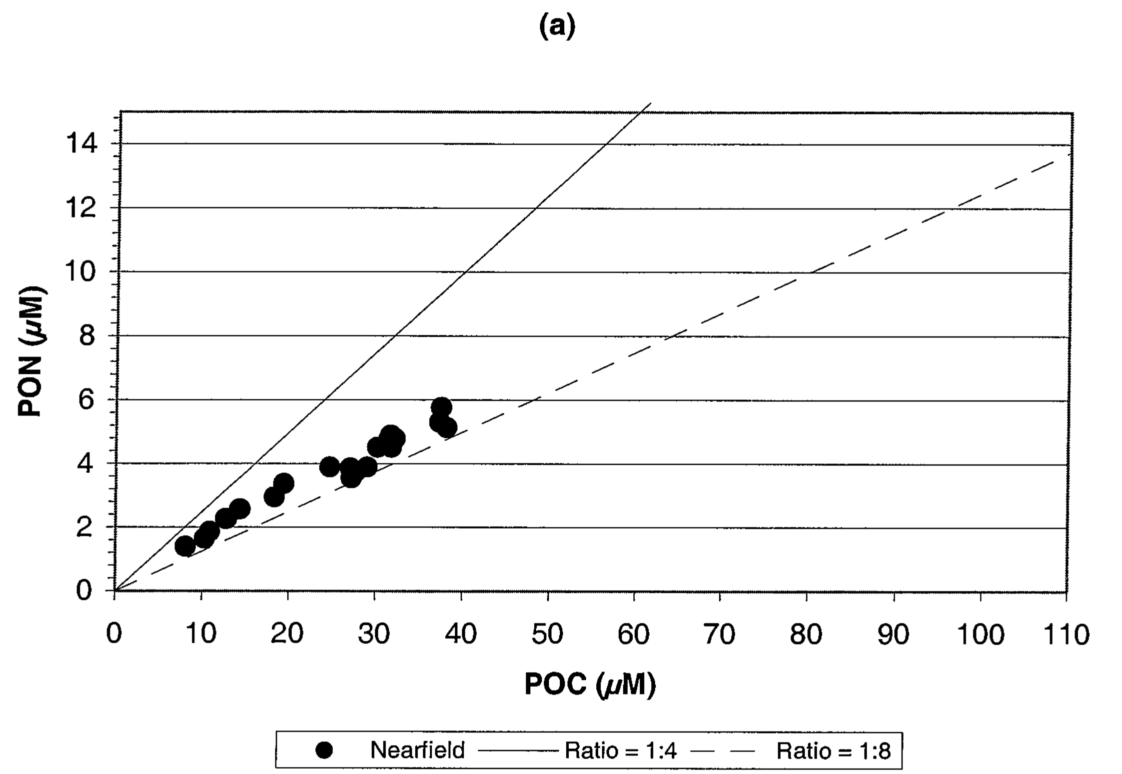


Figure D-99. Nutrient vs. Nutrient Plots for Nearfield Survey WN99G, (Nov 99)



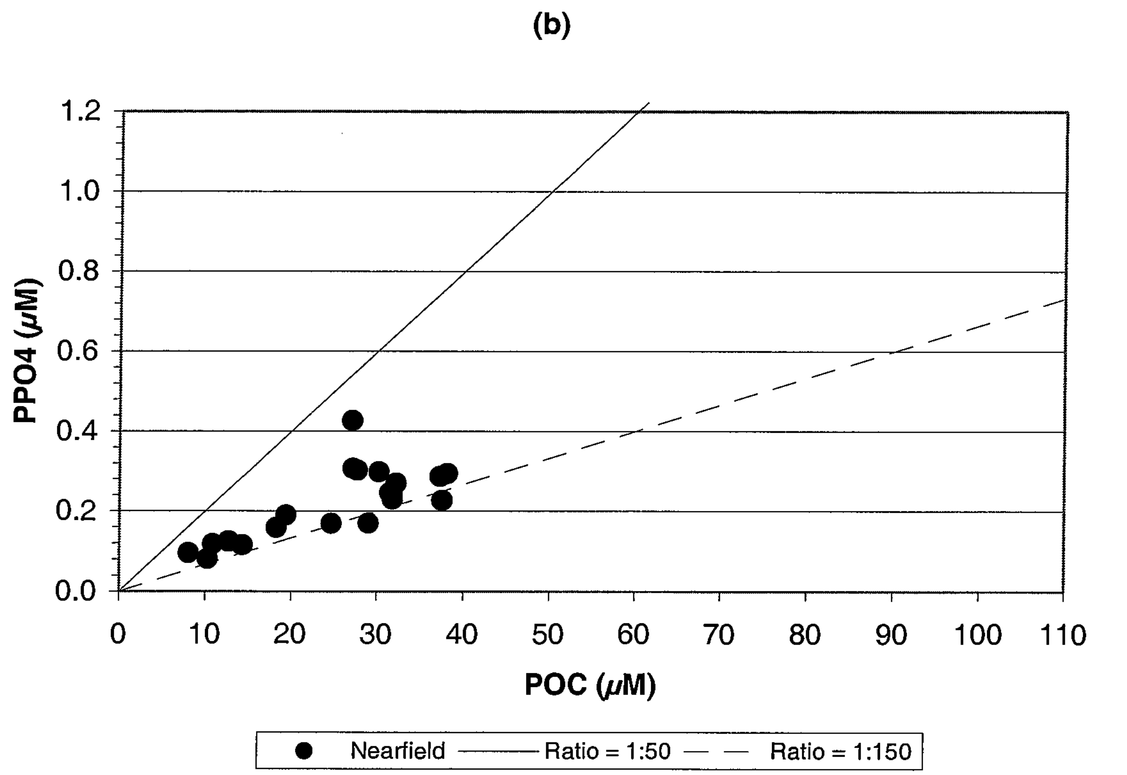
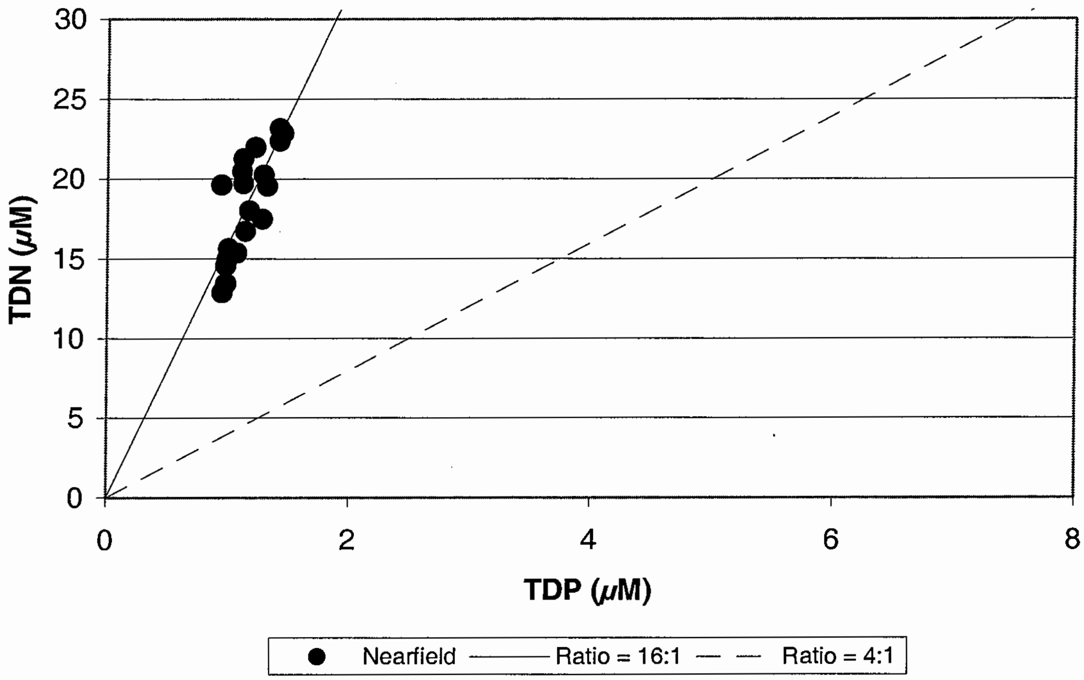


Figure D-100. Nutrient vs. Nutrient Plots for Nearfield Survey WN99G, (Nov 99)

(a)



(b)

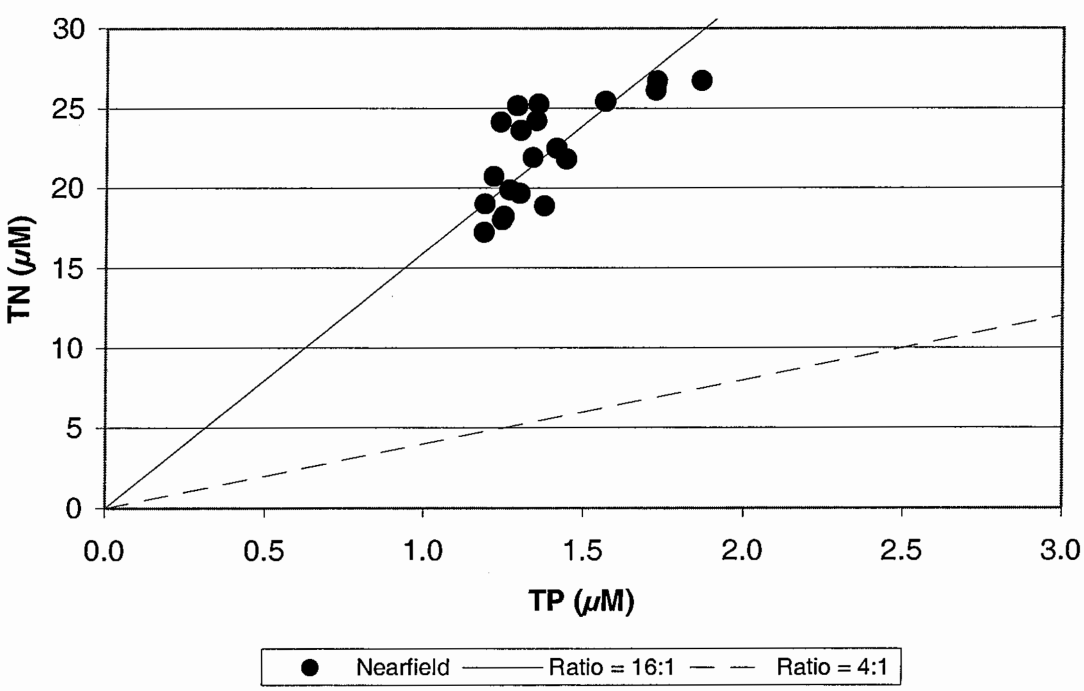
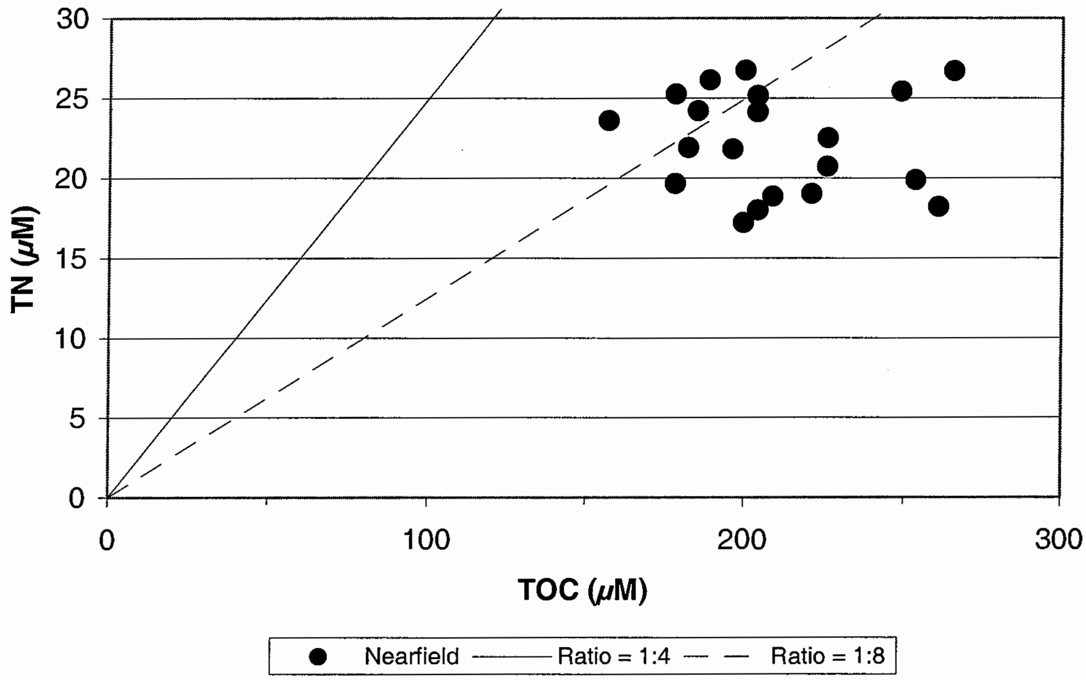


Figure D-101. Nutrient vs. Nutrient Plots for Nearfield Survey WN99G, (Nov 99)

(a)



(b)

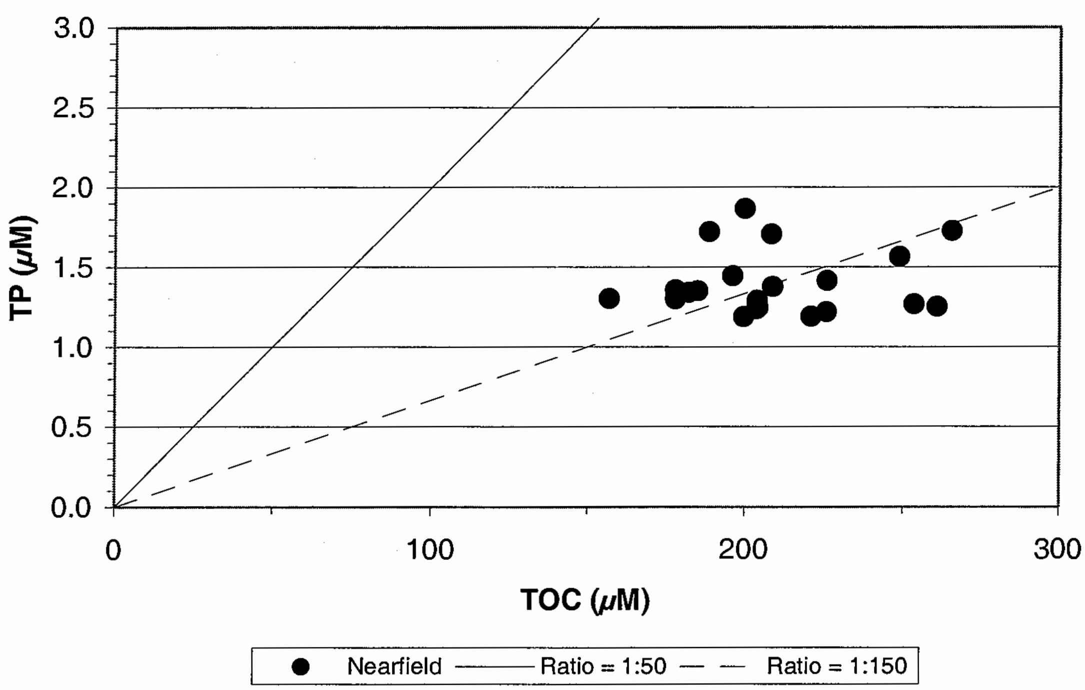


Figure D-102. Nutrient vs. Nutrient Plots for Nearfield Survey WN99G, (Nov 99)

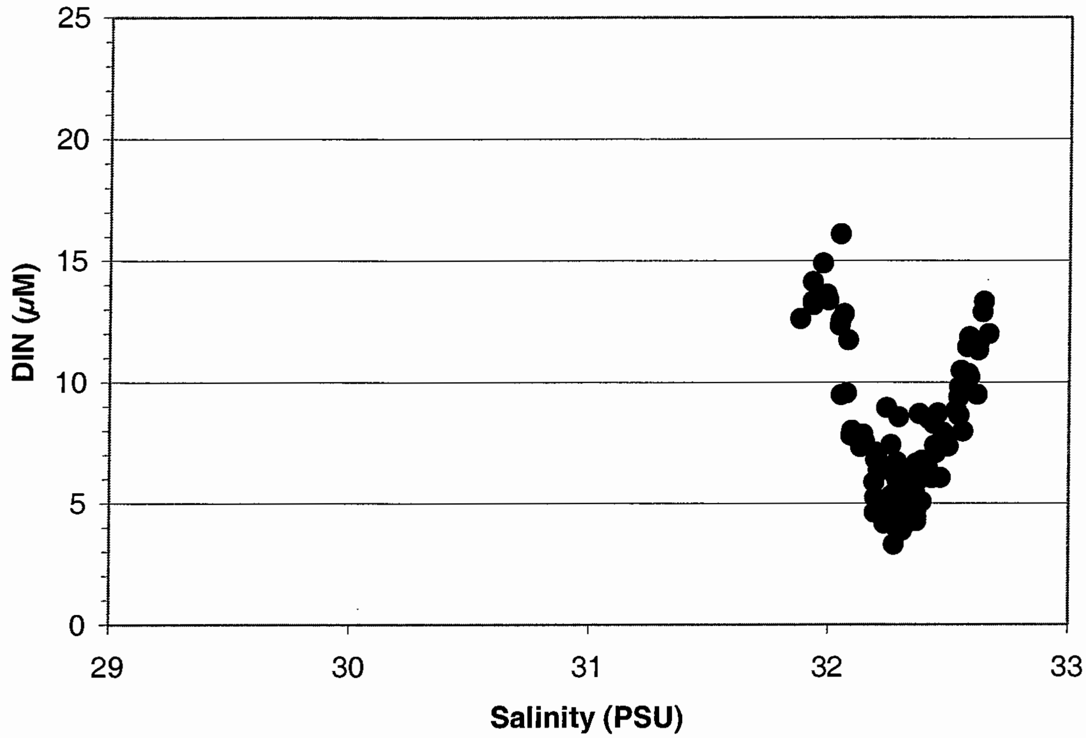
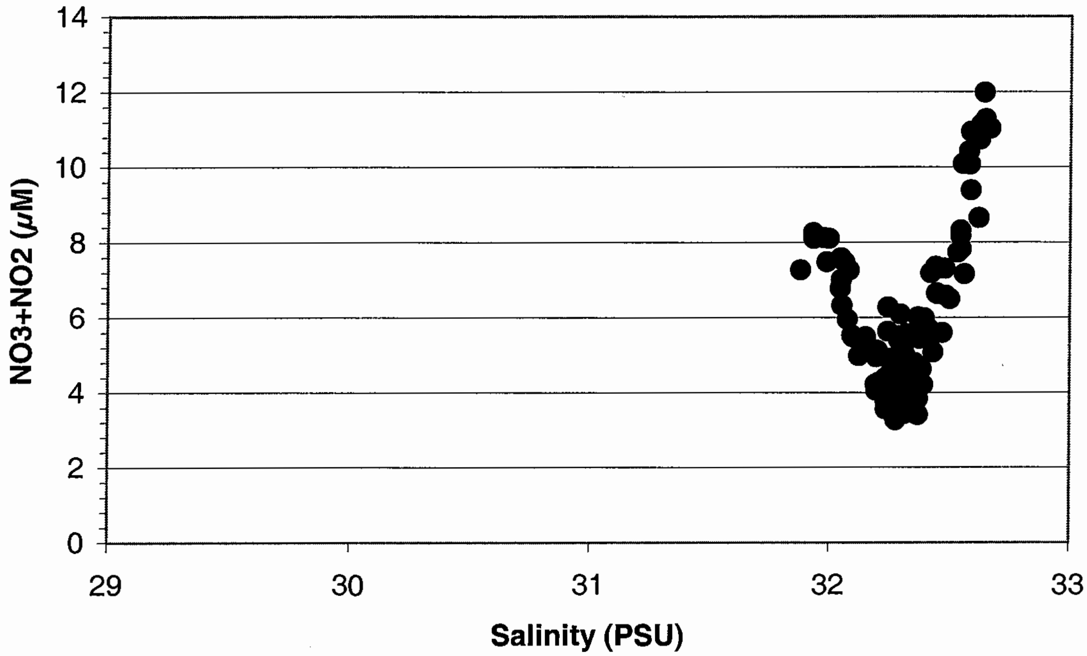


Figure D-103. Nutrient vs. Salinity Plots for Nearfield Survey WN99G, (Nov 99)

(a)



(b)

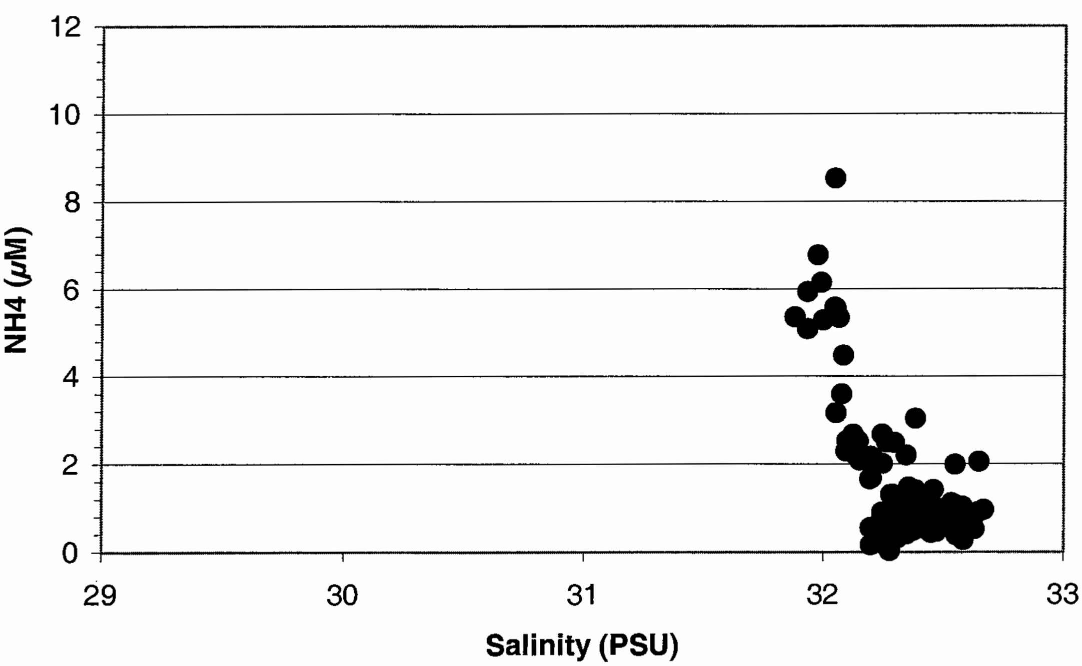
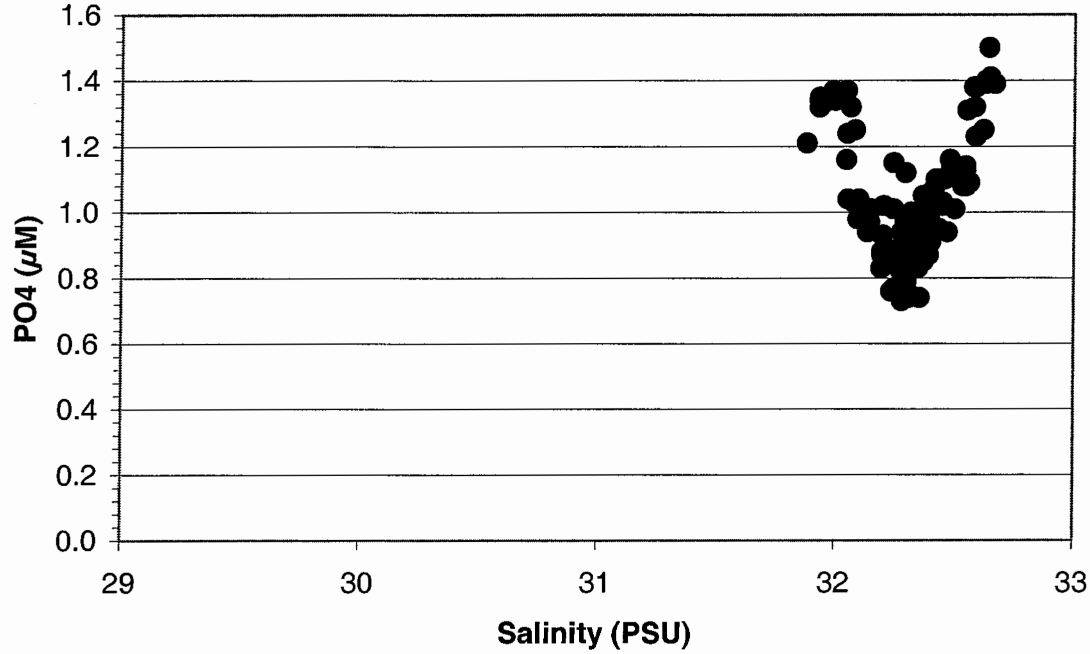


Figure D-104. Nutrient vs. Salinity Plots for Nearfield Survey WN99G, (Nov 99)

(a)



(b)

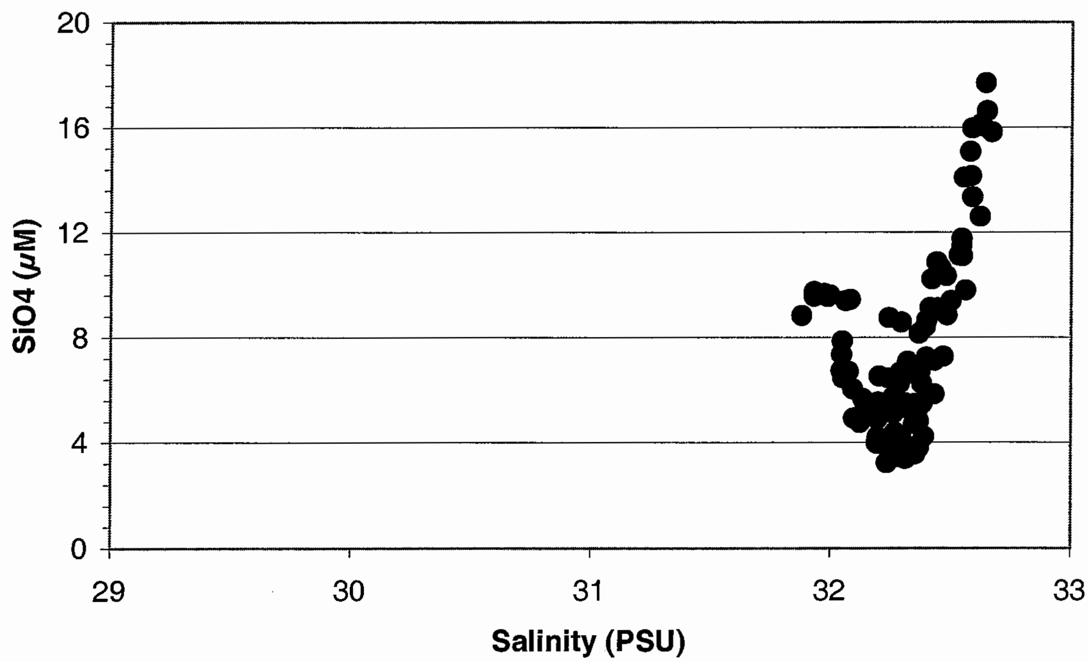


Figure D-105. Nutrient vs. Salinity Plots for Nearfield Survey WN99G, (Nov 99)

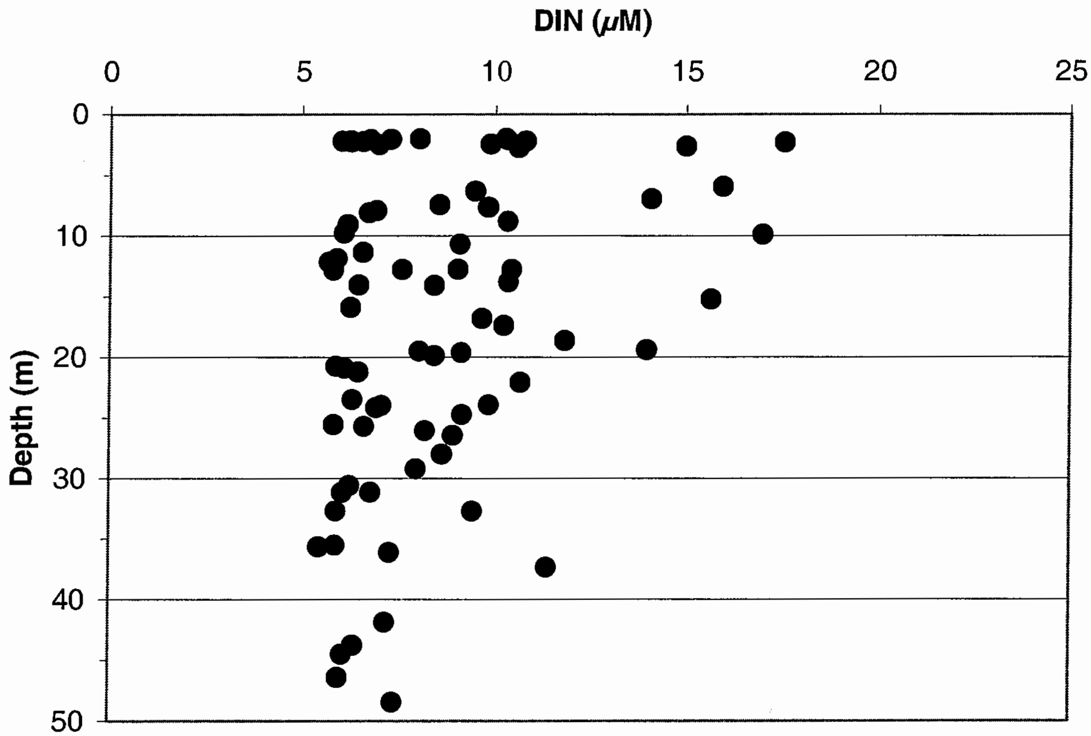
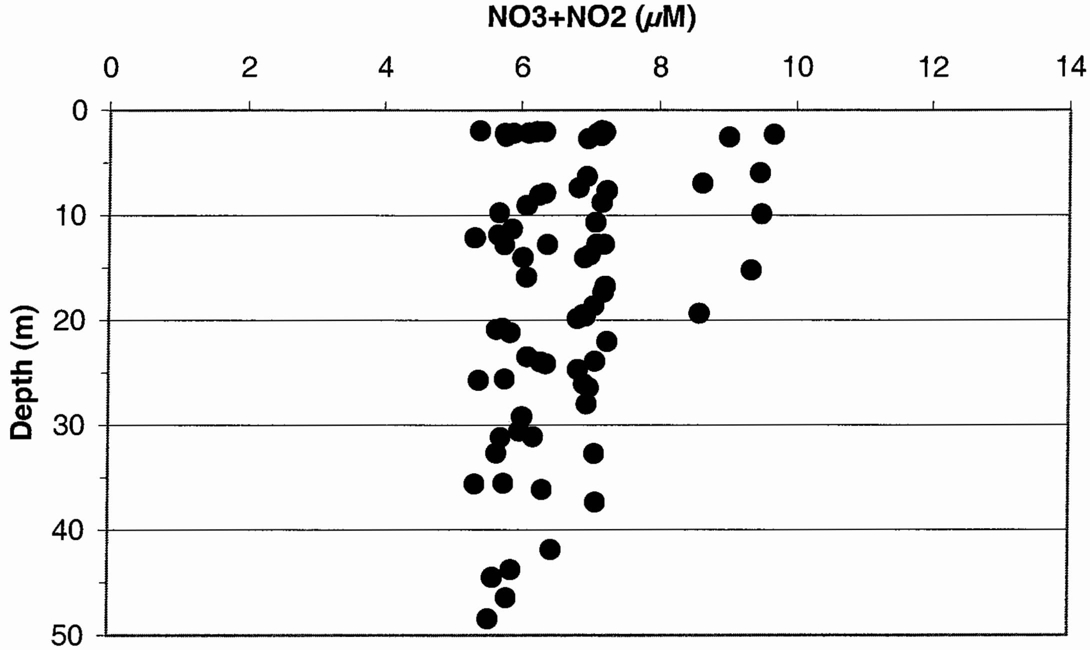


Figure D-106. Depth vs. Nutrient Plots for Nearfield Survey WN99H, (Dec 99)

(a)



(b)

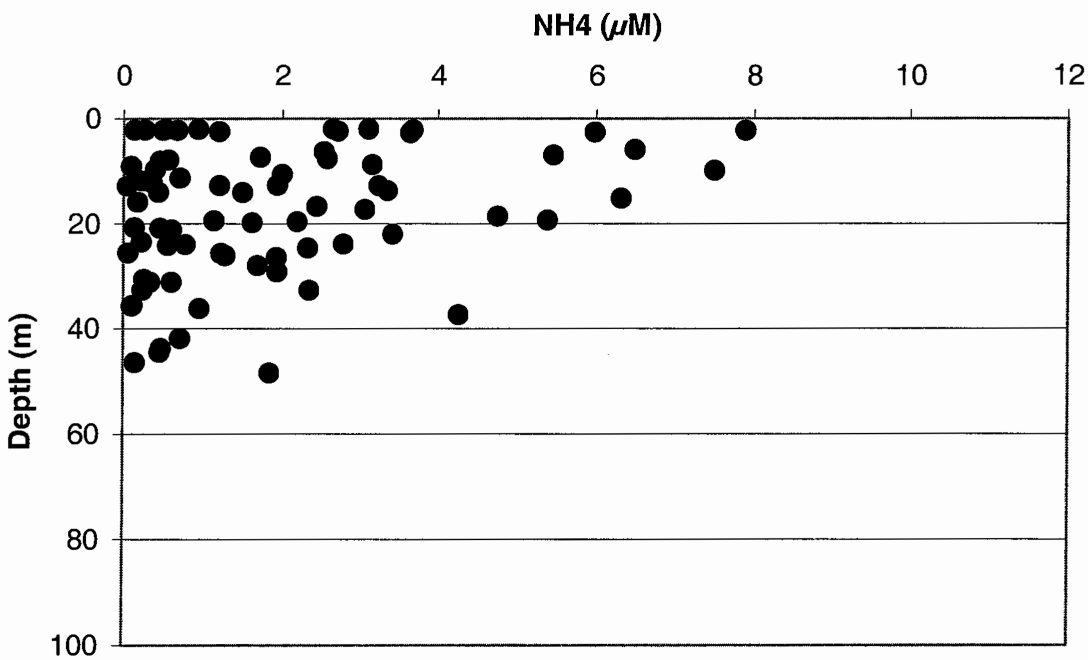
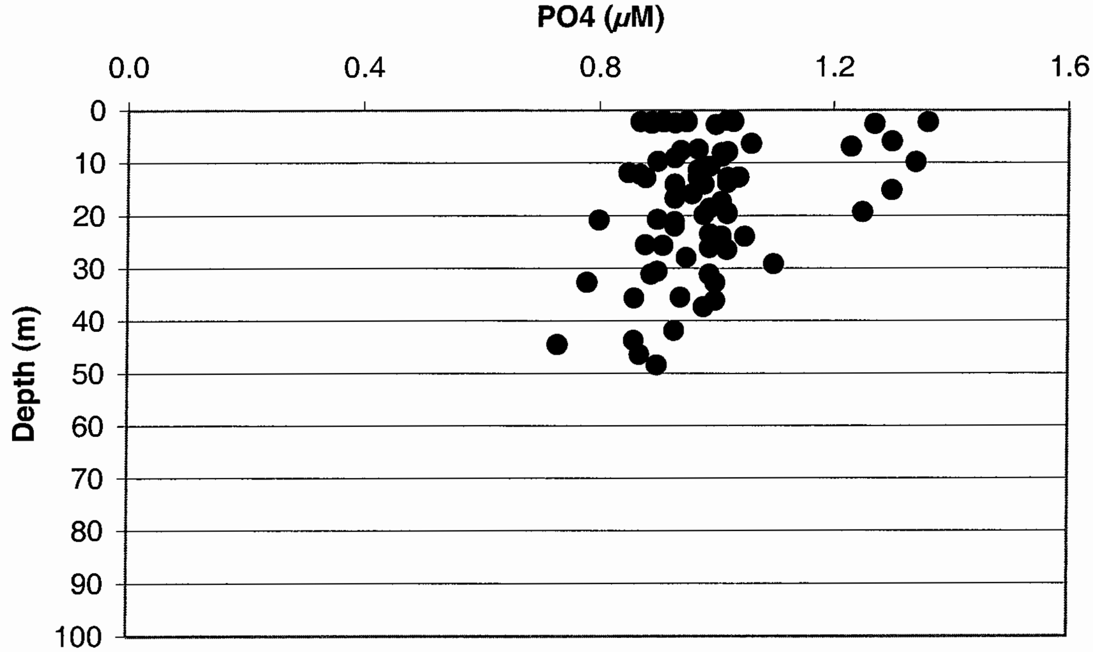


Figure D-107. Depth vs. Nutrient Plots for Nearfield Survey WN99H, (Dec 99)

(a)



(b)

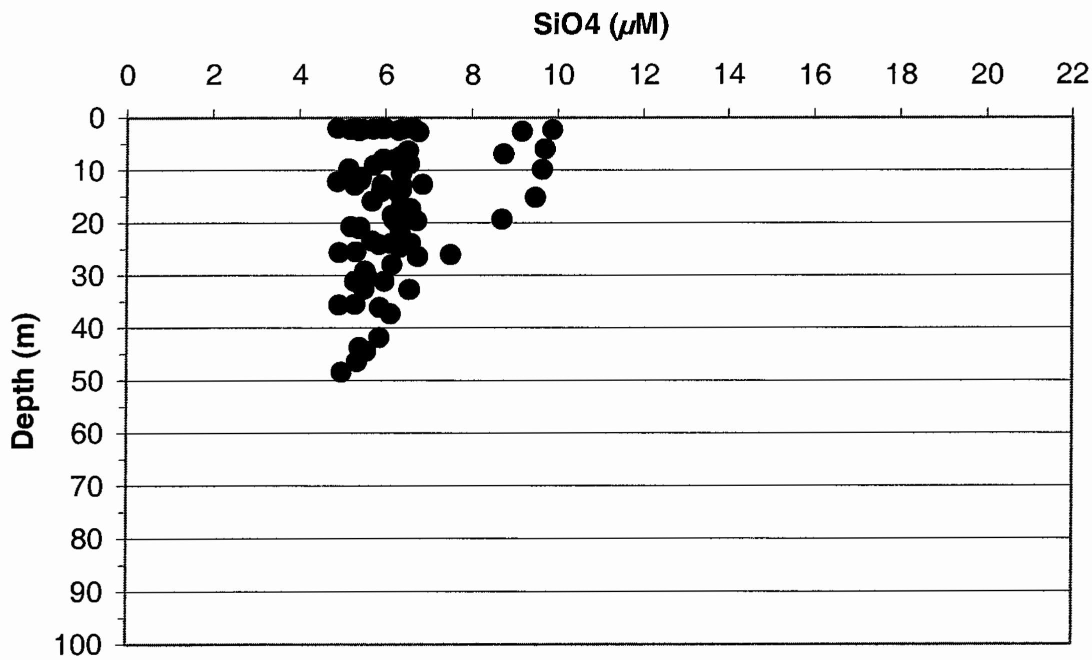
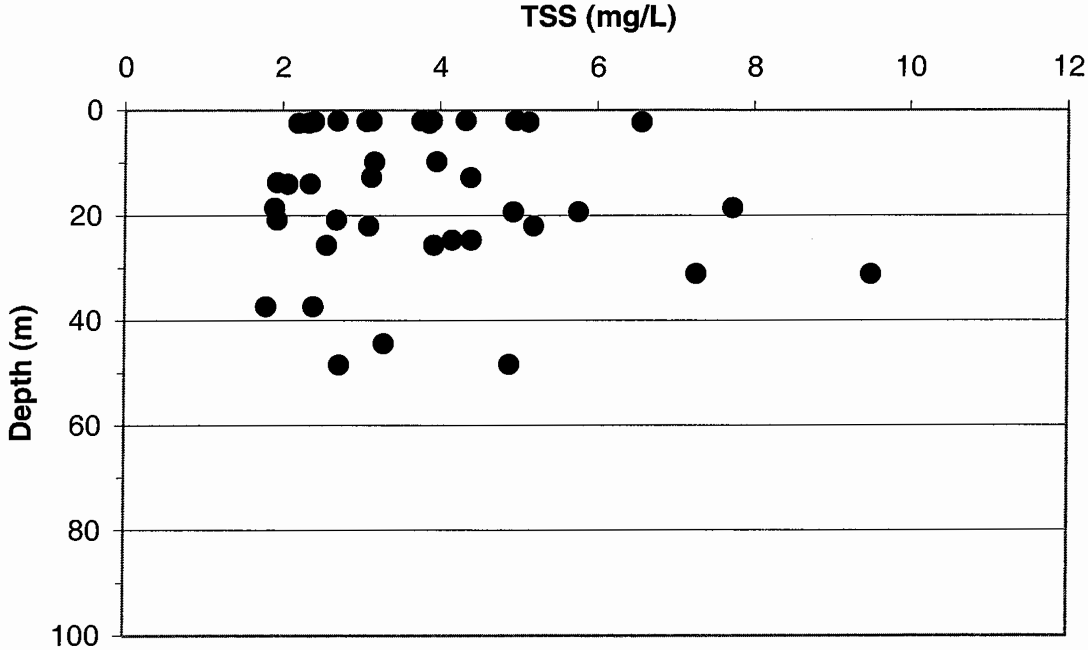


Figure D-108. Depth vs. Nutrient Plots for Nearfield Survey WN99H, (Dec 99)

(a)



(b)

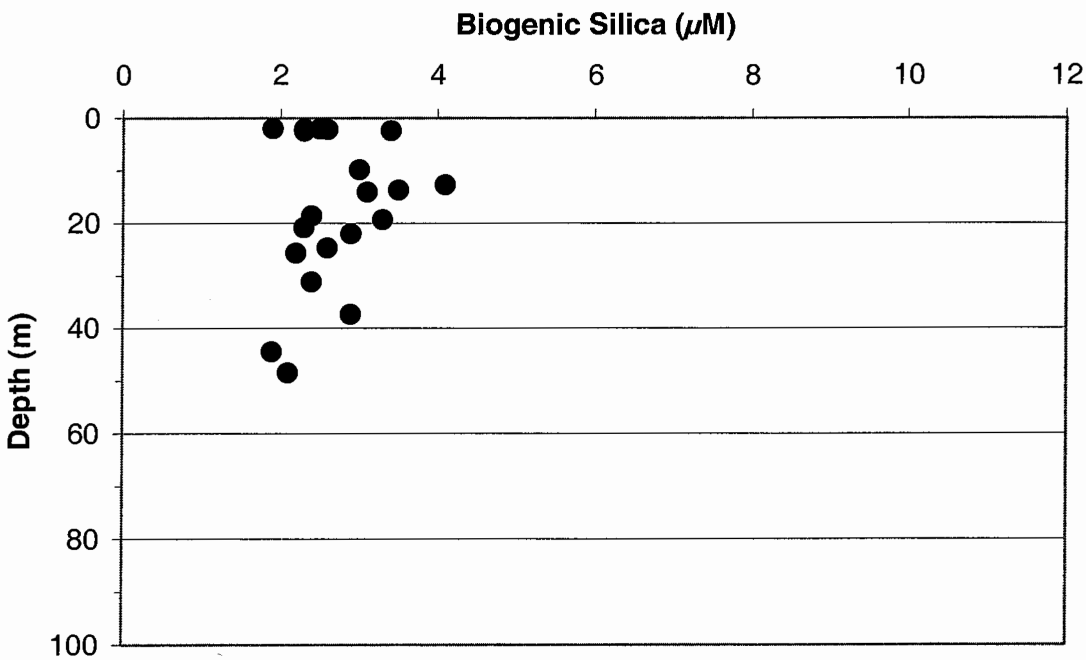
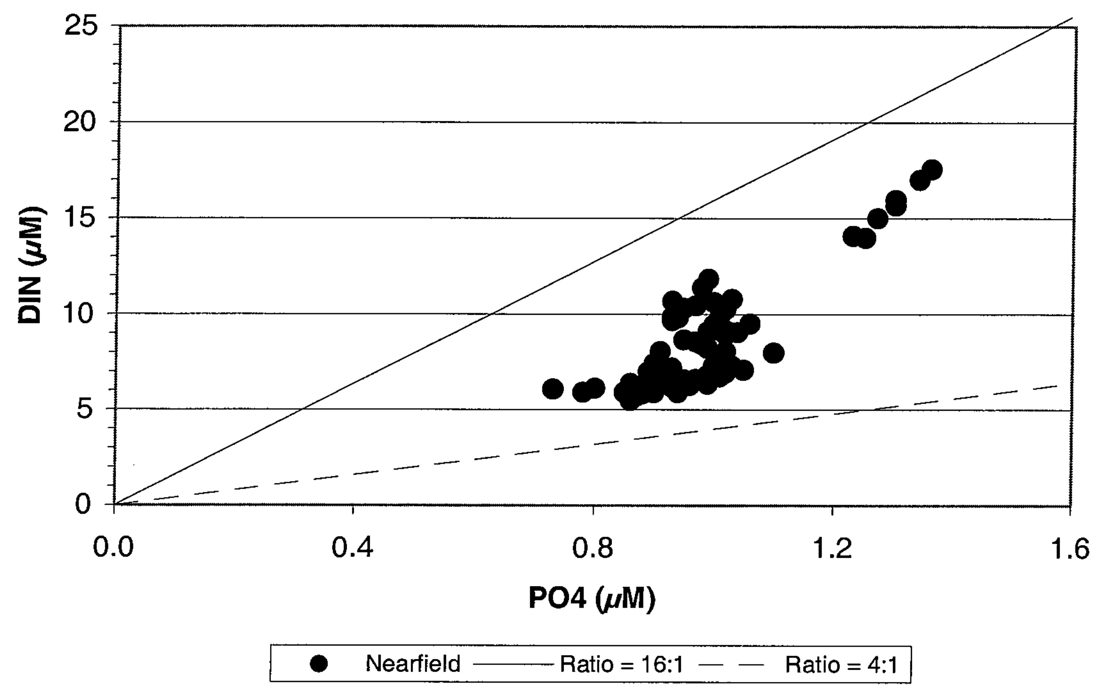


Figure D-109. Depth vs. Nutrient Plots for Nearfield Survey WN99H, (Dec 99)

(a)



(b)

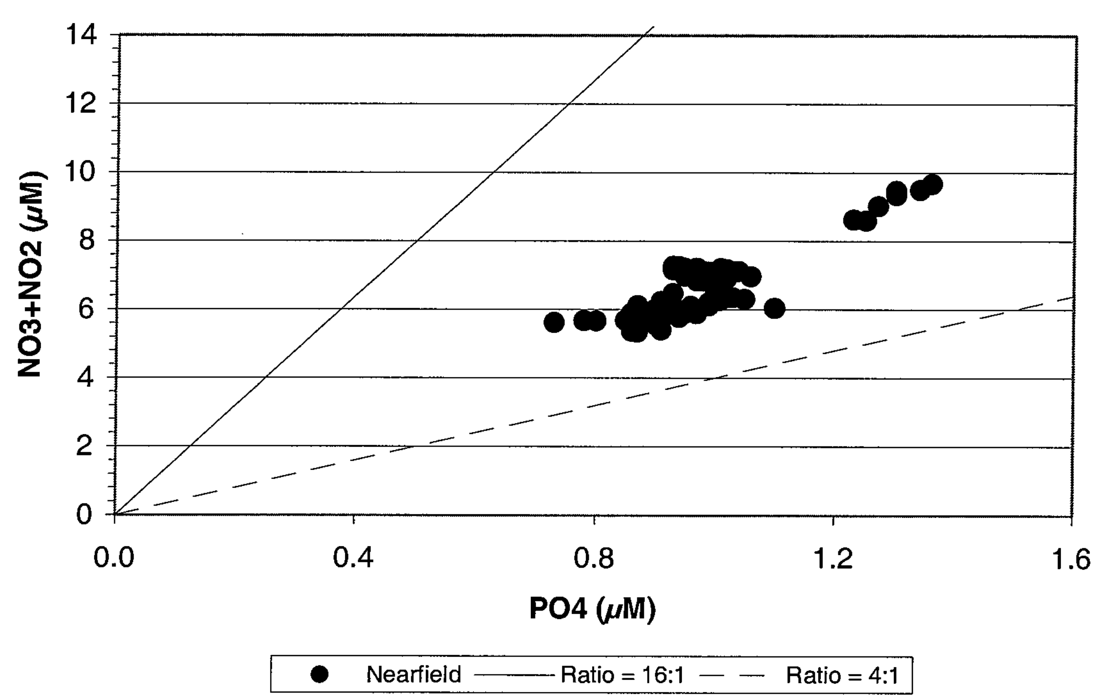
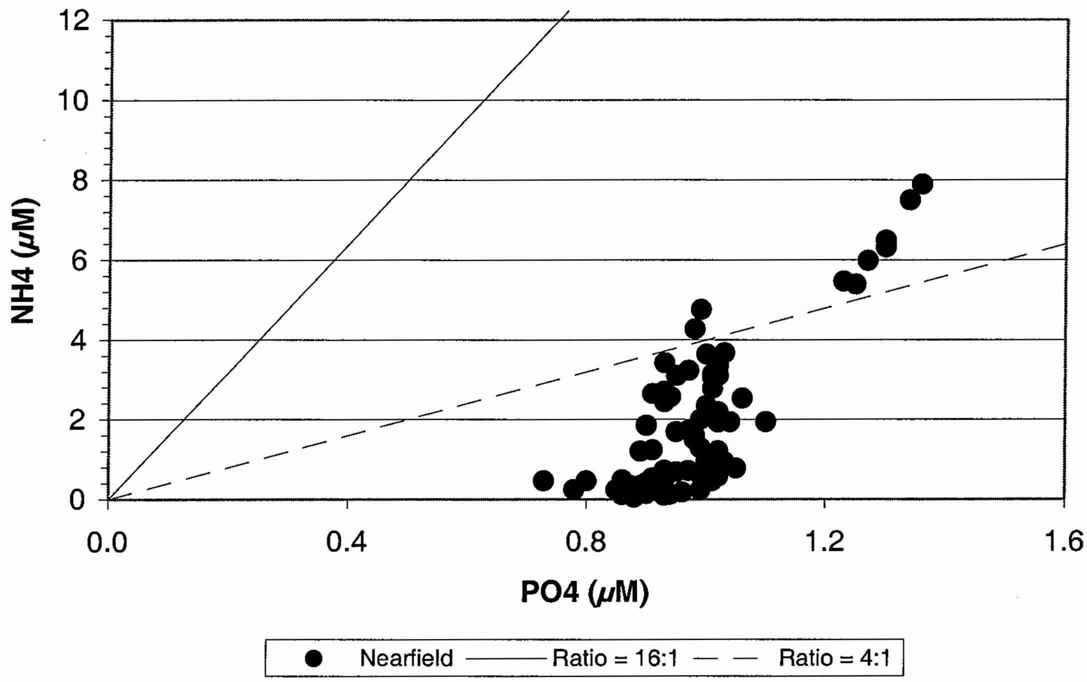


Figure D-110. Nutrient vs. Nutrient Plots for Nearfield Survey WN99H, (Dec 99)

(a)



(b)

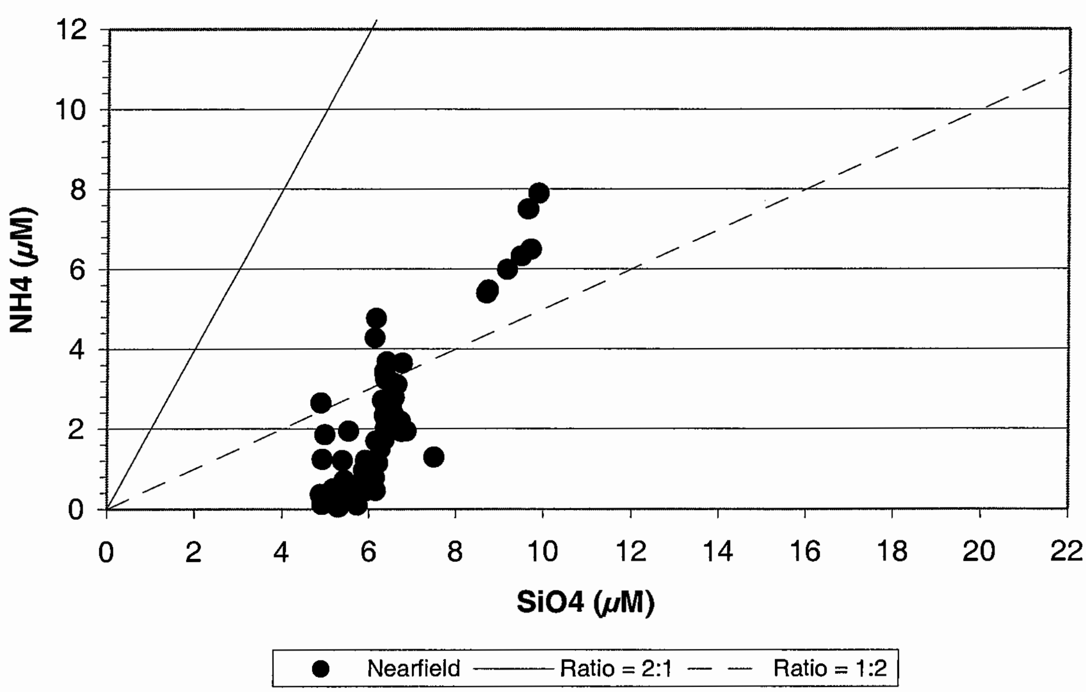
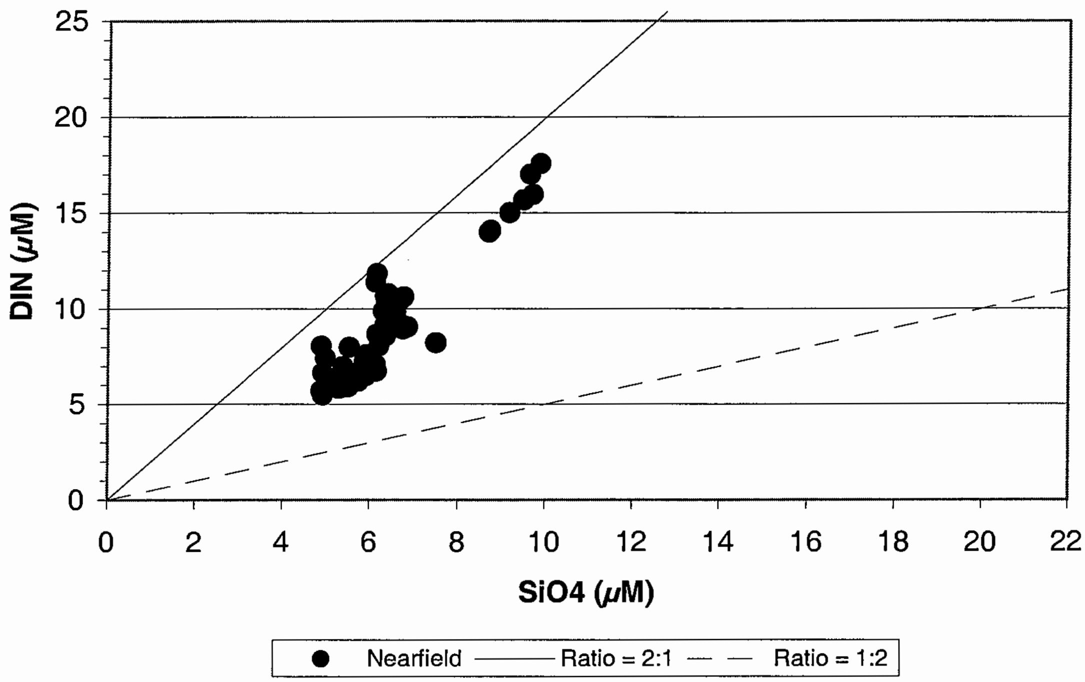


Figure D-111. Nutrient vs. Nutrient Plots for Nearfield Survey WN99H, (Dec 99)

(a)



(b)

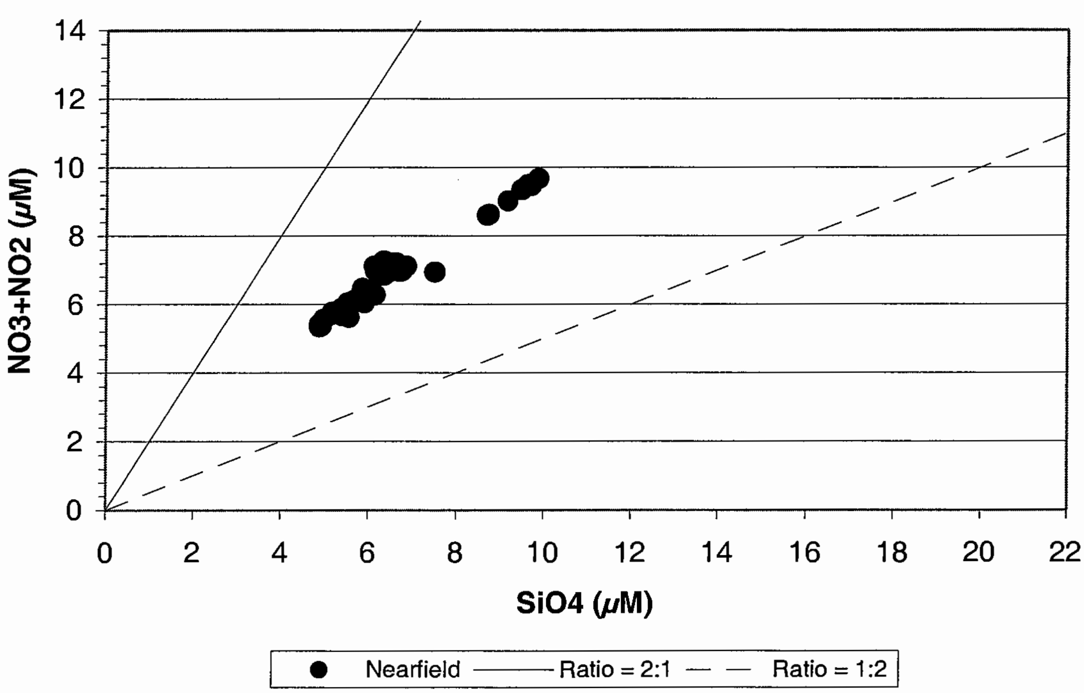
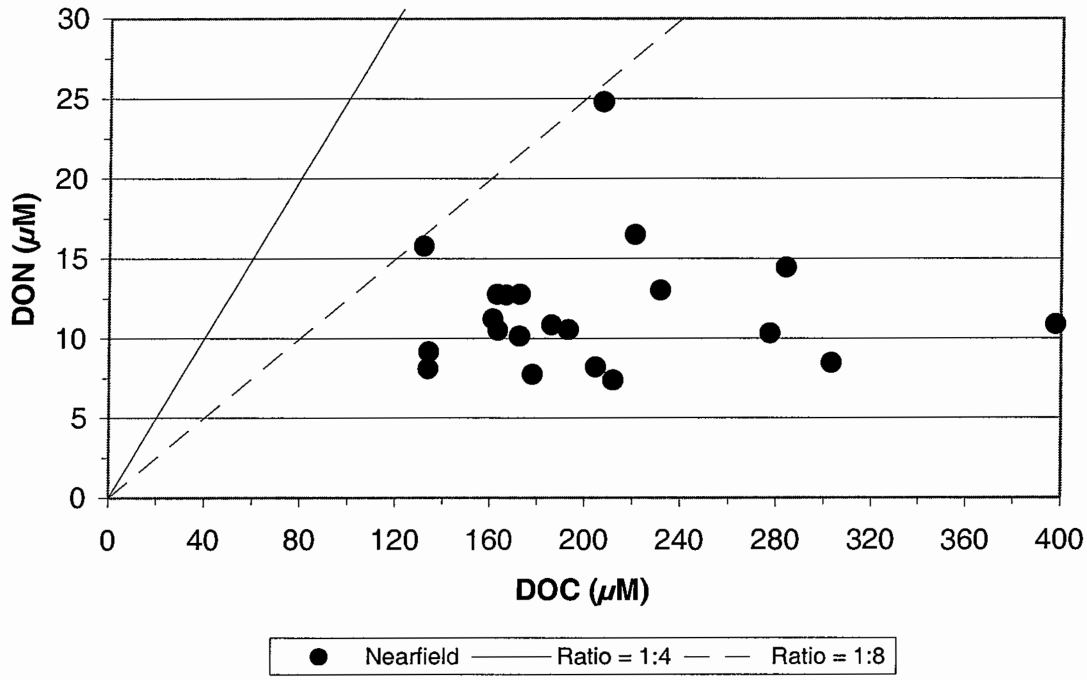


Figure D-112. Nutrient vs. Nutrient Plots for Nearfield Survey WN99H, (Dec 99)

(a)



(b)

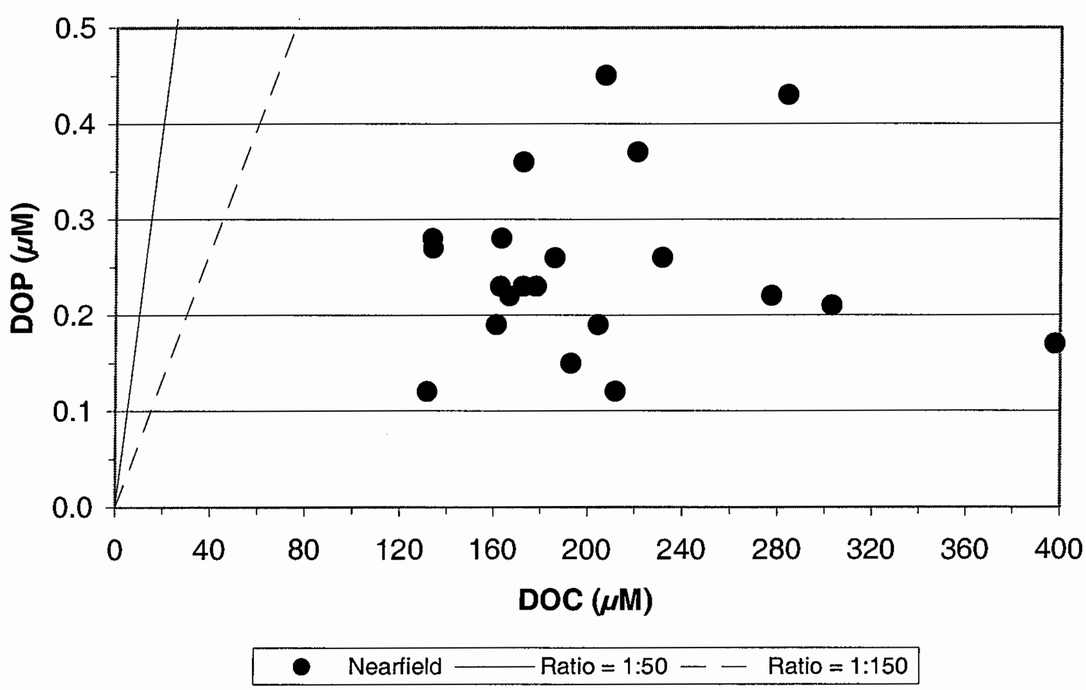
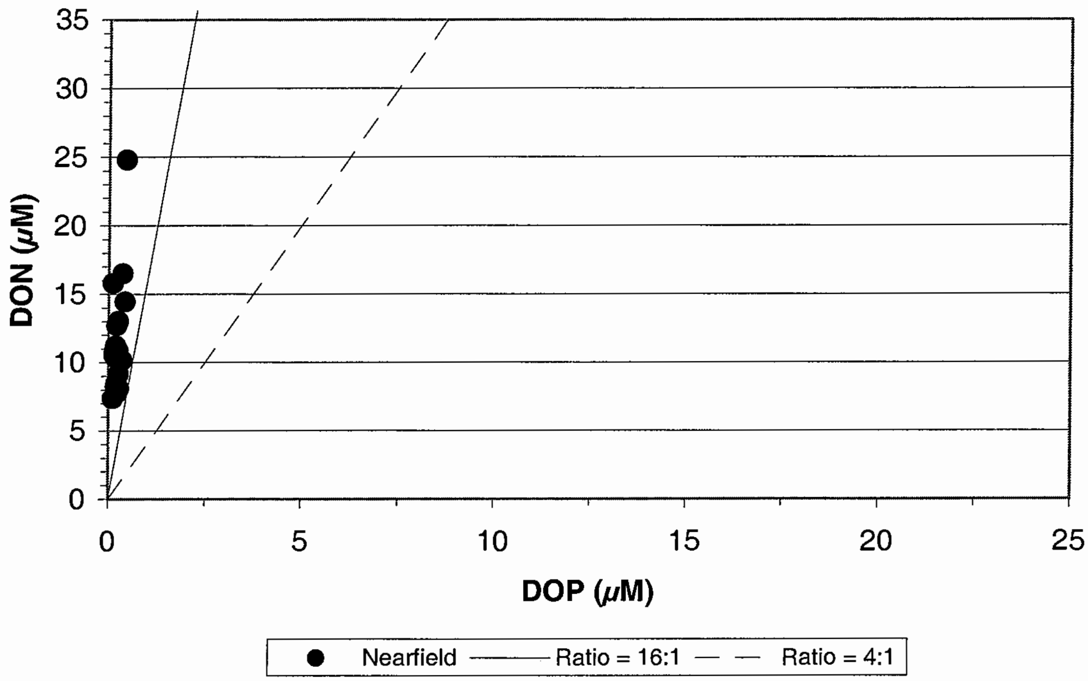


Figure D-113. Nutrient vs. Nutrient Plots for Nearfield Survey WN99H, (Dec 99)

(a)



(b)

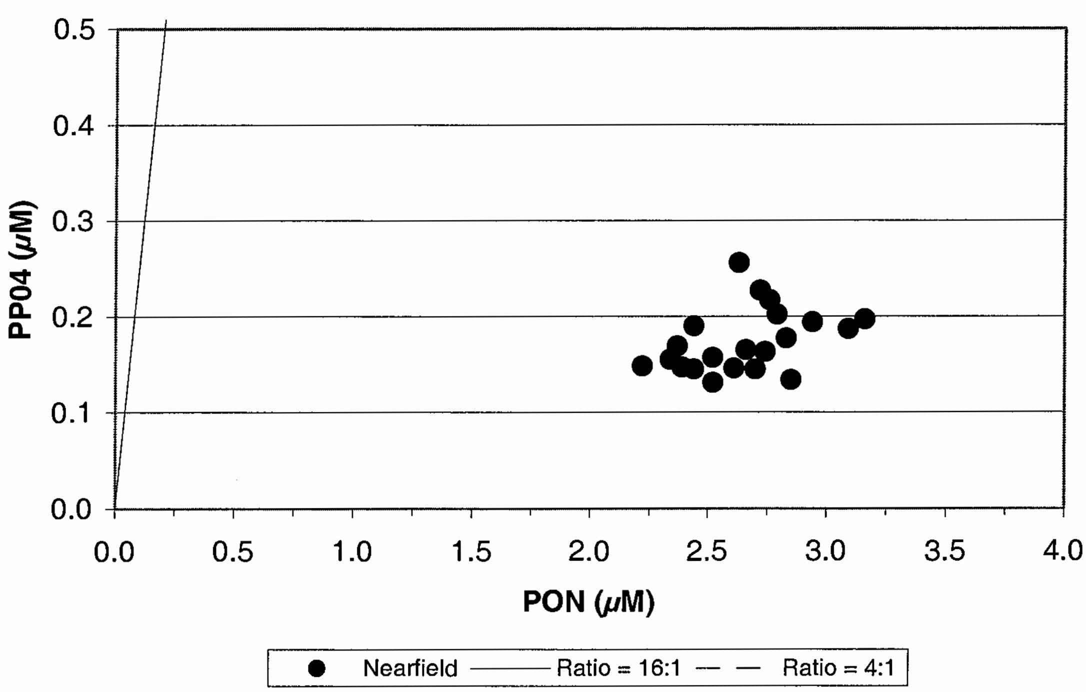
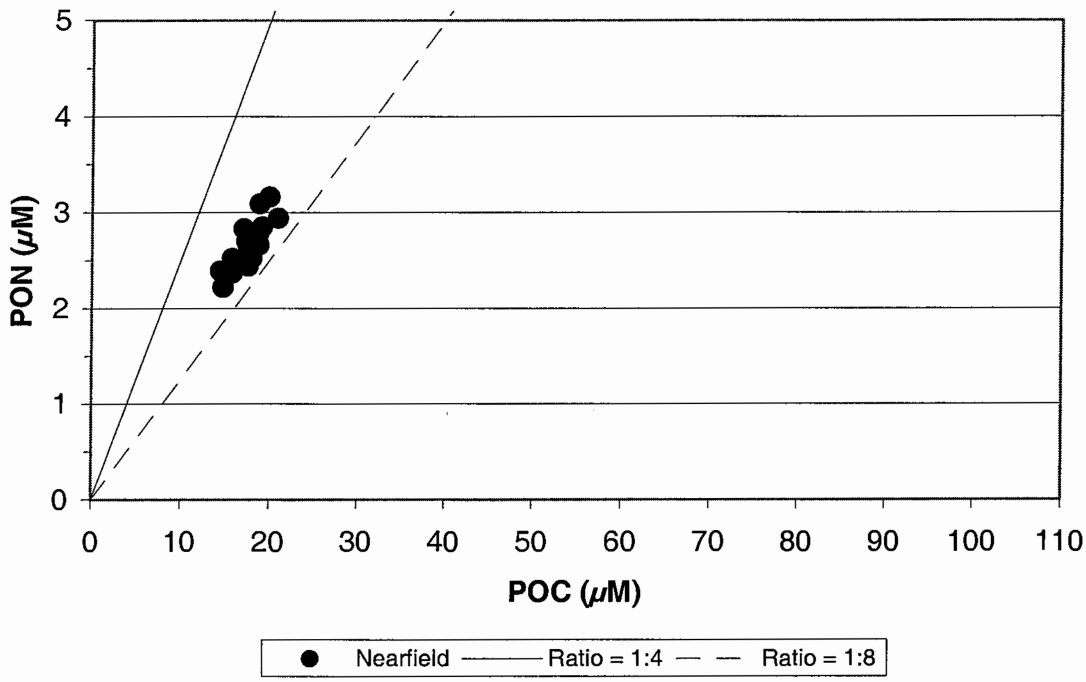


Figure D-114. Nutrient vs. Nutrient Plots for Nearfield Survey WN99H, (Dec 99)

(a)



(b)

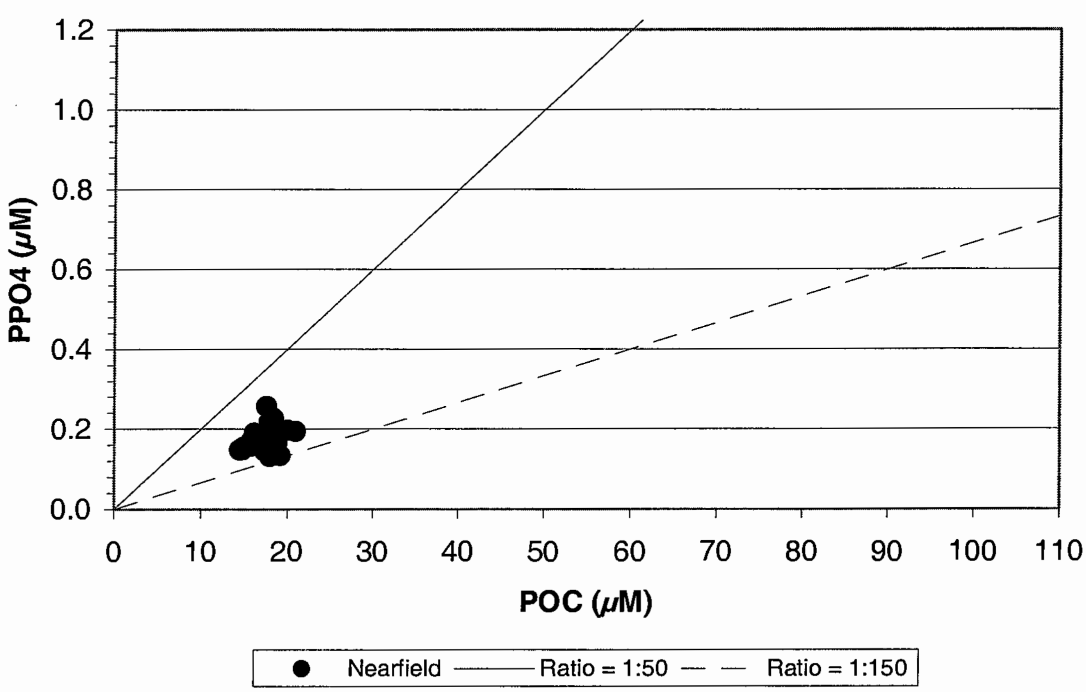
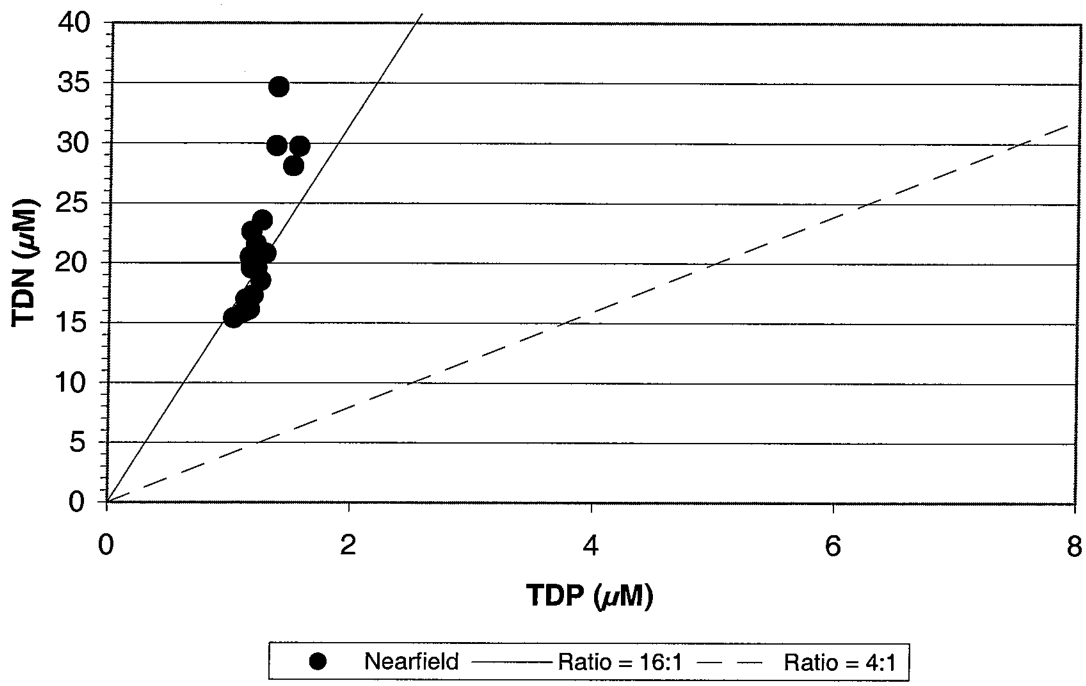


Figure D-115. Nutrient vs. Nutrient Plots for Nearfield Survey WN99H, (Dec 99)

(a)



(b)

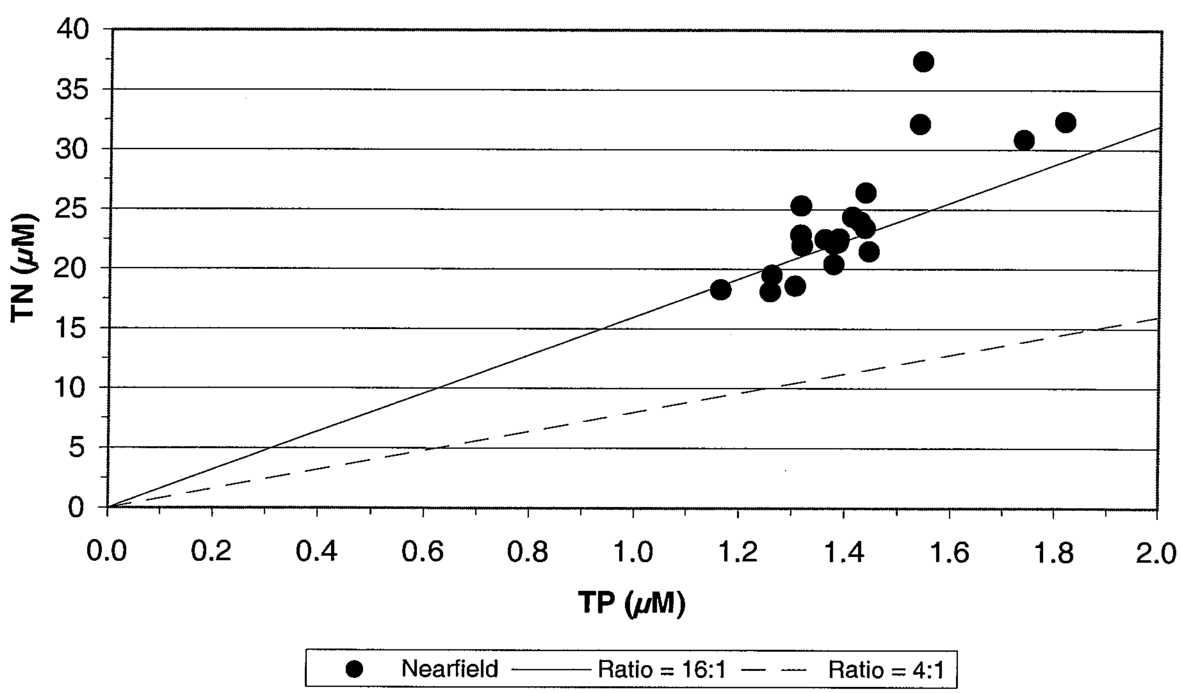
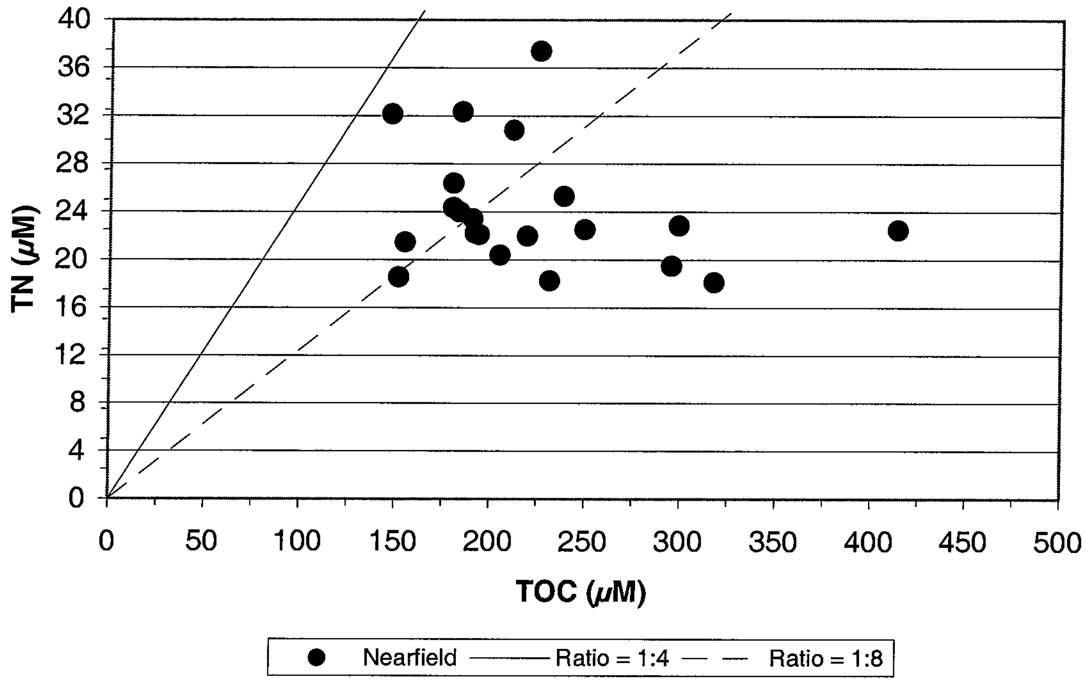


Figure D-116. Nutrient vs. Nutrient Plots for Nearfield Survey WN99H, (Dec 99)

(a)



(b)

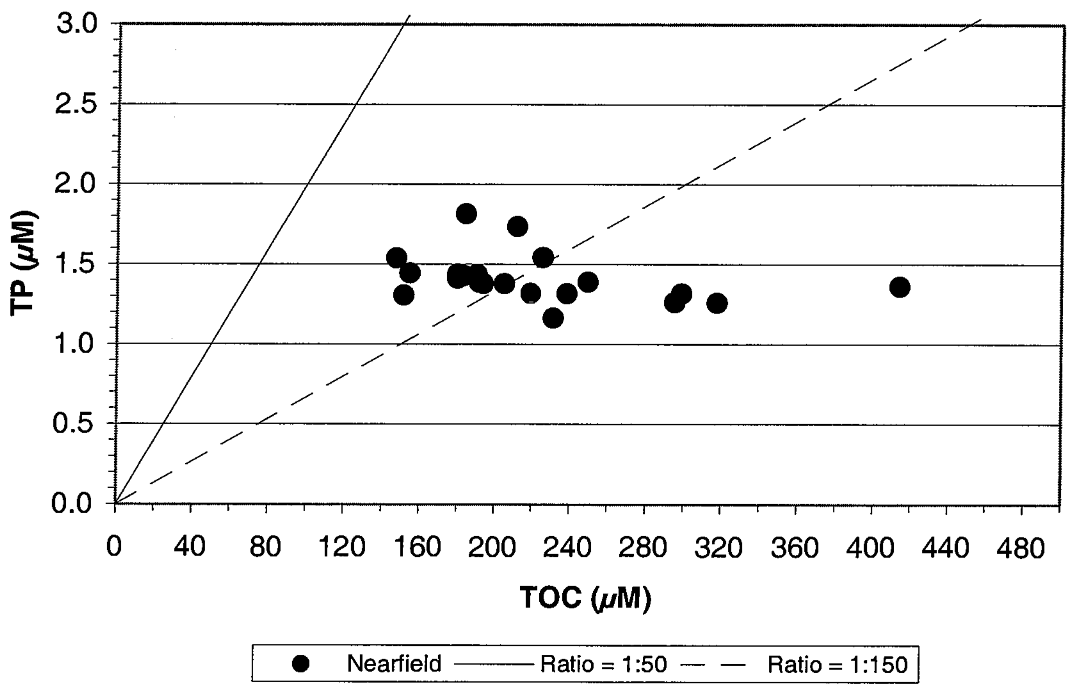


Figure D-117. Nutrient vs. Nutrient Plots for Nearfield Survey WN99H, (Dec 99)

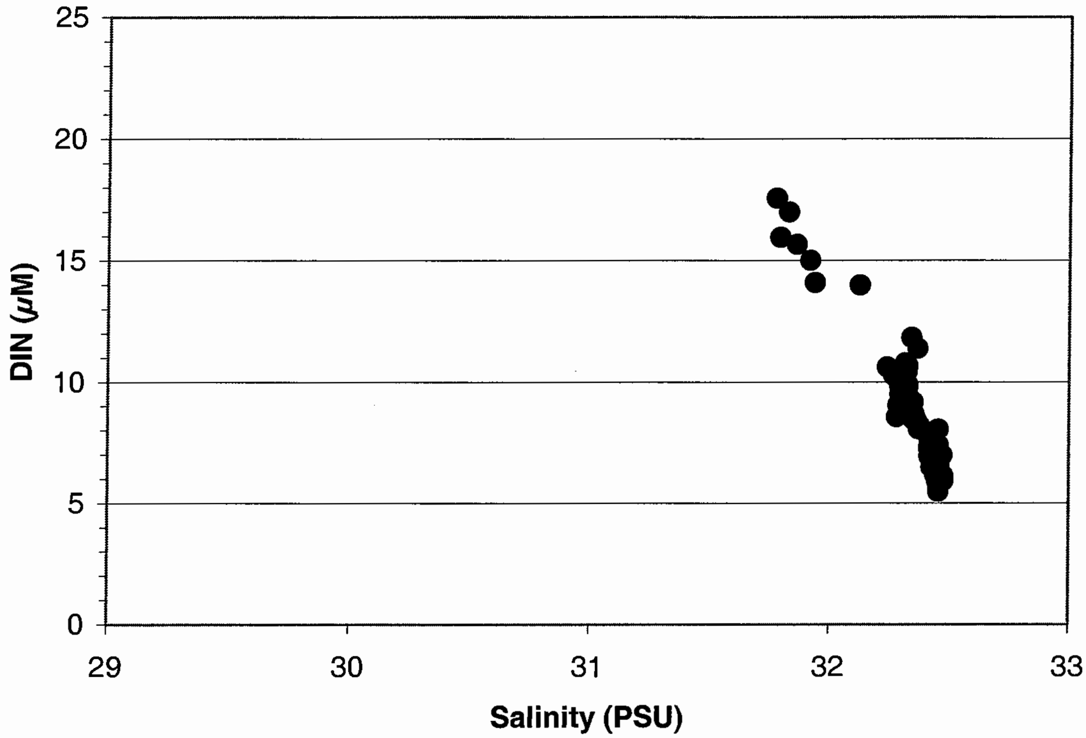
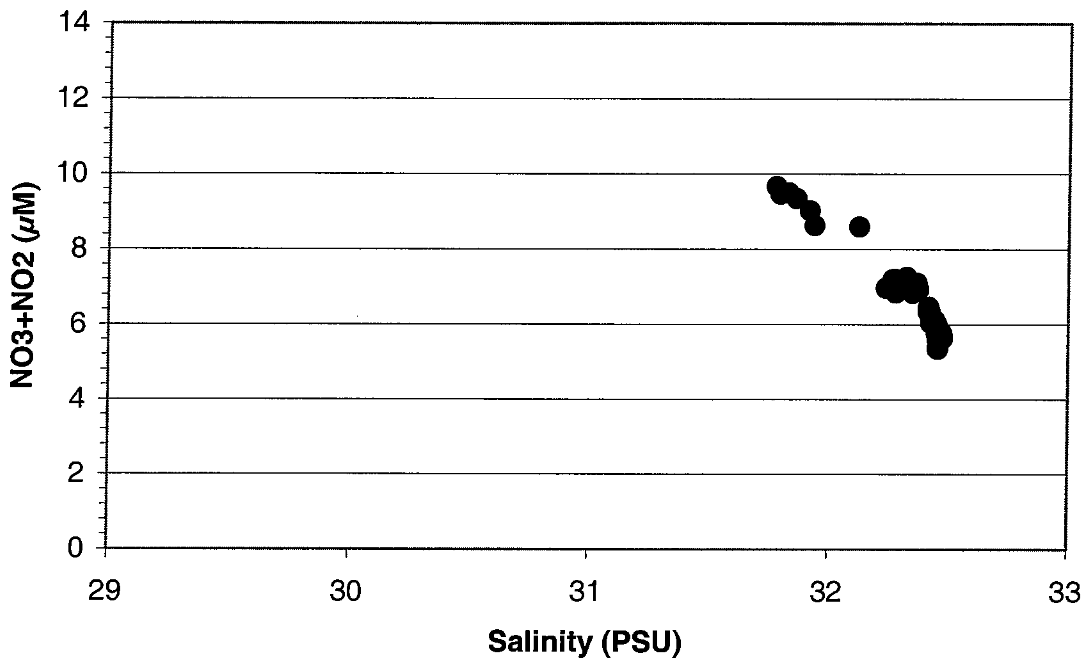


Figure D-118. Nutrient vs. Salinity Plots for Nearfield Survey WN99H, (Dec 99)

(a)



(b)

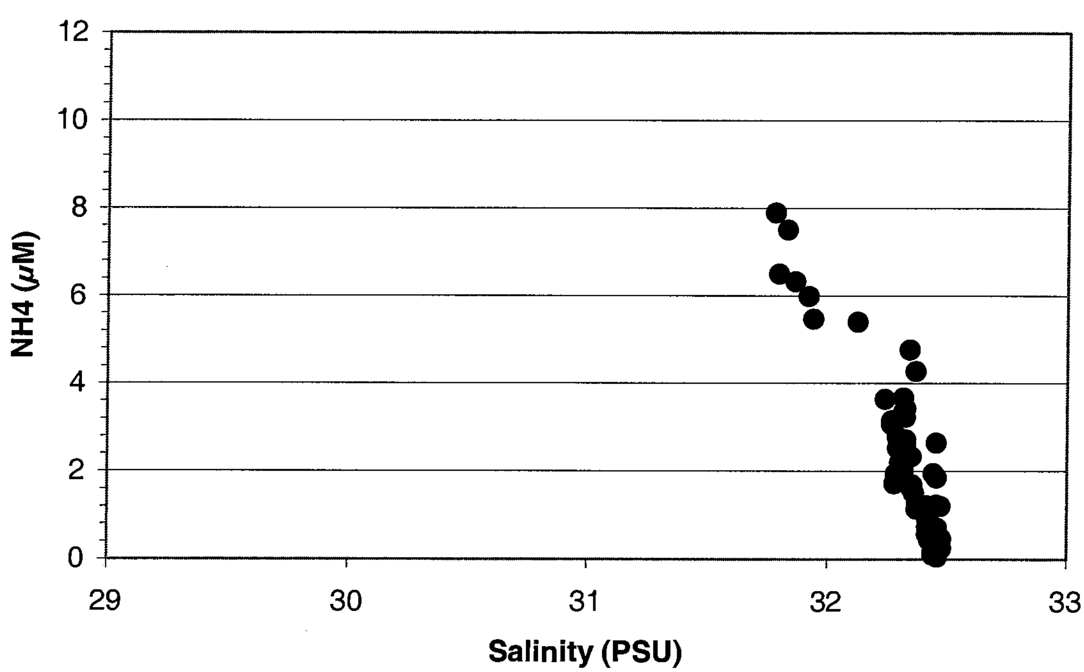
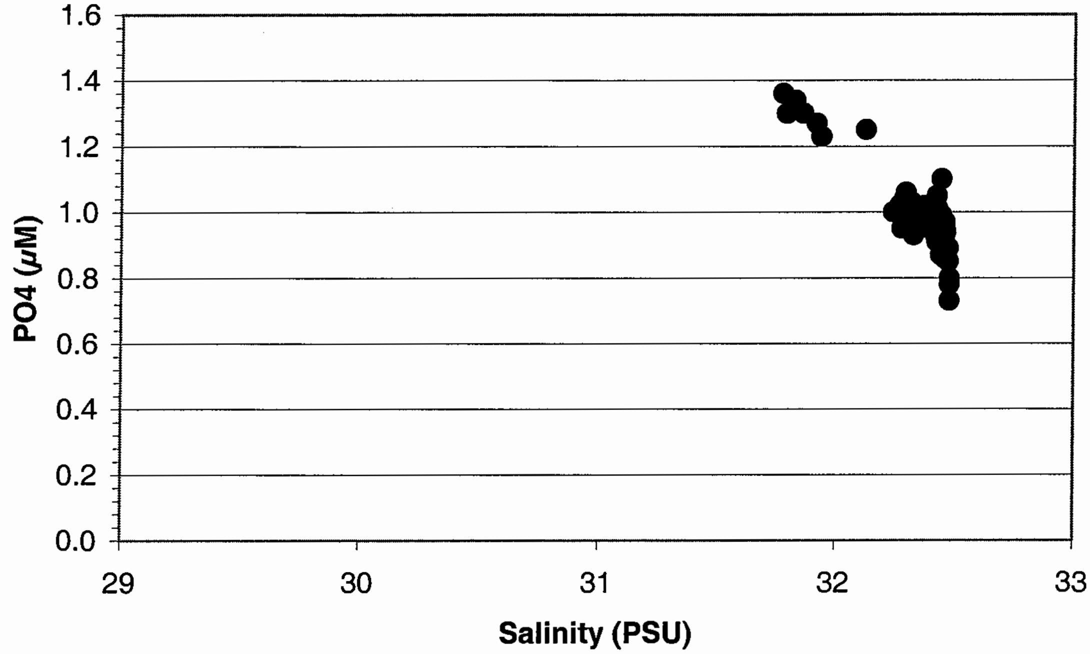


Figure D-119. Nutrient vs. Salinity Plots for Nearfield Survey WN99H, (Dec 99)

(a)



(b)

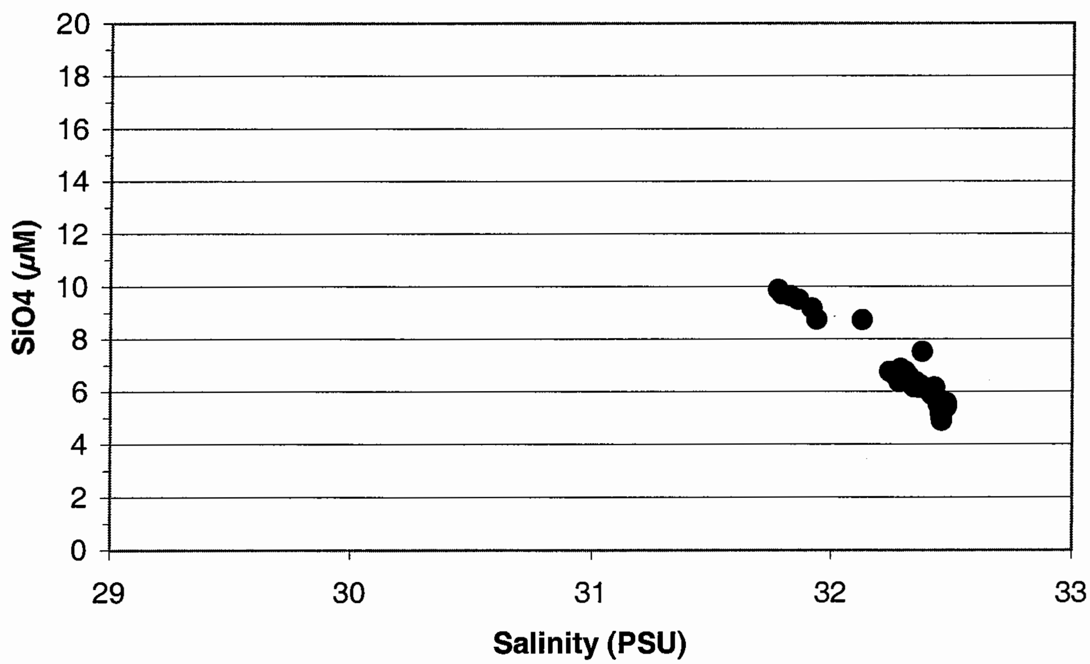


Figure D-120. Nutrient vs. Salinity Plots for Nearfield Survey WN99H, (Dec 99)

APPENDIX E

Photosynthesis-Irradiance (P-I) Curves

Photosynthesis-Irradiance (P-I) Curves

Productivity (Prod, mg C m^{-3} hr^{-1}) versus irradiance (Light, μE m^{-2} sec^{-1}) curves for the period August 2 to December 20, 1999. Comprehensive data are presented for each cruise by station (N04, N18, and F23) and by depth (surface, mid-surface, middle, mid-bottom and bottom). Productivity calculations (Appendix A) utilized light attenuation data from a CTD-mounted 4-π sensor and incident light time-series data from a 2-π irradiance sensor located on Deer Island, MA. After collection of the productivity samples, they were transported to the Marine Ecosystems Research Laboratory (MERL) where they were incubated in temperature controlled incubators. Hourly productivity measurements were converted to daily values by fitting the measured hourly rates and light data to one of two P-I models (with or without photoinhibition). Using the fitted parameters, the measured incident light, and the light attenuation data, production rates were calculated for each 15-minute interval over the daylight period (centered from 6 AM to 6 PM), summed for each sampling depth, then integrated over depth to give areal production for each station.

WN99A **Station NO4**

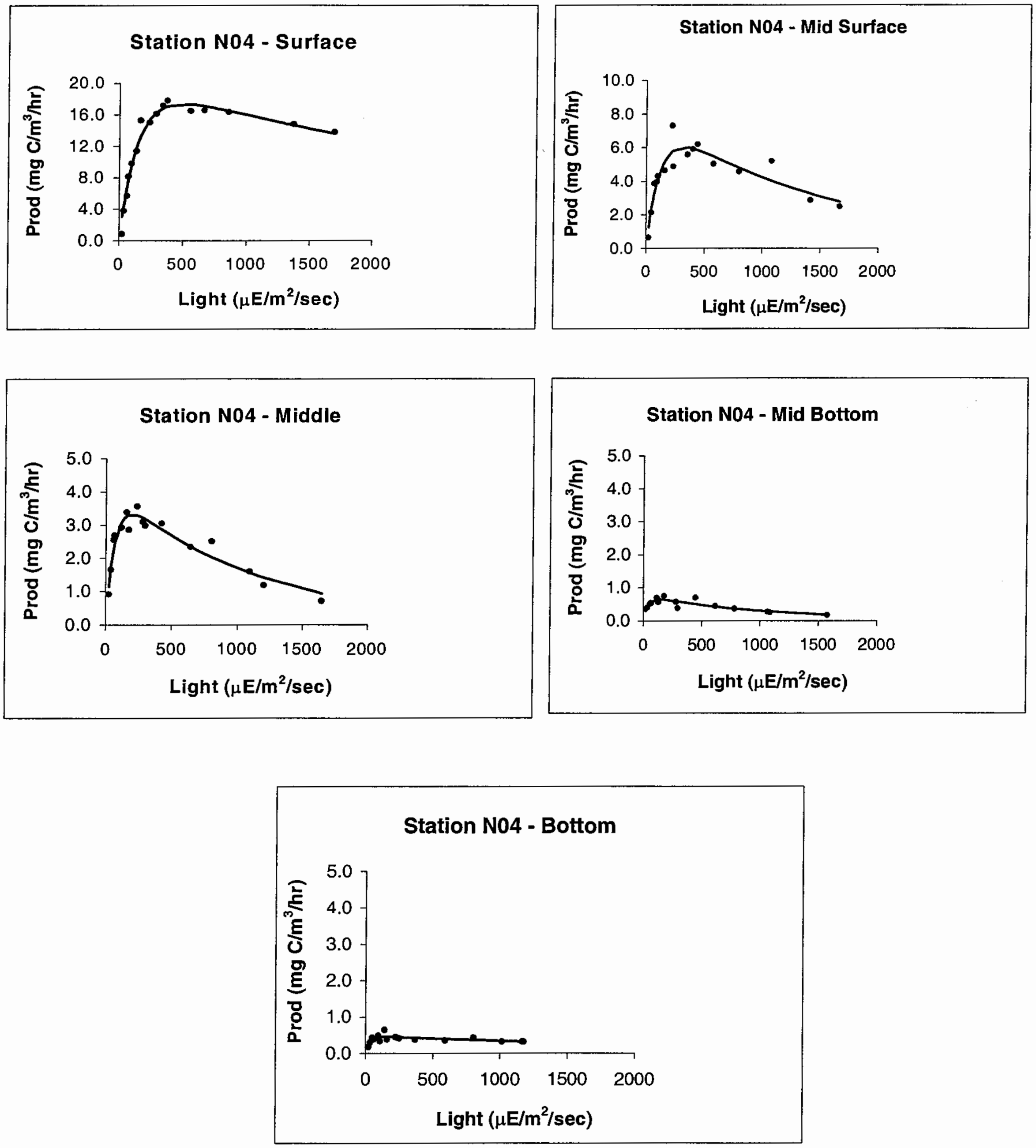


Figure E-1. Photosynthesis-Irradiance (P-I) Curves for Station N04 from Nearfield Survey WN99A (Aug 99)

WN99A **Station N18**

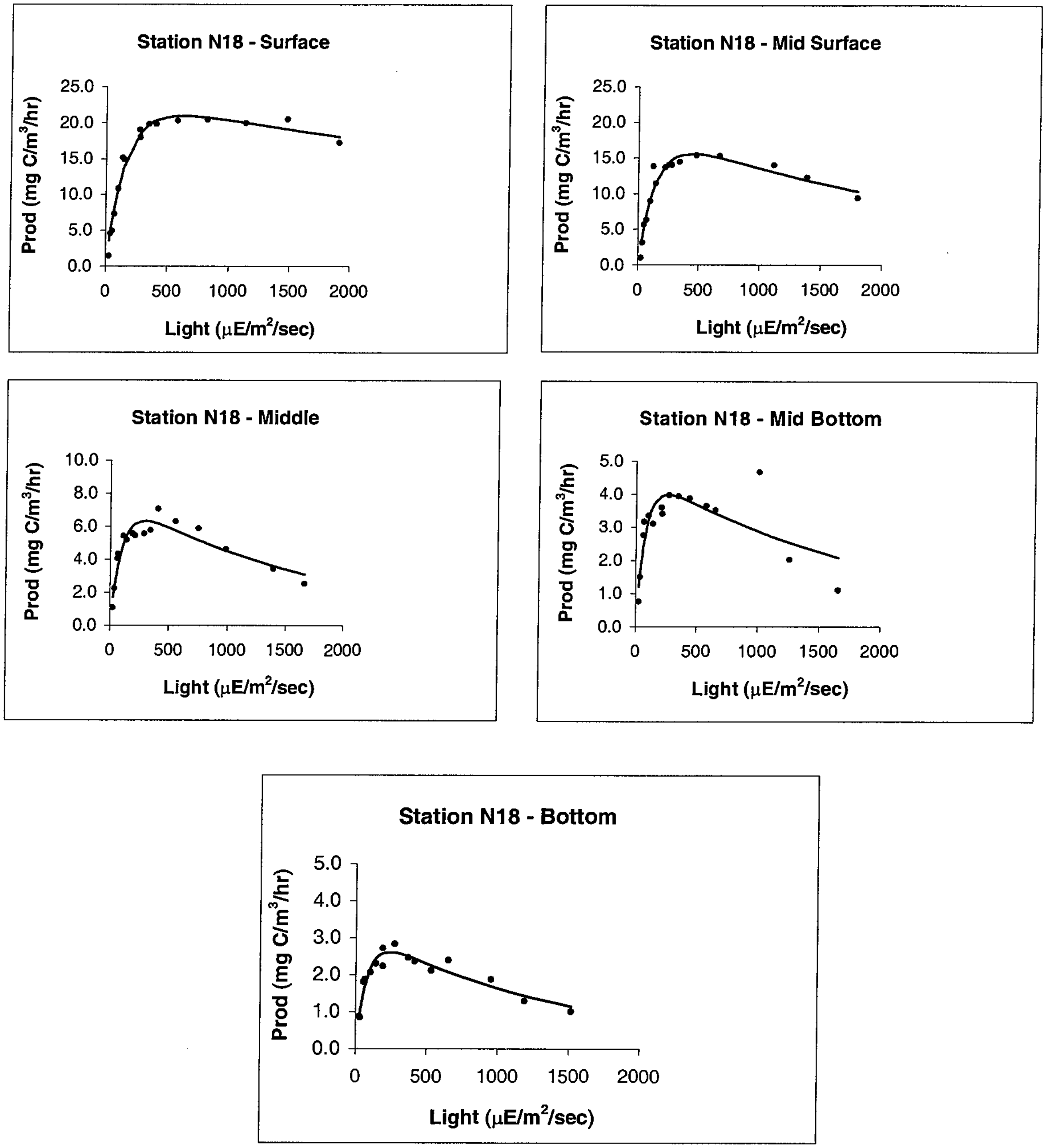


Figure E-2. Photosynthesis-Irradiance (P-I) Curves for Station N18 from Nearfield Survey WN99A (Aug 99)

WF99B **Station NO4**

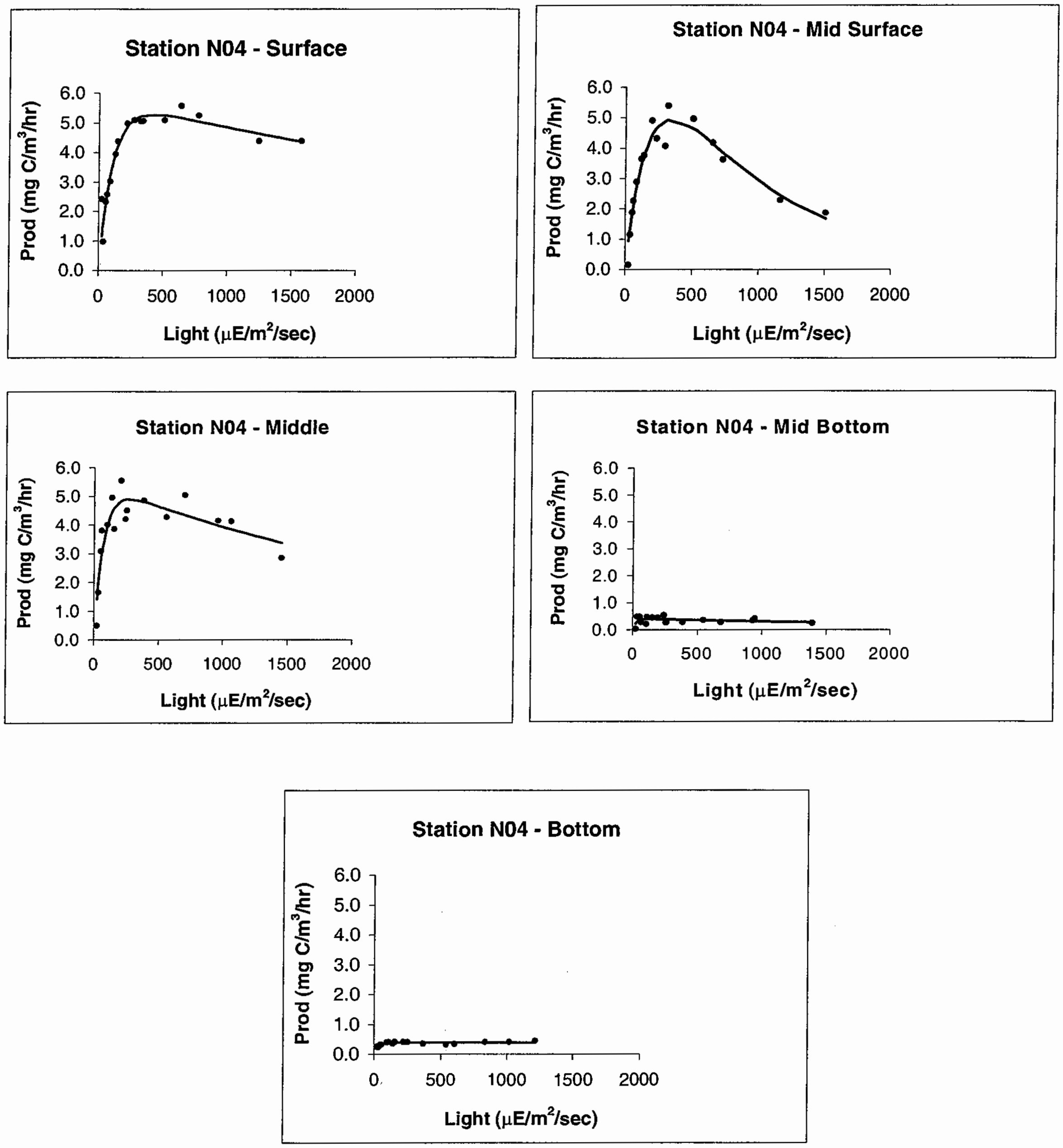


Figure E-3. Photosynthesis-Irradiance (P-I) Curves for Station N04 from Farfield Survey WF99B (Aug 99)

WF99B **Station N18**

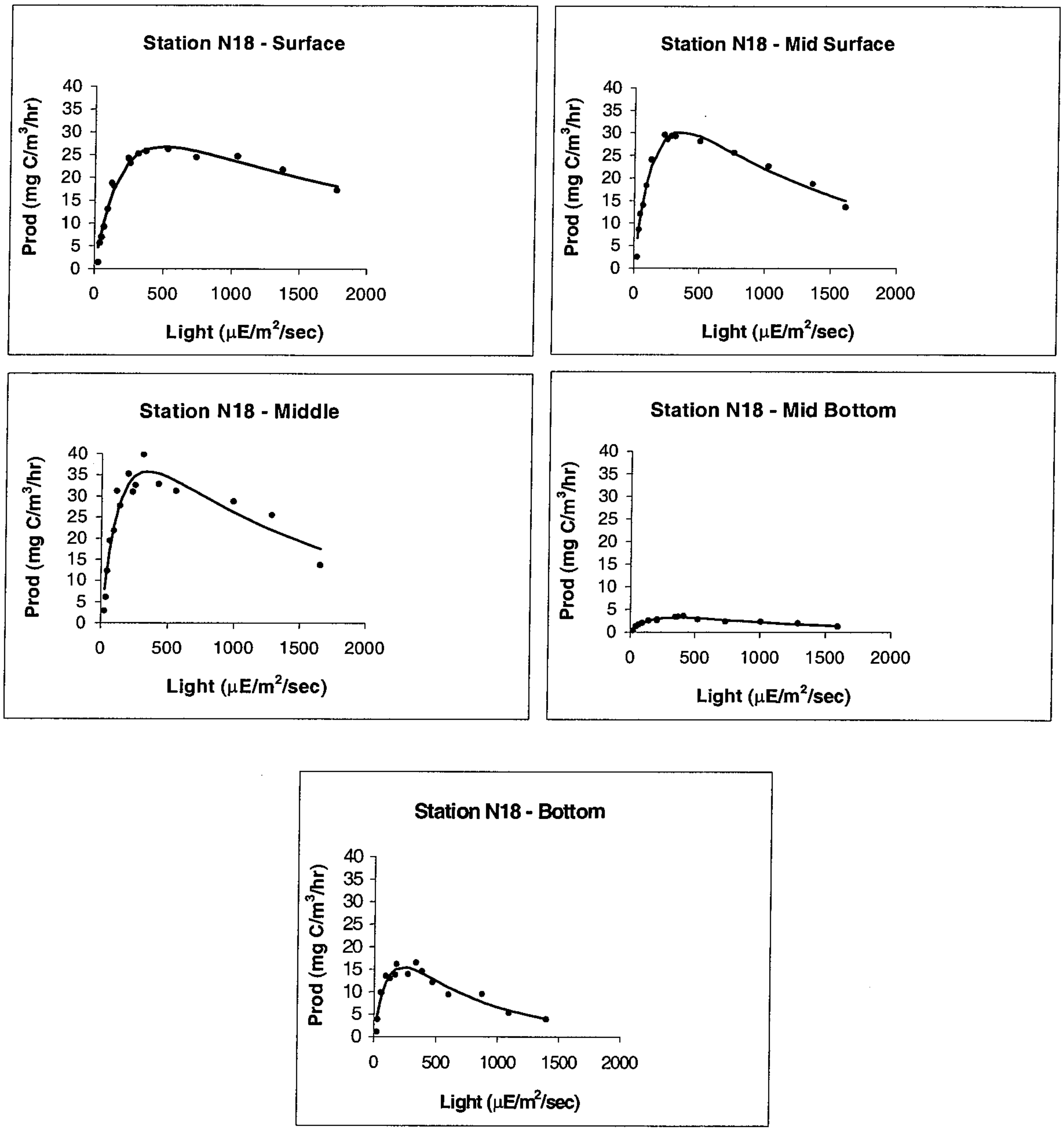
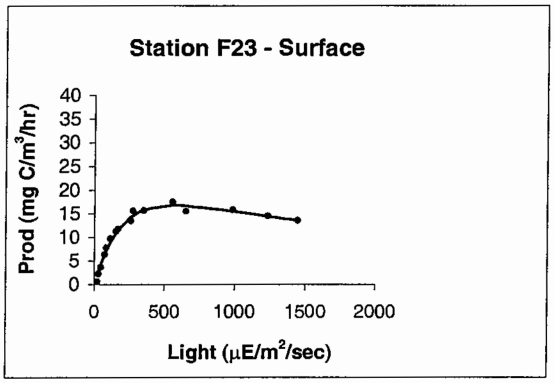
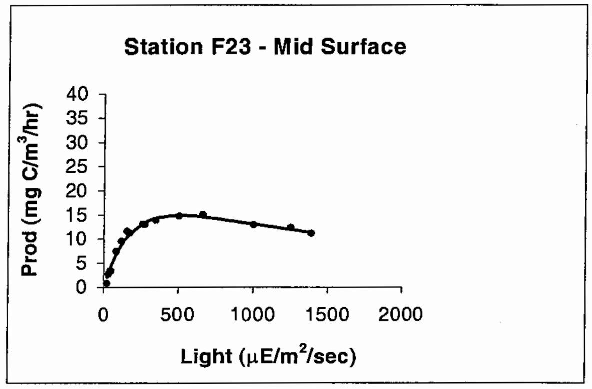
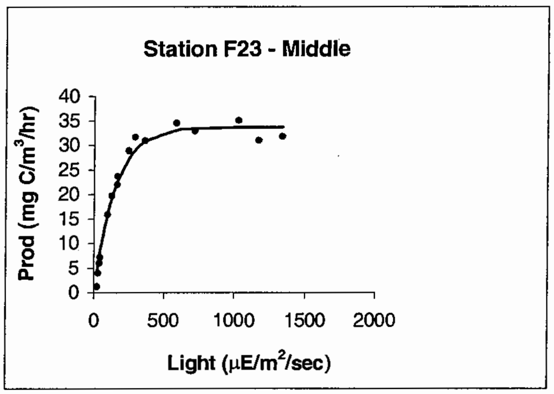


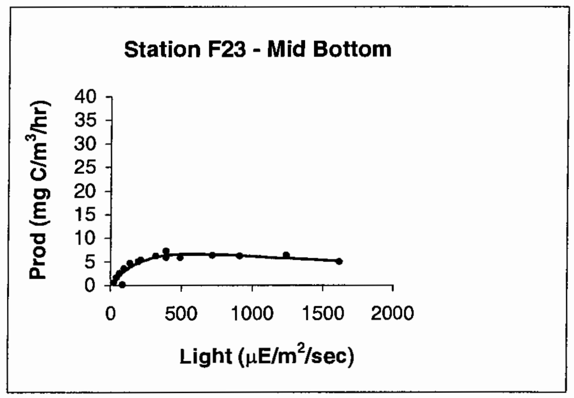
Figure E-4. Photosynthesis-Irradiance (P-I) Curves for Station N18 from Farfield Survey WF99B (Aug 99)

WF99B **Station F23**









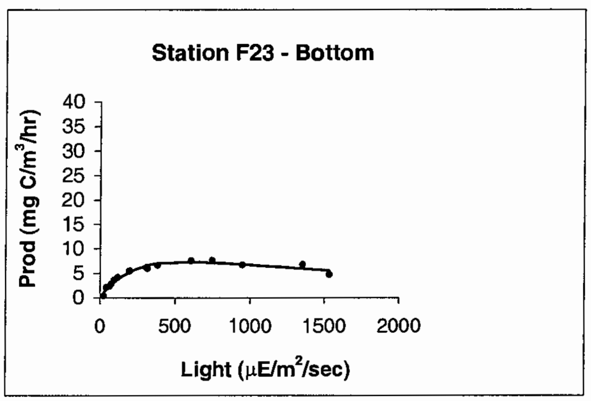


Figure E-5. Photosynthesis-Irradiance (P-I) Curves for Station F23 from Farfield Survey WF99B (Aug 99)

WN99C **Station NO4**

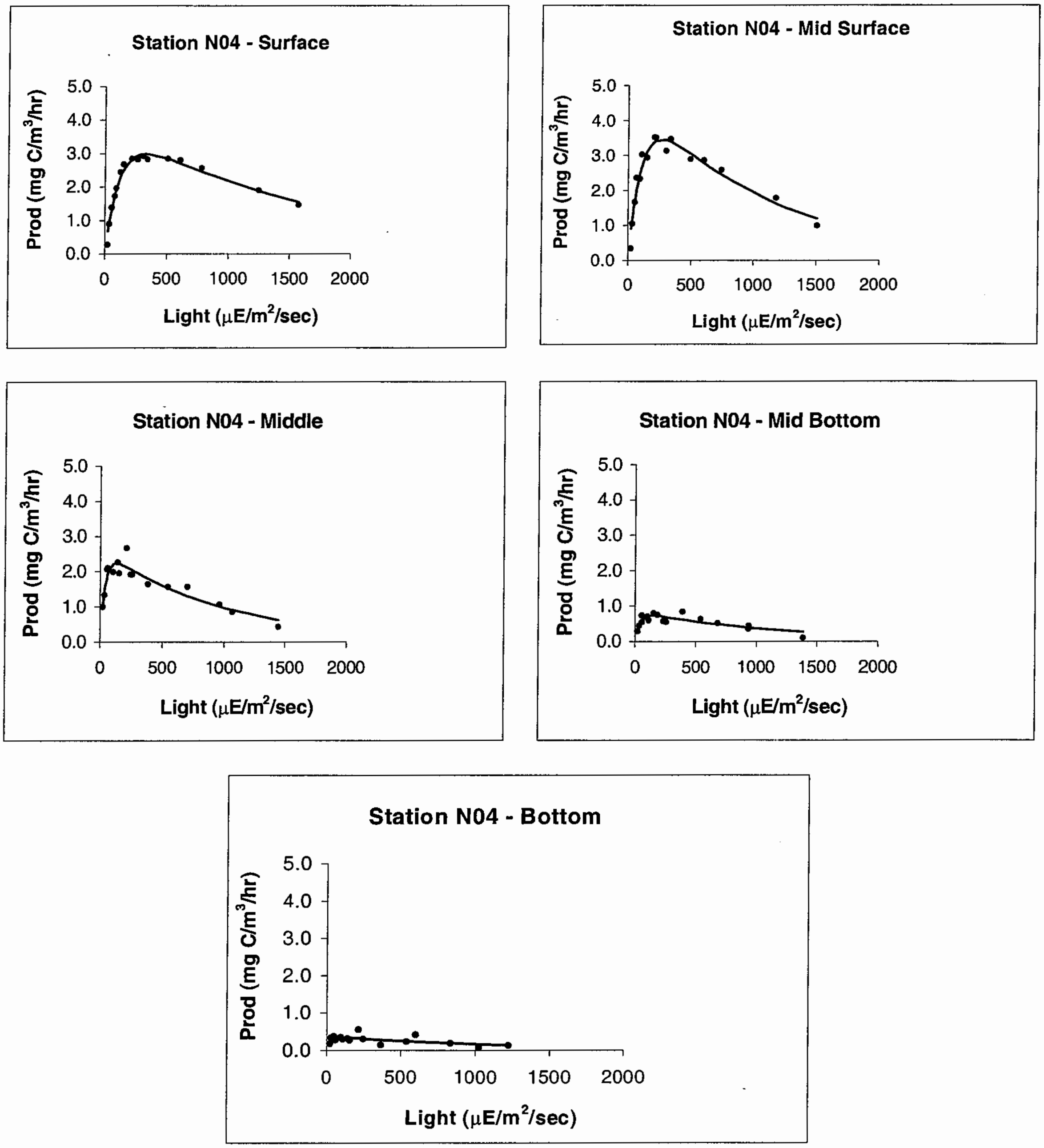


Figure E-6. Photosynthesis-Irradiance (P-I) Curves for Station N04 from Nearfield Survey WN99C (Sept 99)

WN99C **Station N18**

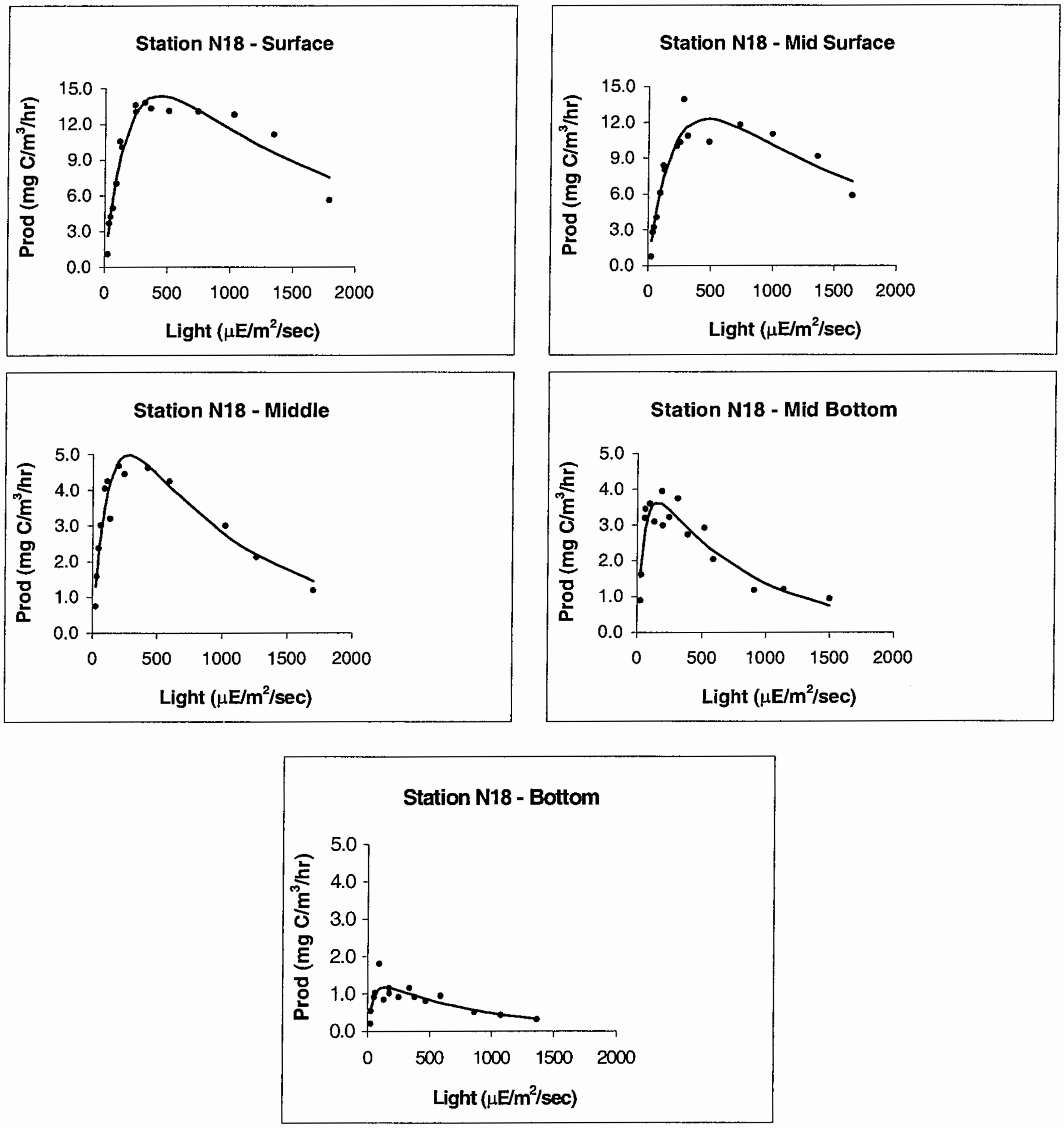


Figure E-7. Photosynthesis-Irradiance (P-I) Curves for Station N18 from Nearfield Survey WN99C (Sept 99)

WN99D **Station NO4**

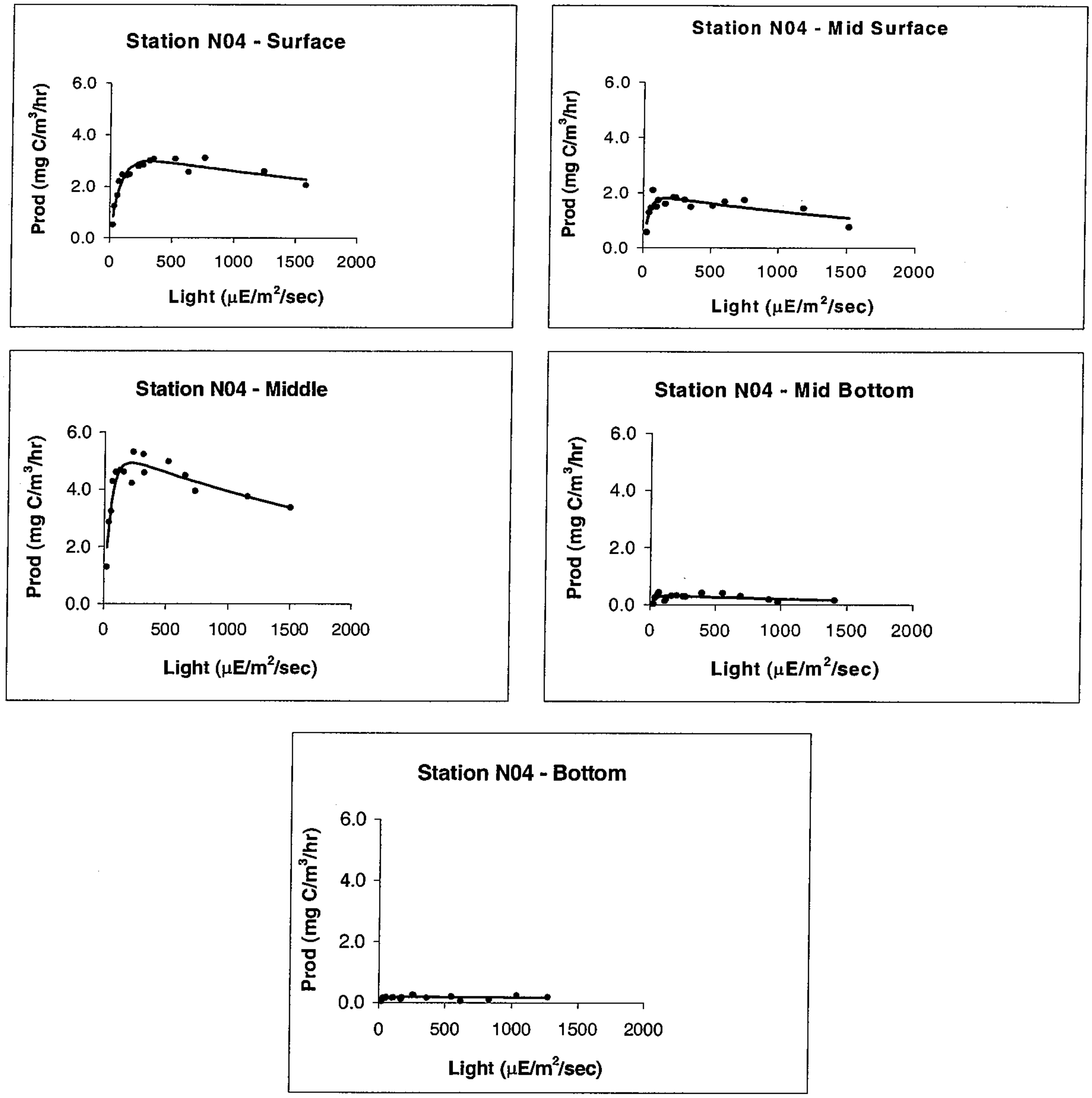
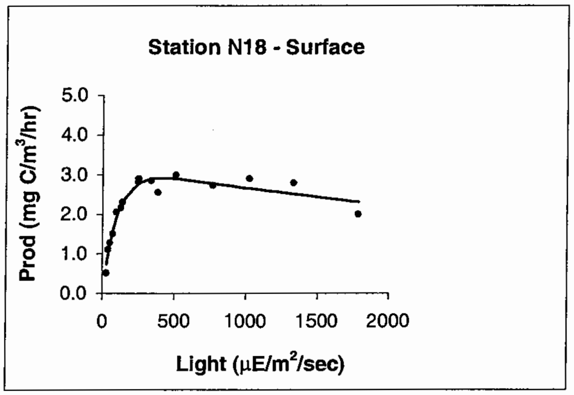
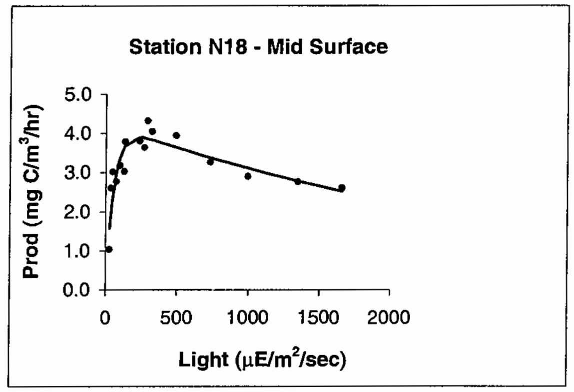
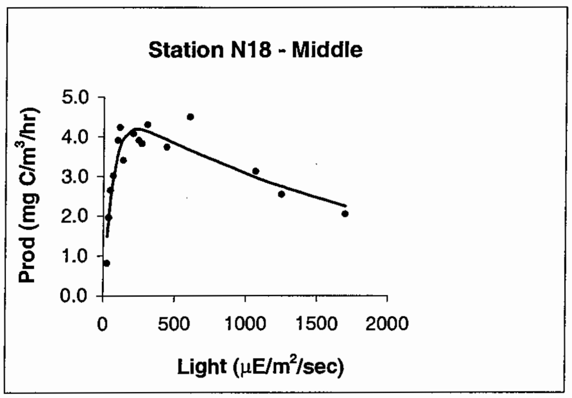


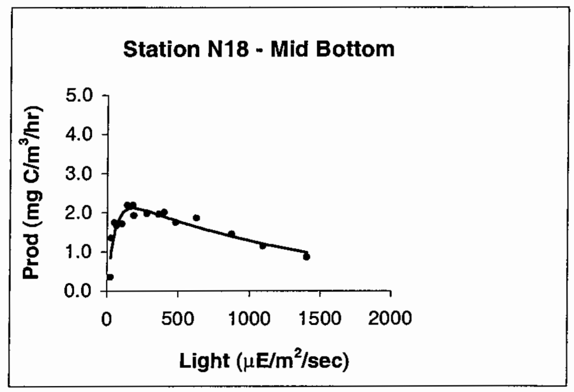
Figure E-8. Photosynthesis-Irradiance (P-I) Curves for Station N04 from Nearfield Survey WN99D (Sept 99)

WN99D **Station N18**









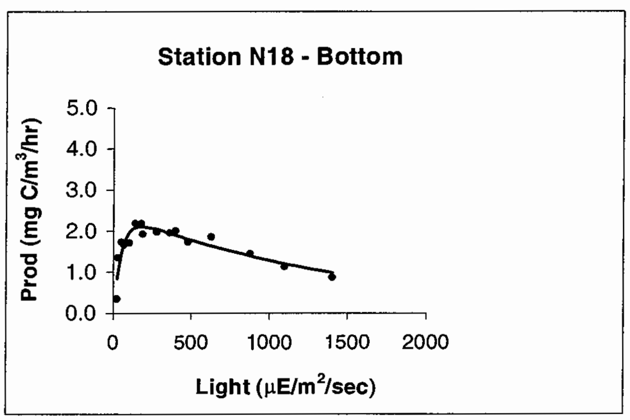


Figure E-9. Photosynthesis-Irradiance (P-I) Curves for Station N18 from Nearfield Survey WN99D (Sept 99)

WF99E **Station NO4**

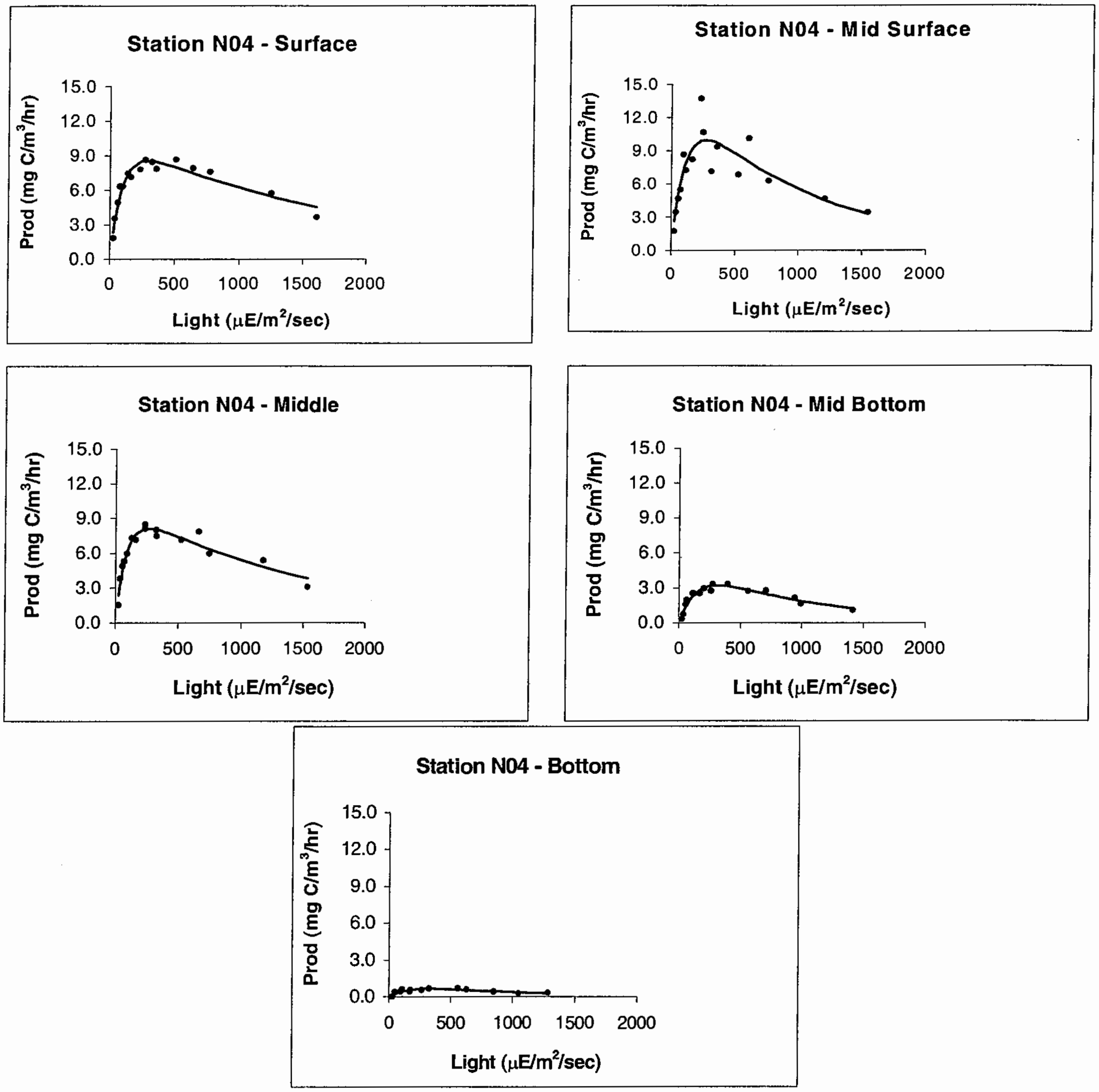


Figure E-10. Photosynthesis-Irradiance (P-I) Curves for Station N04 from Farfield Survey WF99E (Oct 99)

WF99E **Station N18**

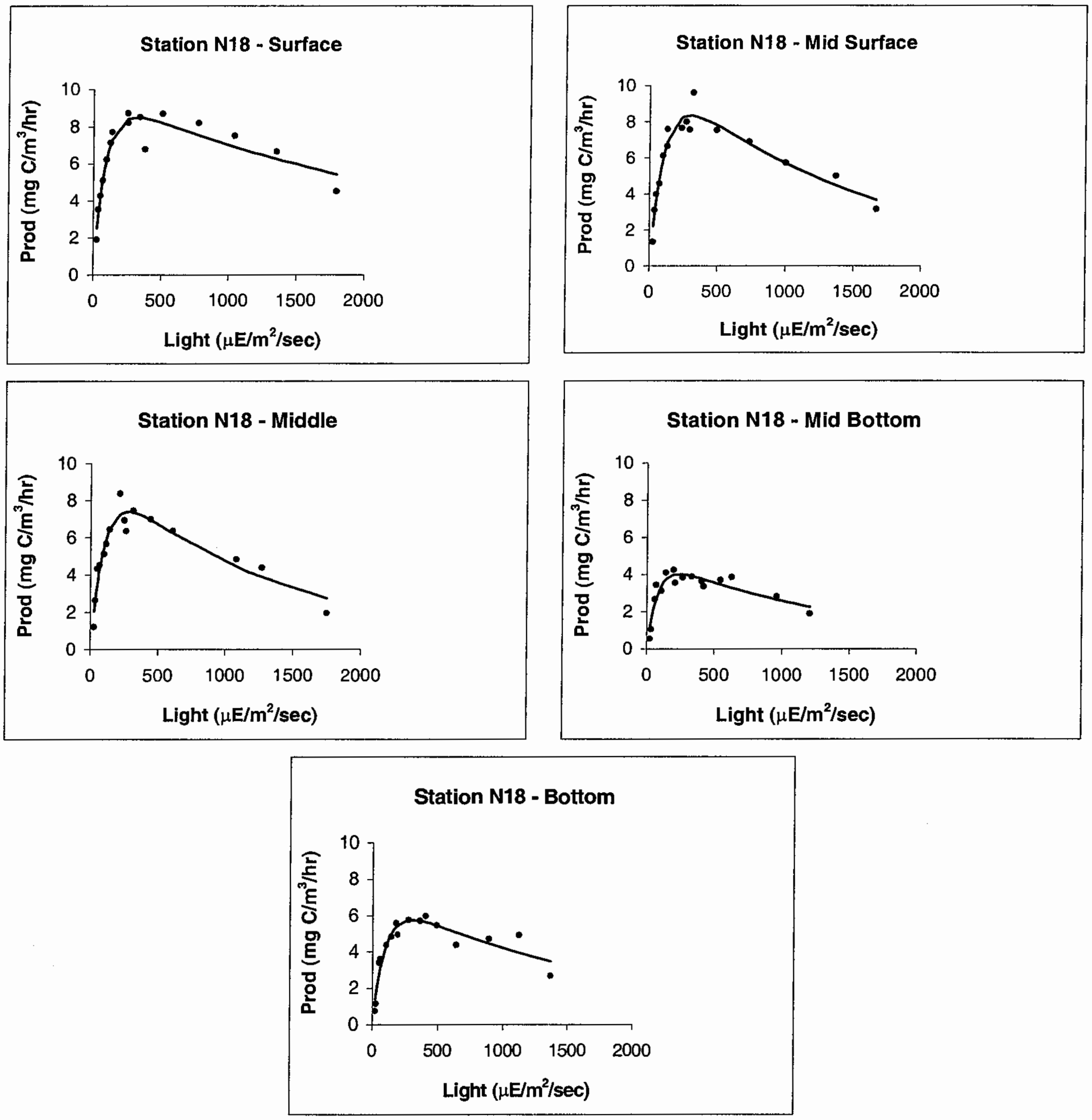


Figure E-11. Photosynthesis-Irradiance (P-I) Curves for Station N18 from Farfield Survey WF99E (Oct 99)

WF99E **Station F23**

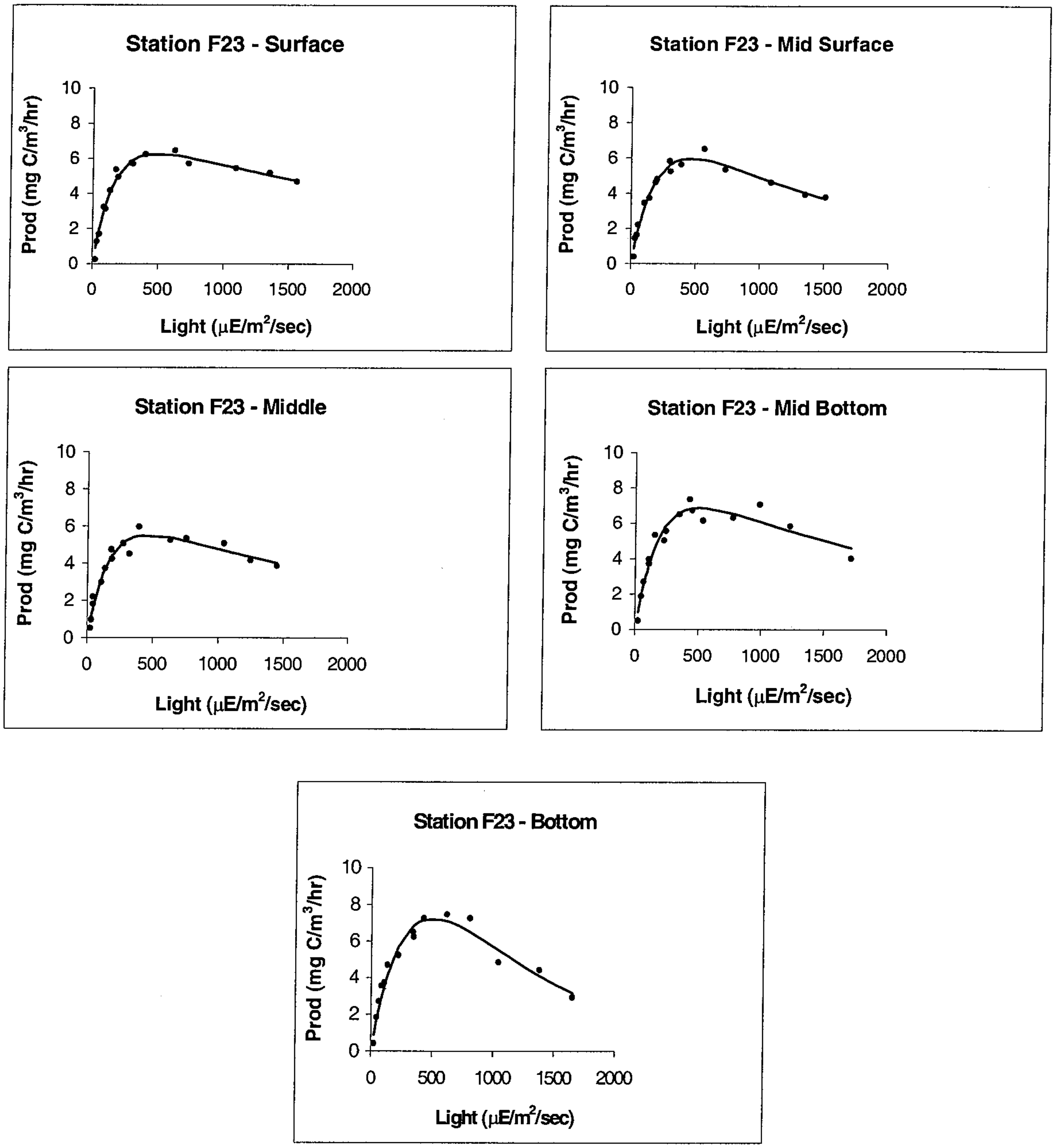


Figure E-12. Photosynthesis-Irradiance (P-I) Curves for Station F23 from Farfield Survey WF99E (Oct 99)

WN99F **Station NO4**

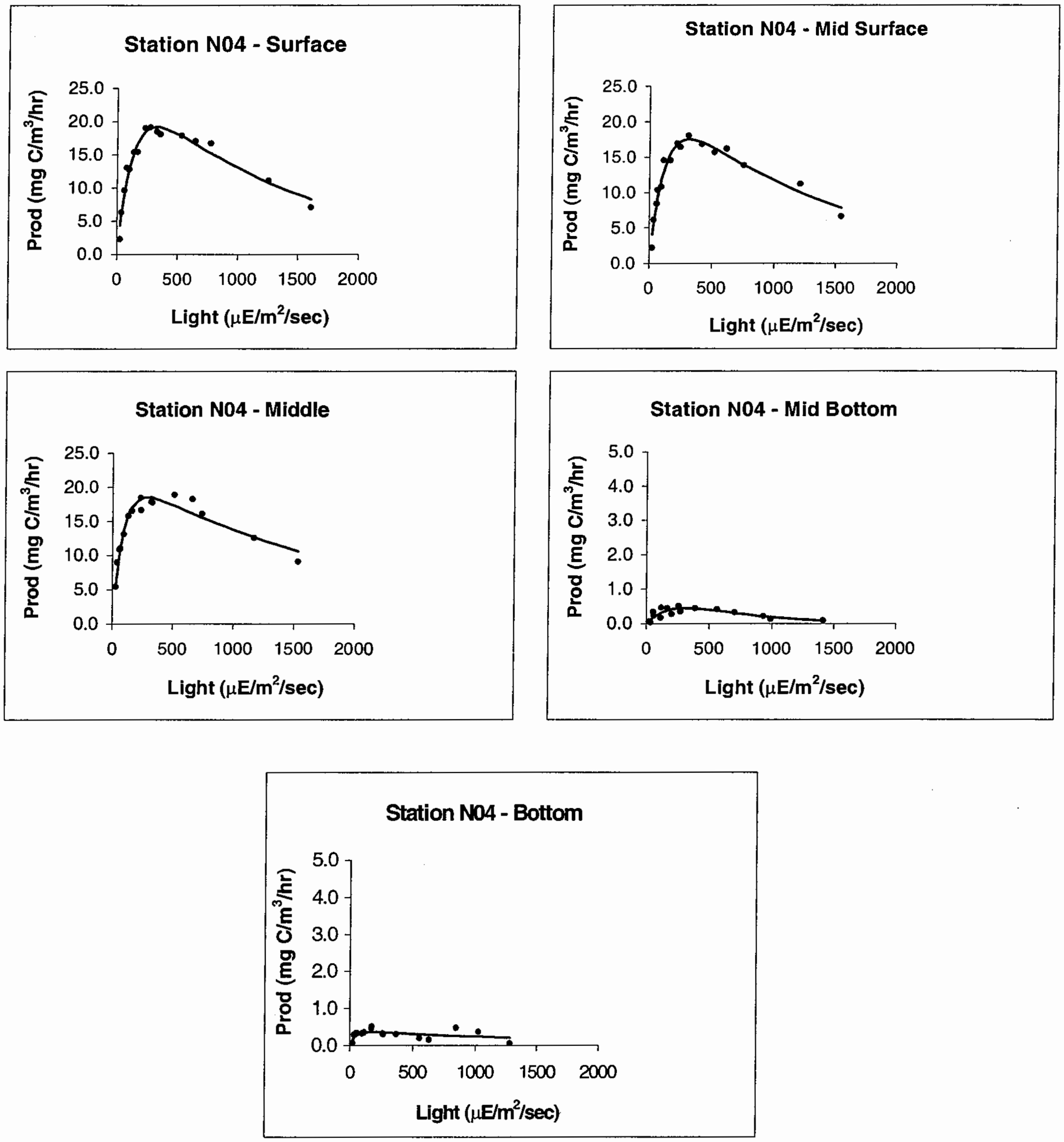


Figure E-13. Photosynthesis-Irradiance (P-I) Curves for Station N04 from Nearfield Survey WN99F (Oct 99)

WN99F **Station N18**

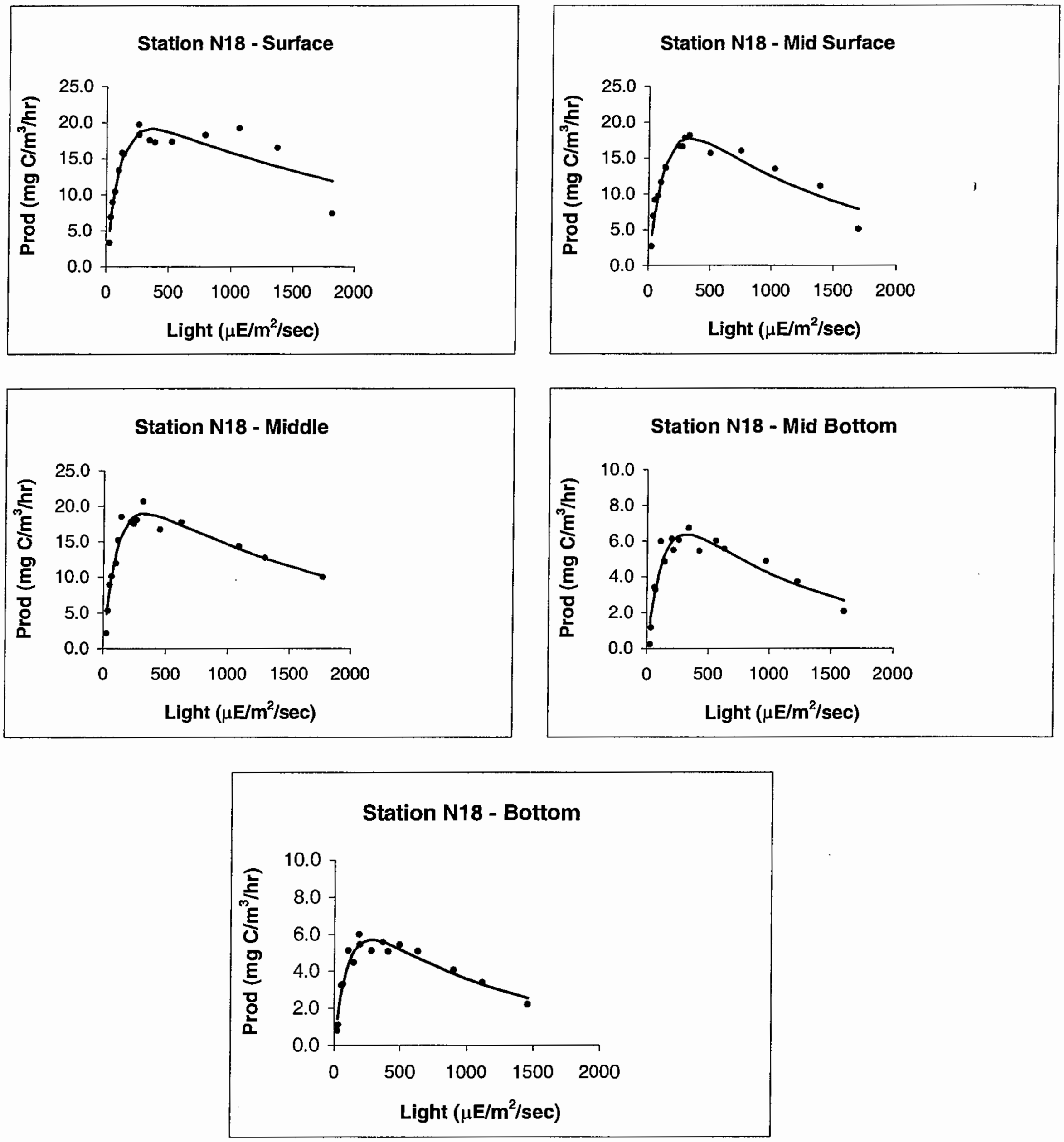


Figure E-14. Photosynthesis-Irradiance (P-I) Curves for Station N18 from Nearfield Survey WN99F (Oct 99)

WN99G **Station NO4**

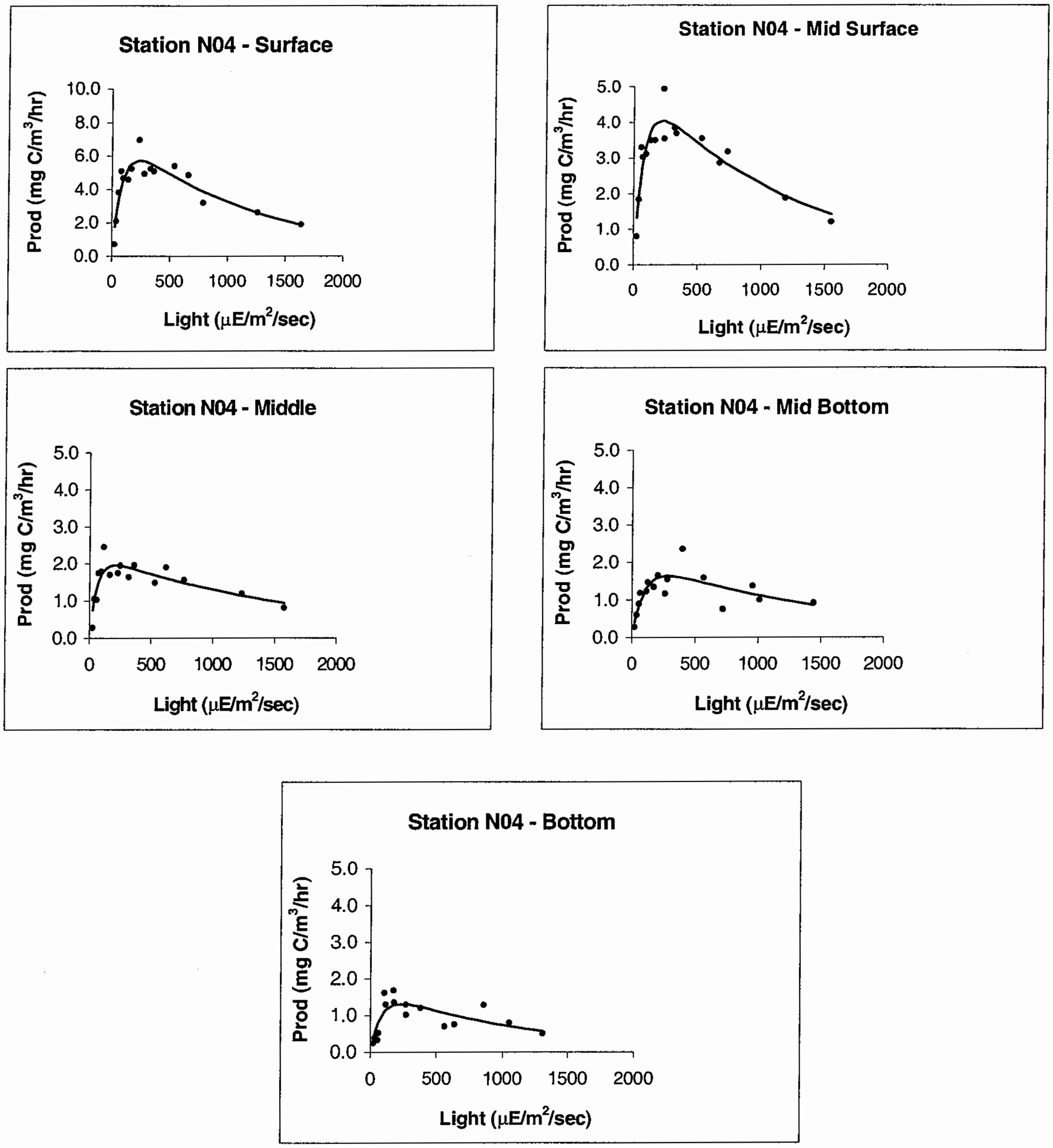


Figure E-15. Photosynthesis-Irradiance (P-I) Curves for Station N04 from Nearfield Survey WN99G (Nov 99)

WN99G **Station N18**

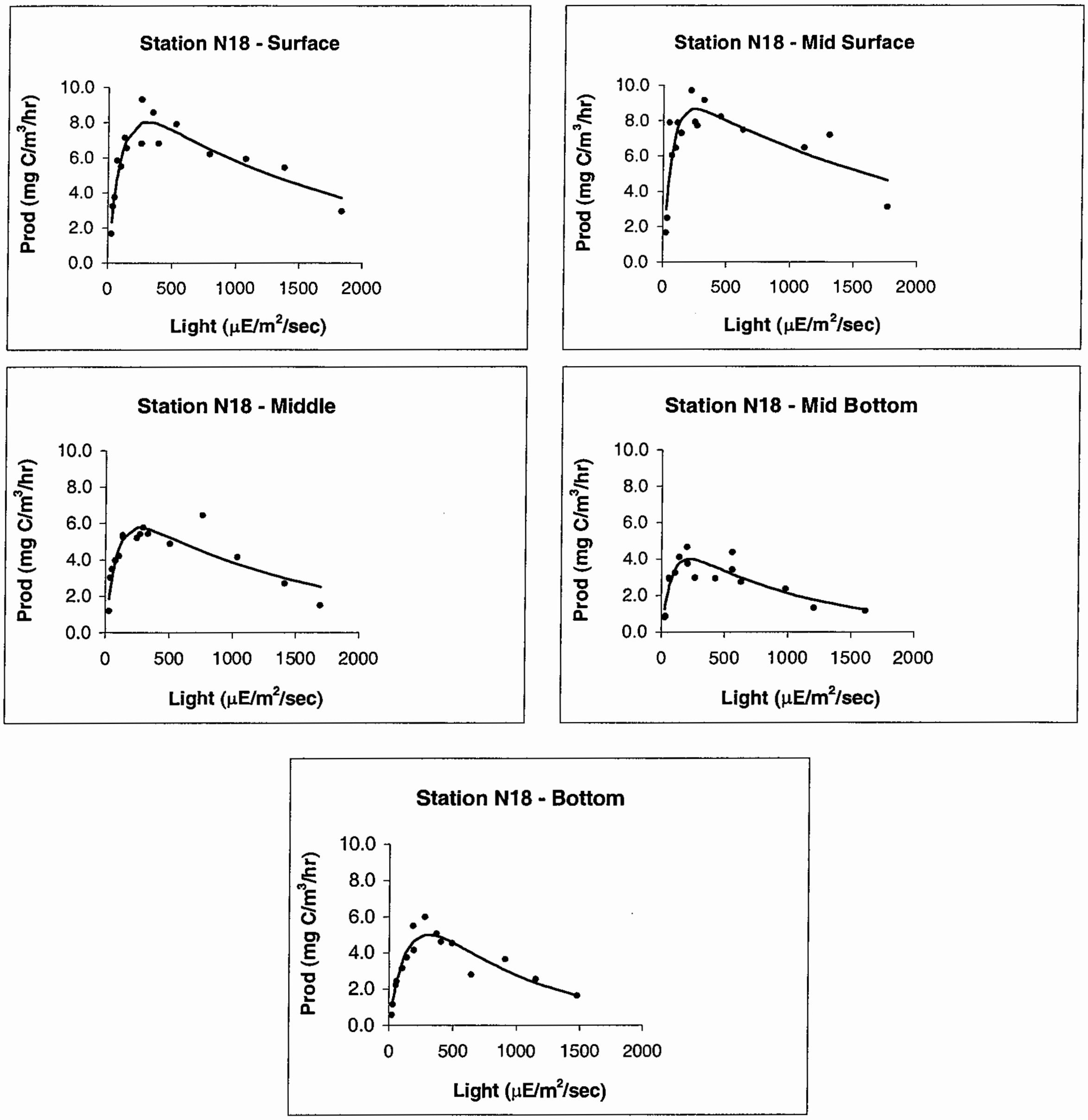
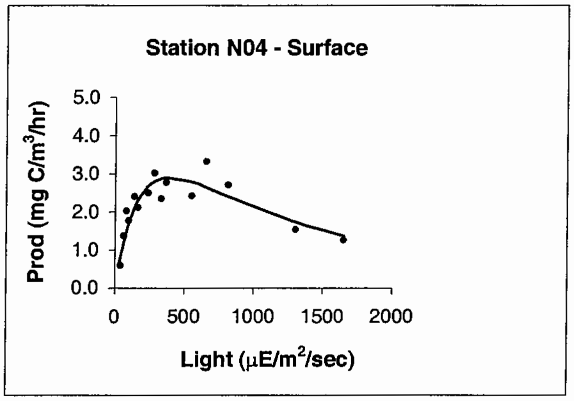
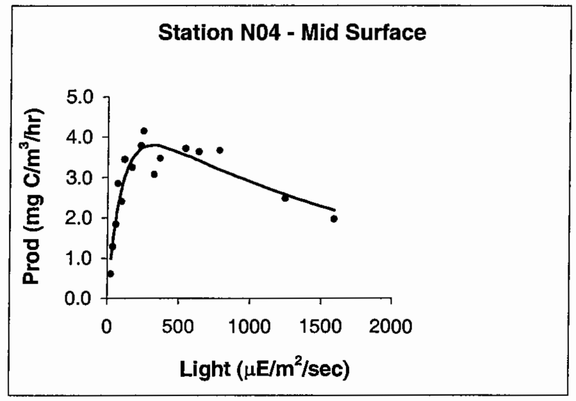
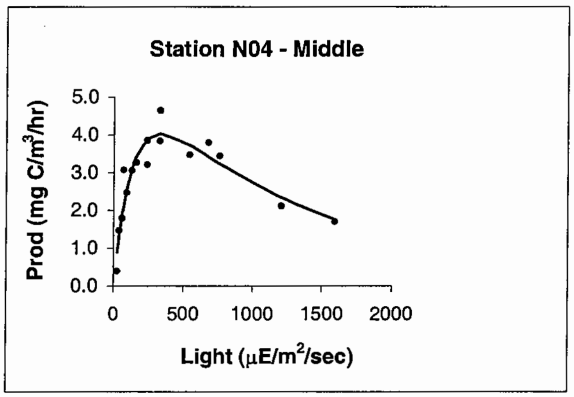


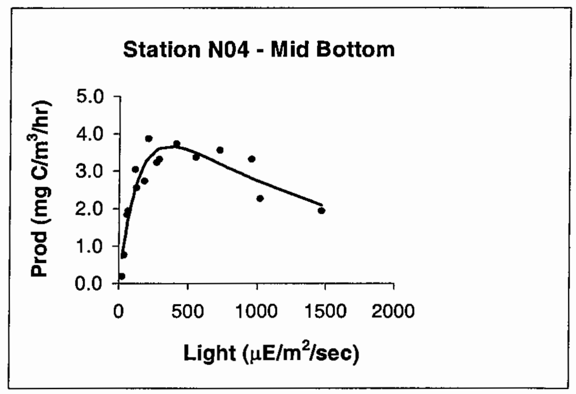
Figure E-16. Photosynthesis-Irradiance (P-I) Curves for Station N18 from Nearfield Survey WN99G (Nov 99)

WN99H **Station NO4**









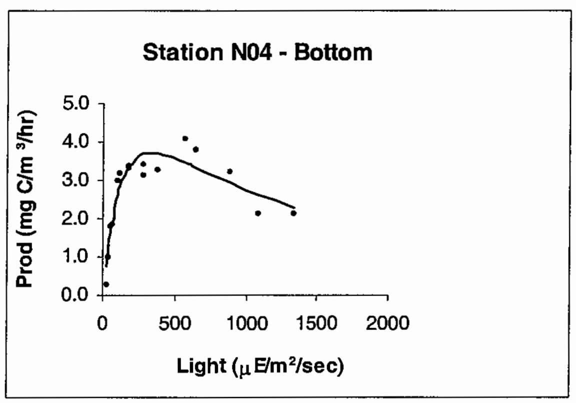


Figure E-17. Photosynthesis-Irradiance (P-I) Curves for Station N04 from Nearfield Survey WN99H (Dec 99)

WN99H **Station N18**

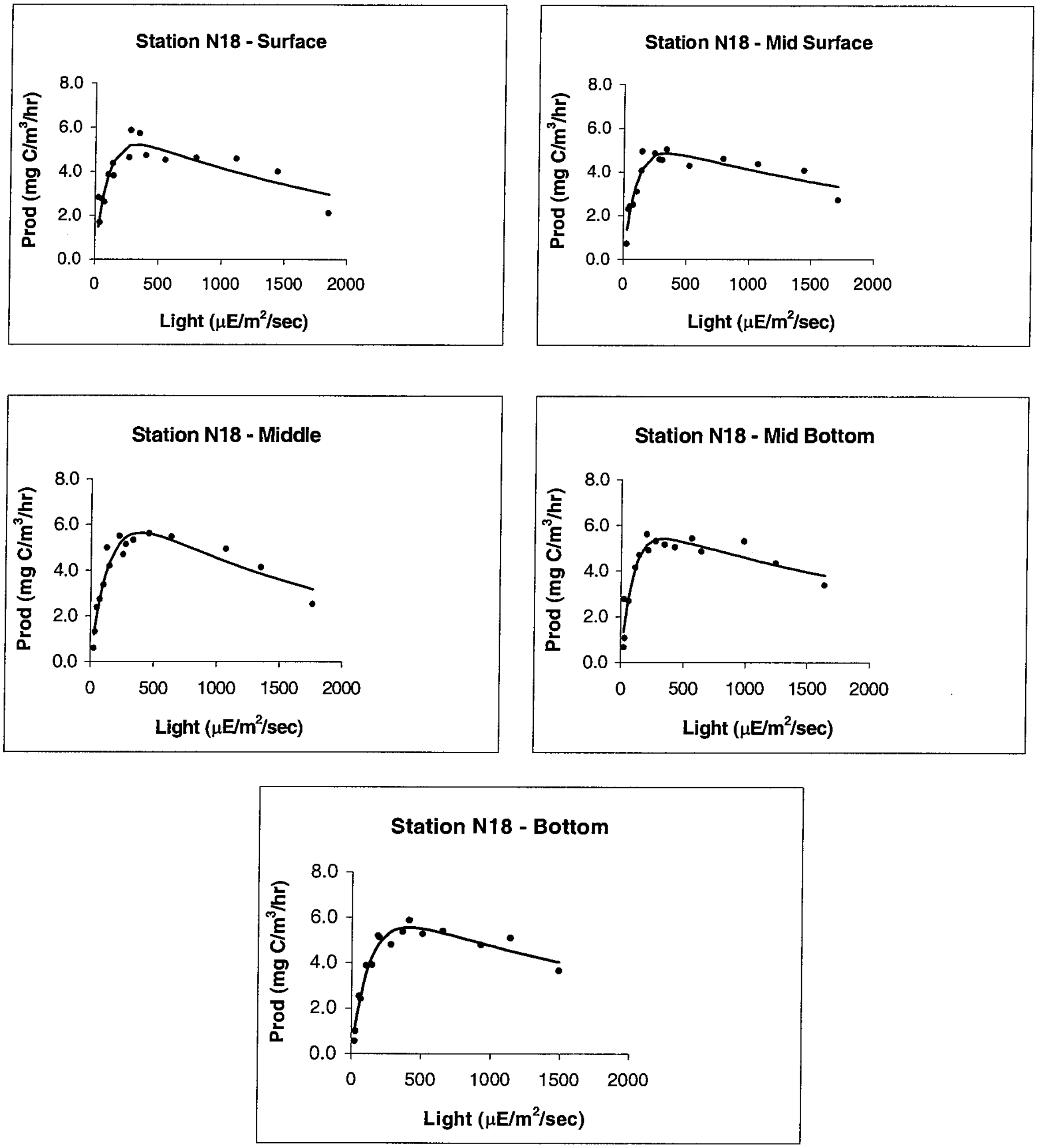


Figure E-18. Photosynthesis-Irradiance (P-I) Curves for Station N18 from Nearfield Survey WN99H (Dec 99)

APPENDIX F

ABUNDANCE OF PREVALENT PHYTOPLANKTON SPECIES IN WHOLE WATER SURFACE AND CHLOROPHYLL-A MAXIMUM SAMPLES

Life Stage and Group Definitions

Life Stage Definitions:

A = ADULT (not sexed)
B = CYST
C = COPEPODITES
F = FEMALE
G = FRAGMENT
J = Juvenile (unspecified stage)
K = Colonial species, not counted individually
L = LARVAE
M = MALE
N = NAUPLII
O = OVA
P = POST LARVAE
R = REGENERATING
S = SPORES
T = TROCHOPHORE
U = UNIDENTIFIED (lumped) not able to identify to stage or gender
V = VELIGER
X = Complex
Y = CYPRIDS
Z = ZOEA
null = no value, used as a place holder for a key field

Group Definitions:

B = BARNACLE
CD = CENTRIC DIATOM
CH = CHLOROPHYTES
CR = CHRYSOPHYTES
C = COPEPOD
CY = CRYTPOPHYTES
CN = CYANOPHYTES
DF = DINOFLAGELLATES
EU = EUGLENOPHYTES
H = HAPTOPHYTES
MF = MICROFLAGELLATES
OZ = OTHER (ZOO)
PD = PENNATE DIATOM
PR = PRASINOPHYTES

Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Whole Water Phytoplankton, Survey WN99A

			N04	N18
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	86.752	89.080
		E6CELLS/L	2.148	4.125

Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Whole Water Phytoplankton, Survey WF99B

			F01	F02	F06	F13	F23	F24	F25
CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICRONS	CD	%	5.039	7.192			9.167	10.993	5.936
		E6CELLS/L	0.035	0.062			0.140	0.153	0.090
CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRONS	CY	%	7.714	6.865			14.919	10.586	6.529
		E6CELLS/L	0.053	0.059			0.228	0.147	0.100
CYLINDROTHECA CLOSTERIUM	PD	%							
		E6CELLS/L							
GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM L	DF	%							
		E6CELLS/L							
LEPTOCYLINDRUS DANICUS	CD	%			41.478	59.588			27.897
		E6CELLS/L			0.873	1.821			0.425
LEPTOCYLINDRUS MINIMUS	CD	%			14.511				
		E6CELLS/L			0.305				
RHIZOSOLENIA FRAGILISSIMA	CD	%		7.125					
		E6CELLS/L		0.062					
THALASSIOSIRA SP. GROUP 3 10-20 MICRONS LENGTH	CD	%					9.062	7.994	
		E6CELLS/L					0.139	0.111	
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	68.448	62.763	29.143	20.300	54.285	57.135	40.955
		E6CELLS/L	0.470	0.543	0.613	0.620	0.830	0.793	0.624

**Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Whole Water Phytoplankton, Survey WF99B**

			F27	F30	F31	N04	N16	N18
CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICRONS	CD	%		5.430		6.330		8.573
		E6CELLS/L		0.093		0.159		0.150
CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRONS	CY	%		17.477	7.181	5.409		
		E6CELLS/L		0.301	0.233	0.136		
CYLINDROTHECA CLOSTERIUM	PD	%				9.437		
		E6CELLS/L				0.237		
GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM L	DF	%	5.027					
		E6CELLS/L	0.105					
LEPTOCYLINDRUS DANICUS	CD	%	52.206		39.191	16.457	36.079	47.010
		E6CELLS/L	1.089		1.274	0.413	0.417	0.824
LEPTOCYLINDRUS MINIMUS	CD	%						
		E6CELLS/L						
RHIZOSOLENIA FRAGILISSIMA	CD	%					6.893	5.135
		E6CELLS/L					0.080	0.090
THALASSIOSIRA SP. GROUP 3 10-20 MICRONS LENGTH	CD	%		5.717				
		E6CELLS/L		0.098				
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	32.868	52.089	33.654	51.903	36.577	22.148
		E6CELLS/L	0.686	0.896	1.094	1.301	0.422	0.388

**Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Whole Water Phytoplankton, Survey WN99C**

			N04	N18
CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICRONS	CD	%		6.205
		E6CELLS/L		0.066
CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRONS	CY	%	9.097	
		E6CELLS/L	0.093	
LEPTOCYLINDRUS DANICUS	CD	%		16.390
		E6CELLS/L		0.174
PSEUDONITZSCHIA SPP.	PD	%		8.647
		E6CELLS/L		0.092
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	78.211	57.655
		E6CELLS/L	0.796	0.611

Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Whole Water Phytoplankton, Survey WN99D

			N04	N18
CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICRONS	CD	%	10.330	13.809
		E6CELLS/L	0.126	0.124
CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRONS	CY	%	13.058	7.132
		E6CELLS/L	0.159	0.064
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	71.139	73.296
		E6CELLS/L	0.867	0.657

Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Whole Water Phytoplankton, Survey WF99E

			F01	F02	F06	F13	F23	F24	F25
CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICRONS	CD	%			12.464	17.283	10.793		19.347
		E6CELLS/L			0.178	0.223	0.134		0.091
CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRONS	CY	%	21.878		15.164	16.440	5.714		13.828
		E6CELLS/L	0.220		0.216	0.212	0.071		0.065
THALASSIOSIRA SP. GROUP 3 10-20 MICRONS LENGTH	CD	%			5.651				
		E6CELLS/L			0.080				
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	61.756	86.817	55.256	57.119	75.553	86.490	47.049
		E6CELLS/L	0.622	0.784	0.787	0.737	0.941	0.843	0.221

Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Whole Water Phytoplankton, Survey WF99E

			F27	F30	F31	N04	N16	N18
CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICRONS	CD	%			9.411		16.377	7.016
		E6CELLS/L			0.062		0.188	0.047
CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRONS	CY	%	17.382	22.269	23.238	13.315	5.086	10.273
		E6CELLS/L	0.274	0.249	0.153	0.163	0.058	0.069
THALASSIOSIRA SP. GROUP 3 10-20 MICRONS LENGTH	CD	%					5.510	
		E6CELLS/L					0.063	
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	72.671	65.370	54.543	76.416	65.144	74.503
		E6CELLS/L	1.145	0.730	0.359	0.935	0.748	0.501

Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Whole Water Phytoplankton, Survey WN99F

			N04	N18
CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICRONS	CD	%	19.728	19.268
		E6CELLS/L	0.235	0.274
CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRONS	CY	%	9.739	13.227
		E6CELLS/L	0.116	0.188
THALASSIOSIRA SP. GROUP 3 10-20 MICRONS LENGTH	CD	%	5.734	7.295
		E6CELLS/L	0.068	0.104
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	56.438	51.763
		E6CELLS/L	0.673	0.735

**Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Whole Water Phytoplankton, Survey WN99G**

			N04	N18
CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICRONS	CD	%	5.445	
		E6CELLS/L	0.030	
CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRONS	CY	%	14.849	8.914
		E6CELLS/L	0.082	0.060
GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM L	DF	%	6.435	
		E6CELLS/L	0.036	
LEPTOCYLINDRUS DANICUS	CD	%	9.574	6.622
		E6CELLS/L	0.053	0.045
PROROCENTRUM MICANS	DF	%	6.362	
		E6CELLS/L	0.035	
RHIZOSOLENIA SETIGERA	CD	%	5.065	
		E6CELLS/L	0.028	
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	43.063	59.184
		E6CELLS/L	0.238	0.401

Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Whole Water Phytoplankton, Survey WN99H

			N04	N18
CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICRONS	CD	%	12.271	7.725
		E6CELLS/L	0.036	0.030
CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRONS	CY	%	6.272	7.635
		E6CELLS/L	0.019	0.030
THALASSIOSIRA SP. GROUP 3 10-20 MICRONS LENGTH	CD	%	6.076	5.938
		E6CELLS/L	0.018	0.023
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	61.847	64.891
		E6CELLS/L	0.184	0.255

**Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample
Whole Water Phytoplankton, Survey WN99A**

			N04	N18
GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM L	DF	%		6.783
		E6CELLS/L		0.228
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	94.137	78.994
		E6CELLS/L	0.734	2.654

**Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample
Whole Water Phytoplankton, Survey WF99B**

			F01	F02	F06	F13	F23	F24	F25
CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICRONS	CD	%						18.624	9.107
		E6CELLS/L						0.146	0.183
CRYPTOMONAS SP. GROUP LENGTH <10 MICRONS	CY	%	5.158	18.367	5.239		10.116	15.903	12.720
		E6CELLS/L	0.050	0.223	0.057		0.140	0.125	0.256
CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRONS	CY	%						14.020	
		E6CELLS/L						0.110	
LEPTOCYLINDRUS DANICUS	CD	%			37.682	50.143			8.875
		E6CELLS/L			0.411	1.217			0.1786
RHIZOSOLENIA FRAGILISSIMA	CD	%							8.528
		E6CELLS/L							0.172
SKELETONEMA COSTATUM	CD	%							
		E6CELLS/L							
THALASSIOSIRA SP. GROUP 3 10-20 MICRONS LENGTH	CD	%					11.922	7.625	
		E6CELLS/L					0.165	0.060	
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	83.716	70.213	37.176	28.764	62.663	24.693	46.689
		E6CELLS/L	0.810	0.854	0.405	0.698	0.868	0.194	0.939

Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample
Whole Water Phytoplankton, Survey WF99B

			F27	F30	F31	N04	N16	N18
CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICRONS	CD	%			7.523			6.494
		E6CELLS/L			0.230			0.088
CERATIUM LONGIPES	DF	%						
		E6CELLS/L						
CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRONS	CY	%	8.274	19.435		13.500	7.183	7.006
		E6CELLS/L	0.209	0.353		0.225	0.105	0.095
CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRONS	CY	%						
		E6CELLS/L						
LEPTOCYLINDRUS DANICUS	CD	%	42.747		41.661		18.923	25.558
		E6CELLS/L	1.078		1.275		0.276	0.345
RHIZOSOLENIA FRAGILISSIMA	CD	%					11.807	
		E6CELLS/L					0.172	
SKELETONEMA COSTATUM	CD	%		5.853				
		E6CELLS/L		0.106				
THALASSIOSIRA SP. GROUP 3 10-20 MICRONS LENGTH	CD	%			5.445			
		E6CELLS/L			0.167			
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	36.594	47.062	26.990	79.121	43.366	40.012
		E6CELLS/L	0.923	0.855	0.826	1.317	0.633	0.540

Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample Whole Water Phytoplankton, Survey WN99C

			N04	N18
CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICRONS	CD	%		6.895
		E6CELLS/L		0.072
CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRONS	CY	%	15.265	5.481
		E6CELLS/L	0.190	0.057
GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM L	DF	%		5.363
		E6CELLS/L		0.056
PSEUDONITZSCHIA SPP.	PD	%		12.874
		E6CELLS/L		0.134
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	73.855	63.842
		E6CELLS/L	0.917	0.663

Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample
Whole Water Phytoplankton, Survey WN99D

			N04	N18
CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICRONS	CD	%	7.519	5.114
		E6CELLS/L	0.073	0.047
CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRONS	CY	%	12.181	12.043
		E6CELLS/L	0.118	0.110
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	73.840	76.383
		E6CELLS/L	0.715	0.698

**Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample
Whole Water Phytoplankton, Survey WF99E**

			F01	F02	F06	F13	F23	F24	F25
CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICRONS	CD	%			10.314	18.504	5.424	9.003	5.021
		E6CELLS/L			0.113	0.209	0.049	0.051	0.053
CERATIUM TRIPOS	DF	%		5.341					
		E6CELLS/L		0.039					
CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRONS	CY	%	23.445	5.967	7.430	10.540	20.267	21.825	20.879
		E6CELLS/L	0.192	0.043	0.081	0.119	0.183	0.124	0.219
CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRONS	CY	%							
		E6CELLS/L							
THALASSIOSIRA SP. GROUP 3 10-20 MICRONS LENGTH	CD	%			10.999	5.729			
		E6CELLS/L			0.120	0.065			
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	55.045		62.589	57.853	65.655	56.472	65.544
		E6CELLS/L	0.452		0.684	0.652	0.592	0.322	0.688
UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH >10 MICRONS	MF	%		79.002					
		E6CELLS/L		0.570					

Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample
Whole Water Phytoplankton, Survey WF99E

			F27	F30	F31	N04	N16	N18
CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICRONS	CD	%			7.651	6.487	13.500	
		E6CELLS/L			0.084	0.028	0.143	
CERATIUM TRIPOS	DF	%						
		E6CELLS/L						
CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRONS	CY	%	15.955	19.985	22.491	8.846		9.059
		E6CELLS/L	0.243	0.211	0.246	0.038		0.050
CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRONS	CY	%			8.811			
		E6CELLS/L			0.096			
THALASSIOSIRA SP. GROUP 3 10-20 MICRONS LENGTH	CD	%						
		E6CELLS/L						
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	75.190	66.785	50.314	71.946	72.002	76.142
		E6CELLS/L	1.143	0.706	0.550	0.312	0.763	0.422
UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH >10 MICRONS	MF	%						
		E6CELLS/L						

Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample Whole Water Phytoplankton, Survey WN99F

			N04	N18
CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICRONS	CD	%	20.203	23.533
		E6CELLS/L	0.257	0.407
CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRONS	CY	%	12.837	8.734
		E6CELLS/L	0.163	0.151
THALASSIOSIRA SP. GROUP 3 10-20 MICRONS LENGTH	CD	%	7.301	7.024
		E6CELLS/L	0.093	0.121
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	51.139	54.102
		E6CELLS/L	0.650	0.936

Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample Whole Water Phytoplankton, Survey WN99G

			N04	N18
CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICRONS	CD	%		6.421
		E6CELLS/L		0.037
CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRONS	CY	%	23.065	8.166
		E6CELLS/L	0.205	0.048
GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM L	DF	%		5.045
		E6CELLS/L		0.029
LEPTOCYLINDRUS DANICUS	CD	%		5.571
		E6CELLS/L		0.032
PROROCENTRUM MICANS	DF	%		6.945
		E6CELLS/L		0.040
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	49.013	48.617
		E6CELLS/L	0.435	0.283

**Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample
Whole Water Phytoplankton, Survey WN99H**

			N04	N18
CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICRONS	CD	%	6.934	7.985
		E6CELLS/L	0.034	0.073
CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRONS	CY	%	5.134	17.634
		E6CELLS/L	0.025	0.162
RHIZOSOLENIA DELICATULA	CD	%		5.124
		E6CELLS/L		0.047
UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH <10 MICRONS	MF	%	76.852	57.560
		E6CELLS/L	0.379	0.528

APPENDIX G

ABUNDANCE OF PREVALENT PHYTOPLANKTON SPECIES IN SCREENED WATER SURFACE AND CHLOROPHYLL-A MAXIMUM SAMPLES

Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Screened Phytoplankton, Survey WN99A

			N04	N18
CERATIUM FUSUS	DF	%	7.4	
		CELLS/L	168.0	
CERATIUM LONGIPES	DF	%	7.1	5.3
		CELLS/L	162.0	67.4
CERATIUM SPP.	DF	%	8.6	7.1
		CELLS/L	196.5	89.4
CERATIUM TRIPOS	DF	%	74.5	83.5
		CELLS/L	1693.5	1056.0

**Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Screened Phytoplankton, Survey WF99B**

			F01	F02	F06	F13	F23	F24	F25
CERATIUM FUSUS	DF	%					14.2	5.3	
		CELLS/L					73.5	40.8	
CERATIUM SPP.	DF	%	5.7	8.0		10.6	16.8		9.6
		CELLS/L	395.5	270.9		463.6	87.0		117.3
CERATIUM TRIPOS	DF	%	81.5	82.7	59.8	55.1	40.3	41.8	70.7
		CELLS/L	5614.0	2816.1	1521.0	2403.4	208.5	319.6	863.6
DINOPHYSIS NORVEGICA	DF	%							
		CELLS/L							
PROROCENTRUM MICANS	DF	%				5.9	11.0	5.3	
		CELLS/L				256.2	57.0	40.8	
PROROCENTRUM MINIMUM	DF	%					6.4		
		CELLS/L					33.0		
SCRIPPSIELLA TROCHOIDEA	DF	%			23.0	10.7		36.4	
		CELLS/L			585.0	465.1		278.8	

Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Screened Phytoplankton, Survey WF99B

			F27	F30	F31	N04	N16	N18
CERATIUM FUSUS	DF	%		9.5	5.3			
		CELLS/L		24.8	154.0			
CERATIUM SPP.	DF	%			16.9	6.6		6.3
		CELLS/L			490.0	417.6		176.4
CERATIUM TRIPOS	DF	%	87.4	36.1	52.5	83.1	89.1	48.2
		CELLS/L	11338.8	94.5	1526.0	5284.8	3492.0	1348.2
DINOPHYSIS NORVEGICA	DF	%		5.3				
		CELLS/L		14.0				
PROROCENTRUM MICANS	DF	%		22.5	5.8			5.0
		CELLS/L		58.9	169.8			140.2
PROROCENTRUM MINIMUM	DF	%						
		CELLS/L						
SCRIPPSIELLA TROCHOIDEA	DF	%		15.4	9.9			29.7
		CELLS/L		40.3	287.0			831.6

**Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Screened Phytoplankton, Survey WN99C**

			N04	N18
CERATIUM FUSUS	DF	%		9.0
		CELLS/L		55.1
CERATIUM LONGIPES	DF	%	6.9	
		CELLS/L	164.7	
CERATIUM SPP.	DF	%	7.9	14.0
		CELLS/L	188.7	85.5
CERATIUM TRIPOS	DF	%	82.8	69.5
		CELLS/L	1983.2	423.4

**Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Screened Phytoplankton, Survey WN99D**

			N04	N18
CERATIUM LONGIPES	DF	%	8.0	7.8
		CELLS/L	580.5	513.0
CERATIUM SPP.	DF	%	6.5	
		CELLS/L	471.0	
CERATIUM TRIPOS	DF	%	83.1	84.7
		CELLS/L	6024.0	5592.0

Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Screened Phytoplankton, Survey WF99E

			F01	F02	F06	F13	F23	F24	F25
ATHECATE DINOFLAGELLATE	DF	%					6.9		
		CELLS/L					33.0		
CERATIUM FUSUS	DF	%	6.2				8.1		
		CELLS/L	1495.0				39.0		
CERATIUM LONGIPES	DF	%					7.8		
		CELLS/L					37.5		
CERATIUM TRIPOS	DF	%	84.0	94.7			55.0		
		CELLS/L	20220.0	21360.0			264.0		
DICTYOCHA FIBULA	CR	%			16.2	14.4			5.2
		CELLS/L			3045.0	429.3			78.8
DISTEPHANUS SPECULUM	CR	%				11.3			
		CELLS/L				334.8			
PROROCENTRUM MICANS	DF	%			76.2	72.2	20.0	93.5	89.0
		CELLS/L			14340.0	2149.2	96.0	743.9	1345.0

Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Screened Phytoplankton, Survey WF99E

			F27	F30	F31	N04	N16	N18
ATHECATE DINOFLAGELLATE	DF	%						
		CELLS/L						
CERATIUM FUSUS	DF	%					6.4	
		CELLS/L					375.3	
CERATIUM LONGIPES	DF	%				5.4		
		CELLS/L				633.6		
CERATIUM TRIPOS	DF	%	13.6		6.9	25.1	21.5	13.7
		CELLS/L	2511.6		71.0	2963.2	1263.6	1574.2
DICTYOCHA FIBULA	CR	%					11.1	
		CELLS/L					650.7	
DISTEPHANUS SPECULUM	CR	%						
		CELLS/L						
PROROCENTRUM MICANS	DF	%	78.7	95.8	89.8	64.5	57.3	79.9
		CELLS/L	14480.7	1857.6	923.6	7609.6	3369.6	9200.4

Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Screened Phytoplankton, Survey WN99F

			N04	N18
CERATIUM TRIPOS	DF	%	11.7	8.4
		CELLS/L	817.1	826.5
DICTYOCHA FIBULA	CR	%	26.8	34.7
		CELLS/L	1864.4	3424.9
DISTEPHANUS SPECULUM	CR	%	11.0	21.0
		CELLS/L	770.0	2074.9
PROROCENTRUM MICANS	DF	%	41.7	29.9
		CELLS/L	2902.8	2947.8

Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Screened Phytoplankton, Survey WN99G

			N04	N18
CERATIUM TRIPOS	DF	%	5.5	
		CELLS/L	1184.0	
DISTEPHANUS SPECULUM	CR	%	6.3	7.7
		CELLS/L	1360.0	1055.6
PROROCENTRUM MICANS	DF	%	81.7	85.0
		CELLS/L	17584.0	11713.1

Abundance of Prevalent Species (>5% Total Count) in Surface Sample
Screened Phytoplankton, Survey WN99H

			N04	N18
PROROCENTRUM MICANS	DF	%	91.0	95.3
		CELLS/L	6174.0	5669.3

Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample Screened Phytoplankton, Survey WN99A

			N04	N18
CERATIUM LONGIPES	DF	%	27.1	
		CELLS/L	446.3	
CERATIUM SPP.	DF	%		7.3
		CELLS/L		210.4
CERATIUM TRIPOS	DF	%	64.4	82.1
		CELLS/L	1061.1	2356.8

**Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample
Screened Phytoplankton, Survey WF99B**

			F01	F02	F06	F13	F23	F24	F25
CERATIUM FUSUS	DF	%				5.6	6.6		
		CELLS/L				604.8	29.0		
CERATIUM SPP.	DF	%	7.1		6.6		5.3	5.6	11.0
		CELLS/L	780.5		371.7		23.2	95.7	93.0
CERATIUM TRIPOS	DF	%	86.2	85.1	63.0	77.4	67.7	61.6	60.0
		CELLS/L	9464.0	24780.0	3553.2	8294.4	297.3	1055.6	508.4
GONYAULAX SPP.	DF	%							
		CELLS/L							
PROROCENTRUM MICANS	DF	%							10.1
		CELLS/L							85.3
PROTOPERIDINIUM SP. GROUP 2 31-75W 41-80L	DF	%			14.3				
		CELLS/L			806.4				
SCRIPPSIELLA TROCHOIDEA	DF	%			6.9	7.8	7.9	22.1	
		CELLS/L			390.6	835.2	34.8	378.4	

Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample
Screened Phytoplankton, Survey WF99B

			F27	F30	F31	N04	N16	N18
CERATIUM FUSUS	DF	%			5.0			
		CELLS/L			223.2			
CERATIUM SPP.	DF	%			15.0	7.4	8.6	
		CELLS/L			669.6	219.3	723.9	
CERATIUM TRIPOS	DF	%	84.3	31.6	57.5	76.3	77.4	71.9
		CELLS/L	7798.8	157.5	2566.8	2271.2	6492.3	745.7
GONYAULAX SPP.	DF	%		8.4				
		CELLS/L		42.0				
PROROCENTRUM MICANS	DF	%		8.4	5.7			
		CELLS/L		42.0	252.7			
PROTOPERIDINIUM SP. GROUP 2 31-75W 41-80L	DF	%	6.7	5.3				
		CELLS/L	616.4	26.3				
SCRIPPSIELLA TROCHOIDEA	DF	%		28.4	7.2	7.3		5.4
		CELLS/L		141.8	322.4	217.6		56.4

Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample Screened Phytoplankton, Survey WN99C

			N04	N18
CERATIUM FUSUS	DF	%		6.4
		CELLS/L		716.0
CERATIUM LONGIPES	DF	%	7.1	
		CELLS/L	318.4	
CERATIUM SPP.	DF	%		9.5
		CELLS/L		1056.0
CERATIUM TRIPOS	DF	%	85.4	81.2
		CELLS/L	3806.6	9024.0

**Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample
Screened Phytoplankton, Survey WN99D**

			N04	N18
CERATIUM LONGIPES	DF	%	7.0	6.8
		CELLS/L	1064.0	1315.8
CERATIUM TRIPOS	DF	%	79.4	83.1
		CELLS/L	12040.0	15996.0
PROTOPERIDINIUM SP. GROUP 3 76-150W 81-150L	DF	%	7.4	
		CELLS/L	1120.0	

**Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample
Screened Phytoplankton, Survey WF99E**

			F01	F02	F06	F13	F23	F24	F25
CERATIUM FUSUS	DF	%	7.6				6.2		5.1
		CELLS/L	1560.0				23.2		86.8
CERATIUM LONGIPES	DF	%							
		CELLS/L							
CERATIUM TRIPOS	DF	%	83.9	89.7	6.4		64.6	6.4	8.5
		CELLS/L	17324.0	20196.0	798.0		240.7	56.1	145.6
DICTYOCHA FIBULA	CR	%			24.1	20.8		17.6	7.8
		CELLS/L			3024.0	466.9		153.4	133.0
DISTEPHANUS SPECULUM	CR	%				13.5			
		CELLS/L				303.8			
PROROCENTRUM MICANS	DF	%			64.6	62.7	23.0	74.5	77.4
		CELLS/L			8106.0	1410.0	85.5	649.0	1321.6

Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample
Screened Phytoplankton, Survey WF99E

			F27	F30	F31	N04	N16	N18
CERATIUM FUSUS	DF	%					6.6	
		CELLS/L					488.7	
CERATIUM LONGIPES	DF	%				5.4		7.0
		CELLS/L				367.2		1115.2
CERATIUM TRIPOS	DF	%	16.9	5.0		19.9	23.9	35.7
		CELLS/L	2612.2	79.7		1358.1	1771.2	5684.8
DICTYOCHA FIBULA	CR	%					10.9	
		CELLS/L					807.3	
DISTEPHANUS SPECULUM	CR	%						
		CELLS/L						
PROROCENTRUM MICANS	DF	%	75.0	90.3	92.8	67.2	55.0	48.8
		CELLS/L	11573.6	1436.4	1112.8	4579.2	4082.4	7755.4

**Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample
Screened Phytoplankton, Survey WN99F**

			N04	N18
CERATIUM FUSUS	DF	%	5.0	
		CELLS/L	360.0	
CERATIUM TRIPOS	DF	%	10.1	9.8
		CELLS/L	721.6	1089.6
DICTYOCHA FIBULA	CR	%	38.0	34.0
		CELLS/L	2729.6	3792.0
DISTEPHANUS SPECULUM	CR	%	11.2	15.1
		CELLS/L	804.8	1691.2
PROROCENTRUM MICANS	DF	%	35.4	38.0
		CELLS/L	2540.8	4246.4

Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample Screened Phytoplankton, Survey WN99G

			N04	N18
DICTYOCHA FIBULA	CR	%	5.4	
		CELLS/L	486.0	
DISTEPHANUS SPECULUM	CR	%	10.2	6.9
		CELLS/L	923.4	1640.0
PROROCENTRUM MICANS	DF	%	78.8	88.6
		CELLS/L	7106.4	21012.0

Abundance of Prevalent Species (>5% Total Count) in Chlorophyll a Maximum Sample Screened Phytoplankton, Survey WN99H

			N04	N18
PROROCENTRUM MICANS	DF	%	90.2	95.8
		CELLS/L	6636.8	4236.0

APPENDIX H

ABUNDANCE OF PREVALENT SPECIES IN ZOOPLANKTON TOW SAMPLES

Abundance of Prevalent Species (>5% Total Count)
Zooplankton, Survey WN99A

				N04	N18
COPEPOD SPP.	N	C	%	34	40
			ind/m3	64066	92746
OITHONA SIMILIS	C	C	%	15	19
			ind/m3	28253	44477
PSEUDOCALANUS NEWMANI	C	C	%	31	28
			ind/m3	58097	64129

Abundance of Prevalent Species (>5% Total Count)
Zooplankton, Survey WF99B

				F01	F02	F06	F13	F23	F24	F25
ACARTIA SPP.	C	C	%							
			ind/m3							
BIVALVIA SPP.	V	OZ	%		11	31	12		5	
			ind/m3		7877	20696	3883		3140	
CALANUS FINMARCHICUS	C	C	%							
			ind/m3							
COPEPOD SPP.	N	C	%	21	48		7	15	11	13
			ind/m3	17397	34308		2257	4765	6106	2003
MEDUSA	null	OZ	%			6	11	24	37	16
			ind/m3			3779	3431	7568	21544	2438
MICROSETELLA NORVEGICA	null	C	%	6						
			ind/m3	5285						
OIKOPLEURA DIOICA	null	OZ	%	8		8	13			
			ind/m3	6827		5219	4154			
OITHONA SIMILIS	C	C	%	19	11	18	21	9	13	20
			ind/m3	15415	7702	12058	6592	2896	7240	3091
OITHONA SIMILIS	F	C	%	9						
			ind/m3	7708						
POLYCHAETE SPP.	L	OZ	%					13		
			ind/m3					4204		
PSEUDOCALANUS NEWMANI	C	C	%	11	12	10		9	12	12
			ind/m3	9029	8577	6659		2990	7065	1829
	F	C	%							
			ind/m3							
TEMORA LONGICORNIS	C	C	%						6	5
			ind/m3						3402	827
	F	C	%			6	8			
			ind/m3			3779	2438			
	M	C	%				5	5		
			ind/m3				1716	1682		

Abundance of Prevalent Species (>5% Total Count)
Zooplankton, Survey WF99B

				F27	F30	F31	N04	N16	N18
ACARTIA SPP.	C	C	%		9				
			ind/m3		4597				
BIVALVIA SPP.	V	OZ	%		8	8			13
			ind/m3		4102	1558			5180
CALANUS FINMARCHICUS	C	C	%	7					
			ind/m3	5576					
COPEPOD SPP.	N	C	%	11	31	14	22	9	8
			ind/m3	8449	15275	2526	17411	4331	3373
MEDUSA	null	OZ	%			11			14
			ind/m3			1979			5662
MICROSETELLA NORVEGICA	null	C	%						
			ind/m3						
OIKOPLEURA DIOICA	null	OZ	%			38			
			ind/m3			6947			
OITHONA SIMILIS	C	C	%	63	15	19	27	28	33
			ind/m3	49510	7284	3579	21247	13089	13493
	F	C	%	13	5			8	6
			ind/m3	9970	2617			3753	2650
POLYCHAETE SPP.	L	OZ	%		19				
			ind/m3		9547				
PSEUDOCALANUS NEWMANI	C	C	%				20	23	8
			ind/m3				15640	10779	3253
	F	C	%					6	
			ind/m3					2791	
TEMORA LONGICORNIS	C	C	%						
			ind/m3						
	F	C	%						
			ind/m3						
	M	C	%						
			ind/m3						

Abundance of Prevalent Species (>5% Total Count)
Zooplankton, Survey WN99C

				N04	N18
BIVALVIA SPP.	V	OZ	%	16	19
			ind/m3	5389	12827
COPEPOD SPP.	N	C	%	8	12
			ind/m3	2626	8044
OITHONA SIMILIS	C	C	%	42	33
			ind/m3	13888	22176
OITHONA SIMILIS	F	C	%	8	7
			ind/m3	2695	4348
SALPA SPP.	null	OZ	%		10
			ind/m3		6522

Abundance of Prevalent Species (>5% Total Count)
Zooplankton, Survey WN99D

				N04	N18
BIVALVIA SPP.	V	OZ	%	10	
			ind/m3	2001	
CENTROPAGES SPP.	C	C	%		10
			ind/m3		1877
COPEPOD SPP.	N	C	%	5	
			ind/m3	1035	
MICROSETELLA NORVEGICA	null	C	%	6	
			ind/m3	1311	
OIKOPLEURA DIOICA	null	OZ	%	5	6
			ind/m3	1035	1107
OITHONA SIMILIS	C	C	%	50	52
			ind/m3	10212	10250
	F	C	%	5	10
			ind/m3	1035	1877
PARACALANUS PARVUS	C	C	%		6
			ind/m3		1107

Abundance of Prevalent Species (>5% Total Count)
Zooplankton, Survey WF99E

				F01	F02	F06	F13	F23	F24	F25
BIVALVIA SPP.	V	OZ	%	48	28	12	11	6	42	22
			ind/m3	18700	10342	3907	1910	147	1493	2925
CENTROPAGES HAMATUS	F	C	%				5			
			ind/m3				860			
	M	C	%						8	
			ind/m3						291	
CENTROPAGES SPP.	C	C	%	13	13	10	14	35	10	
			ind/m3	5063	5001	3290	2388	820	339	
CENTROPAGES TYPICUS	F	C	%						5	
			ind/m3						194	
	M	C	%				5			
			ind/m3				907			
COPEPOD SPP.	N	C	%			14	12			15
			ind/m3			4524	2101			1950
GASTROPODA SPP.	V	OZ	%					5		
			ind/m3					122		
OITHONA SIMILIS	C	C	%	17	22	42	28		7	34
			ind/m3	6451	8307	13571	4872		252	4466
	F	C	%		8	10	6			5
			ind/m3		2967	3153	1051			692
PARACALANUS PARVUS	C	C	%		11					
			ind/m3		4238					
POLYCHAETE SPP.	L	OZ	%					11		
			ind/m3					245		

Abundance of Prevalent Species (>5% Total Count)
Zooplankton, Survey WF99E

				F27	F30	F31	N04	N16	N18
BIVALVIA SPP.	V	OZ	%		12	7	8	28	
			ind/m3		1224	156	1594	7504	
CENTROPAGES HAMATUS	F	C	%						
			ind/m3						
	M	C	%						
			ind/m3						
CENTROPAGES SPP.	C	C	%	52		6	46	6	57
			ind/m3	15227		142	9124	1464	9121
CENTROPAGES TYPICUS	F	C	%						
			ind/m3						
	M	C	%						
			ind/m3						
COPEPOD SPP.	N	C	%		10			9	
			ind/m3		1003			2422	
GASTROPODA SPP.	V	OZ	%			7			
			ind/m3			156			
OITHONA SIMILIS	C	C	%	28		12	24	42	5
			ind/m3	8050		277	4872	11044	817
	F	C	%						
			ind/m3						
PARACALANUS PARVUS	C	C	%						
			ind/m3						
POLYCHAETE SPP.	L	OZ	%		64	59			
			ind/m3		6314	1408			

Abundance of Prevalent Species, (>5% Total Count)
Zooplankton, Survey WN99F

				N04	N18
BIVALVIA SPP.	V	OZ	%	25	33
			ind/m3	7540	9936
CENTROPAGES SPP.	C	C	%	5	
			ind/m3	1580	
COPEPOD SPP.	N	C	%	8	11
			ind/m3	2513	3332
OITHONA SIMILIS	C	C	%	42	35
			ind/m3	12459	10521

Abundance of Prevalent Species (>5% Total Count)
Zooplankton, Survey WN99G

				N04	N18
CENTROPAGES SPP.	C	C	%	8	5
			ind/m3	2388	2269
COPEPOD SPP.	N	C	%	25	36
			ind/m3	7690	15291
OITHONA SIMILIS	C	C	%	42	35
			ind/m3	12991	14946
	F	C	%	14	11
			ind/m3	4251	4834

Abundance of Prevalent Species (>5% Total Count)
Zooplankton, Survey WN99H

				N04	N18
CENTROPAGES SPP.	C	C	%	10	18
			ind/m3	2659	4164
COPEPOD SPP.	N	C	%	26	19
			ind/m3	7025	4421
MICROSETELLA NORVEGICA	null	C	%		12
			ind/m3		2930
OITHONA SIMILIS	C	C	%	47	34
			ind/m3	12899	7916
	F	C	%	8	6
			ind/m3	2104	1388

APPENDIX I

Satellite Images of Chlorophyll a Concentrations and Temperature

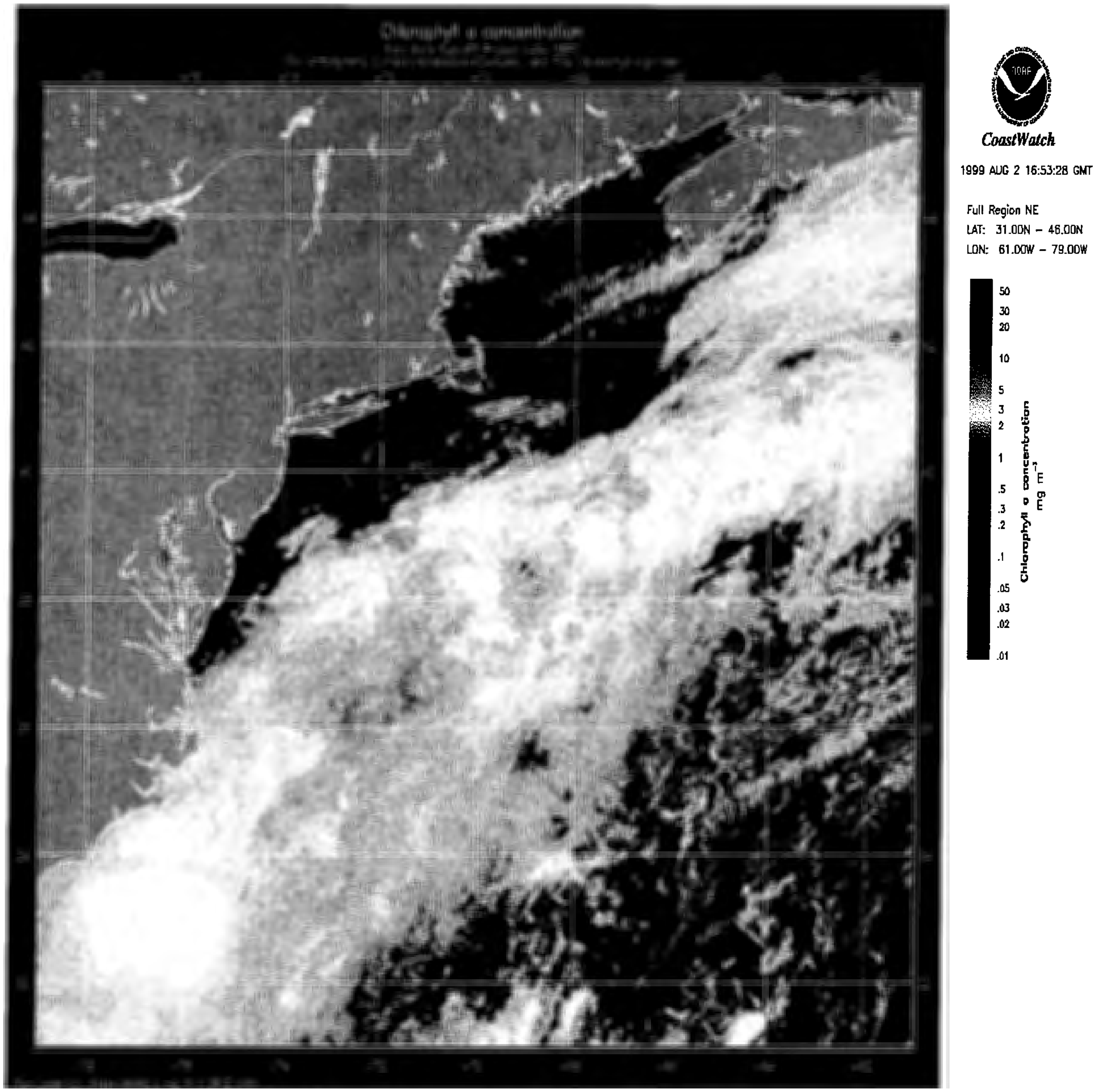


Figure I-1. Chlorophyll a Concentrations from August 2, 1999

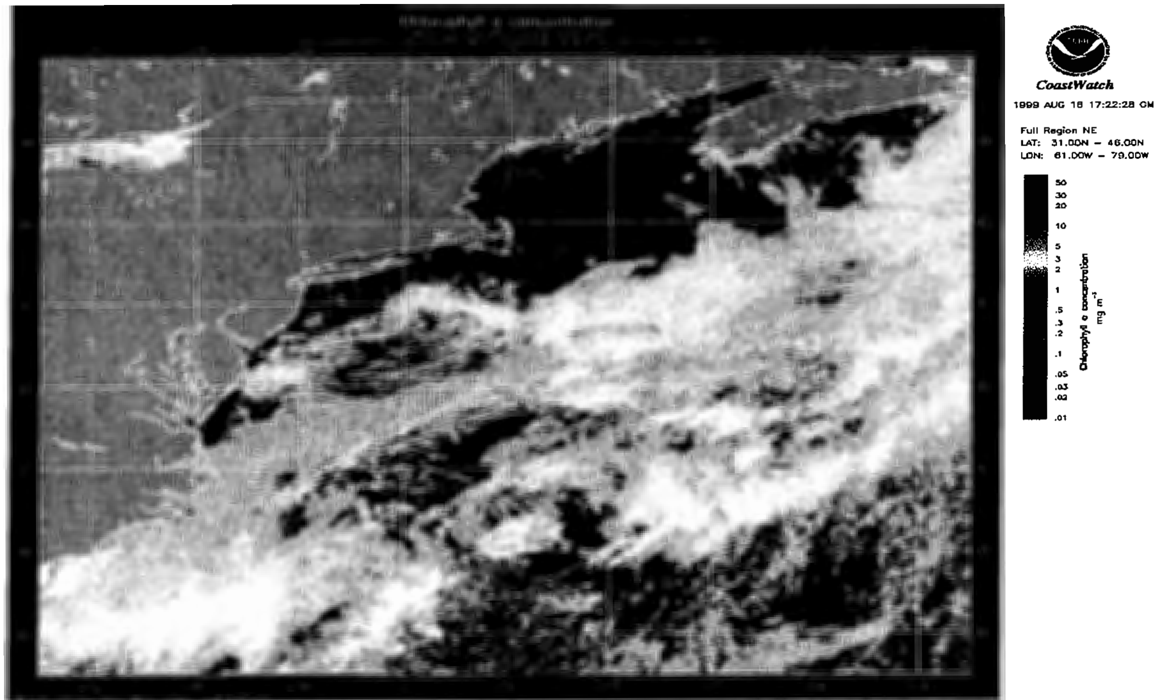


Figure I-2. Chlorophyll a Concentrations from August 16, 1999.

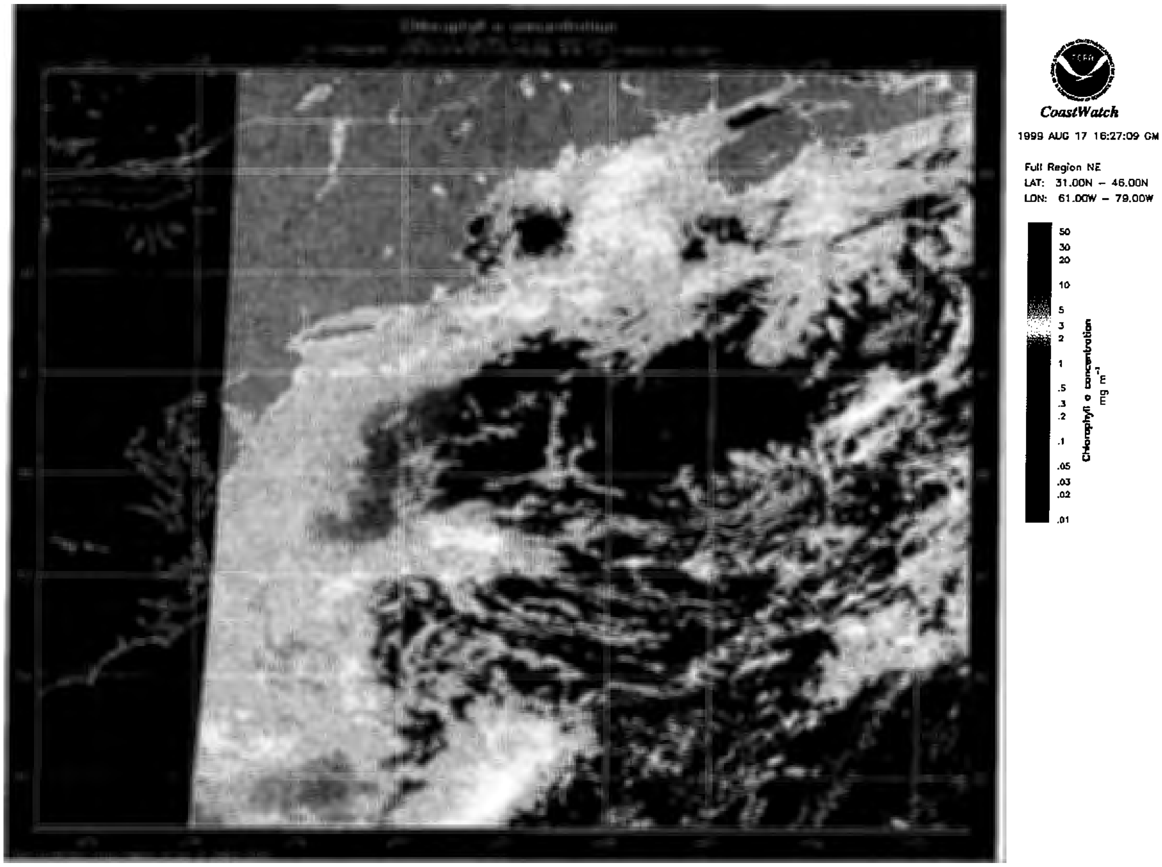


Figure I-3. Chlorophyll a Concentrations from August 17, 1999.

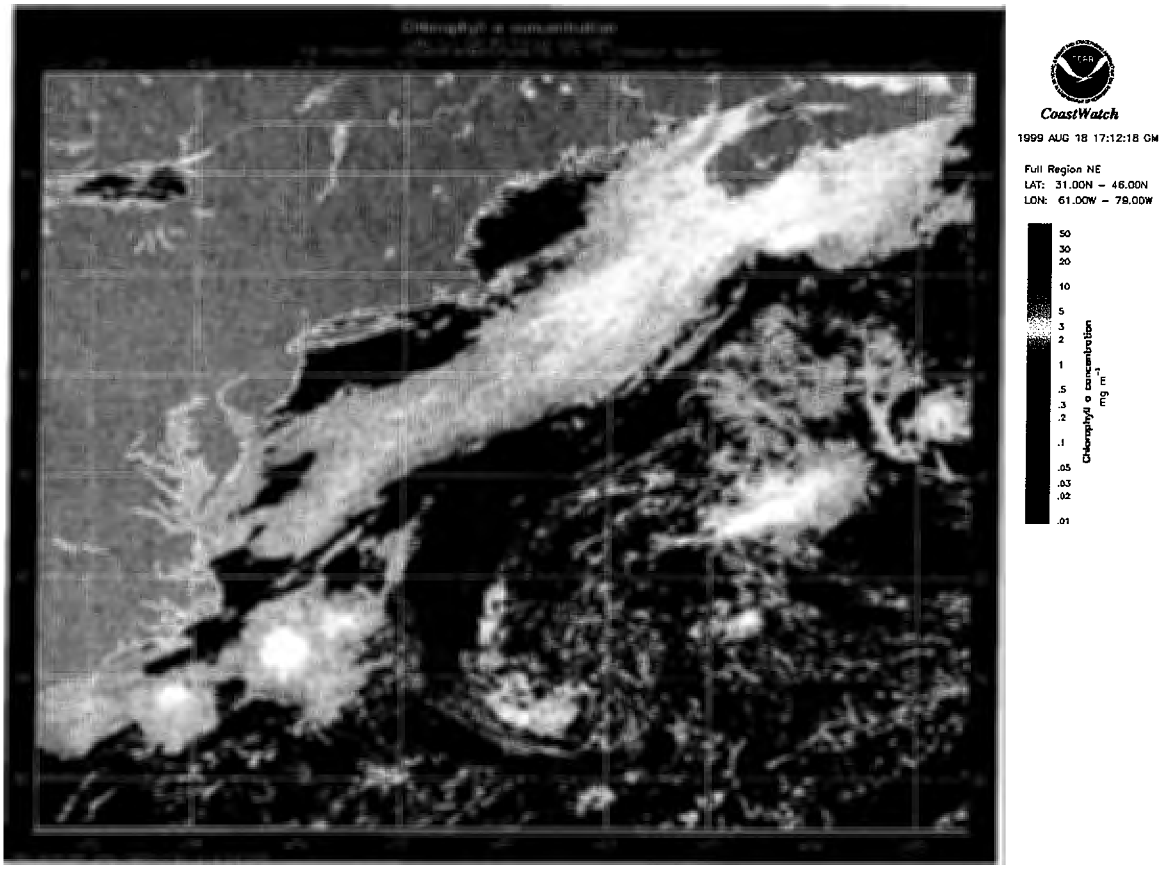


Figure I-4. Chlorophyll a Concentrations from August 18, 1999.

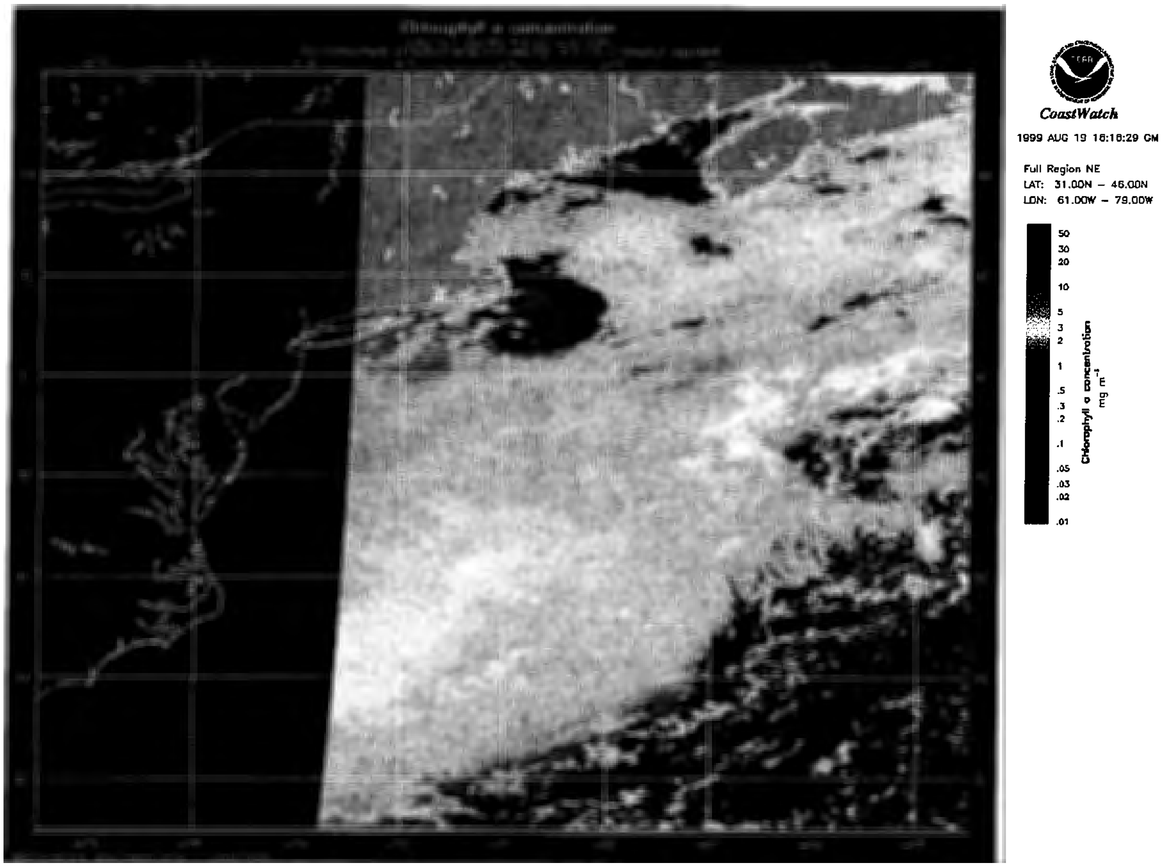


Figure I-5. Chlorophyll a Concentrations from August 19, 1999.

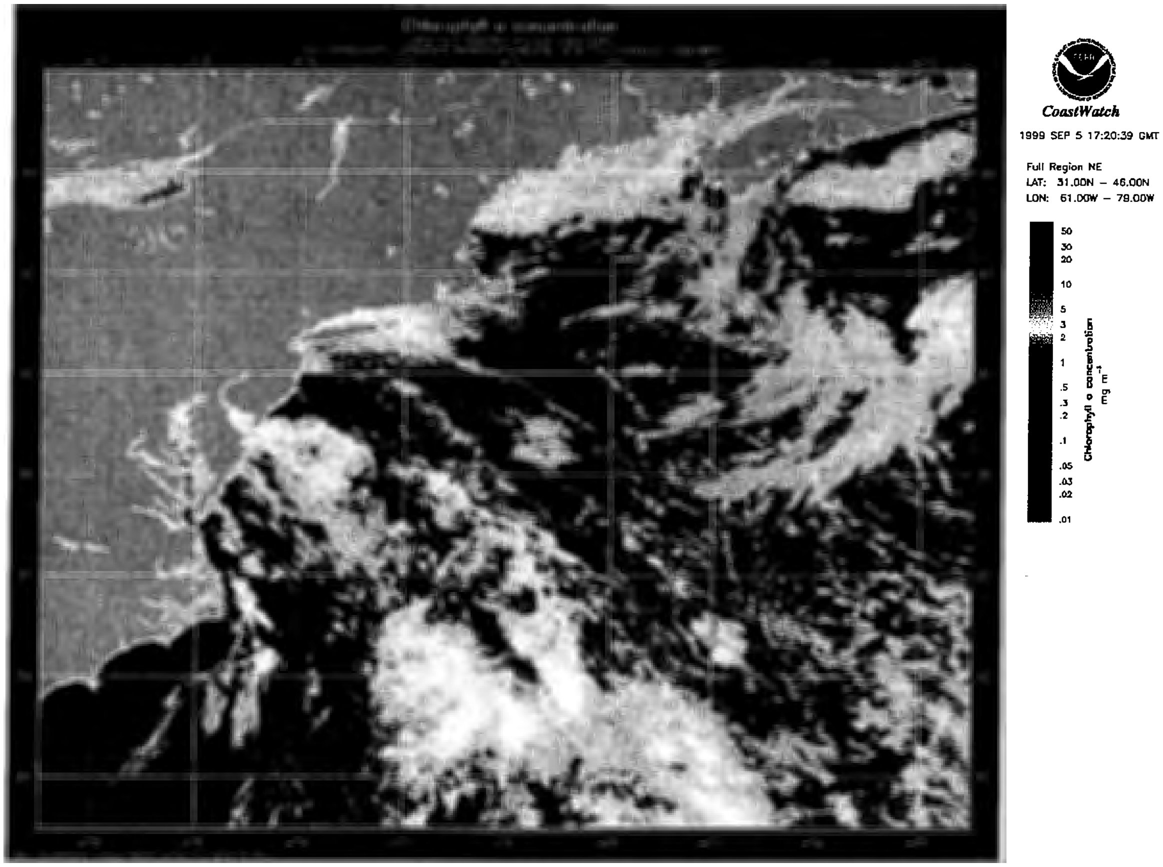


Figure I-6. Chlorophyll a Concentrations from September 5, 1999.

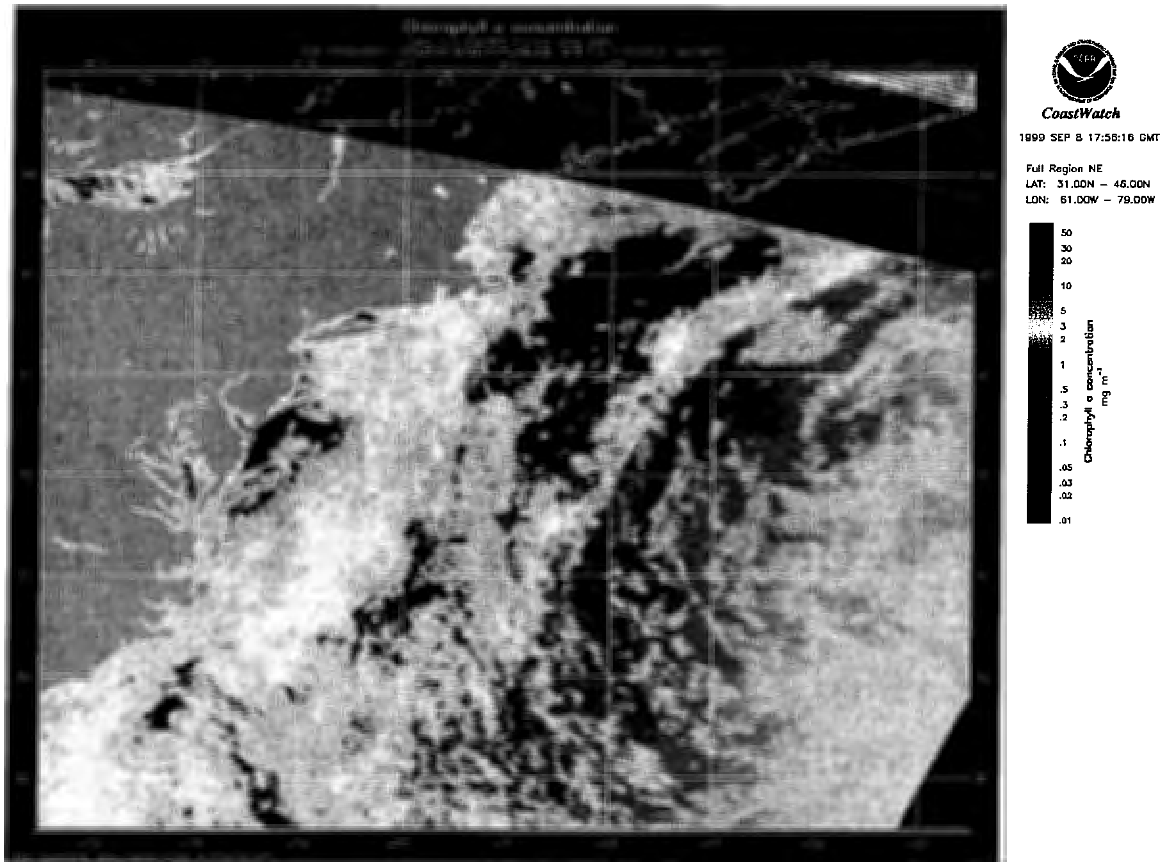


Figure I-7. Chlorophyll a Concentrations from September 8, 1999.

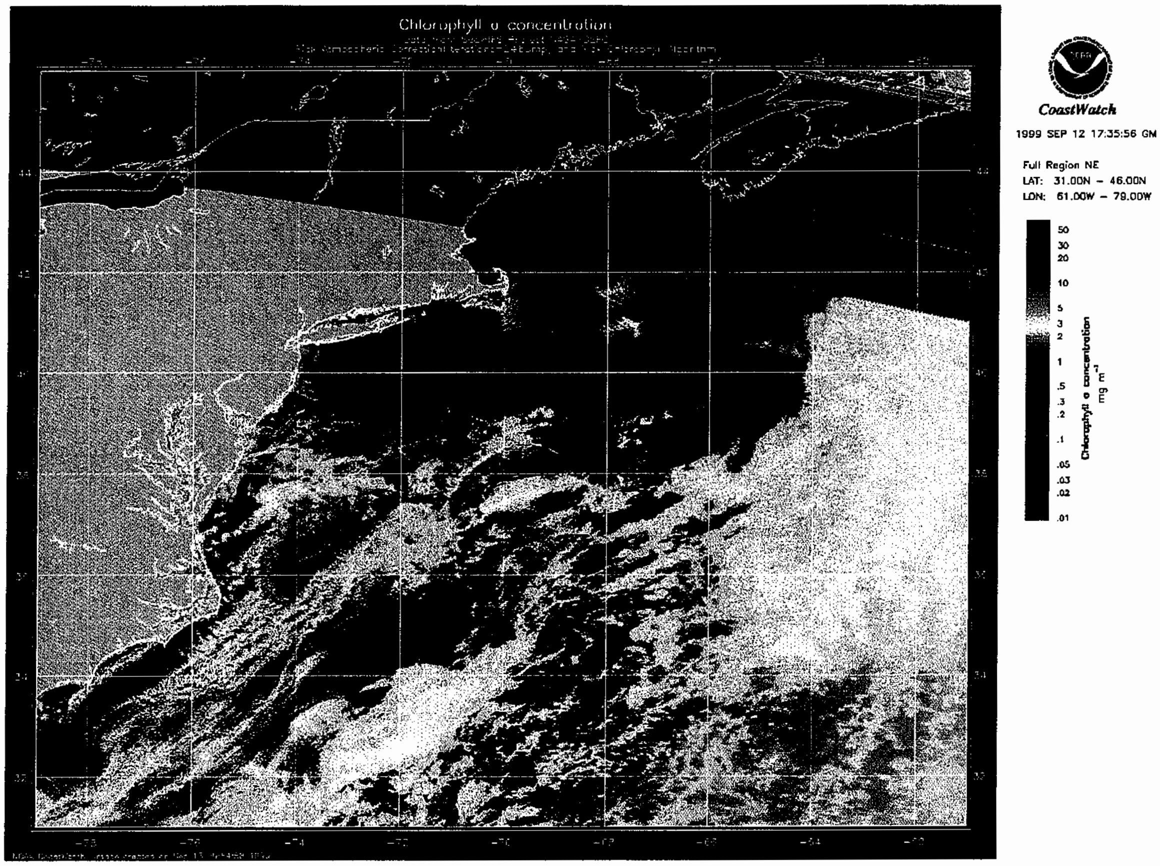


Figure I-8. Chlorophyll a Concentrations from September 12, 1999.

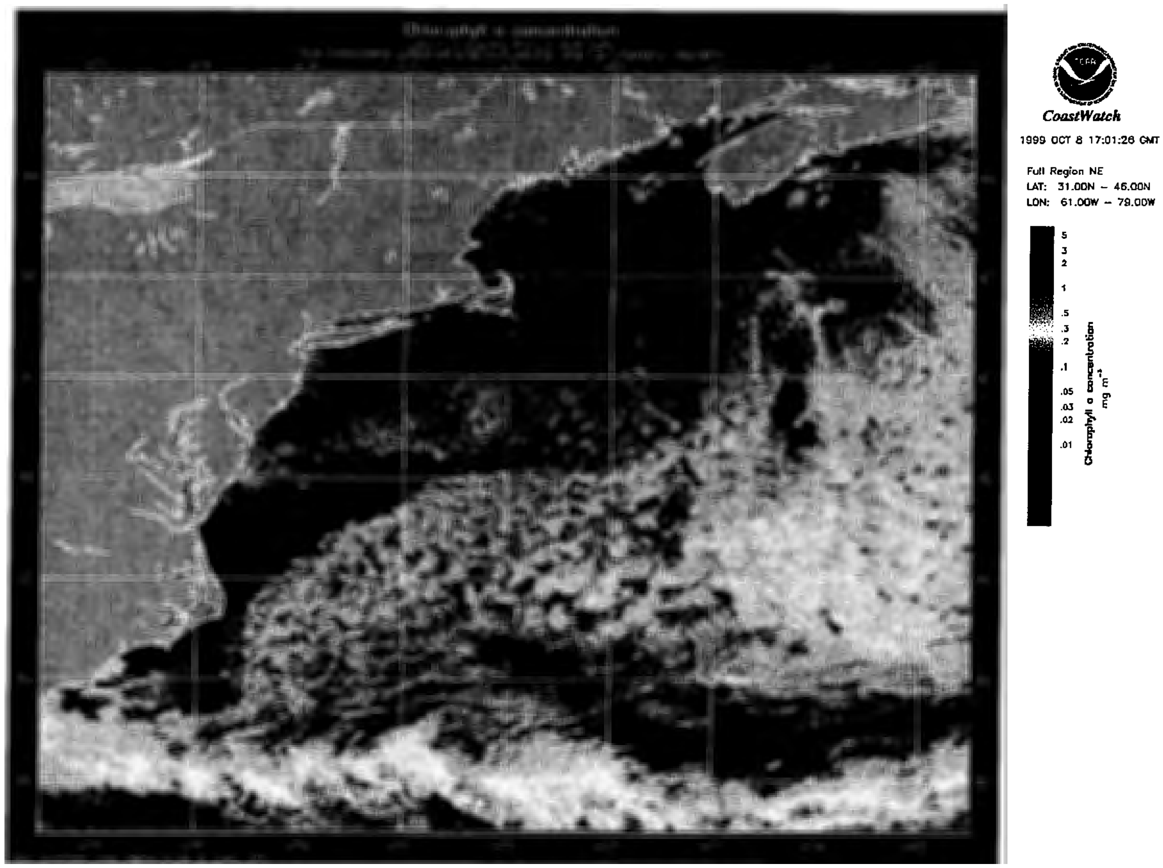


Figure I-9. Chlorophyll a Concentrations from October 8, 1999.

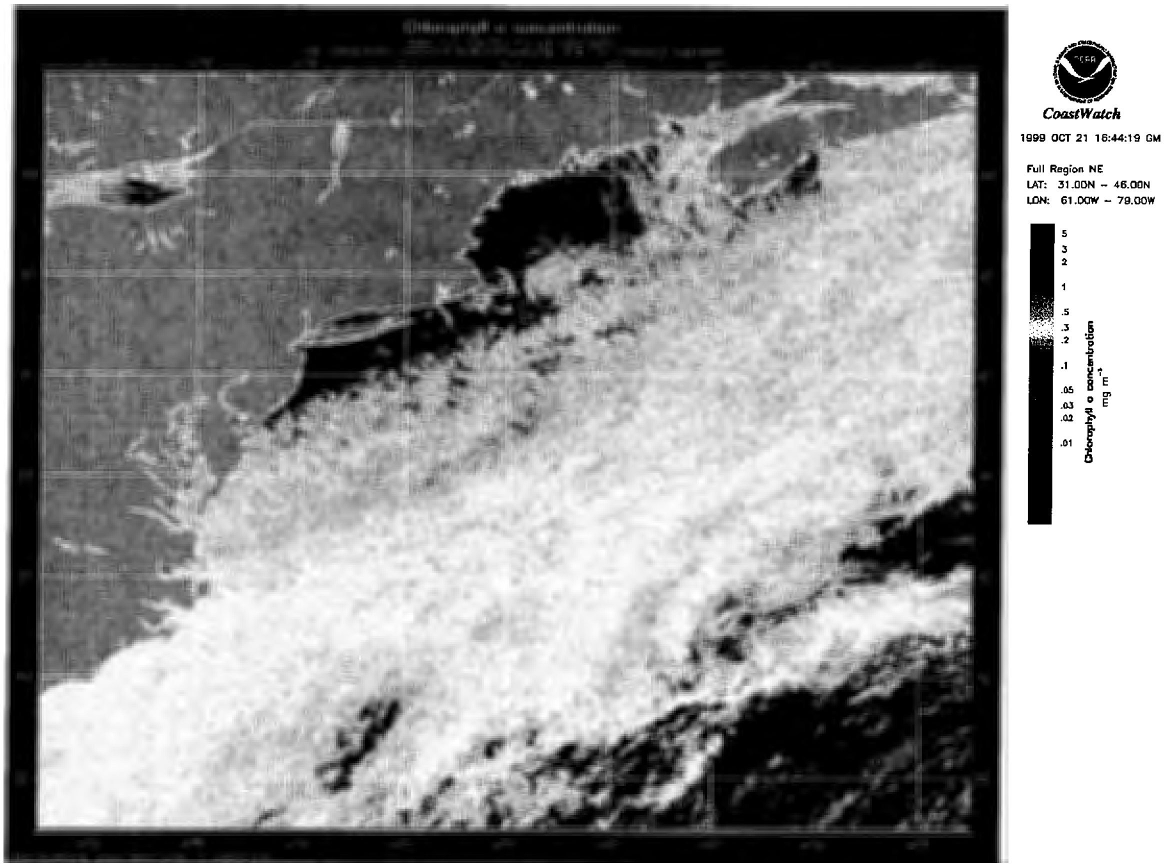


Figure I-10. Chlorophyll a Concentrations from October 21, 1999.

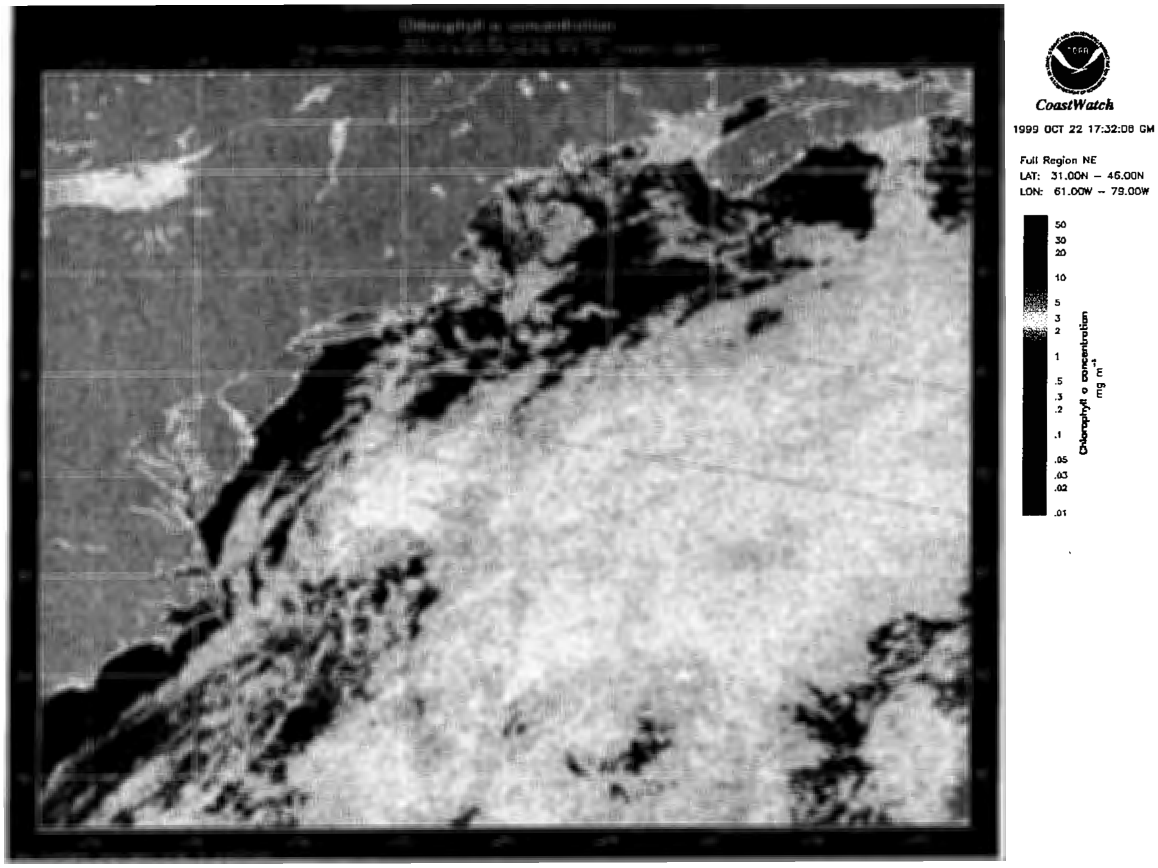


Figure I-11. Chlorophyll a Concentrations from October 22, 1999.

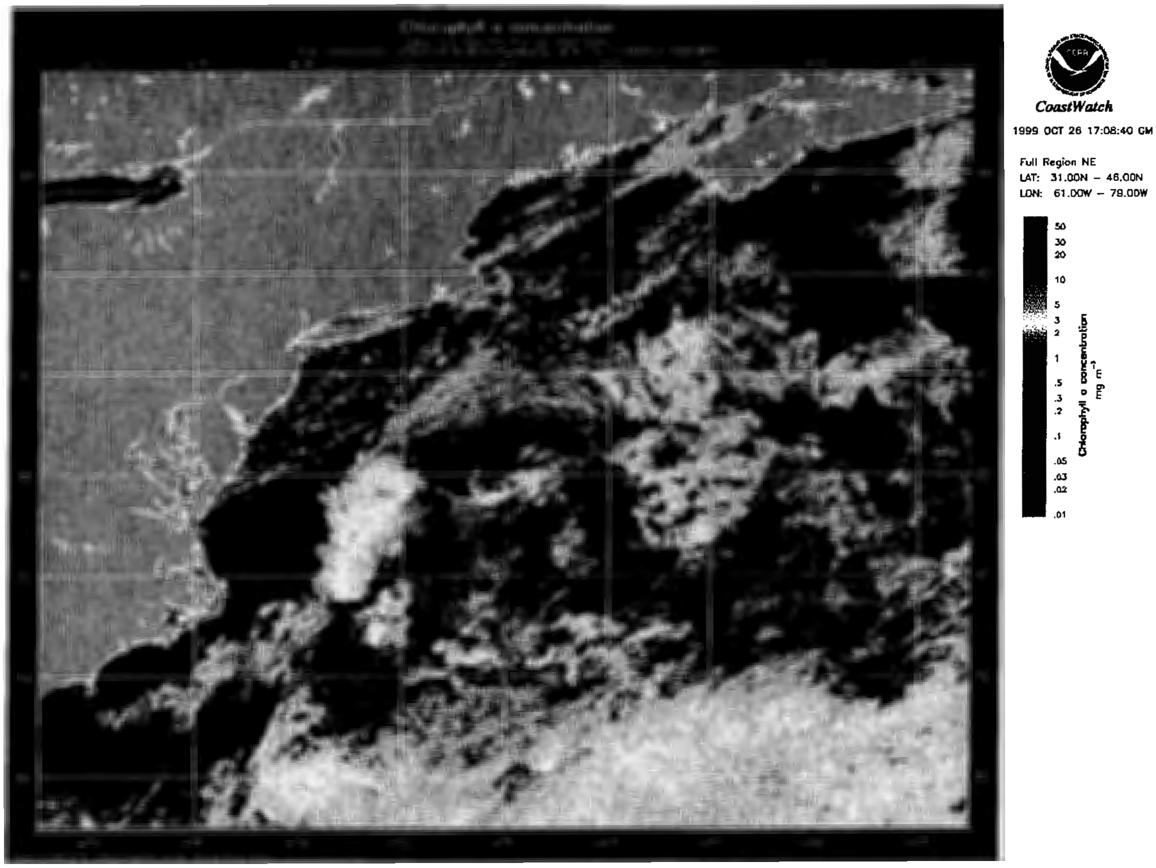


Figure I-12. Chlorophyll a Concentrations from October 26, 1999.

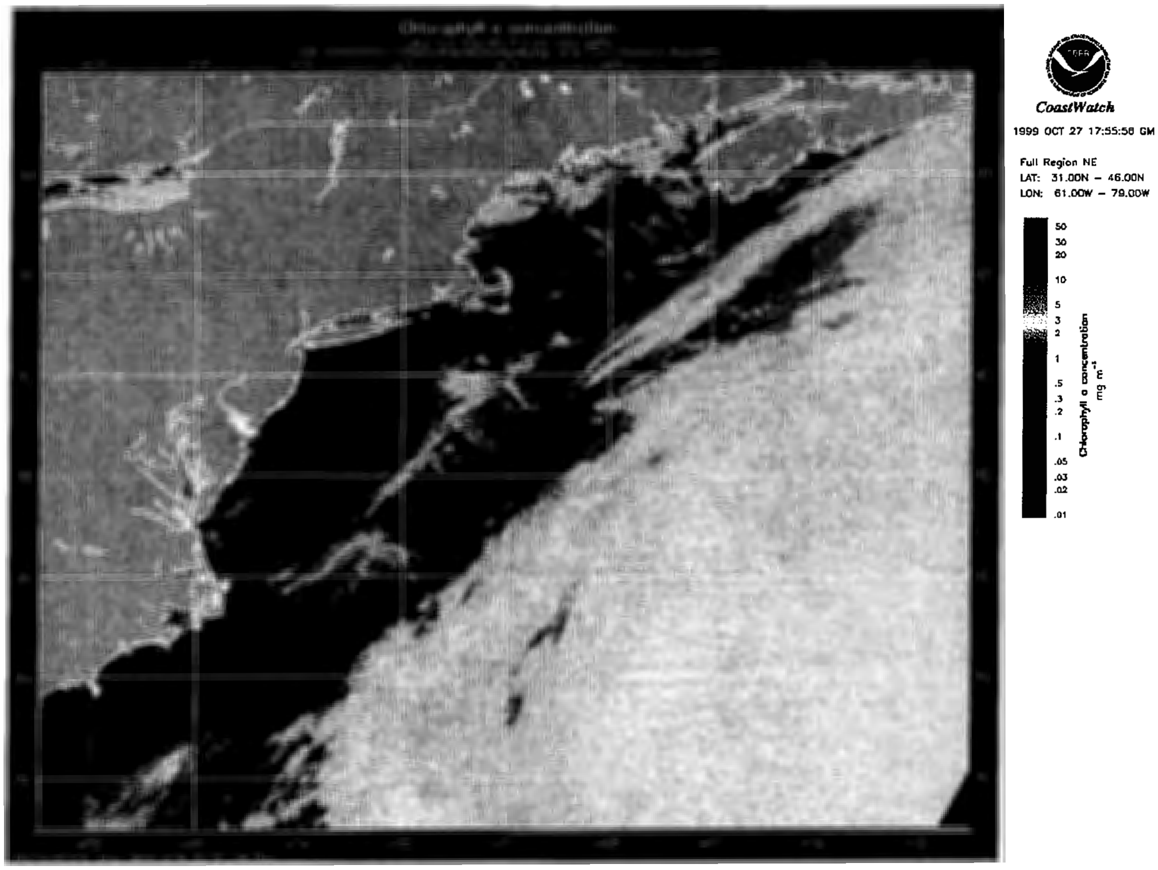


Figure I-13. Chlorophyll a Concentrations from October 27, 1999.

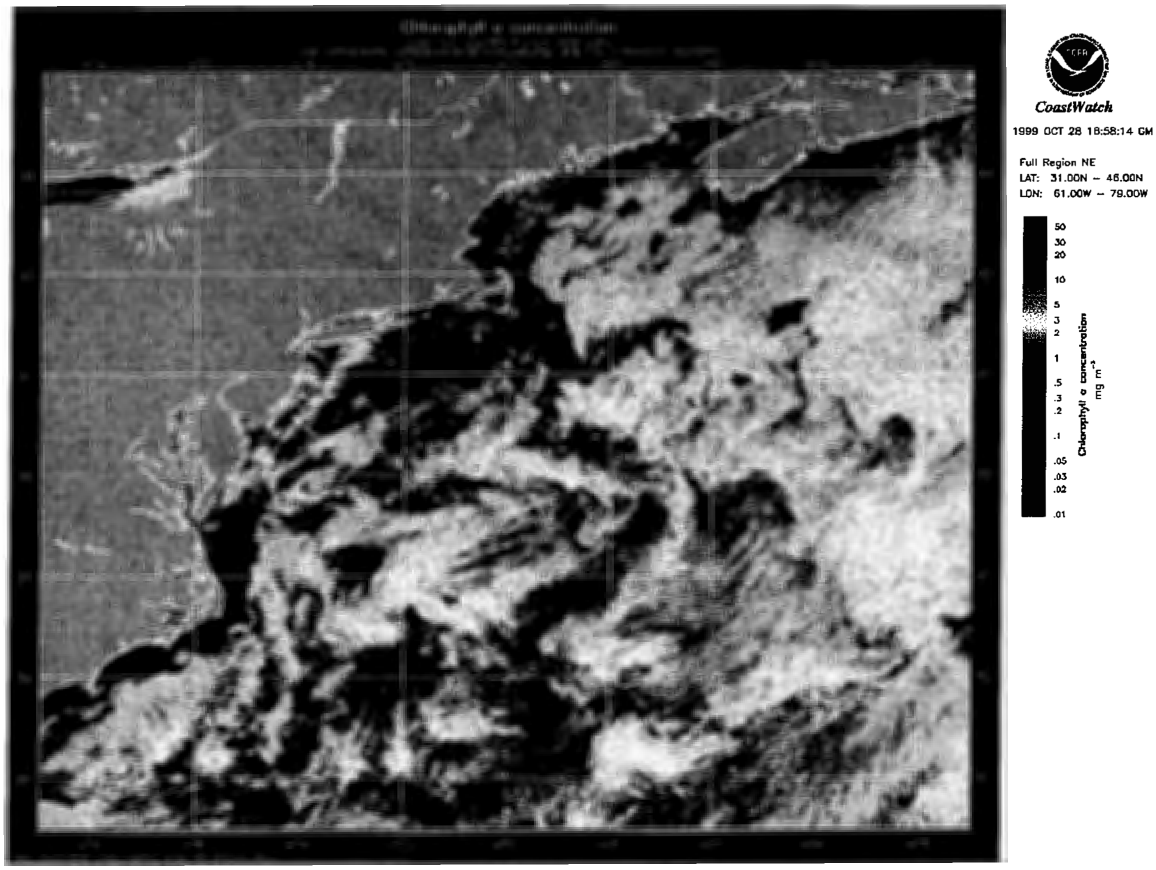


Figure I-14. Chlorophyll a Concentrations from October 28, 1999.

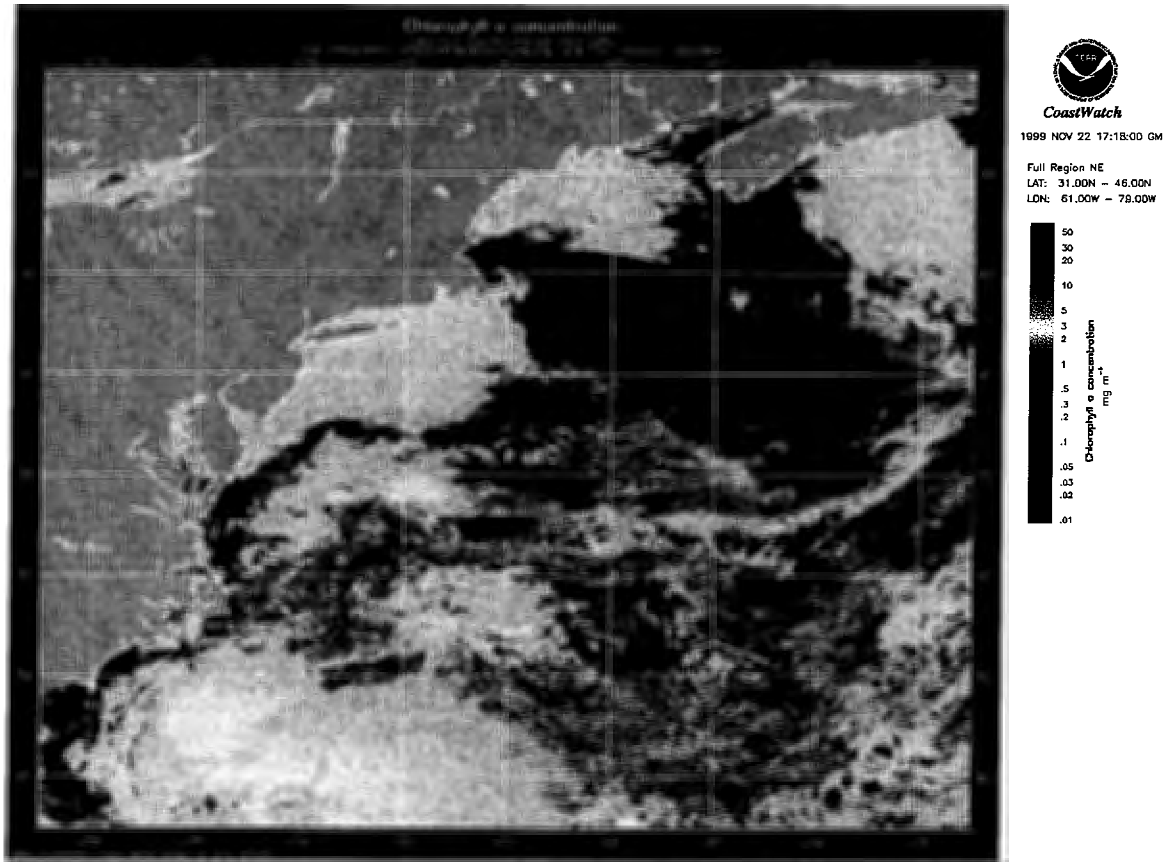


Figure I-15. Average Chlorophyll a Concentrations from November 22, 1999.

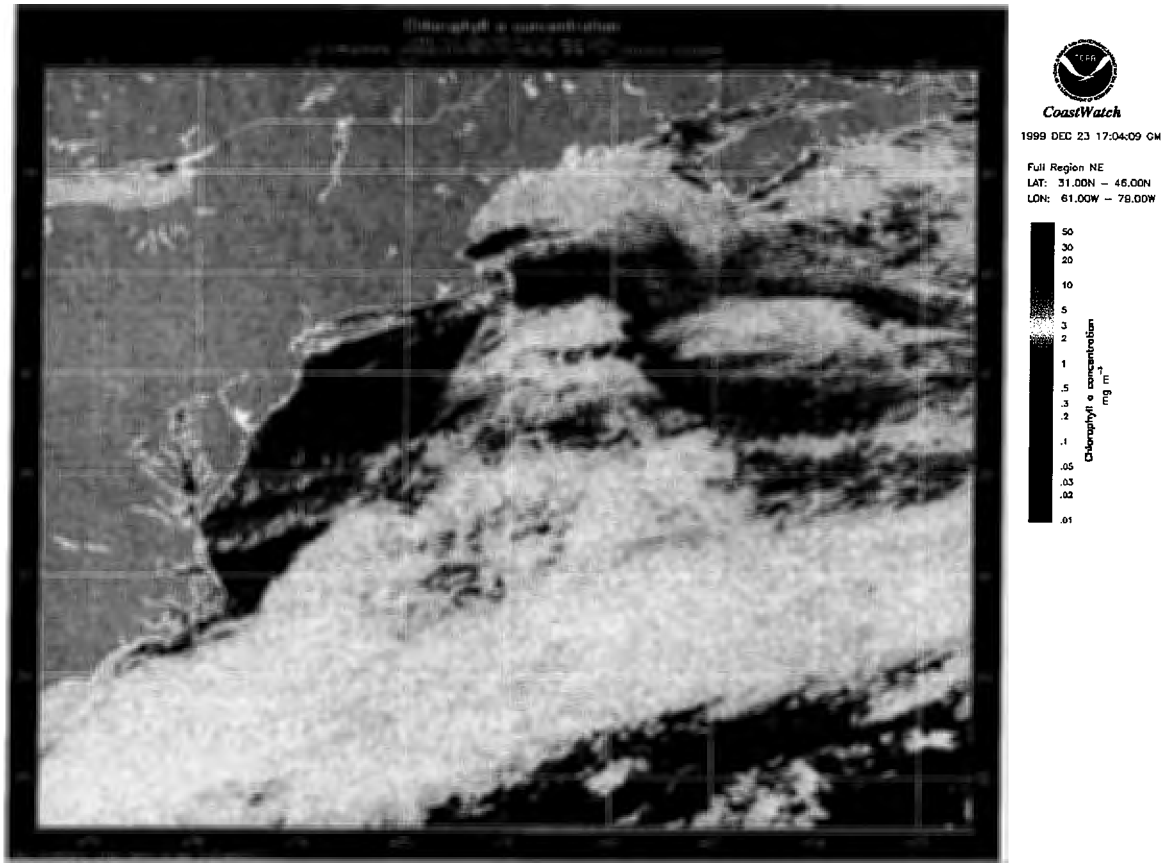


Figure I-16. Average Chlorophyll a Concentrations from December 23, 1999.

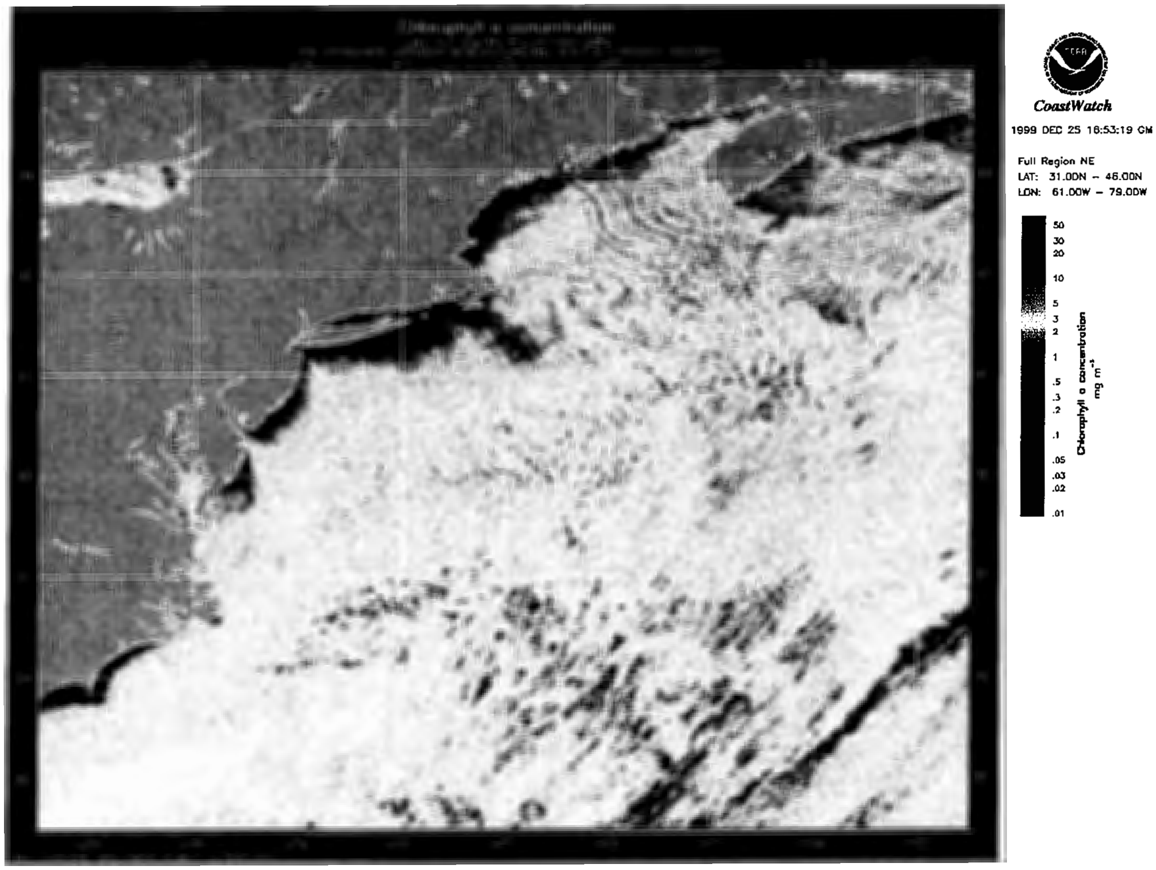


Figure I-17. Average Chlorophyll a Concentrations from December 25, 1999.

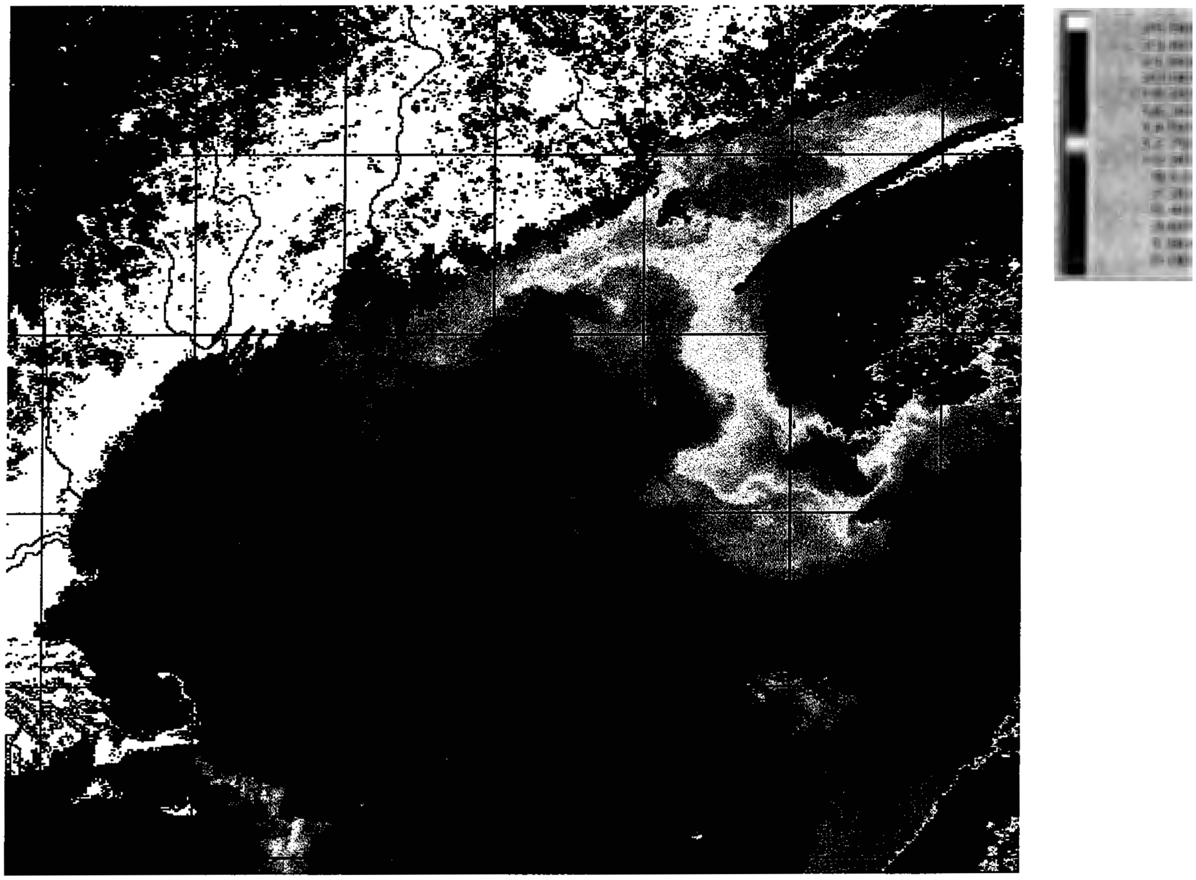


Figure I-18. Sea Surface Temperature from August 16,1999.

Note: The color scale was not included with the original satellite image; it was received and appended later.

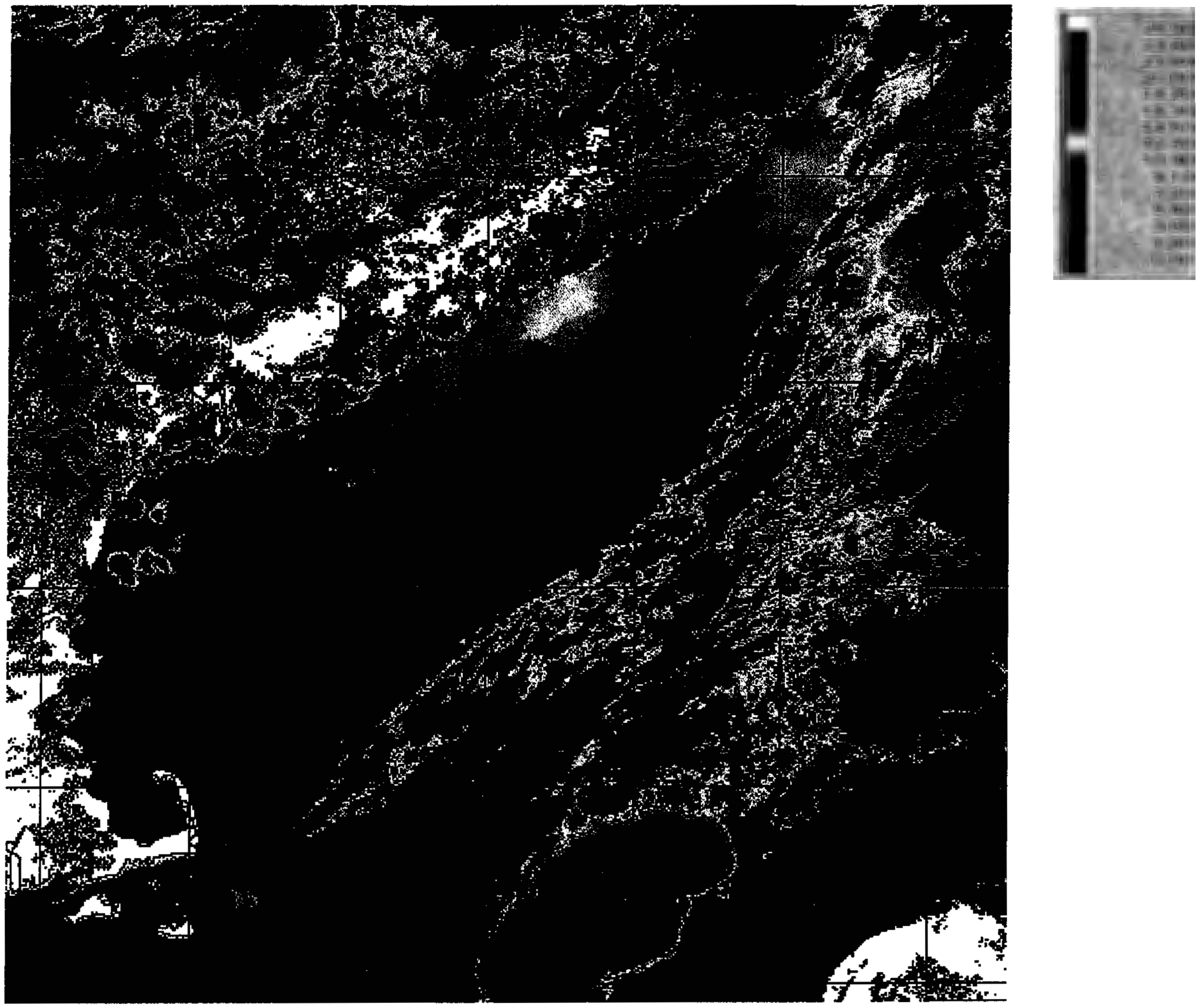


Figure I-19. Sea Surface Temperature from August 17, 1999.

Note: The color scale was not included with the original satellite image; it was received and appended later.

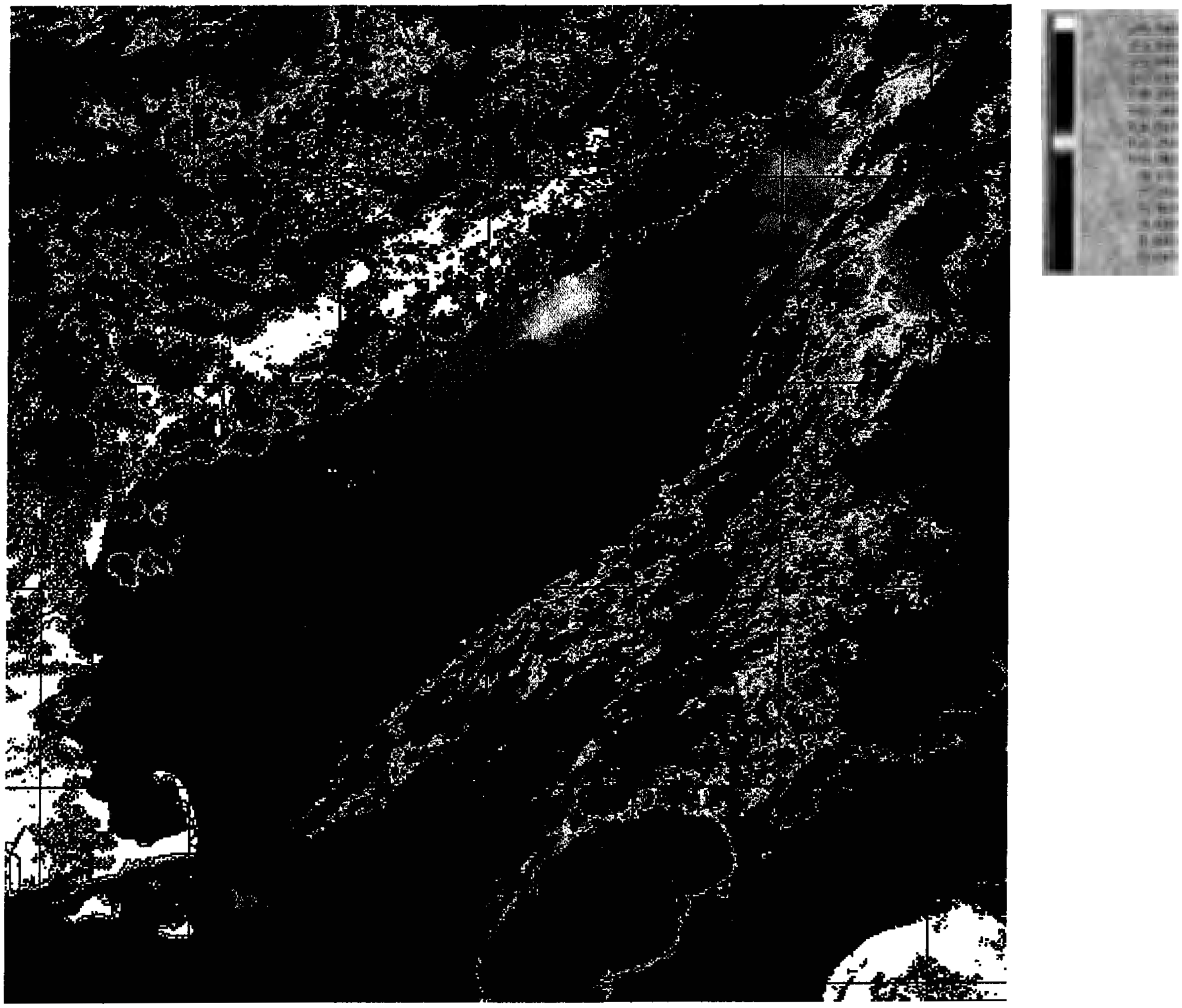


Figure I-20. Sea Surface Temperature from August 18, 1999.

Note: The color scale was not included with the original satellite image; it was received and appended later.

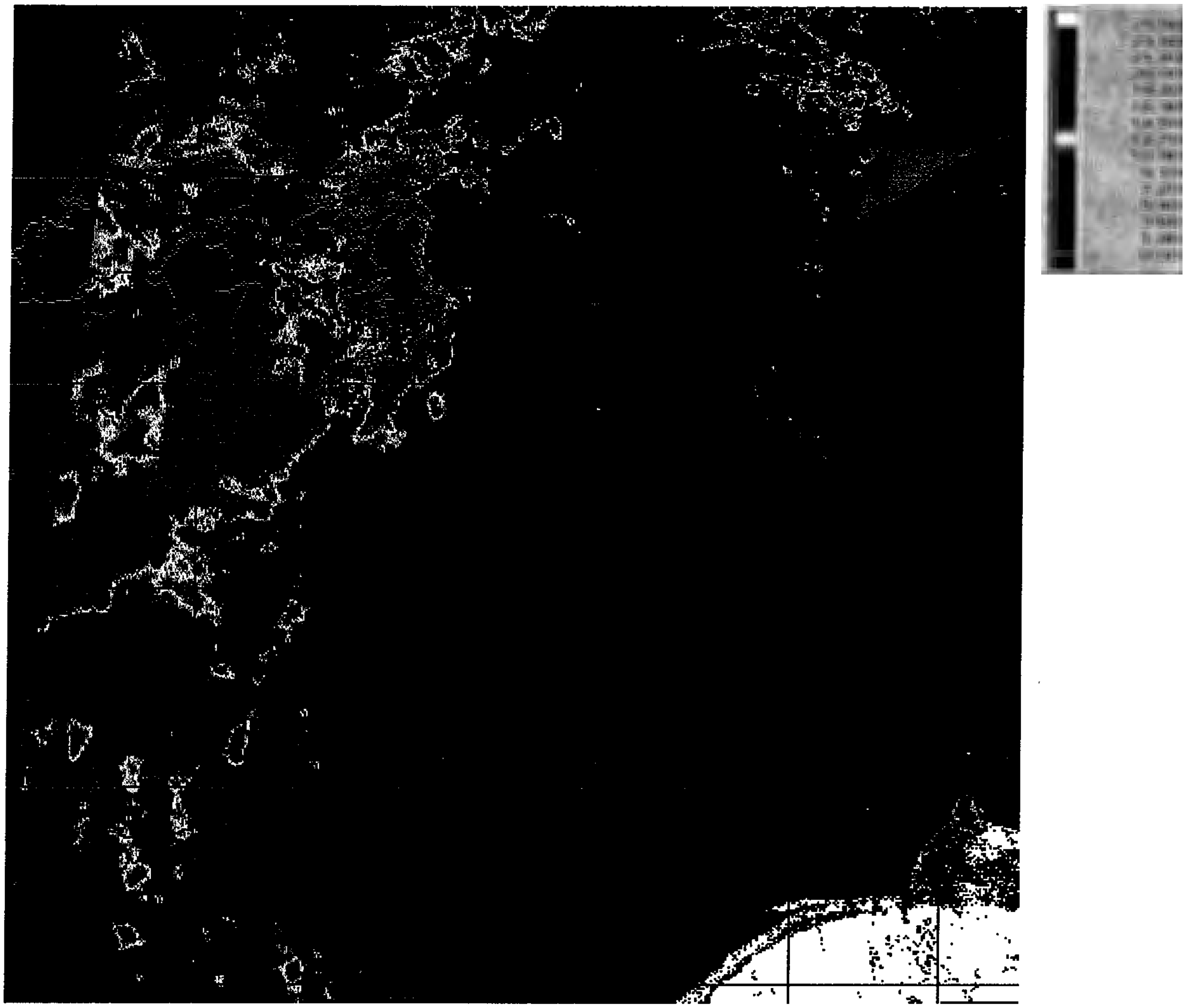


Figure I-21. Sea Surface Temperature from September 7, 1999.

Note: The color scale was not included with the original satellite image; it was received and appended later.

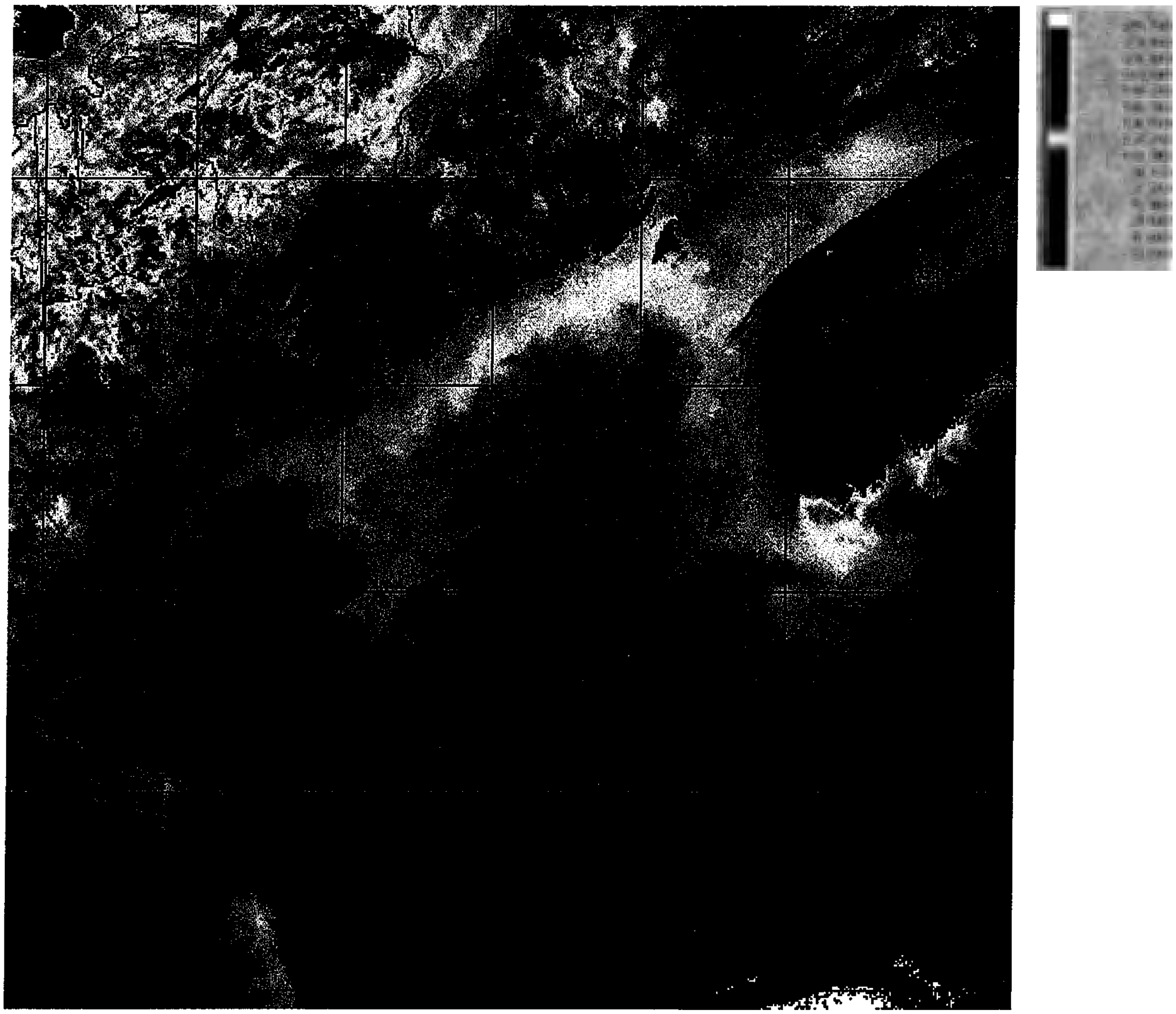


Figure I-22. Sea Surface Temperature from September 24, 1999.

Note: The color scale was not included with the original satellite image; it was received and appended later.

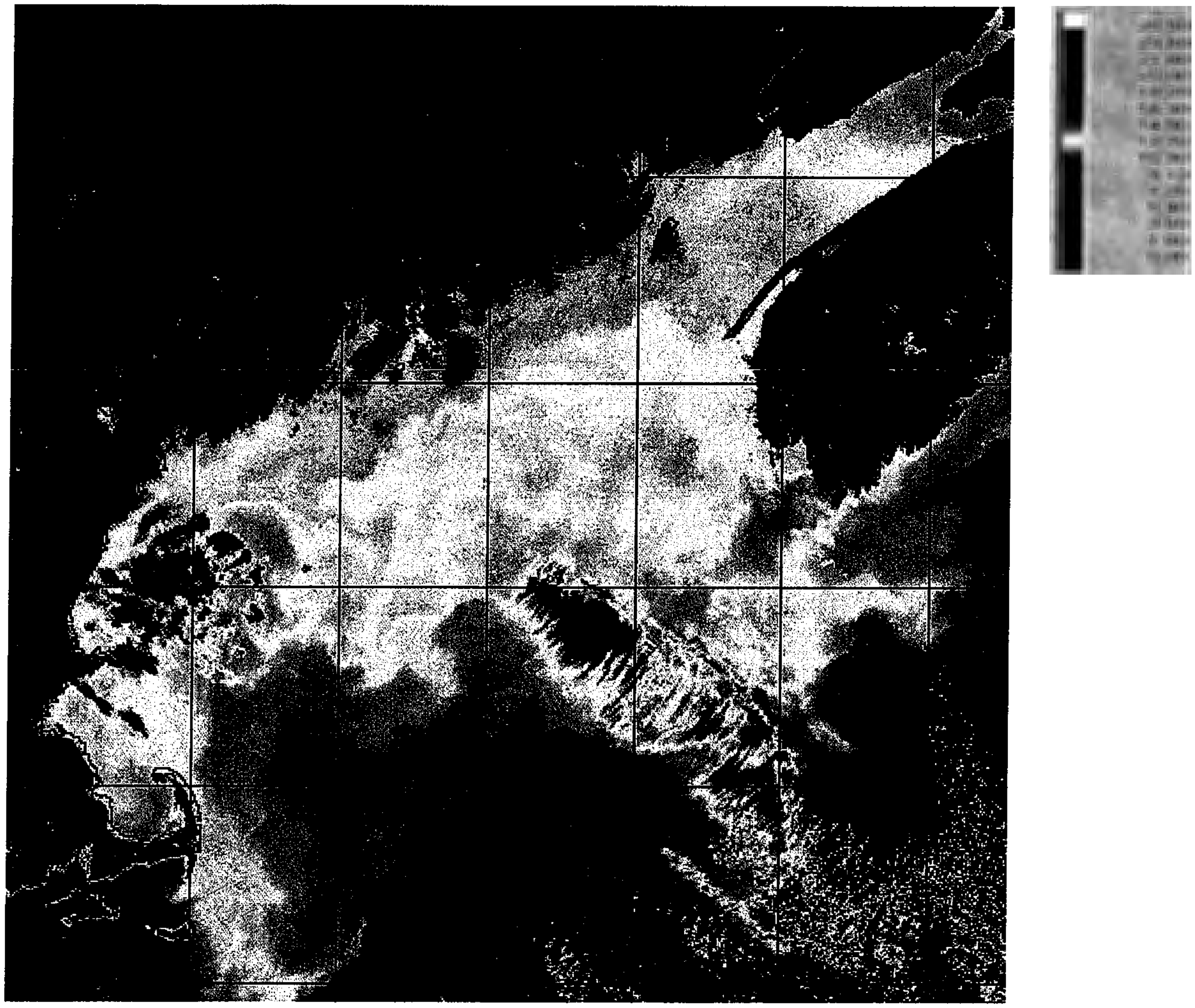


Figure I-23. Sea Surface Temperature from October 8, 1999.

Note: The color scale was not included with the original satellite image; it was received and appended later.

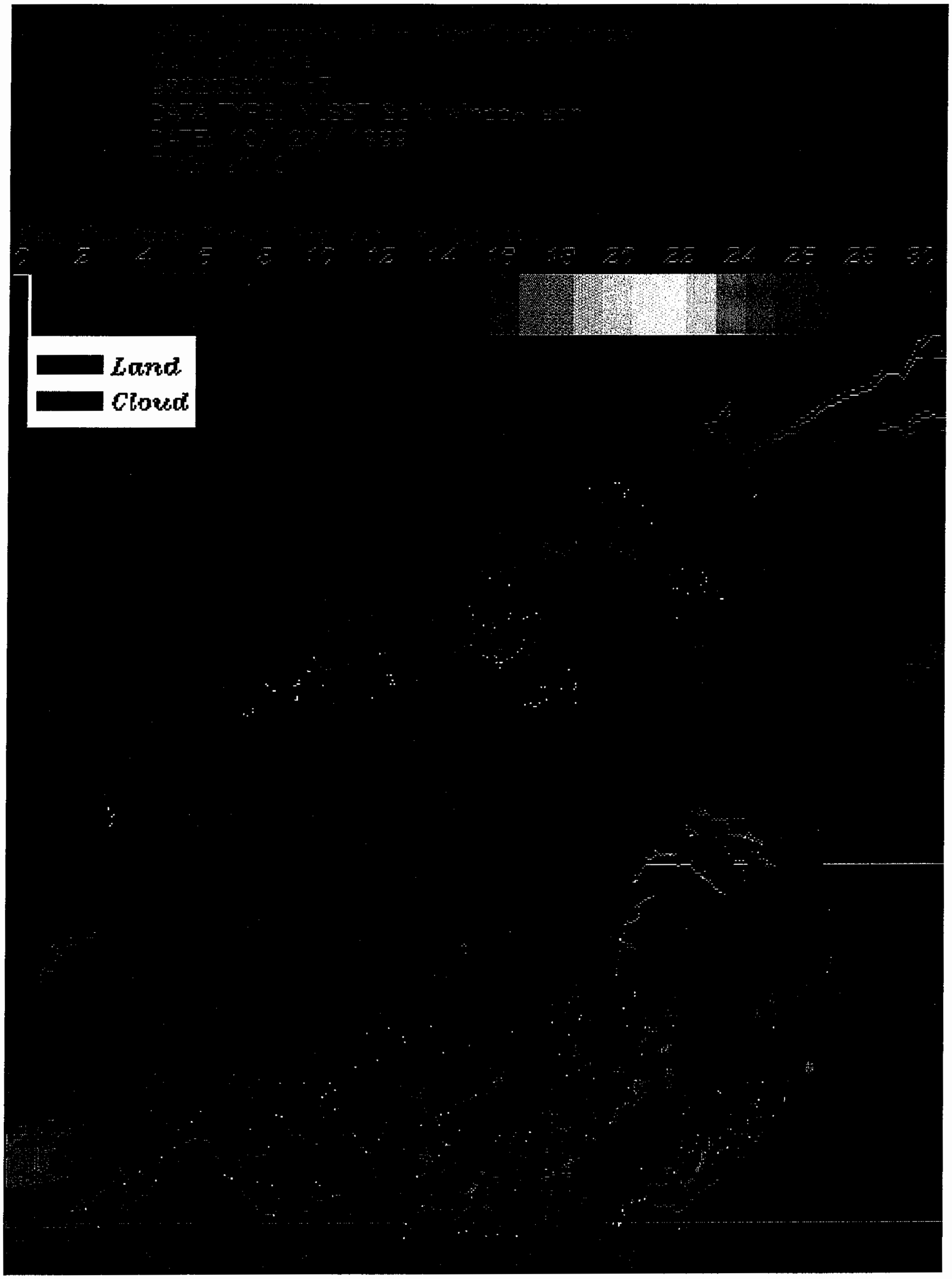


Figure I-24. Sea Surface Temperature from October 22 1999.

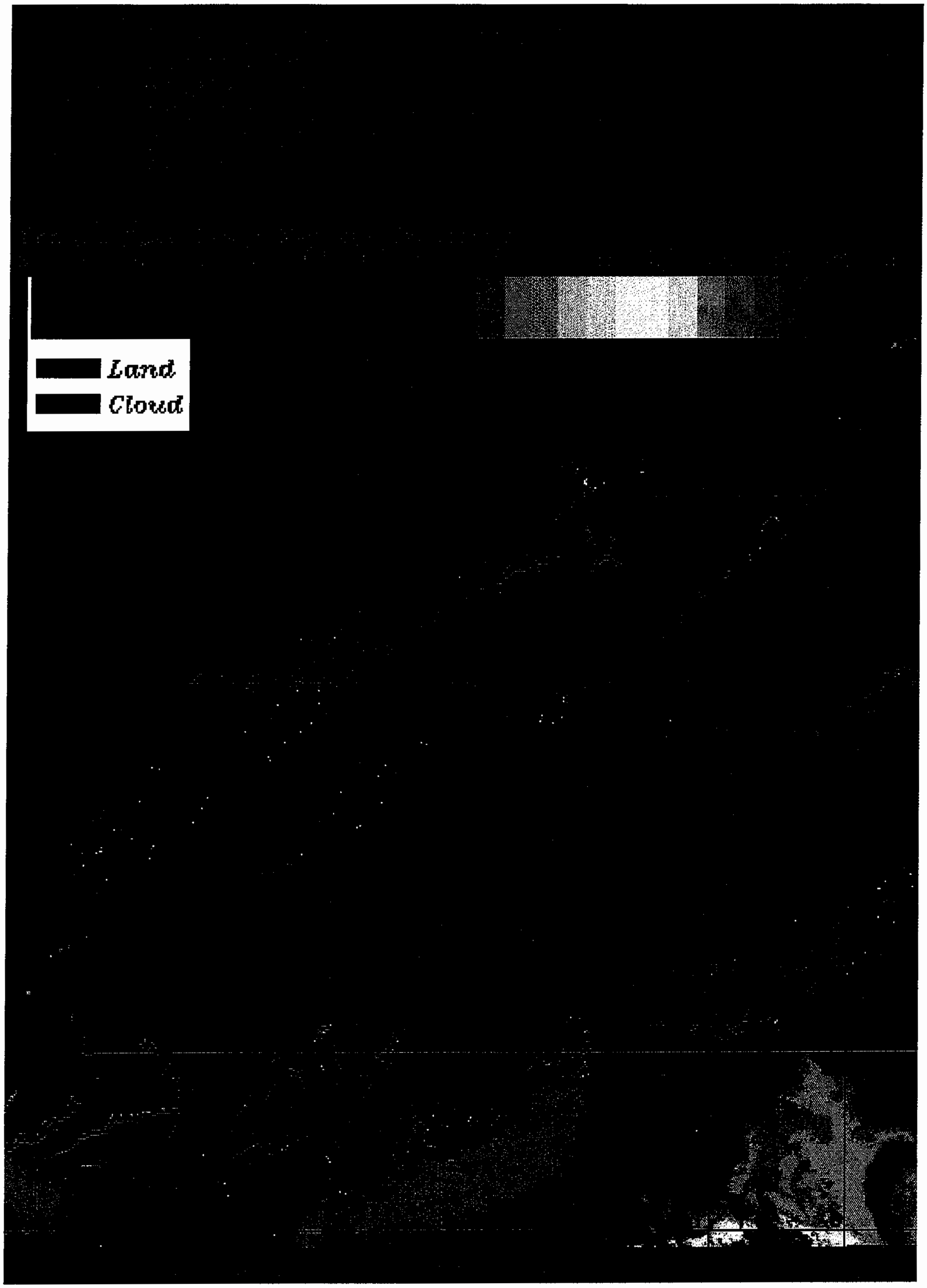


Figure I-25. Sea Surface Temperature from October 26, 1999.

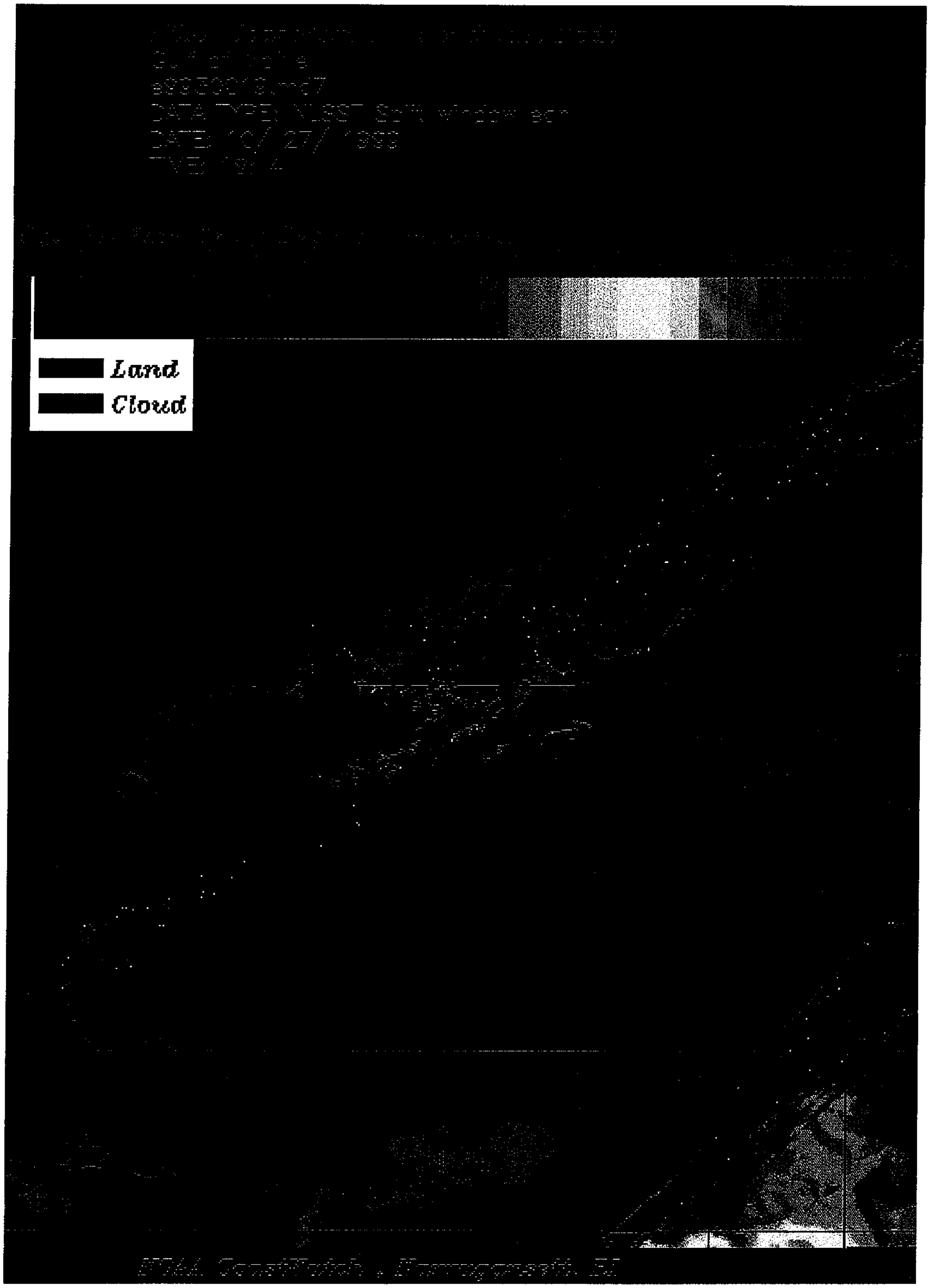


Figure I-26. Sea Surface Temperature from October 27, 1999.

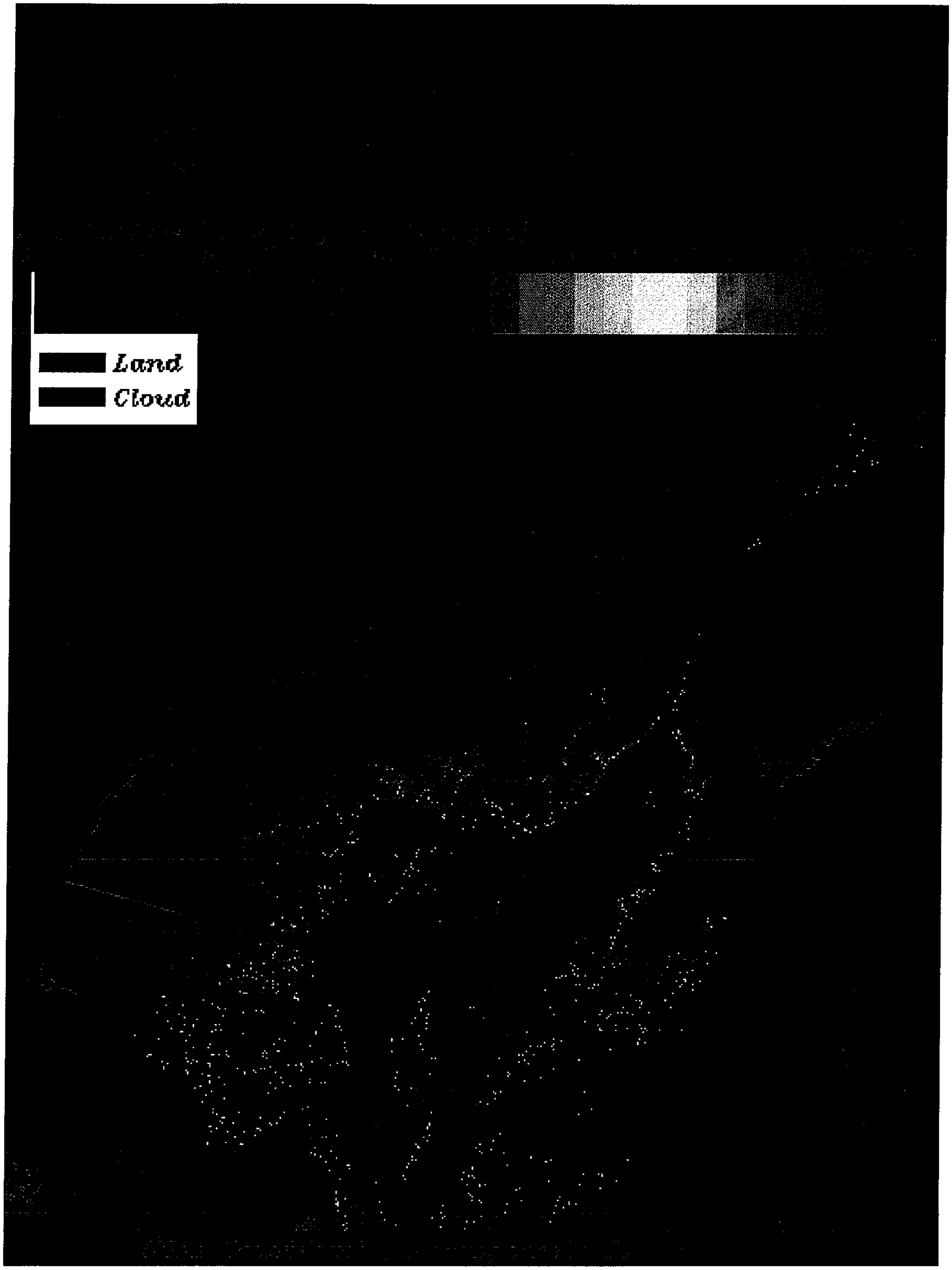


Figure I-27. Sea Surface Temperature from October 28, 1999.

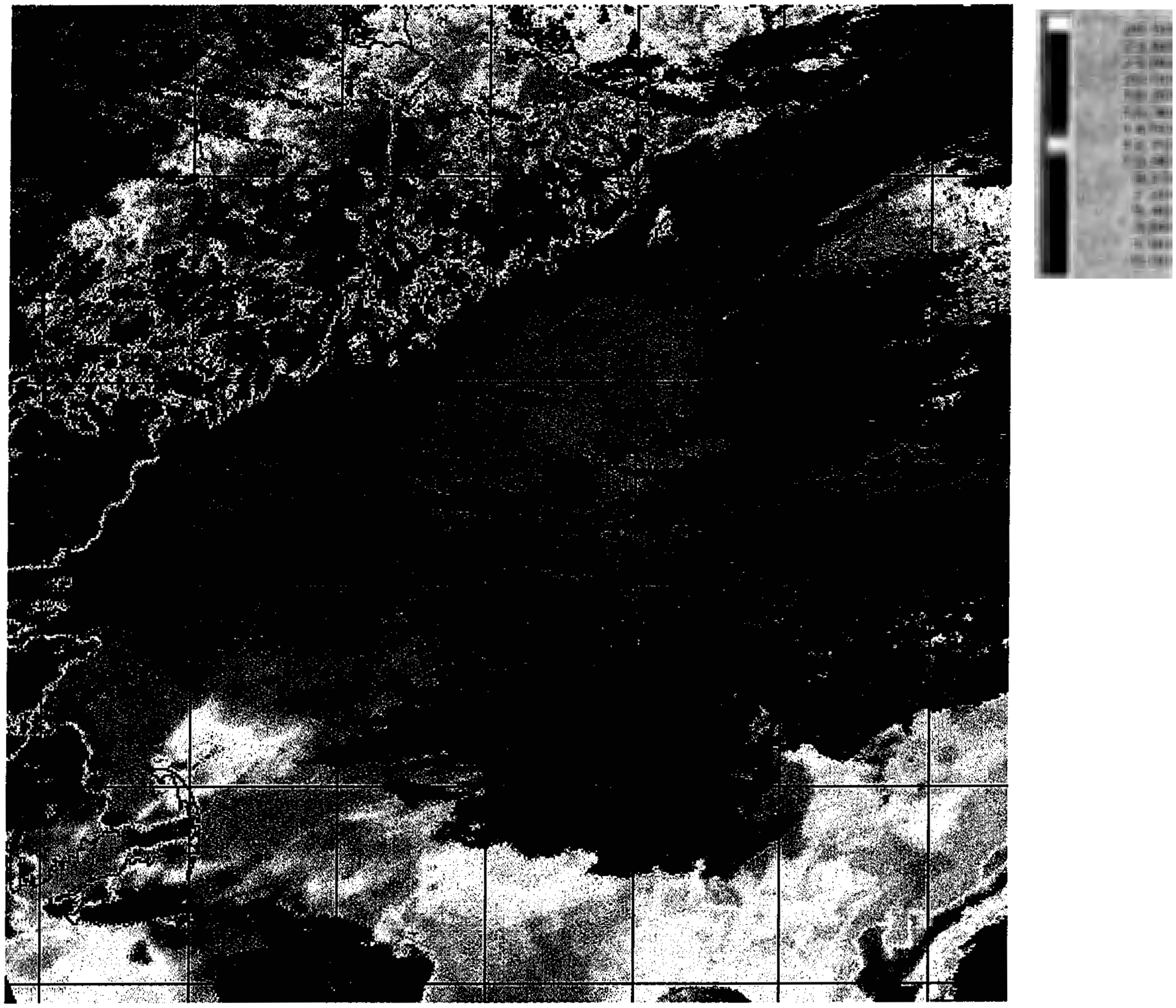


Figure I-28. Sea Surface Temperature from November 23, 1999.

Note: The color scale was not included with the original satellite image; it was received and appended later.

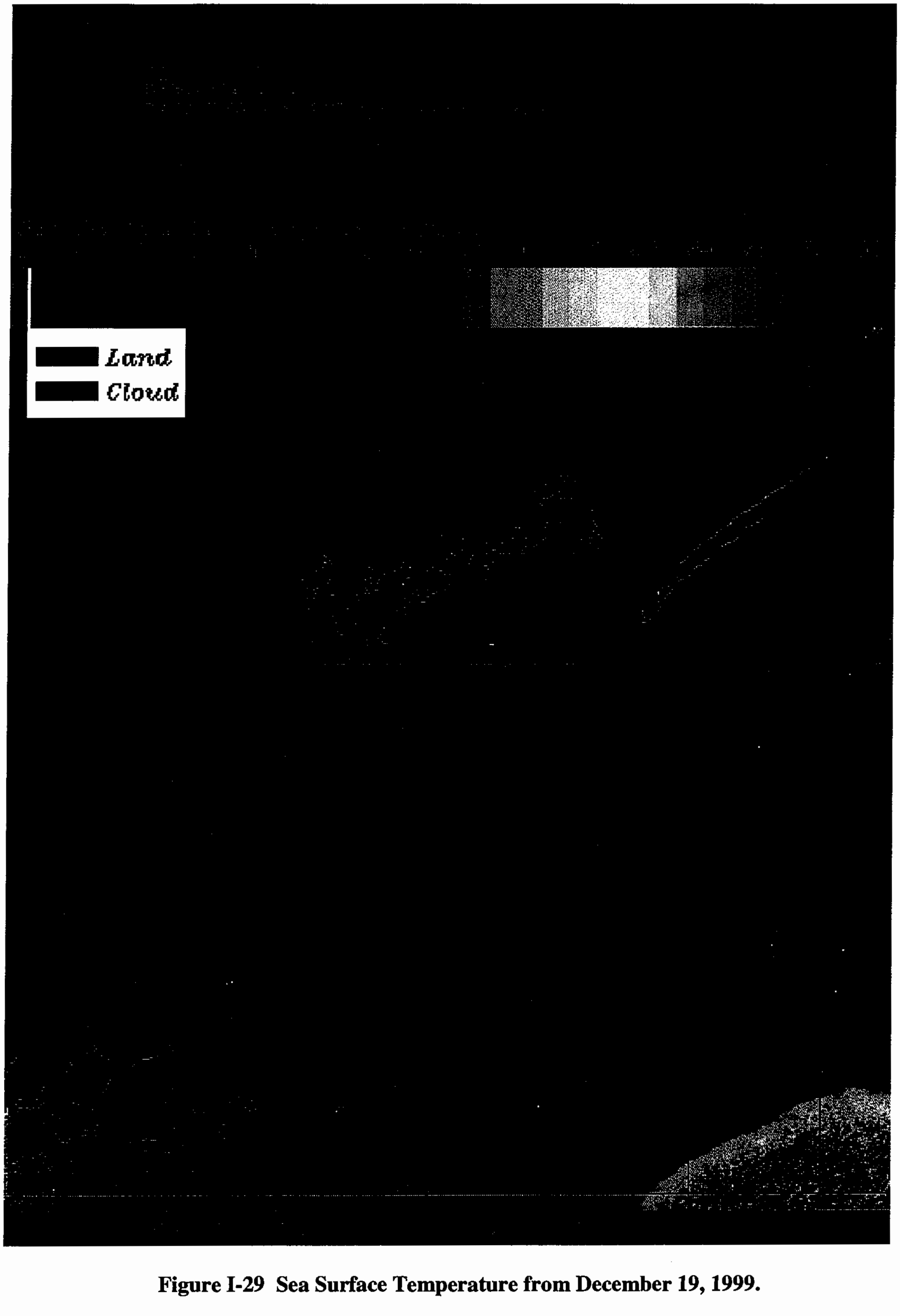


Figure I-29 Sea Surface Temperature from December 19, 1999.

APPENDIX J

Secchi Disk Data

Survey ID	Station ID	Station Arrival Date and Time	Secchi Disk Depth (m)	Qualifier
WF99B	F01	8/16/99 8:33	10.5	v
WF99B	F02	8/16/99 9:51	9.25	v
WF99B	F03	8/16/99 7:45	7	v
WF99B	F05	8/19/99 13:00	8.75	v
WF99B	F06	8/19/99 11:32	8.75	v
WF99B	F07	8/19/99 11:03	7.75	v
WF99B	F10	8/19/99 10:05	5.5	v
WF99B	F12	8/16/99 13:15	10.25	v
WF99B	F13	8/19/99 9:18	5.75	v
WF99B	F14	8/19/99 6:57	3.75	v
WF99B	F15	8/19/99 7:25	5	v
WF99B	F16	8/19/99 7:53	6.5	v
WF99B	F17	8/19/99 8:25	8.75	v
WF99B	F18	8/17/99 12:09	8.5	v
WF99B	F19	8/16/99 16:47	7.75	v
WF99B	F22	8/17/99 10:50	8.5	v
WF99B	F23	8/18/99 6:49	4.25	v
WF99B	F24	8/17/99 12:59	4.25	v
WF99B	F25	8/17/99 7:00	4.75	v
WF99B	F26	8/16/99 15:38	6.5	v
WF99B	F27	8/16/99 14:54	6.5	v
WF99B	F28	8/16/99 13:58	6.5	v
WF99B	F29	8/16/99 11:37	11.75	v
WF99B	F30	8/17/99 13:48	3	v
WF99B	F31	8/19/99 6:16	4	v
WF99B	N16	8/17/99 9:22	7.25	v
WF99E	F01	10/6/99 7:43	6.25	v
WF99E	F02	10/6/99 8:58	8.75	v
WF99E	F03	10/6/99 6:59	5.75	v
WF99E	F05	10/28/99 14:53	4	v
WF99E	F06	10/28/99 14:10	5.75	v
WF99E	F07	10/28/99 13:44	6.75	v
WF99E	F10	10/28/99 13:03	6	v
WF99E	F12	10/6/99 11:41	7.75	v
WF99E	F13	10/28/99 12:13	6.5	v
WF99E	F14	10/28/99 11:44	5.75	v
WF99E	F15	10/28/99 11:20	6.5	v
WF99E	F16	10/28/99 10:49	6	v
WF99E	F17	10/28/99 10:14	7.75	v
WF99E	F18	10/22/99 11:34	4.25	v
WF99E	F19	10/28/99 9:17	7.5	v
WF99E	F22	10/22/99 10:11	7.25	v
WF99E	F23	10/8/99 6:59	4.25	v
WF99E	F24	10/28/99 7:39	3.5	v
WF99E	F25	10/22/99 6:49	4	v
WF99E	F28	10/6/99 12:21	9.5	v

Survey ID	Station ID	Station Arrival Date and Time	Secchi Disk Depth (m)	Qualifier
WF99E	F29	10/6/99 10:20	10.25	v
WF99E	F30	10/22/99 13:24	3.25	v
WF99E	F31	10/22/99 14:06	3.75	v
WF99E	N16	10/22/99 8:51	8.75	v
WN99F	N04	10/27/99 8:42	7.125	v
WN99F	N18	10/27/99 10:11	6.75	v

e- Results not reported, value given is null.
v- Arithmetic mean

APPENDIX K

Estimated Carbon Equivalence Data

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WN99A	N04	WN99A02C	15.08	8/2/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	166.8168
WN99A	N04	WN99A02C	15.08	8/2/99	CERATIUM FUSUS	423.51593
WN99A	N04	WN99A02C	15.08	8/2/99	CERATIUM LONGIPES	8,446.39
WN99A	N04	WN99A02C	15.08	8/2/99	CERATIUM TRIPOS	6,511.45
WN99A	N04	WN99A02C	15.08	8/2/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	55.66296
WN99A	N04	WN99A02C	15.08	8/2/99	CYLINDROTHECA CLOSTERIUM	109.47124
WN99A	N04	WN99A02C	15.08	8/2/99	EUTREPTIA/EUTREPTIELLA SPP.	8.7348
WN99A	N04	WN99A02C	15.08	8/2/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	291.88705
WN99A	N04	WN99A02C	15.08	8/2/99	LEPTOCYLINDRUS DANICUS	835.37974
WN99A	N04	WN99A02C	15.08	8/2/99	LEPTOCYLINDRUS MINIMUS	4.9815
WN99A	N04	WN99A02C	15.08	8/2/99	LICMOPHORA SPP.	91.72538
WN99A	N04	WN99A02C	15.08	8/2/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	15,277.52
WN99A	N04	WN99A02C	15.08	8/2/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	722.67206
WN99A	N04	WN99A02E	2.59	8/2/99	CALYCOMONAS OVALIS	30.78104
WN99A	N04	WN99A02E	2.59	8/2/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	232.23516
WN99A	N04	WN99A02E	2.59	8/2/99	CERATIUM TRIPOS	22,662.40
WN99A	N04	WN99A02E	2.59	8/2/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	335.79678
WN99A	N04	WN99A02E	2.59	8/2/99	CYLINDROTHECA CLOSTERIUM	304.80228
WN99A	N04	WN99A02E	2.59	8/2/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	9,303.33
WN99A	N04	WN99A02E	2.59	8/2/99	LEPTOCYLINDRUS DANICUS	19,988.71
WN99A	N04	WN99A02E	2.59	8/2/99	LEPTOCYLINDRUS MINIMUS	190.71316
WN99A	N04	WN99A02E	2.59	8/2/99	PROROCENTRUM MINIMUM	306.81503
WN99A	N04	WN99A02E	2.59	8/2/99	PSEUDONITZSCHIA SPP.	128.71644
WN99A	N04	WN99A02E	2.59	8/2/99	RHIZOSOLENIA DELICATULA	225.39825
WN99A	N04	WN99A02E	2.59	8/2/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	211.2791
WN99A	N04	WN99A02E	2.59	8/2/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	44,697.50
WN99A	N04	WN99A02E	2.59	8/2/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	3,018.22
WN99A	N18	WN99A055	5.29	8/2/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	1,154.68
WN99A	N18	WN99A055	5.29	8/2/99	CERATIUM TRIPOS	10,516.62
WN99A	N18	WN99A055	5.29	8/2/99	CHAETOCEROS SP. GROUP 1 DIAM <10 MICRONS	14.36417
WN99A	N18	WN99A055	5.29	8/2/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	737.18875
WN99A	N18	WN99A055	5.29	8/2/99	CYLINDROTHECA CLOSTERIUM	424.336
WN99A	N18	WN99A055	5.29	8/2/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	24,455.98
WN99A	N18	WN99A055	5.29	8/2/99	GYRODINIUM SP. GROUP 1 5-20UM W 10-20UM	74.43566
WN99A	N18	WN99A055	5.29	8/2/99	LEPTOCYLINDRUS DANICUS	11,257.55
WN99A	N18	WN99A055	5.29	8/2/99	LEPTOCYLINDRUS MINIMUS	313.77837
WN99A	N18	WN99A055	5.29	8/2/99	LICMOPHORA SPP.	63.49087
WN99A	N18	WN99A055	5.29	8/2/99	RHIZOSOLENIA DELICATULA	470.68836
WN99A	N18	WN99A055	5.29	8/2/99	THALASSIONEMA NITZSCHIOIDES	28.93641

Survey	Sta.	Sample Number	Depth (m)	Samplin g Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WN99A	N18	WN99A055	5.29	8/2/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	147.31547
WN99A	N18	WN99A055	5.29	8/2/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	55,228.85
WN99A	N18	WN99A055	5.29	8/2/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	16,807.47
WN99A	N18	WN99A056	2.79	8/2/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	1,519.58
WN99A	N18	WN99A056	2.79	8/2/99	CERATIUM LONGIPES	7,357.71
WN99A	N18	WN99A056	2.79	8/2/99	CERATIUM TRIPOS	22,688.69
WN99A	N18	WN99A056	2.79	8/2/99	CHAETOCEROS SP. GROUP 1 DIAM <10 MICRONS	77.47357
WN99A	N18	WN99A056	2.79	8/2/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	1,015.18
WN99A	N18	WN99A056	2.79	8/2/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	911.58201
WN99A	N18	WN99A056	2.79	8/2/99	CYLINDROTHECA CLOSTERIUM	801.03403
WN99A	N18	WN99A056	2.79	8/2/99	EUTREPTIA/EUTREPTIELLA SPP.	45.65367
WN99A	N18	WN99A056	2.79	8/2/99	LEPTOCYLINDRUS DANICUS	15,691.15
WN99A	N18	WN99A056	2.79	8/2/99	LEPTOCYLINDRUS MINIMUS	234.32855
WN99A	N18	WN99A056	2.79	8/2/99	PROROCENTRUM MINIMUM	461.53167
WN99A	N18	WN99A056	2.79	8/2/99	RHIZOSOLENIA DELICATULA	338.48953
WN99A	N18	WN99A056	2.79	8/2/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	79.32156
WN99A	N18	WN99A056	2.79	8/2/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	85,838.90
WN99A	N18	WN99A056	2.79	8/2/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	7,554.30
WF99B	F01	WF99B03F	11.43	8/16/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	177.77424
WF99B	F01	WF99B03F	11.43	8/16/99	CERATIUM FUSUS	2,369.51
WF99B	F01	WF99B03F	11.43	8/16/99	CERATIUM TRIPOS	157,865.86
WF99B	F01	WF99B03F	11.43	8/16/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	543.35084
WF99B	F01	WF99B03F	11.43	8/16/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	322.99331
WF99B	F01	WF99B03F	11.43	8/16/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	333.3267
WF99B	F01	WF99B03F	11.43	8/16/99	CYLINDROTHECA CLOSTERIUM	408.31668
WF99B	F01	WF99B03F	11.43	8/16/99	DICTYOCHA SPECULUM	1,538.98
WF99B	F01	WF99B03F	11.43	8/16/99	GUINARDIA FLACCIDA	9,784.39
WF99B	F01	WF99B03F	11.43	8/16/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	2,295.88
WF99B	F01	WF99B03F	11.43	8/16/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	1,057.91
WF99B	F01	WF99B03F	11.43	8/16/99	GYRODINIUM SP. GROUP 2 21-40UM W 21-50UM	528.95364
WF99B	F01	WF99B03F	11.43	8/16/99	HETEROCAPSA ROTUNDATA	56.47701
WF99B	F01	WF99B03F	11.43	8/16/99	LICMOPHORA SPP.	24.4376
WF99B	F01	WF99B03F	11.43	8/16/99	PLEUROSIGMA SPP.	224.64225
WF99B	F01	WF99B03F	11.43	8/16/99	PROBOSCIA ALATA	1,455.03
WF99B	F01	WF99B03F	11.43	8/16/99	PROROCENTRUM MINIMUM	41.1013
WF99B	F01	WF99B03F	11.43	8/16/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	418.50391
WF99B	F01	WF99B03F	11.43	8/16/99	PSEUDONITZSCHIA SPP.	172.43004
WF99B	F01	WF99B03F	11.43	8/16/99	RHIZOSOLENIA FRAGILISSIMA	620.5853
WF99B	F01	WF99B03F	11.43	8/16/99	RHIZOSOLENIA SETIGERA	746.6736
WF99B	F01	WF99B03F	11.43	8/16/99	SKELETONEMA COSTATUM	66.3558

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99B	F01	WF99B03F	11.43	8/16/99	THALASSIONEMA NITZSCHIOIDES	111.37608
WF99B	F01	WF99B03F	11.43	8/16/99	THALASSIOSIRA NORDENSKIOLDII	10.92404
WF99B	F01	WF99B03F	11.43	8/16/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	212.27395
WF99B	F01	WF99B03F	11.43	8/16/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	16,861.36
WF99B	F01	WF99B03F	11.43	8/16/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	336.93673
WF99B	F01	WF99B041	2.29	8/16/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	287.65385
WF99B	F01	WF99B041	2.29	8/16/99	CERATAULINA PELAGICA	171.57667
WF99B	F01	WF99B041	2.29	8/16/99	CERATIUM FUSUS	426.0072
WF99B	F01	WF99B041	2.29	8/16/99	CERATIUM MACROCEROS	423.2167
WF99B	F01	WF99B041	2.29	8/16/99	CERATIUM TRIPOS	77,505.42
WF99B	F01	WF99B041	2.29	8/16/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	537.2815
WF99B	F01	WF99B041	2.29	8/16/99	CHAETOCEROS SPP.(<10UM)	71.56803
WF99B	F01	WF99B041	2.29	8/16/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	342.83081
WF99B	F01	WF99B041	2.29	8/16/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	239.71154
WF99B	F01	WF99B041	2.29	8/16/99	CYLINDROTHECA CLOSTERIUM	308.32253
WF99B	F01	WF99B041	2.29	8/16/99	DICTYOCHA SPECULUM	692.88462
WF99B	F01	WF99B041	2.29	8/16/99	GUINARDIA FLACCIDA	1,319.33
WF99B	F01	WF99B041	2.29	8/16/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	2,786.19
WF99B	F01	WF99B041	2.29	8/16/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	570.59467
WF99B	F01	WF99B041	2.29	8/16/99	GYRODINIUM SP. GROUP 1 5-20UM W 10-20UM	15.45284
WF99B	F01	WF99B041	2.29	8/16/99	GYRODINIUM SP. GROUP 2 21-40UM W 21-50UM	570.59467
WF99B	F01	WF99B041	2.29	8/16/99	LEPTOCYLINDRUS DANICUS	262.59179
WF99B	F01	WF99B041	2.29	8/16/99	LEPTOCYLINDRUS MINIMUS	177.88337
WF99B	F01	WF99B041	2.29	8/16/99	LICMOPHORA SPP.	26.36141
WF99B	F01	WF99B041	2.29	8/16/99	PENNATE DIATOM SP. GROUP 1 <10 MICRONS L	18.54808
WF99B	F01	WF99B041	2.29	8/16/99	PROBOSCIA ALATA	1,569.57
WF99B	F01	WF99B041	2.29	8/16/99	PROROCENTRUM MINIMUM	22.16847
WF99B	F01	WF99B041	2.29	8/16/99	PROTOPERIDINIUM DEPRESSUM	6,947.85
WF99B	F01	WF99B041	2.29	8/16/99	PSEUDONITZSCHIA SPP.	55.8013
WF99B	F01	WF99B041	2.29	8/16/99	PYRAMIMONAS SP. GROUP 1 10-20 MICRONS LE	229.38462
WF99B	F01	WF99B041	2.29	8/16/99	RHIZOSOLENIA DELICATULA	228.00144
WF99B	F01	WF99B041	2.29	8/16/99	RHIZOSOLENIA FRAGILISSIMA	2,247.41
WF99B	F01	WF99B041	2.29	8/16/99	SCRIPPSIELLA TROCHOIDEA	101.25702
WF99B	F01	WF99B041	2.29	8/16/99	SKELETONEMA COSTATUM	327.61411
WF99B	F01	WF99B041	2.29	8/16/99	THALASSIONEMA NITZSCHIOIDES	120.34615
WF99B	F01	WF99B041	2.29	8/16/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	152.91346
WF99B	F01	WF99B041	2.29	8/16/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	9,784.70
WF99B	F01	WF99B041	2.29	8/16/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	2,907.69
WF99B	F02	WF99B04F	14.02	8/16/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	35.19248
WF99B	F02	WF99B04F	14.02	8/16/99	CERATIUM FUSUS	2,784.36
WF99B	F02	WF99B04F	14.02	8/16/99	CERATIUM LINEATUM	5,408.29

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99B	F02	WF99B04F	14.02	8/16/99	CERATIUM LONGIPES	9,253.99
WF99B	F02	WF99B04F	14.02	8/16/99	CERATIUM TRIPOS	313,931.55
WF99B	F02	WF99B04F	14.02	8/16/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	1,596.20
WF99B	F02	WF99B04F	14.02	8/16/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,445.50
WF99B	F02	WF99B04F	14.02	8/16/99	CYLINDROTHECA CLOSTERIUM	359.85356
WF99B	F02	WF99B04F	14.02	8/16/99	GUINARDIA FLACCIDA	6,467.31
WF99B	F02	WF99B04F	14.02	8/16/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	2,731.56
WF99B	F02	WF99B04F	14.02	8/16/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	932.34424
WF99B	F02	WF99B04F	14.02	8/16/99	GYRODINIUM SP. GROUP 2 21-40UM W 21-50UM	932.34424
WF99B	F02	WF99B04F	14.02	8/16/99	HETEROSIGMA AKASHIWO	216.48756
WF99B	F02	WF99B04F	14.02	8/16/99	LEPTOCYLINDRUS DANICUS	600.70018
WF99B	F02	WF99B04F	14.02	8/16/99	LEPTOCYLINDRUS MINIMUS	32.75032
WF99B	F02	WF99B04F	14.02	8/16/99	PROBOSCIA ALATA	2,564.66
WF99B	F02	WF99B04F	14.02	8/16/99	PROTOPERIDINIUM DEPRESSUM	22,705.39
WF99B	F02	WF99B04F	14.02	8/16/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	1,106.50
WF99B	F02	WF99B04F	14.02	8/16/99	PSEUDONITZSCHIA SPP.	1,095.98
WF99B	F02	WF99B04F	14.02	8/16/99	PYRAMIMONAS SP. GROUP 1 10-20 MICRONS LE	112.44344
WF99B	F02	WF99B04F	14.02	8/16/99	RHIZOSOLENIA DELICATULA	532.21625
WF99B	F02	WF99B04F	14.02	8/16/99	RHIZOSOLENIA STOLTERFOTHII	1,134.82
WF99B	F02	WF99B04F	14.02	8/16/99	SKELETONEMA COSTATUM	26.99078
WF99B	F02	WF99B04F	14.02	8/16/99	THALASSIONEMA NITZSCHIOIDES	235.97285
WF99B	F02	WF99B04F	14.02	8/16/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	199.55109
WF99B	F02	WF99B04F	14.02	8/16/99	THALASSIOTHRIX LONGISSIMA	470.55059
WF99B	F02	WF99B04F	14.02	8/16/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	17,773.25
WF99B	F02	WF99B04F	14.02	8/16/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	2,138.01
WF99B	F02	WF99B051	2.5	8/16/99	ASTERIONELLOPSIS GLACIALIS	34.39254
WF99B	F02	WF99B051	2.5	8/16/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	517.02489
WF99B	F02	WF99B051	2.5	8/16/99	CERATAULINA PELAGICA	560.70808
WF99B	F02	WF99B051	2.5	8/16/99	CERATIUM FUSUS	2,784.36
WF99B	F02	WF99B051	2.5	8/16/99	CERATIUM MACROCEROS	1,383.06
WF99B	F02	WF99B051	2.5	8/16/99	CERATIUM TRIPOS	89,185.10
WF99B	F02	WF99B051	2.5	8/16/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	957.72103
WF99B	F02	WF99B051	2.5	8/16/99	CHAETOCEROS SPP.(<10UM)	117.13801
WF99B	F02	WF99B051	2.5	8/16/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	384.24774
WF99B	F02	WF99B051	2.5	8/16/99	CYLINDROTHECA CLOSTERIUM	359.85356
WF99B	F02	WF99B051	2.5	8/16/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	2,124.55
WF99B	F02	WF99B051	2.5	8/16/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	932.34424
WF99B	F02	WF99B051	2.5	8/16/99	GYRODINIUM SP. GROUP 1 5-20UM W 10-20UM	303.50679
WF99B	F02	WF99B051	2.5	8/16/99	LEPTOCYLINDRUS DANICUS	4,119.09
WF99B	F02	WF99B051	2.5	8/16/99	LEPTOCYLINDRUS MINIMUS	114.62612
WF99B	F02	WF99B051	2.5	8/16/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	30.85871
WF99B	F02	WF99B051	2.5	8/16/99	PROBOSCIA ALATA	3,846.99

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99B	F02	WF99B051	2.5	8/16/99	PROROCENTRUM MINIMUM	435.40724
WF99B	F02	WF99B051	2.5	8/16/99	PSEUDONITZSCHIA SPP.	3,282.43
WF99B	F02	WF99B051	2.5	8/16/99	RHIZOSOLENIA DELICATULA	425.773
WF99B	F02	WF99B051	2.5	8/16/99	RHIZOSOLENIA FRAGILISSIMA	20,470.73
WF99B	F02	WF99B051	2.5	8/16/99	SKELETONEMA COSTATUM	71.97542
WF99B	F02	WF99B051	2.5	8/16/99	THALASSIONEMA NITZSCHIOIDES	58.89411
WF99B	F02	WF99B051	2.5	8/16/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	374.1583
WF99B	F02	WF99B051	2.5	8/16/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	11,299.55
WF99B	F02	WF99B051	2.5	8/16/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	2,138.01
WF99B	F27	WF99B0AB	12.08	8/16/99	CALYCOMONAS OVALIS	103.0866
WF99B	F27	WF99B0AB	12.08	8/16/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	311.10492
WF99B	F27	WF99B0AB	12.08	8/16/99	CERATAULINA PELAGICA	17,496.08
WF99B	F27	WF99B0AB	12.08	8/16/99	CERATIUM FUSUS	4,936.47
WF99B	F27	WF99B0AB	12.08	8/16/99	CERATIUM LONGIPES	3,281.69
WF99B	F27	WF99B0AB	12.08	8/16/99	CERATIUM MACROCEROS	980.82766
WF99B	F27	WF99B0AB	12.08	8/16/99	CERATIUM TRIPOS	172,033.31
WF99B	F27	WF99B0AB	12.08	8/16/99	CHAETOCEROS DIDYMUS	49.67475
WF99B	F27	WF99B0AB	12.08	8/16/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	2,721.33
WF99B	F27	WF99B0AB	12.08	8/16/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,349.51
WF99B	F27	WF99B0AB	12.08	8/16/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	333.3267
WF99B	F27	WF99B0AB	12.08	8/16/99	CYLINDROTHECA CLOSTERIUM	510.39585
WF99B	F27	WF99B0AB	12.08	8/16/99	DINOPHYSIS NORVEGICA	11,324.28
WF99B	F27	WF99B0AB	12.08	8/16/99	GUINARDIA FLACCIDA	6,115.25
WF99B	F27	WF99B0AB	12.08	8/16/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	8,322.55
WF99B	F27	WF99B0AB	12.08	8/16/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	1,983.58
WF99B	F27	WF99B0AB	12.08	8/16/99	LEPTOCYLINDRUS DANICUS	196,533.35
WF99B	F27	WF99B0AB	12.08	8/16/99	LEPTOCYLINDRUS MINIMUS	58.06399
WF99B	F27	WF99B0AB	12.08	8/16/99	LICMOPHORA SPP.	30.547
WF99B	F27	WF99B0AB	12.08	8/16/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	21.88412
WF99B	F27	WF99B0AB	12.08	8/16/99	PROBOSCIA ALATA	5,456.35
WF99B	F27	WF99B0AB	12.08	8/16/99	PROROCENTRUM MINIMUM	41.1013
WF99B	F27	WF99B0AB	12.08	8/16/99	PROTOPERIDINIUM BIPES	522.06538
WF99B	F27	WF99B0AB	12.08	8/16/99	PROTOPERIDINIUM DEPRESSUM	16,102.02
WF99B	F27	WF99B0AB	12.08	8/16/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	261.56494
WF99B	F27	WF99B0AB	12.08	8/16/99	PSEUDONITZSCHIA SPP.	387.96759
WF99B	F27	WF99B0AB	12.08	8/16/99	RHIZOSOLENIA DELICATULA	301.94612
WF99B	F27	WF99B0AB	12.08	8/16/99	RHIZOSOLENIA FRAGILISSIMA	1,883.92
WF99B	F27	WF99B0AB	12.08	8/16/99	SKELETONEMA COSTATUM	1,263.31
WF99B	F27	WF99B0AB	12.08	8/16/99	THALASSIONEMA NITZSCHIOIDES	97.45407
WF99B	F27	WF99B0AB	12.08	8/16/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	17.6895
WF99B	F27	WF99B0AB	12.08	8/16/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	19,198.57

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99B	F27	WF99B0AB	12.08	8/16/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	4,043.24
WF99B	F27	WF99B0AC	2.33	8/16/99	AMPHIDINIUM SPP.	55.03125
WF99B	F27	WF99B0AC	2.33	8/16/99	CALYCOMONAS OVALIS	20.74004
WF99B	F27	WF99B0AC	2.33	8/16/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	178.83242
WF99B	F27	WF99B0AC	2.33	8/16/99	CERATAULINA PELAGICA	23,360.30
WF99B	F27	WF99B0AC	2.33	8/16/99	CERATIUM FUSUS	3,178.15
WF99B	F27	WF99B0AC	2.33	8/16/99	CERATIUM TRIPOS	191,381.03
WF99B	F27	WF99B0AC	2.33	8/16/99	CHAETOCEROS BOREALIS	631.1058
WF99B	F27	WF99B0AC	2.33	8/16/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	546.58507
WF99B	F27	WF99B0AC	2.33	8/16/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	330.68395
WF99B	F27	WF99B0AC	2.33	8/16/99	CYLINDROTHECA CLOSTERIUM	410.74714
WF99B	F27	WF99B0AC	2.33	8/16/99	EUTREPTIA/EUTREPTIELLA SPP.	16.38692
WF99B	F27	WF99B0AC	2.33	8/16/99	GUINARDIA FLACCIDA	7,381.98
WF99B	F27	WF99B0AC	2.33	8/16/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	11,259.02
WF99B	F27	WF99B0AC	2.33	8/16/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	2,128.41
WF99B	F27	WF99B0AC	2.33	8/16/99	GYRODINIUM SP. GROUP 1 5-20UM W 10-20UM	28.82078
WF99B	F27	WF99B0AC	2.33	8/16/99	HETEROSIGMA AKASHIWO	205.9209
WF99B	F27	WF99B0AC	2.33	8/16/99	LEPTOCYLINDRUS DANICUS	198,684.35
WF99B	F27	WF99B0AC	2.33	8/16/99	LEPTOCYLINDRUS MINIMUS	224.29291
WF99B	F27	WF99B0AC	2.33	8/16/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	17.61151
WF99B	F27	WF99B0AC	2.33	8/16/99	PROBOSCIA ALATA	5,122.91
WF99B	F27	WF99B0AC	2.33	8/16/99	PROROCENTRUM MINIMUM	82.6919
WF99B	F27	WF99B0AC	2.33	8/16/99	PROTOPERIDINIUM DEPRESSUM	38,874.88
WF99B	F27	WF99B0AC	2.33	8/16/99	PSEUDONITZSCHIA SPP.	624.44307
WF99B	F27	WF99B0AC	2.33	8/16/99	RHIZOSOLENIA FRAGILISSIMA	2,497.12
WF99B	F27	WF99B0AC	2.33	8/16/99	SKELETONEMA COSTATUM	143.7709
WF99B	F27	WF99B0AC	2.33	8/16/99	STEPHANOPYXIS TURRIS	1,553.36
WF99B	F27	WF99B0AC	2.33	8/16/99	THALASSIONEMA NITZSCHIOIDES	56.01952
WF99B	F27	WF99B0AC	2.33	8/16/99	THALASSIOSIRA NORDENSKIOLDII	32.96719
WF99B	F27	WF99B0AC	2.33	8/16/99	THALASSIOSIRA ROTULA	789.74094
WF99B	F27	WF99B0AC	2.33	8/16/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	14.23583
WF99B	F27	WF99B0AC	2.33	8/16/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	14,274.72
WF99B	F27	WF99B0AC	2.33	8/16/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	4,067.31
WF99B	F25	WF99B0D6	5.3	8/17/99	CALYCOMONAS WULFFII	21.90152
WF99B	F25	WF99B0D6	5.3	8/17/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	1,522.72
WF99B	F25	WF99B0D6	5.3	8/17/99	CERATAULINA PELAGICA	5,190.04
WF99B	F25	WF99B0D6	5.3	8/17/99	CERATIUM FUSUS	4,295.45
WF99B	F25	WF99B0D6	5.3	8/17/99	CHAETOCEROS DIDYMUS	865.93895
WF99B	F25	WF99B0D6	5.3	8/17/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	2,462.47
WF99B	F25	WF99B0D6	5.3	8/17/99	COSCINODISCUS SP. GROUP 2 DIAM 40-100 MI	7,568.04
WF99B	F25	WF99B0D6	5.3	8/17/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,656.02

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99B	F25	WF99B0D6	5.3	8/17/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	120.85101
WF99B	F25	WF99B0D6	5.3	8/17/99	CYLINDROTHECA CLOSTERIUM	2,224.33
WF99B	F25	WF99B0D6	5.3	8/17/99	EUTREPTIA/EUTREPTIELLA SPP.	88.59135
WF99B	F25	WF99B0D6	5.3	8/17/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	3,433.62
WF99B	F25	WF99B0D6	5.3	8/17/99	GYRODINIUM SP. GROUP 2 21-40UM W 21-50UM	5,753.33
WF99B	F25	WF99B0D6	5.3	8/17/99	HETEROCAPSA ROTUNDATA	61.42896
WF99B	F25	WF99B0D6	5.3	8/17/99	HETEROCAPSA TRIQUETRA	1,099.32
WF99B	F25	WF99B0D6	5.3	8/17/99	LEPTOCYLINDRUS DANICUS	32,566.99
WF99B	F25	WF99B0D6	5.3	8/17/99	LEPTOCYLINDRUS MINIMUS	959.95737
WF99B	F25	WF99B0D6	5.3	8/17/99	LITHODESMIUM UNDULATUM	4,763.98
WF99B	F25	WF99B0D6	5.3	8/17/99	ODONTELLA SINENSIS	229,244.80
WF99B	F25	WF99B0D6	5.3	8/17/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	47.60587
WF99B	F25	WF99B0D6	5.3	8/17/99	PROROCENTRUM MINIMUM	2,686.82
WF99B	F25	WF99B0D6	5.3	8/17/99	PROROCENTRUM TRIESTINUM	447.80318
WF99B	F25	WF99B0D6	5.3	8/17/99	PROTOPERIDINIUM BIPES	1,514.24
WF99B	F25	WF99B0D6	5.3	8/17/99	PSEUDONITZSCHIA SPP.	1,878.64
WF99B	F25	WF99B0D6	5.3	8/17/99	RHIZOSOLENIA FRAGILISSIMA	56,988.48
WF99B	F25	WF99B0D6	5.3	8/17/99	RHIZOSOLENIA STOLTERFOTHII	29,761.70
WF99B	F25	WF99B0D6	5.3	8/17/99	THALASSIONEMA NITZSCHIOIDES	242.69094
WF99B	F25	WF99B0D6	5.3	8/17/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	2,847.60
WF99B	F25	WF99B0D6	5.3	8/17/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	19,550.32
WF99B	F25	WF99B0D6	5.3	8/17/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	1,099.44
WF99B	F25	WF99B0D8	2.3	8/17/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	751.75808
WF99B	F25	WF99B0D8	2.3	8/17/99	CERATAULINA PELAGICA	597.86744
WF99B	F25	WF99B0D8	2.3	8/17/99	CERATIUM TRIPOS	15,215.29
WF99B	F25	WF99B0D8	2.3	8/17/99	CHAETOCEROS DIDYMUS	149.37655
WF99B	F25	WF99B0D8	2.3	8/17/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	850.99275
WF99B	F25	WF99B0D8	2.3	8/17/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	643.83421
WF99B	F25	WF99B0D8	2.3	8/17/99	CYLINDROTHECA CLOSTERIUM	1,844.87
WF99B	F25	WF99B0D8	2.3	8/17/99	EUTREPTIA/EUTREPTIELLA SPP.	61.23174
WF99B	F25	WF99B0D8	2.3	8/17/99	GUINARDIA FLACCIDA	2,298.64
WF99B	F25	WF99B0D8	2.3	8/17/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	970.86254
WF99B	F25	WF99B0D8	2.3	8/17/99	GYRODINIUM SPIRALE	4,375.33
WF99B	F25	WF99B0D8	2.3	8/17/99	LEPTOCYLINDRUS DANICUS	77,540.45
WF99B	F25	WF99B0D8	2.3	8/17/99	LEPTOCYLINDRUS MINIMUS	787.03914
WF99B	F25	WF99B0D8	2.3	8/17/99	LICMOPHORA SPP.	276.03664
WF99B	F25	WF99B0D8	2.3	8/17/99	LITHODESMIUM UNDULATUM	9,878.18
WF99B	F25	WF99B0D8	2.3	8/17/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	296.63234
WF99B	F25	WF99B0D8	2.3	8/17/99	PROROCENTRUM MINIMUM	928.52526
WF99B	F25	WF99B0D8	2.3	8/17/99	PROROCENTRUM TRIESTINUM	231.74137
WF99B	F25	WF99B0D8	2.3	8/17/99	PROTOPERIDINIUM DEPRESSUM	24,210.13
WF99B	F25	WF99B0D8	2.3	8/17/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	2,363.62

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99B	F25	WF99B0D8	2.3	8/17/99	PSEUDONITZSCHIA SPP.	518.51303
WF99B	F25	WF99B0D8	2.3	8/17/99	PYRAMIMONAS SP. GROUP 1 10-20 MICRONS LE	359.68594
WF99B	F25	WF99B0D8	2.3	8/17/99	RHIZOSOLENIA DELICATULA	682.13075
WF99B	F25	WF99B0D8	2.3	8/17/99	RHIZOSOLENIA FRAGILISSIMA	5,665.12
WF99B	F25	WF99B0D8	2.3	8/17/99	RHIZOSOLENIA STOLTERFOTHII	33,880.68
WF99B	F25	WF99B0D8	2.3	8/17/99	SCRIPPSIELLA TROCHOIDEA	1,058.51
WF99B	F25	WF99B0D8	2.3	8/17/99	SKELETONEMA COSTATUM	268.60885
WF99B	F25	WF99B0D8	2.3	8/17/99	STRIATELLA SPP.	13,895.31
WF99B	F25	WF99B0D8	2.3	8/17/99	THALASSIONEMA NITZSCHIOIDES	125.59431
WF99B	F25	WF99B0D8	2.3	8/17/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	2,287.34
WF99B	F25	WF99B0D8	2.3	8/17/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	12,989.67
WF99B	F25	WF99B0D8	2.3	8/17/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	5,699.25
WF99B	N16	WF99B0F7	8.25	8/17/99	CALYCOMONAS OVALIS	22.19599
WF99B	N16	WF99B0F7	8.25	8/17/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	311.00299
WF99B	N16	WF99B0F7	8.25	8/17/99	CERATAULINA PELAGICA	10,274.05
WF99B	N16	WF99B0F7	8.25	8/17/99	CERATIUM FUSUS	4,251.57
WF99B	N16	WF99B0F7	8.25	8/17/99	CERATIUM LONGIPES	14,131.87
WF99B	N16	WF99B0F7	8.25	8/17/99	CERATIUM MACROCEROS	4,223.72
WF99B	N16	WF99B0F7	8.25	8/17/99	CERATIUM TRIPOS	65,366.80
WF99B	N16	WF99B0F7	8.25	8/17/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	1,953.13
WF99B	N16	WF99B0F7	8.25	8/17/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	678.71457
WF99B	N16	WF99B0F7	8.25	8/17/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	239.23307
WF99B	N16	WF99B0F7	8.25	8/17/99	CYLINDROTHECA CLOSTERIUM	9,246.75
WF99B	N16	WF99B0F7	8.25	8/17/99	GUINARDIA FLACCIDA	32,917.46
WF99B	N16	WF99B0F7	8.25	8/17/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	2,471.67
WF99B	N16	WF99B0F7	8.25	8/17/99	GYRODINIUM SP. GROUP 1 5-20UM W 10-20UM	154.22
WF99B	N16	WF99B0F7	8.25	8/17/99	HETEROCAPSA ROTUNDATA	60.80147
WF99B	N16	WF99B0F7	8.25	8/17/99	LEPTOCYLINDRUS DANICUS	50,401.66
WF99B	N16	WF99B0F7	8.25	8/17/99	LEPTOCYLINDRUS MINIMUS	651.1976
WF99B	N16	WF99B0F7	8.25	8/17/99	PROBOSCIA ALATA	3,916.10
WF99B	N16	WF99B0F7	8.25	8/17/99	PROROCENTRUM MINIMUM	3,102.60
WF99B	N16	WF99B0F7	8.25	8/17/99	PROROCENTRUM TRIESTINUM	886.45785
WF99B	N16	WF99B0F7	8.25	8/17/99	PSEUDONITZSCHIA SPP.	928.16527
WF99B	N16	WF99B0F7	8.25	8/17/99	RHIZOSOLENIA DELICATULA	651.22639
WF99B	N16	WF99B0F7	8.25	8/17/99	RHIZOSOLENIA FRAGILISSIMA	57,266.03
WF99B	N16	WF99B0F7	8.25	8/17/99	RHIZOSOLENIA STOLTERFOTHII	13,862.44
WF99B	N16	WF99B0F7	8.25	8/17/99	THALASSIONEMA NITZSCHIOIDES	59.95209
WF99B	N16	WF99B0F7	8.25	8/17/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	13,179.99
WF99B	N16	WF99B0F7	8.25	8/17/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	2,176.42
WF99B	N16	WF99B0F8	2.45	8/17/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	238.76593
WF99B	N16	WF99B0F8	2.45	8/17/99	CERATAULINA PELAGICA	5,981.49

Survey	Sta.	Sample Number	Depth (m)	Samplin g Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99B	N16	WF99B0F8	2.45	8/17/99	CERATIUM MACROCEROS	8,445.13
WF99B	N16	WF99B0F8	2.45	8/17/99	CERATIUM TRIPOS	43,565.96
WF99B	N16	WF99B0F8	2.45	8/17/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	204.14471
WF99B	N16	WF99B0F8	2.45	8/17/99	CYLINDROTHECA CLOSTERIUM	3,290.42
WF99B	N16	WF99B0F8	2.45	8/17/99	EUCAMPIA CORNUTA	
WF99B	N16	WF99B0F8	2.45	8/17/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	4,625.34
WF99B	N16	WF99B0F8	2.45	8/17/99	LEPTOCYLINDRUS DANICUS	75,978.85
WF99B	N16	WF99B0F8	2.45	8/17/99	LEPTOCYLINDRUS MINIMUS	486.62569
WF99B	N16	WF99B0F8	2.45	8/17/99	PENNATE DIATOM SP. GROUP 1 <10 MICRONS L	4.61097
WF99B	N16	WF99B0F8	2.45	8/17/99	PROBOSCIA ALATA	15,660.11
WF99B	N16	WF99B0F8	2.45	8/17/99	PROROCENTRUM MINIMUM	1,327.09
WF99B	N16	WF99B0F8	2.45	8/17/99	PROTOPERIDINIUM DEPRESSUM	138,641.75
WF99B	N16	WF99B0F8	2.45	8/17/99	PSEUDONITZSCHIA SPP.	1,855.82
WF99B	N16	WF99B0F8	2.45	8/17/99	RHIZOSOLENIA DELICATULA	324.43147
WF99B	N16	WF99B0F8	2.45	8/17/99	RHIZOSOLENIA FRAGILISSIMA	26,433.82
WF99B	N16	WF99B0F8	2.45	8/17/99	RHIZOSOLENIA STOLTERFOTHII	5,188.26
WF99B	N16	WF99B0F8	2.45	8/17/99	THALASSIONEMA NITZSCHIOIDES	359.61425
WF99B	N16	WF99B0F8	2.45	8/17/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	266.09519
WF99B	N16	WF99B0F8	2.45	8/17/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	8,789.43
WF99B	N16	WF99B0F8	2.45	8/17/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	2,172.17
WF99B	F24	WF99B123	4.82	8/17/99	CALYCOMONAS OVALIS	37.93948
WF99B	F24	WF99B123	4.82	8/17/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	1,213.13
WF99B	F24	WF99B123	4.82	8/17/99	CERATAULINA PELAGICA	5,863.64
WF99B	F24	WF99B123	4.82	8/17/99	CERATIUM TRIPOS	6,207.28
WF99B	F24	WF99B123	4.82	8/17/99	CHAETOCEROS DECIPIENS	1,219.64
WF99B	F24	WF99B123	4.82	8/17/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	1,669.24
WF99B	F24	WF99B123	4.82	8/17/99	CHOANOFLAGELLATE SPP.	33.44514
WF99B	F24	WF99B123	4.82	8/17/99	COSCINODISCUS SP. GROUP 2 DIAM 40-100 MI	4,260.78
WF99B	F24	WF99B123	4.82	8/17/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	806.5543
WF99B	F24	WF99B123	4.82	8/17/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	4,566.27
WF99B	F24	WF99B123	4.82	8/17/99	CYLINDROTHECA CLOSTERIUM	1,627.98
WF99B	F24	WF99B123	4.82	8/17/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	1,056.20
WF99B	F24	WF99B123	4.82	8/17/99	GYRODINIUM SP. GROUP 2 21-40UM W 21-50UM	3,244.56
WF99B	F24	WF99B123	4.82	8/17/99	LEPTOCYLINDRUS DANICUS	1,642.49
WF99B	F24	WF99B123	4.82	8/17/99	LEPTOCYLINDRUS MINIMUS	142.70362
WF99B	F24	WF99B123	4.82	8/17/99	LITHODESMIUM UNDULATUM	12,089.81
WF99B	F24	WF99B123	4.82	8/17/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	484.06052
WF99B	F24	WF99B123	4.82	8/17/99	PROROCENTRUM MINIMUM	1,512.67
WF99B	F24	WF99B123	4.82	8/17/99	PROROCENTRUM TRIESTINUM	252.11197
WF99B	F24	WF99B123	4.82	8/17/99	PROTOPERIDINIUM BIPES	426.97412
WF99B	F24	WF99B123	4.82	8/17/99	PSEUDONITZSCHIA SPP.	635.67081

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99B	F24	WF99B123	4.82	8/17/99	RHIZOSOLENIA DELICATULA	1,855.23
WF99B	F24	WF99B123	4.82	8/17/99	RHIZOSOLENIA FRAGILISSIMA	1,087.61
WF99B	F24	WF99B123	4.82	8/17/99	RHIZOSOLENIA SETIGERA	2,293.87
WF99B	F24	WF99B123	4.82	8/17/99	SCRIPPSIELLA TROCHOIDEA	1,153.49
WF99B	F24	WF99B123	4.82	8/17/99	SKELETONEMA COSTATUM	172.20119
WF99B	F24	WF99B123	4.82	8/17/99	THALASSIONEMA NITZSCHIOIDES	307.42726
WF99B	F24	WF99B123	4.82	8/17/99	THALASSIOSIRA ROTULA	8,441.38
WF99B	F24	WF99B123	4.82	8/17/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	3,168.37
WF99B	F24	WF99B123	4.82	8/17/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	4,027.82
WF99B	F24	WF99B123	4.82	8/17/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	1,033.37
WF99B	F24	WF99B124	2.28	8/17/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	1,267.95
WF99B	F24	WF99B124	2.28	8/17/99	CERATIUM TRIPOS	14,257.10
WF99B	F24	WF99B124	2.28	8/17/99	CHAETOCEROS DIDYMUS	140.20496
WF99B	F24	WF99B124	2.28	8/17/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	637.92062
WF99B	F24	WF99B124	2.28	8/17/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	950.63596
WF99B	F24	WF99B124	2.28	8/17/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	1,174.03
WF99B	F24	WF99B124	2.28	8/17/99	CYLINDROTHECA CLOSTERIUM	2,304.91
WF99B	F24	WF99B124	2.28	8/17/99	EUTREPTIA/EUTREPTIELLA SPP.	286.8781
WF99B	F24	WF99B124	2.28	8/17/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	2,223.76
WF99B	F24	WF99B124	2.28	8/17/99	HETEROCAPSA ROTUNDATA	119.35223
WF99B	F24	WF99B124	2.28	8/17/99	LEPTOCYLINDRUS DANICUS	2,061.20
WF99B	F24	WF99B124	2.28	8/17/99	LICMOPHORA SPP.	172.43534
WF99B	F24	WF99B124	2.28	8/17/99	LITHODESMIUM UNDULATUM	6,170.73
WF99B	F24	WF99B124	2.28	8/17/99	PENNATE DIATOM SP. GROUP 1 <10 MICRONS L	24.22458
WF99B	F24	WF99B124	2.28	8/17/99	PROBOSCIA ALATA	2,562.41
WF99B	F24	WF99B124	2.28	8/17/99	PROROCENTRUM MICANS	581.29722
WF99B	F24	WF99B124	2.28	8/17/99	PROROCENTRUM MINIMUM	2,895.30
WF99B	F24	WF99B124	2.28	8/17/99	PROROCENTRUM TRIESTINUM	1,447.65
WF99B	F24	WF99B124	2.28	8/17/99	PYRAMIMONAS SP. GROUP 1 10-20 MICRONS LE	74.89654
WF99B	F24	WF99B124	2.28	8/17/99	RHIZOSOLENIA FRAGILISSIMA	2,502.25
WF99B	F24	WF99B124	2.28	8/17/99	SCRIPPSIELLA TROCHOIDEA	661.23005
WF99B	F24	WF99B124	2.28	8/17/99	SKELETONEMA COSTATUM	53.93421
WF99B	F24	WF99B124	2.28	8/17/99	THALASSIONEMA NITZSCHIOIDES	196.1415
WF99B	F24	WF99B124	2.28	8/17/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	5,881.59
WF99B	F24	WF99B124	2.28	8/17/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	16,503.25
WF99B	F24	WF99B124	2.28	8/17/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	4,509.62
WF99B	F30	WF99B12F	5.21	8/17/99	CALYCOMONAS WULFFII	21.97974
WF99B	F30	WF99B12F	5.21	8/17/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	751.95227
WF99B	F30	WF99B12F	5.21	8/17/99	CERATAULINA PELAGICA	868.09627
WF99B	F30	WF99B12F	5.21	8/17/99	CHAETOCEROS DECIPIENS	2,170.42
WF99B	F30	WF99B12F	5.21	8/17/99	CHAETOCEROS DIDYMUS	651.7737

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99B	F30	WF99B12F	5.21	8/17/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	6,178.16
WF99B	F30	WF99B12F	5.21	8/17/99	CHAETOCEROS SPP.(<10UM)	211.2251
WF99B	F30	WF99B12F	5.21	8/17/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	2,285.16
WF99B	F30	WF99B12F	5.21	8/17/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	2,668.22
WF99B	F30	WF99B12F	5.21	8/17/99	CYANOPHYCEAE (NOSTOC-LIKE 4um diam)	61.29808
WF99B	F30	WF99B12F	5.21	8/17/99	CYLINDROTHECA CLOSTERIUM	891.40869
WF99B	F30	WF99B12F	5.21	8/17/99	EUTREPTIA/EUTREPTIELLA SPP.	356.2294
WF99B	F30	WF99B12F	5.21	8/17/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	1,253.05
WF99B	F30	WF99B12F	5.21	8/17/99	GYRODINIUM SPIRALE	25,411.70
WF99B	F30	WF99B12F	5.21	8/17/99	HETEROCAPSA ROTUNDATA	61.64835
WF99B	F30	WF99B12F	5.21	8/17/99	HETEROCAPSA TRIQUETRA	1,376.74
WF99B	F30	WF99B12F	5.21	8/17/99	LEPTOCYLINDRUS DANICUS	265.71789
WF99B	F30	WF99B12F	5.21	8/17/99	LEPTOCYLINDRUS MINIMUS	101.40903
WF99B	F30	WF99B12F	5.21	8/17/99	LITHODESMIUM UNDULATUM	16,733.50
WF99B	F30	WF99B12F	5.21	8/17/99	PARALIA SULCATA	871.17788
WF99B	F30	WF99B12F	5.21	8/17/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	95.71257
WF99B	F30	WF99B12F	5.21	8/17/99	PENNATE DIATOM SP. GROUP 3 31-60 MICRONS	887.97011
WF99B	F30	WF99B12F	5.21	8/17/99	PROROCENTRUM MINIMUM	2,696.41
WF99B	F30	WF99B12F	5.21	8/17/99	PROROCENTRUM TRIESTINUM	4,037.83
WF99B	F30	WF99B12F	5.21	8/17/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	2,287.97
WF99B	F30	WF99B12F	5.21	8/17/99	PSEUDONITZSCHIA SPP.	94.10933
WF99B	F30	WF99B12F	5.21	8/17/99	PYRAMIMONAS SP. GROUP 1 10-20 MICRONS LE	116.05769
WF99B	F30	WF99B12F	5.21	8/17/99	RHIZOSOLENIA FRAGILISSIMA	1,938.71
WF99B	F30	WF99B12F	5.21	8/17/99	SCRIPPSIELLA TROCHOIDEA	512.3123
WF99B	F30	WF99B12F	5.21	8/17/99	SKELETONEMA COSTATUM	2,033.66
WF99B	F30	WF99B12F	5.21	8/17/99	THALASSIONEMA NITZSCHIOIDES	60.78714
WF99B	F30	WF99B12F	5.21	8/17/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	3,475.66
WF99B	F30	WF99B12F	5.21	8/17/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	17,797.84
WF99B	F30	WF99B12F	5.21	8/17/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	8,826.92
WF99B	F30	WF99B130	2.86	8/17/99	CALYCOMONAS WULFFII	21.97974
WF99B	F30	WF99B130	2.86	8/17/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	776.20879
WF99B	F30	WF99B130	2.86	8/17/99	CHAETOCEROS DIDYMUS	108.44647
WF99B	F30	WF99B130	2.86	8/17/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	1,977.01
WF99B	F30	WF99B130	2.86	8/17/99	CHAETOCEROS SPP.(<10UM)	271.57513
WF99B	F30	WF99B130	2.86	8/17/99	CHOANOFLAGELLATE SPP.	59.51751
WF99B	F30	WF99B130	2.86	8/17/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,945.22
WF99B	F30	WF99B130	2.86	8/17/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	2,061.80
WF99B	F30	WF99B130	2.86	8/17/99	CYLINDROTHECA CLOSTERIUM	892.90865
WF99B	F30	WF99B130	2.86	8/17/99	EUTREPTIA/EUTREPTIELLA SPP.	534.34409
WF99B	F30	WF99B130	2.86	8/17/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	626.52473
WF99B	F30	WF99B130	2.86	8/17/99	GYRODINIUM SPIRALE	6,352.93

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99B	F30	WF99B130	2.86	8/17/99	HETEROCAPSA ROTUNDATA	123.2967
WF99B	F30	WF99B130	2.86	8/17/99	HETEROCAPSA TRIQUETRA	275.34883
WF99B	F30	WF99B130	2.86	8/17/99	LEPTOCYLINDRUS DANICUS	265.71789
WF99B	F30	WF99B130	2.86	8/17/99	LEPTOCYLINDRUS MINIMUS	457.10852
WF99B	F30	WF99B130	2.86	8/17/99	LITHODESMIUM UNDULATUM	20,319.24
WF99B	F30	WF99B130	2.86	8/17/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	286.65535
WF99B	F30	WF99B130	2.86	8/17/99	PROROCENTRUM MINIMUM	4,943.43
WF99B	F30	WF99B130	2.86	8/17/99	PROROCENTRUM TRIESTINUM	4,044.62
WF99B	F30	WF99B130	2.86	8/17/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	1,713.09
WF99B	F30	WF99B130	2.86	8/17/99	PYRAMIMONAS SP. GROUP 1 10-20 MICRONS LE	116.05769
WF99B	F30	WF99B130	2.86	8/17/99	SKELETONEMA COSTATUM	1,337.20
WF99B	F30	WF99B130	2.86	8/17/99	THALASSIONEMA NITZSCHIOIDES	334.32925
WF99B	F30	WF99B130	2.86	8/17/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	5,213.50
WF99B	F30	WF99B130	2.86	8/17/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	18,648.25
WF99B	F30	WF99B130	2.86	8/17/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	4,781.25
WF99B	F23	WF99B149	8.97	8/18/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	420.44643
WF99B	F23	WF99B149	8.97	8/18/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	1,320.22
WF99B	F23	WF99B149	8.97	8/18/99	CHAETOCEROS SPP.(<10UM)	241.80632
WF99B	F23	WF99B149	8.97	8/18/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	906.51099
WF99B	F23	WF99B149	8.97	8/18/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	161.71016
WF99B	F23	WF99B149	8.97	8/18/99	CYLINDROTHECA CLOSTERIUM	1,188.54
WF99B	F23	WF99B149	8.97	8/18/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	417.68315
WF99B	F23	WF99B149	8.97	8/18/99	LEPTOCYLINDRUS DANICUS	1,417.16
WF99B	F23	WF99B149	8.97	8/18/99	LEPTOCYLINDRUS MINIMUS	405.63612
WF99B	F23	WF99B149	8.97	8/18/99	LITHODESMIUM UNDULATUM	19,123.99
WF99B	F23	WF99B149	8.97	8/18/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	254.80476
WF99B	F23	WF99B149	8.97	8/18/99	PROROCENTRUM MINIMUM	599.2033
WF99B	F23	WF99B149	8.97	8/18/99	PROROCENTRUM TRIESTINUM	1,196.39
WF99B	F23	WF99B149	8.97	8/18/99	PSEUDONITZSCHIA SPP.	250.95821
WF99B	F23	WF99B149	8.97	8/18/99	RHIZOSOLENIA FRAGILISSIMA	1,292.47
WF99B	F23	WF99B149	8.97	8/18/99	SKELETONEMA COSTATUM	891.46697
WF99B	F23	WF99B149	8.97	8/18/99	THALASSIONEMA NITZSCHIOIDES	486.2971
WF99B	F23	WF99B149	8.97	8/18/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	8,753.52
WF99B	F23	WF99B149	8.97	8/18/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	18,061.06
WF99B	F23	WF99B149	8.97	8/18/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	490.38462
WF99B	F23	WF99B14B	1.78	8/18/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	1,164.31
WF99B	F23	WF99B14B	1.78	8/18/99	CERATIUM FUSUS	4,057.21
WF99B	F23	WF99B14B	1.78	8/18/99	CHAETOCEROS DIDYMUS	204.47802
WF99B	F23	WF99B14B	1.78	8/18/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	1,395.54
WF99B	F23	WF99B14B	1.78	8/18/99	CHAETOCEROS SPP.(<10UM)	198.8001
WF99B	F23	WF99B14B	1.78	8/18/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10	1,475.30

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
					MICRO	
WF99B	F23	WF99B14B	1.78	8/18/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	228.2967
WF99B	F23	WF99B14B	1.78	8/18/99	CYLINDROTHECA CLOSTERIUM	1,887.69
WF99B	F23	WF99B14B	1.78	8/18/99	EUTREPTIA/EUTREPTIELLA SPP.	251.03363
WF99B	F23	WF99B14B	1.78	8/18/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	884.50549
WF99B	F23	WF99B14B	1.78	8/18/99	HETEROCAPSA ROTUNDATA	58.02198
WF99B	F23	WF99B14B	1.78	8/18/99	LEPTOCYLINDRUS DANICUS	2,500.87
WF99B	F23	WF99B14B	1.78	8/18/99	LEPTOCYLINDRUS MINIMUS	286.33138
WF99B	F23	WF99B14B	1.78	8/18/99	LITHODESMIUM UNDULATUM	11,249.41
WF99B	F23	WF99B14B	1.78	8/18/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	269.79327
WF99B	F23	WF99B14B	1.78	8/18/99	PROROCENTRUM MINIMUM	1,477.90
WF99B	F23	WF99B14B	1.78	8/18/99	PROROCENTRUM TRIESTINUM	2,960.77
WF99B	F23	WF99B14B	1.78	8/18/99	RHIZOSOLENIA FRAGILISSIMA	2,277.01
WF99B	F23	WF99B14B	1.78	8/18/99	SKELETONEMA COSTATUM	891.46697
WF99B	F23	WF99B14B	1.78	8/18/99	THALASSIONEMA NITZSCHIOIDES	228.84569
WF99B	F23	WF99B14B	1.78	8/18/99	THALASSIOSIRA ROTULA	2,016.36
WF99B	F23	WF99B14B	1.78	8/18/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	7,342.05
WF99B	F23	WF99B14B	1.78	8/18/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	17,265.44
WF99B	F23	WF99B14B	1.78	8/18/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	692.30769
WF99B	N04	WF99B18A	9.72	8/18/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	354.60287
WF99B	N04	WF99B18A	9.72	8/18/99	CERATAULINA PELAGICA	676.83106
WF99B	N04	WF99B18A	9.72	8/18/99	CERATIUM FUSUS	2,520.75
WF99B	N04	WF99B18A	9.72	8/18/99	CERATIUM TRIPOS	25,837.29
WF99B	N04	WF99B18A	9.72	8/18/99	CHAETOCEROS SPP.(<10UM)	17.64498
WF99B	N04	WF99B18A	9.72	8/18/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,454.06
WF99B	N04	WF99B18A	9.72	8/18/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	236.40191
WF99B	N04	WF99B18A	9.72	8/18/99	CYLINDROTHECA CLOSTERIUM	1,390.01
WF99B	N04	WF99B18A	9.72	8/18/99	DICTYOCHA SPECULUM	68.21703
WF99B	N04	WF99B18A	9.72	8/18/99	GUINARDIA FLACCIDA	9,107.81
WF99B	N04	WF99B18A	9.72	8/18/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	610.60537
WF99B	N04	WF99B18A	9.72	8/18/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	562.71664
WF99B	N04	WF99B18A	9.72	8/18/99	HETEROCAPSA ROTUNDATA	60.08193
WF99B	N04	WF99B18A	9.72	8/18/99	LEPTOCYLINDRUS DANICUS	1,605.59
WF99B	N04	WF99B18A	9.72	8/18/99	LEPTOCYLINDRUS MINIMUS	19.76647
WF99B	N04	WF99B18A	9.72	8/18/99	PROBOSCIA ALATA	7,752.53
WF99B	N04	WF99B18A	9.72	8/18/99	PROROCENTRUM MICANS	175.57507
WF99B	N04	WF99B18A	9.72	8/18/99	PROROCENTRUM MINIMUM	2,452.71
WF99B	N04	WF99B18A	9.72	8/18/99	PROTOPERIDINIUM DEPRESSUM	13,703.85
WF99B	N04	WF99B18A	9.72	8/18/99	PSEUDONITZSCHIA SPP.	36.68724
WF99B	N04	WF99B18A	9.72	8/18/99	RHIZOSOLENIA DELICATULA	192.73156
WF99B	N04	WF99B18A	9.72	8/18/99	RHIZOSOLENIA FRAGILISSIMA	471.56938

Survey	Sta.	Sample Number	Depth (m)	Samplin g Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99B	N04	WF99B18A	9.72	8/18/99	RHIZOSOLENIA HEBETATA	157.95849
WF99B	N04	WF99B18A	9.72	8/18/99	SCRIPPSIELLA TROCHOIDEA	399.43597
WF99B	N04	WF99B18A	9.72	8/18/99	THALASSIONEMA NITZSCHIOIDES	59.2426
WF99B	N04	WF99B18A	9.72	8/18/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	15.05489
WF99B	N04	WF99B18A	9.72	8/18/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	27,409.62
WF99B	N04	WF99B18A	9.72	8/18/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	1,792.22
WF99B	N04	WF99B18B	2.06	8/18/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	1,318.41
WF99B	N04	WF99B18B	2.06	8/18/99	CERATAULINA PELAGICA	3,437.31
WF99B	N04	WF99B18B	2.06	8/18/99	CERATIUM FUSUS	4,260.07
WF99B	N04	WF99B18B	2.06	8/18/99	CERATIUM MACROCEROS	4,232.17
WF99B	N04	WF99B18B	2.06	8/18/99	CERATIUM TRIPOS	32,748.77
WF99B	N04	WF99B18B	2.06	8/18/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	877.18269
WF99B	N04	WF99B18B	2.06	8/18/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	119.85577
WF99B	N04	WF99B18B	2.06	8/18/99	CYLINDROTHECA CLOSTERIUM	36,178.56
WF99B	N04	WF99B18B	2.06	8/18/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	2,167.04
WF99B	N04	WF99B18B	2.06	8/18/99	GYRODINIUM SPIRALE	50,310
WF99B	N04	WF99B18B	2.06	8/18/99	LEPTOCYLINDRUS DANICUS	75,227.63
WF99B	N04	WF99B18B	2.06	8/18/99	LEPTOCYLINDRUS MINIMUS	375.80994
WF99B	N04	WF99B18B	2.06	8/18/99	PROBOSCIA ALATA	3,923.93
WF99B	N04	WF99B18B	2.06	8/18/99	PROROCENTRUM MINIMUM	6,661.73
WF99B	N04	WF99B18B	2.06	8/18/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	1,128.62
WF99B	N04	WF99B18B	2.06	8/18/99	PSEUDONITZSCHIA SPP.	372.63462
WF99B	N04	WF99B18B	2.06	8/18/99	RHIZOSOLENIA DELICATULA	1,305.06
WF99B	N04	WF99B18B	2.06	8/18/99	RHIZOSOLENIA FRAGILISSIMA	28,212.11
WF99B	N04	WF99B18B	2.06	8/18/99	SKELETONEMA COSTATUM	220.61538
WF99B	N04	WF99B18B	2.06	8/18/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	228.98488
WF99B	N04	WF99B18B	2.06	8/18/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	27,073.01
WF99B	N04	WF99B18B	2.06	8/18/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	5,815.38
WF99B	N18	WF99B1B5	7.12	8/18/99	AMPHIDINIUM SPP.	867.82704
WF99B	N18	WF99B1B5	7.12	8/18/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	728.53507
WF99B	N18	WF99B1B5	7.12	8/18/99	CERATAULINA PELAGICA	3,369.91
WF99B	N18	WF99B1B5	7.12	8/18/99	CHAETOCEROS DIDYMUS	105.06924
WF99B	N18	WF99B1B5	7.12	8/18/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	2,394.30
WF99B	N18	WF99B1B5	7.12	8/18/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	611.93693
WF99B	N18	WF99B1B5	7.12	8/18/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	235.01131
WF99B	N18	WF99B1B5	7.12	8/18/99	CYLINDROTHECA CLOSTERIUM	5,623.16
WF99B	N18	WF99B1B5	7.12	8/18/99	DICTYOCHA SPECULUM	339.07876
WF99B	N18	WF99B1B5	7.12	8/18/99	DINOPHYSIS NORVEGICA	5,978.06
WF99B	N18	WF99B1B5	7.12	8/18/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	1,517.53
WF99B	N18	WF99B1B5	7.12	8/18/99	HETEROCAPSA ROTUNDATA	59.72851

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99B	N18	WF99B1B5	7.12	8/18/99	LEPTOCYLINDRUS DANICUS	62,921.78
WF99B	N18	WF99B1B5	7.12	8/18/99	LEPTOCYLINDRUS MINIMUS	442.8733
WF99B	N18	WF99B1B5	7.12	8/18/99	LITHODESMIUM UNDULATUM	2,316.05
WF99B	N18	WF99B1B5	7.12	8/18/99	PROROCENTRUM MINIMUM	435.40724
WF99B	N18	WF99B1B5	7.12	8/18/99	PROROCENTRUM TRIESTINUM	435.40724
WF99B	N18	WF99B1B5	7.12	8/18/99	PROTOPERIDINIUM BIPES	736.16228
WF99B	N18	WF99B1B5	7.12	8/18/99	PSEUDONITZSCHIA SPP.	1,094.14
WF99B	N18	WF99B1B5	7.12	8/18/99	RHIZOSOLENIA DELICATULA	1,279.47
WF99B	N18	WF99B1B5	7.12	8/18/99	RHIZOSOLENIA FRAGILISSIMA	9,844.70
WF99B	N18	WF99B1B5	7.12	8/18/99	RHIZOSOLENIA STOLTERFOTHII	68,089.05
WF99B	N18	WF99B1B5	7.12	8/18/99	THALASSIONEMA NITZSCHIOIDES	353.95928
WF99B	N18	WF99B1B5	7.12	8/18/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	2,095.29
WF99B	N18	WF99B1B5	7.12	8/18/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	11,240.70
WF99B	N18	WF99B1B5	7.12	8/18/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	2,850.68
WF99B	N18	WF99B1B7	2.26	8/18/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	1,249.41
WF99B	N18	WF99B1B7	2.26	8/18/99	CERATIUM TRIPOS	37,931.23
WF99B	N18	WF99B1B7	2.26	8/18/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	850.02681
WF99B	N18	WF99B1B7	2.26	8/18/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	258.9675
WF99B	N18	WF99B1B7	2.26	8/18/99	CYLINDROTHECA CLOSTERIUM	2,487.05
WF99B	N18	WF99B1B7	2.26	8/18/99	EBRIA TRIPARTITA	609.74438
WF99B	N18	WF99B1B7	2.26	8/18/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	2,420.33
WF99B	N18	WF99B1B7	2.26	8/18/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	4,956.68
WF99B	N18	WF99B1B7	2.26	8/18/99	GYRODINIUM SPIRALE	32,722.67
WF99B	N18	WF99B1B7	2.26	8/18/99	HETEROCAPSA ROTUNDATA	52.92308
WF99B	N18	WF99B1B7	2.26	8/18/99	LEPTOCYLINDRUS DANICUS	150,348.97
WF99B	N18	WF99B1B7	2.26	8/18/99	LEPTOCYLINDRUS MINIMUS	1,090.03
WF99B	N18	WF99B1B7	2.26	8/18/99	LITHODESMIUM UNDULATUM	6,156.49
WF99B	N18	WF99B1B7	2.26	8/18/99	PROBOSCIA ALATA	6,817.33
WF99B	N18	WF99B1B7	2.26	8/18/99	PROROCENTRUM MINIMUM	1,928.99
WF99B	N18	WF99B1B7	2.26	8/18/99	PROROCENTRUM TRIESTINUM	1,543.19
WF99B	N18	WF99B1B7	2.26	8/18/99	PROTOPERIDINIUM BIPES	652.2844
WF99B	N18	WF99B1B7	2.26	8/18/99	PROTOPERIDINIUM DEPRESSUM	60,355.06
WF99B	N18	WF99B1B7	2.26	8/18/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	3,928.29
WF99B	N18	WF99B1B7	2.26	8/18/99	PSEUDONITZSCHIA SPP.	1,131.06
WF99B	N18	WF99B1B7	2.26	8/18/99	RHIZOSOLENIA FRAGILISSIMA	29,907.44
WF99B	N18	WF99B1B7	2.26	8/18/99	RHIZOSOLENIA STOLTERFOTHII	18,099.31
WF99B	N18	WF99B1B7	2.26	8/18/99	SCRIPPSIELLA TROCHOIDEA	879.60643
WF99B	N18	WF99B1B7	2.26	8/18/99	THALASSIONEMA NITZSCHIOIDES	209.08625
WF99B	N18	WF99B1B7	2.26	8/18/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	1,458.72
WF99B	N18	WF99B1B7	2.26	8/18/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	8,082.67
WF99B	N18	WF99B1B7	2.26	8/18/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	5,998.95

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99B	F31	WF99B274	6.26	8/19/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	1,913.86
WF99B	F31	WF99B274	6.26	8/19/99	CERATAULINA PELAGICA	6,860.89
WF99B	F31	WF99B274	6.26	8/19/99	CERATIUM FUSUS	4,251.57
WF99B	F31	WF99B274	6.26	8/19/99	CERATIUM TRIPOS	10,894.47
WF99B	F31	WF99B274	6.26	8/19/99	CHAETOCEROS DIDYMUS	214.27338
WF99B	F31	WF99B274	6.26	8/19/99	CHAETOCEROS SPP.(<10UM)	89.28148
WF99B	F31	WF99B274	6.26	8/19/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	875.43183
WF99B	F31	WF99B274	6.26	8/19/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	119.61654
WF99B	F31	WF99B274	6.26	8/19/99	CYLINDROTHECA CLOSTERIUM	11,448.35
WF99B	F31	WF99B274	6.26	8/19/99	DICTYOCHA SPECULUM	345.16999
WF99B	F31	WF99B274	6.26	8/19/99	EUTREPTIA/EUTREPTIELLA SPP.	175.66789
WF99B	F31	WF99B274	6.26	8/19/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	1,544.80
WF99B	F31	WF99B274	6.26	8/19/99	GYRODINIUM SPIRALE	37,593.93
WF99B	F31	WF99B274	6.26	8/19/99	HETEROCAPSA ROTUNDATA	60.80147
WF99B	F31	WF99B274	6.26	8/19/99	HETEROCAPSA TRIQUETRA	1,088.09
WF99B	F31	WF99B274	6.26	8/19/99	LEPTOCYLINDRUS DANICUS	232,582.65
WF99B	F31	WF99B274	6.26	8/19/99	LEPTOCYLINDRUS MINIMUS	1,803.32
WF99B	F31	WF99B274	6.26	8/19/99	LITHODESMIUM UNDULATUM	4,723.26
WF99B	F31	WF99B274	6.26	8/19/99	PROROCENTRUM MICANS	888.38881
WF99B	F31	WF99B274	6.26	8/19/99	PROROCENTRUM MINIMUM	2,654.91
WF99B	F31	WF99B274	6.26	8/19/99	PROROCENTRUM TRIESTINUM	1,327.45
WF99B	F31	WF99B274	6.26	8/19/99	PROTOPERIDINIUM BIPES	749.38676
WF99B	F31	WF99B274	6.26	8/19/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	3,379.12
WF99B	F31	WF99B274	6.26	8/19/99	PSEUDONITZSCHIA SPP.	3,718.91
WF99B	F31	WF99B274	6.26	8/19/99	RHIZOSOLENIA FRAGILISSIMA	15,296.64
WF99B	F31	WF99B274	6.26	8/19/99	RHIZOSOLENIA STOLTERFOTHII	43,320.13
WF99B	F31	WF99B274	6.26	8/19/99	SCRIPPSIELLA TROCHOIDEA	1,010.55
WF99B	F31	WF99B274	6.26	8/19/99	THALASSIONEMA NITZSCHIOIDES	240.21188
WF99B	F31	WF99B274	6.26	8/19/99	THALASSIOSIRA ROTULA	7,395.33
WF99B	F31	WF99B274	6.26	8/19/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	8,836.41
WF99B	F31	WF99B274	6.26	8/19/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	17,193.89
WF99B	F31	WF99B274	6.26	8/19/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	4,715.57
WF99B	F31	WF99B275	2.37	8/19/99	CALYCOMONAS WULFFII	21.17072
WF99B	F31	WF99B275	2.37	8/19/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	584.09244
WF99B	F31	WF99B275	2.37	8/19/99	CERATAULINA PELAGICA	3,350.20
WF99B	F31	WF99B275	2.37	8/19/99	CERATIUM TRIPOS	10,639.63
WF99B	F31	WF99B275	2.37	8/19/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	2,861.17
WF99B	F31	WF99B275	2.37	8/19/99	COCCONEIS SPP.	289.8673
WF99B	F31	WF99B275	2.37	8/19/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,509.81
WF99B	F31	WF99B275	2.37	8/19/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	350.45547
WF99B	F31	WF99B275	2.37	8/19/99	CYLINDROTHECA CLOSTERIUM	9,030.45

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99B	F31	WF99B275	2.37	8/19/99	EUTREPTIA/EUTREPTIELLA SPP.	85.63525
WF99B	F31	WF99B275	2.37	8/19/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	905.19568
WF99B	F31	WF99B275	2.37	8/19/99	GYRODINIUM SPIRALE	24,517.54
WF99B	F31	WF99B275	2.37	8/19/99	HETEROCAPSA ROTUNDATA	59.37922
WF99B	F31	WF99B275	2.37	8/19/99	LEPTOCYLINDRUS DANICUS	232,269.48
WF99B	F31	WF99B275	2.37	8/19/99	LEPTOCYLINDRUS MINIMUS	1,614.37
WF99B	F31	WF99B275	2.37	8/19/99	LITHODESMIUM UNDULATUM	20,722.59
WF99B	F31	WF99B275	2.37	8/19/99	PROBOSCIA ALATA	3,824.49
WF99B	F31	WF99B275	2.37	8/19/99	PROROCENTRUM MINIMUM	865.722
WF99B	F31	WF99B275	2.37	8/19/99	PROROCENTRUM TRIESTINUM	216.06693
WF99B	F31	WF99B275	2.37	8/19/99	PROTOPERIDINIUM BIPES	1,463.71
WF99B	F31	WF99B275	2.37	8/19/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	3,300.07
WF99B	F31	WF99B275	2.37	8/19/99	PSEUDONITZSCHIA SPP.	4,532.27
WF99B	F31	WF99B275	2.37	8/19/99	PYRAMIMONAS SP. GROUP 1 10-20 MICRONS LE	111.78587
WF99B	F31	WF99B275	2.37	8/19/99	RHIZOSOLENIA FRAGILISSIMA	15,872.50
WF99B	F31	WF99B275	2.37	8/19/99	RHIZOSOLENIA STOLTERFOTHII	88,146.20
WF99B	F31	WF99B275	2.37	8/19/99	SCRIPPSIELLA TROCHOIDEA	3,954.28
WF99B	F31	WF99B275	2.37	8/19/99	SKELETONEMA COSTATUM	860.09897
WF99B	F31	WF99B275	2.37	8/19/99	THALASSIONEMA NITZSCHIOIDES	586.48223
WF99B	F31	WF99B275	2.37	8/19/99	THALASSIOSIRA ROTULA	4,134.00
WF99B	F31	WF99B275	2.37	8/19/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	6,621.07
WF99B	F31	WF99B275	2.37	8/19/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	22,759.47
WF99B	F31	WF99B275	2.37	8/19/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	354.25101
WF99B	F13	WF99B2B3	11.61	8/19/99	AMPHIDINIUM SPP.	547.97679
WF99B	F13	WF99B2B3	11.61	8/19/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	266.66136
WF99B	F13	WF99B2B3	11.61	8/19/99	CERATIUM FUSUS	7,911.65
WF99B	F13	WF99B2B3	11.61	8/19/99	CERATIUM LONGIPES	13,126.75
WF99B	F13	WF99B2B3	11.61	8/19/99	CERATIUM TRIPOS	121,639.62
WF99B	F13	WF99B2B3	11.61	8/19/99	CHAETOCEROS DIDYMUS	597.10002
WF99B	F13	WF99B2B3	11.61	8/19/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	3,628.43
WF99B	F13	WF99B2B3	11.61	8/19/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	588.24875
WF99B	F13	WF99B2B3	11.61	8/19/99	CYLINDROTHECA CLOSTERIUM	1,633.27
WF99B	F13	WF99B2B3	11.61	8/19/99	GUINARDIA FLACCIDA	24,460.99
WF99B	F13	WF99B2B3	11.61	8/19/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	860.95357
WF99B	F13	WF99B2B3	11.61	8/19/99	GYRODINIUM SP. GROUP 1 5-20UM W 10-20UM	286.98452
WF99B	F13	WF99B2B3	11.61	8/19/99	LEPTOCYLINDRUS DANICUS	221,892.49
WF99B	F13	WF99B2B3	11.61	8/19/99	LEPTOCYLINDRUS MINIMUS	1,209.76
WF99B	F13	WF99B2B3	11.61	8/19/99	LITHODESMIUM UNDULATUM	4,387.32
WF99B	F13	WF99B2B3	11.61	8/19/99	PROBOSCIA ALATA	3,637.57
WF99B	F13	WF99B2B3	11.61	8/19/99	PROTOPERIDINIUM BIPES	5,578.07
WF99B	F13	WF99B2B3	11.61	8/19/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	4,192.08
WF99B	F13	WF99B2B3	11.61	8/19/99	PSEUDONITZSCHIA SPP.	3,108.96
WF99B	F13	WF99B2B3	11.61	8/19/99	RHIZOSOLENIA FRAGILISSIMA	17,760.84

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99B	F13	WF99B2B3	11.61	8/19/99	RHIZOSOLENIA SETIGERA	1,866.68
WF99B	F13	WF99B2B3	11.61	8/19/99	RHIZOSOLENIA STOLTERFOTHII	72,430.23
WF99B	F13	WF99B2B3	11.61	8/19/99	SCRIPPSIELLA TROCHOIDEA	1,880.51
WF99B	F13	WF99B2B3	11.61	8/19/99	THALASSIONEMA NITZSCHIOIDES	223.12699
WF99B	F13	WF99B2B3	11.61	8/19/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	4,316.24
WF99B	F13	WF99B2B3	11.61	8/19/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	14,524.14
WF99B	F13	WF99B2B3	11.61	8/19/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	336.93673
WF99B	F13	WF99B2B5	3.01	8/19/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	399.99203
WF99B	F13	WF99B2B5	3.01	8/19/99	CERATIUM TRIPOS	50,598.03
WF99B	F13	WF99B2B5	3.01	8/19/99	CHAETOCEROS DECIPIENS	3,976.70
WF99B	F13	WF99B2B5	3.01	8/19/99	CHAETOCEROS DIDYMUS	199.03334
WF99B	F13	WF99B2B5	3.01	8/19/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	1,814.22
WF99B	F13	WF99B2B5	3.01	8/19/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	640.15305
WF99B	F13	WF99B2B5	3.01	8/19/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	111.1089
WF99B	F13	WF99B2B5	3.01	8/19/99	CYLINDROTHECA CLOSTERIUM	10,207.92
WF99B	F13	WF99B2B5	3.01	8/19/99	EUTREPTIA/EUTREPTIELLA SPP.	81.44977
WF99B	F13	WF99B2B5	3.01	8/19/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	1,721.91
WF99B	F13	WF99B2B5	3.01	8/19/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	2,644.77
WF99B	F13	WF99B2B5	3.01	8/19/99	GYRODINIUM SP. GROUP 1 5-20UM W 10-20UM	286.98452
WF99B	F13	WF99B2B5	3.01	8/19/99	HETEROCAPSA ROTUNDATA	112.95403
WF99B	F13	WF99B2B5	3.01	8/19/99	LEPTOCYLINDRUS DANICUS	332,107.23
WF99B	F13	WF99B2B5	3.01	8/19/99	LEPTOCYLINDRUS MINIMUS	1,954.23
WF99B	F13	WF99B2B5	3.01	8/19/99	PROBOSCIA ALATA	3,637.57
WF99B	F13	WF99B2B5	3.01	8/19/99	PROROCENTRUM MICANS	1,653.18
WF99B	F13	WF99B2B5	3.01	8/19/99	PROTOPERIDINIUM BIPES	696.08718
WF99B	F13	WF99B2B5	3.01	8/19/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	2,096.04
WF99B	F13	WF99B2B5	3.01	8/19/99	PSEUDONITZSCHIA SPP.	5,172.90
WF99B	F13	WF99B2B5	3.01	8/19/99	RHIZOSOLENIA FRAGILISSIMA	20,390.66
WF99B	F13	WF99B2B5	3.01	8/19/99	RHIZOSOLENIA STOLTERFOTHII	87,062.53
WF99B	F13	WF99B2B5	3.01	8/19/99	SCRIPPSIELLA TROCHOIDEA	1,877.35
WF99B	F13	WF99B2B5	3.01	8/19/99	SKELETONEMA COSTATUM	51.04292
WF99B	F13	WF99B2B5	3.01	8/19/99	THALASSIONEMA NITZSCHIOIDES	557.81748
WF99B	F13	WF99B2B5	3.01	8/19/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	2,051.98
WF99B	F13	WF99B2B5	3.01	8/19/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	12,910.35
WF99B	F06	WF99B2E5	13.45	8/19/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	320.54993
WF99B	F06	WF99B2E5	13.45	8/19/99	CERATIUM FUSUS	4,069.07
WF99B	F06	WF99B2E5	13.45	8/19/99	CERATIUM LONGIPES	6,762.63
WF99B	F06	WF99B2E5	13.45	8/19/99	CERATIUM TRIPOS	72,987.83
WF99B	F06	WF99B2E5	13.45	8/19/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	1,869.30
WF99B	F06	WF99B2E5	13.45	8/19/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	369.2826
WF99B	F06	WF99B2E5	13.45	8/19/99	CYLINDROTHECA CLOSTERIUM	4,214.21

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99B	F06	WF99B2E5	13.45	8/19/99	DICTYOCHA SPECULUM	660.70785
WF99B	F06	WF99B2E5	13.45	8/19/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	295.69726
WF99B	F06	WF99B2E5	13.45	8/19/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	10,918.59
WF99B	F06	WF99B2E5	13.45	8/19/99	HEMIAULUS SPP.	4,009.15
WF99B	F06	WF99B2E5	13.45	8/19/99	LEPTOCYLINDRUS DANICUS	74,869.74
WF99B	F06	WF99B2E5	13.45	8/19/99	LEPTOCYLINDRUS MINIMUS	287.65182
WF99B	F06	WF99B2E5	13.45	8/19/99	LITHODESMIUM UNDULATUM	4,520.51
WF99B	F06	WF99B2E5	13.45	8/19/99	PROBOSCIA ALATA	7,496.01
WF99B	F06	WF99B2E5	13.45	8/19/99	PROROCENTRUM MINIMUM	424.20378
WF99B	F06	WF99B2E5	13.45	8/19/99	PROTOPERIDINIUM BIPES	1,436.85
WF99B	F06	WF99B2E5	13.45	8/19/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	2,159.68
WF99B	F06	WF99B2E5	13.45	8/19/99	PSEUDONITZSCHIA SPP.	1,423.71
WF99B	F06	WF99B2E5	13.45	8/19/99	RHIZOSOLENIA DELICATULA	622.22615
WF99B	F06	WF99B2E5	13.45	8/19/99	RHIZOSOLENIA FRAGILISSIMA	15,528.92
WF99B	F06	WF99B2E5	13.45	8/19/99	RHIZOSOLENIA HEBETATA	382.472
WF99B	F06	WF99B2E5	13.45	8/19/99	RHIZOSOLENIA STOLTERFOTHII	8,292.13
WF99B	F06	WF99B2E5	13.45	8/19/99	SCRIPPSIELLA TROCHOIDEA	483.58616
WF99B	F06	WF99B2E5	13.45	8/19/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	328.07775
WF99B	F06	WF99B2E5	13.45	8/19/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	8,428.61
WF99B	F06	WF99B2E5	13.45	8/19/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	1,735.83
WF99B	F06	WF99B2E7	3.15	8/19/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	401.86934
WF99B	F06	WF99B2E7	3.15	8/19/99	CERATAULINA PELAGICA	9,098.76
WF99B	F06	WF99B2E7	3.15	8/19/99	CERATIUM TRIPOS	19,263.98
WF99B	F06	WF99B2E7	3.15	8/19/99	CHAETOCEROS DECIPIENS	1,892.54
WF99B	F06	WF99B2E7	3.15	8/19/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	863.39932
WF99B	F06	WF99B2E7	3.15	8/19/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	510.50057
WF99B	F06	WF99B2E7	3.15	8/19/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	105.75509
WF99B	F06	WF99B2E7	3.15	8/19/99	CYLINDROTHECA CLOSTERIUM	3,503.66
WF99B	F06	WF99B2E7	3.15	8/19/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	1,638.94
WF99B	F06	WF99B2E7	3.15	8/19/99	GYRODINIUM SP. GROUP 1 5-20UM W 10-20UM	273.15611
WF99B	F06	WF99B2E7	3.15	8/19/99	GYRODINIUM SPIRALE	22,158.30
WF99B	F06	WF99B2E7	3.15	8/19/99	LEPTOCYLINDRUS DANICUS	159,212.72
WF99B	F06	WF99B2E7	3.15	8/19/99	LEPTOCYLINDRUS MINIMUS	5,314.48
WF99B	F06	WF99B2E7	3.15	8/19/99	PROBOSCIA ALATA	24,236.04
WF99B	F06	WF99B2E7	3.15	8/19/99	PROROCENTRUM MINIMUM	1,567.47
WF99B	F06	WF99B2E7	3.15	8/19/99	PSEUDONITZSCHIA SPP.	3,945.54
WF99B	F06	WF99B2E7	3.15	8/19/99	RHIZOSOLENIA FRAGILISSIMA	11,391.73
WF99B	F06	WF99B2E7	3.15	8/19/99	RHIZOSOLENIA STOLTERFOTHII	29,108.07
WF99B	F06	WF99B2E7	3.15	8/19/99	SCRIPPSIELLA TROCHOIDEA	1,786.89
WF99B	F06	WF99B2E7	3.15	8/19/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	471.43946
WF99B	F06	WF99B2E7	3.15	8/19/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	12,764.96

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99B	F06	WF99B2E7	3.15	8/19/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	641.40271
WN99C	N04	WN99C03A	17.56	9/8/99	AMPHIDINIUM SPP.	57.03352
WN99C	N04	WN99C03A	17.56	9/8/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	115.83694
WN99C	N04	WN99C03A	17.56	9/8/99	CERATAULINA PELAGICA	663.29444
WN99C	N04	WN99C03A	17.56	9/8/99	CERATIUM LONGIPES	2,737.07
WN99C	N04	WN99C03A	17.56	9/8/99	CERATIUM TRIPOS	75,961.64
WN99C	N04	WN99C03A	17.56	9/8/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,226.56
WN99C	N04	WN99C03A	17.56	9/8/99	CYLINDROTHECA CLOSTERIUM	595.96861
WN99C	N04	WN99C03A	17.56	9/8/99	EUTREPTIA/EUTREPTIELLA SPP.	16.98314
WN99C	N04	WN99C03A	17.56	9/8/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	5,385.54
WN99C	N04	WN99C03A	17.56	9/8/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	2,205.85
WN99C	N04	WN99C03A	17.56	9/8/99	GYRODINIUM SP. GROUP 2 21-40UM W 21-50UM	1,102.92
WN99C	N04	WN99C03A	17.56	9/8/99	LEPTOCYLINDRUS DANICUS	4,466.65
WN99C	N04	WN99C03A	17.56	9/8/99	LITHODESMIUM UNDULATUM	456.6328
WN99C	N04	WN99C03A	17.56	9/8/99	PROROCENTRUM TRIESTINUM	42.85029
WN99C	N04	WN99C03A	17.56	9/8/99	PSEUDONITZSCHIA SPP.	287.62798
WN99C	N04	WN99C03A	17.56	9/8/99	SKELETONEMA COSTATUM	85.14394
WN99C	N04	WN99C03A	17.56	9/8/99	THALASSIONEMA NITZSCHIOIDES	150.95014
WN99C	N04	WN99C03A	17.56	9/8/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	103.27655
WN99C	N04	WN99C03A	17.56	9/8/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	19,087.28
WN99C	N04	WN99C03A	17.56	9/8/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	2,107.65
WN99C	N04	WN99C03C	2.4	9/8/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	256.4356
WN99C	N04	WN99C03C	2.4	9/8/99	CERATIUM FUSUS	1,085.07
WN99C	N04	WN99C03C	2.4	9/8/99	CERATIUM LONGIPES	1,803.34
WN99C	N04	WN99C03C	2.4	9/8/99	CERATIUM TRIPOS	33,365.30
WN99C	N04	WN99C03C	2.4	9/8/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	598.96691
WN99C	N04	WN99C03C	2.4	9/8/99	CYLINDROTHECA CLOSTERIUM	84.14118
WN99C	N04	WN99C03C	2.4	9/8/99	EUTREPTIA/EUTREPTIELLA SPP.	11.18948
WN99C	N04	WN99C03C	2.4	9/8/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	2,897.78
WN99C	N04	WN99C03C	2.4	9/8/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	726.67096
WN99C	N04	WN99C03C	2.4	9/8/99	GYRODINIUM SP. GROUP 2 21-40UM W 21-50UM	5,095.26
WN99C	N04	WN99C03C	2.4	9/8/99	HETEROCAPSA ROTUNDATA	13.55501
WN99C	N04	WN99C03C	2.4	9/8/99	HETEROSIGMA AKASHIWO	14.03728
WN99C	N04	WN99C03C	2.4	9/8/99	LEPTOCYLINDRUS DANICUS	2,240.61
WN99C	N04	WN99C03C	2.4	9/8/99	PROBOSCIA ALATA	499.72542
WN99C	N04	WN99C03C	2.4	9/8/99	PROROCENTRUM MICANS	227.11251
WN99C	N04	WN99C03C	2.4	9/8/99	PSEUDONITZSCHIA SPP.	2,368.83
WN99C	N04	WN99C03C	2.4	9/8/99	RHIZOSOLENIA FRAGILISSIMA	60.89668
WN99C	N04	WN99C03C	2.4	9/8/99	SCRIPPSIELLA TROCHOIDEA	386.86237
WN99C	N04	WN99C03C	2.4	9/8/99	SKELETONEMA COSTATUM	38.56723
WN99C	N04	WN99C03C	2.4	9/8/99	THALASSIONEMA NITZSCHIOIDES	214.57066

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WN99C	N04	WN99C03C	2.4	9/8/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	48.60329
WN99C	N04	WN99C03C	2.4	9/8/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	16,562.61
WN99C	N04	WN99C03C	2.4	9/8/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	2,754.14
WN99C	N18	WN99C067	13.76	9/8/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	595.14589
WN99C	N18	WN99C067	13.76	9/8/99	CERATIUM FUSUS	1,958.65
WN99C	N18	WN99C067	13.76	9/8/99	CERATIUM TRIPOS	90,341.43
WN99C	N18	WN99C067	13.76	9/8/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	368.35895
WN99C	N18	WN99C067	13.76	9/8/99	CYLINDROTHECA CLOSTERIUM	101.25535
WN99C	N18	WN99C067	13.76	9/8/99	EUTREPTIA/EUTREPTIELLA SPP.	40.39622
WN99C	N18	WN99C067	13.76	9/8/99	GUINARDIA FLACCIDA	6,065.89
WN99C	N18	WN99C067	13.76	9/8/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	5,978.04
WN99C	N18	WN99C067	13.76	9/8/99	LEPTOCYLINDRUS DANICUS	1,810.98
WN99C	N18	WN99C067	13.76	9/8/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	21.7075
WN99C	N18	WN99C067	13.76	9/8/99	PROBOSCIA ALATA	1,804.11
WN99C	N18	WN99C067	13.76	9/8/99	PSEUDONITZSCHIA SPP.	17,274.88
WN99C	N18	WN99C067	13.76	9/8/99	RHIZOSOLENIA FRAGILISSIMA	879.39558
WN99C	N18	WN99C067	13.76	9/8/99	RHIZOSOLENIA SETIGERA	925.80952
WN99C	N18	WN99C067	13.76	9/8/99	RHIZOSOLENIA STOLTERFOTHII	1,596.57
WN99C	N18	WN99C067	13.76	9/8/99	SKELETONEMA COSTATUM	189.86619
WN99C	N18	WN99C067	13.76	9/8/99	THALASSIONEMA NITZSCHIOIDES	82.85792
WN99C	N18	WN99C067	13.76	9/8/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	631.68243
WN99C	N18	WN99C067	13.76	9/8/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	13,799.73
WN99C	N18	WN99C067	13.76	9/8/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	334.21751
WN99C	N18	WN99C069	2.13	9/8/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	546.31932
WN99C	N18	WN99C069	2.13	9/8/99	CERATIUM TRIPOS	10,366.21
WN99C	N18	WN99C069	2.13	9/8/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	4,646.07
WN99C	N18	WN99C069	2.13	9/8/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	92.88973
WN99C	N18	WN99C069	2.13	9/8/99	CYLINDROTHECA CLOSTERIUM	209.1335
WN99C	N18	WN99C069	2.13	9/8/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	881.93426
WN99C	N18	WN99C069	2.13	9/8/99	HETEROCAPSA TRIQUETRA	258.39849
WN99C	N18	WN99C069	2.13	9/8/99	LEPTOCYLINDRUS DANICUS	31,668.77
WN99C	N18	WN99C069	2.13	9/8/99	LEPTOCYLINDRUS MINIMUS	35.68738
WN99C	N18	WN99C069	2.13	9/8/99	LICMOPHORA SPP.	62.58281
WN99C	N18	WN99C069	2.13	9/8/99	PENNATE DIATOM SP. GROUP 1 <10 MICRONS L	4.39597
WN99C	N18	WN99C069	2.13	9/8/99	PSEUDONITZSCHIA SPP.	11,834.34
WN99C	N18	WN99C069	2.13	9/8/99	RHIZOSOLENIA DELICATULA	309.30428
WN99C	N18	WN99C069	2.13	9/8/99	RHIZOSOLENIA SETIGERA	1,912.17
WN99C	N18	WN99C069	2.13	9/8/99	RHIZOSOLENIA STOLTERFOTHII	1,648.78
WN99C	N18	WN99C069	2.13	9/8/99	SKELETONEMA COSTATUM	718.94341
WN99C	N18	WN99C069	2.13	9/8/99	THALASSIONEMA NITZSCHIOIDES	28.52256
WN99C	N18	WN99C069	2.13	9/8/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	1,268.44

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WN99C	N18	WN99C069	2.13	9/8/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	12,711.92
WN99C	N18	WN99C069	2.13	9/8/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	1,035.44
WN99D	N04	WN99D03A	11.39	9/24/99	AMPHIDINIUM SPP.	298.54312
WN99D	N04	WN99D03A	11.39	9/24/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	605.33217
WN99D	N04	WN99D03A	11.39	9/24/99	CERATIUM FUSUS	1,721.24
WN99D	N04	WN99D03A	11.39	9/24/99	CERATIUM LONGIPES	2,860.63
WN99D	N04	WN99D03A	11.39	9/24/99	CERATIUM TRIPOS	143,344.78
WN99D	N04	WN99D03A	11.39	9/24/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	763.50524
WN99D	N04	WN99D03A	11.39	9/24/99	CYLINDROTHECA CLOSTERIUM	88.98197
WN99D	N04	WN99D03A	11.39	9/24/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	1,438.44
WN99D	N04	WN99D03A	11.39	9/24/99	LEPTOCYLINDRUS DANICUS	106.09769
WN99D	N04	WN99D03A	11.39	9/24/99	LICMOPHORA SPP.	26.62769
WN99D	N04	WN99D03A	11.39	9/24/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	143.31294
WN99D	N04	WN99D03A	11.39	9/24/99	PROROCENTRUM MICANS	179.83143
WN99D	N04	WN99D03A	11.39	9/24/99	PROROCENTRUM MINIMUM	224.3007
WN99D	N04	WN99D03A	11.39	9/24/99	PROTOPERIDINIUM DEPRESSUM	126,324.55
WN99D	N04	WN99D03A	11.39	9/24/99	PSEUDONITZSCHIA SPP.	37.57663
WN99D	N04	WN99D03A	11.39	9/24/99	SKELETONEMA COSTATUM	122.35821
WN99D	N04	WN99D03A	11.39	9/24/99	THALASSIONEMA NITZSCHIOIDES	315.52967
WN99D	N04	WN99D03A	11.39	9/24/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	107.939
WN99D	N04	WN99D03A	11.39	9/24/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	14,885.94
WN99D	N04	WN99D03A	11.39	9/24/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	183.56643
WN99D	N04	WN99D03B	1.66	9/24/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	1,046.27
WN99D	N04	WN99D03B	1.66	9/24/99	CERATIUM FUSUS	1,403.32
WN99D	N04	WN99D03B	1.66	9/24/99	CERATIUM LONGIPES	2,332.26
WN99D	N04	WN99D03B	1.66	9/24/99	CERATIUM TRIPOS	118,666.13
WN99D	N04	WN99D03B	1.66	9/24/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,029.78
WN99D	N04	WN99D03B	1.66	9/24/99	DICTYOCHA FIBULA	99.03223
WN99D	N04	WN99D03B	1.66	9/24/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	3,314.29
WN99D	N04	WN99D03B	1.66	9/24/99	HETEROCAPSA ROTUNDATA	50.17195
WN99D	N04	WN99D03B	1.66	9/24/99	PROROCENTRUM MINIMUM	365.74208
WN99D	N04	WN99D03B	1.66	9/24/99	PSEUDONITZSCHIA SPP.	61.27201
WN99D	N04	WN99D03B	1.66	9/24/99	THALASSIONEMA NITZSCHIOIDES	385.87422
WN99D	N04	WN99D03B	1.66	9/24/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	18,043.96
WN99D	N04	WN99D03B	1.66	9/24/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	598.64253
WN99D	N18	WN99D061	18.59	9/24/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	388.40834
WN99D	N18	WN99D061	18.59	9/24/99	CERATIUM FUSUS	2,672.00
WN99D	N18	WN99D061	18.59	9/24/99	CERATIUM LONGIPES	17,763.00
WN99D	N18	WN99D061	18.59	9/24/99	CERATIUM TRIPOS	155,196.01
WN99D	N18	WN99D061	18.59	9/24/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10	712.11965

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
					MICRO	
WN99D	N18	WN99D061	18.59	9/24/99	EUTREPTIA/EUTREPTIELLA SPP.	92.00216
WN99D	N18	WN99D061	18.59	9/24/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	1,456.29
WN99D	N18	WN99D061	18.59	9/24/99	HETEROCAPSA ROTUNDATA	31.84342
WN99D	N18	WN99D061	18.59	9/24/99	LEPTOCYLINDRUS DANICUS	274.50424
WN99D	N18	WN99D061	18.59	9/24/99	PROTOPERIDINIUM DEPRESSUM	43,578.23
WN99D	N18	WN99D061	18.59	9/24/99	PSEUDONITZSCHIA SPP.	38.88848
WN99D	N18	WN99D061	18.59	9/24/99	SKELETONEMA COSTATUM	80.58266
WN99D	N18	WN99D061	18.59	9/24/99	THALASSIONEMA NITZSCHIOIDES	351.66406
WN99D	N18	WN99D061	18.59	9/24/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	47.87455
WN99D	N18	WN99D061	18.59	9/24/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	14,527.10
WN99D	N18	WN99D061	18.59	9/24/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	379.94993
WN99D	N18	WN99D064	1.69	9/24/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	1,029.36
WN99D	N18	WN99D064	1.69	9/24/99	CERATIUM LONGIPES	5,345.59
WN99D	N18	WN99D064	1.69	9/24/99	CERATIUM TRIPOS	76,238.43
WN99D	N18	WN99D064	1.69	9/24/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	92.19507
WN99D	N18	WN99D064	1.69	9/24/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	413.93159
WN99D	N18	WN99D064	1.69	9/24/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	2,775.62
WN99D	N18	WN99D064	1.69	9/24/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	538.51304
WN99D	N18	WN99D064	1.69	9/24/99	LEPTOCYLINDRUS DANICUS	297.39311
WN99D	N18	WN99D064	1.69	9/24/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	8.91185
WN99D	N18	WN99D064	1.69	9/24/99	PROROCENTRUM MICANS	841.52977
WN99D	N18	WN99D064	1.69	9/24/99	PROTOPERIDINIUM DEPRESSUM	13,114.42
WN99D	N18	WN99D064	1.69	9/24/99	PSEUDONITZSCHIA SPP.	105.32775
WN99D	N18	WN99D064	1.69	9/24/99	SKELETONEMA COSTATUM	20.78615
WN99D	N18	WN99D064	1.69	9/24/99	THALASSIONEMA NITZSCHIOIDES	306.15004
WN99D	N18	WN99D064	1.69	9/24/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	28.8147
WN99D	N18	WN99D064	1.69	9/24/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	13,681.88
WN99D	N18	WN99D064	1.69	9/24/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	171.51297
WF99E	F01	WF99E02B	14.5	10/6/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	208.50649
WF99E	F01	WF99E02B	14.5	10/6/99	CERATIUM FUSUS	2,058.61
WF99E	F01	WF99E02B	14.5	10/6/99	CERATIUM LONGIPES	3,421.33
WF99E	F01	WF99E02B	14.5	10/6/99	CERATIUM TRIPOS	245,292.80
WF99E	F01	WF99E02B	14.5	10/6/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	2,837.13
WF99E	F01	WF99E02B	14.5	10/6/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,244.60
WF99E	F01	WF99E02B	14.5	10/6/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	231.67387
WF99E	F01	WF99E02B	14.5	10/6/99	DICTYOCHA FIBULA	145.27657
WF99E	F01	WF99E02B	14.5	10/6/99	EBRIA TRIPARTITA	169.59486
WF99E	F01	WF99E02B	14.5	10/6/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	2,393.57
WF99E	F01	WF99E02B	14.5	10/6/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	689.32788

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99E	F01	WF99E02B	14.5	10/6/99	LEPTOCYLINDRUS DANICUS	824.80755
WF99E	F01	WF99E02B	14.5	10/6/99	PROBOSCIA ALATA	948.08981
WF99E	F01	WF99E02B	14.5	10/6/99	PROROCENTRUM MICANS	860.31783
WF99E	F01	WF99E02B	14.5	10/6/99	PROTOPERIDINIUM DEPRESSUM	83,936.06
WF99E	F01	WF99E02B	14.5	10/6/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	272.69537
WF99E	F01	WF99E02B	14.5	10/6/99	PSEUDONITZSCHIA SPP.	4,314.42
WF99E	F01	WF99E02B	14.5	10/6/99	RHIZOSOLENIA DELICATULA	1,967.47
WF99E	F01	WF99E02B	14.5	10/6/99	RHIZOSOLENIA FRAGILISSIMA	7,163.14
WF99E	F01	WF99E02B	14.5	10/6/99	RHIZOSOLENIA SETIGERA	1,459.59
WF99E	F01	WF99E02B	14.5	10/6/99	THALASSIONEMA NITZSCHIOIDES	159.6588
WF99E	F01	WF99E02B	14.5	10/6/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	55.32672
WF99E	F01	WF99E02B	14.5	10/6/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	9,398.60
WF99E	F01	WF99E02B	14.5	10/6/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	351.27447
WF99E	F01	WF99E02D	1.73	10/6/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	254.84126
WF99E	F01	WF99E02D	1.73	10/6/99	CERATIUM FUSUS	4,117.23
WF99E	F01	WF99E02D	1.73	10/6/99	CERATIUM TRIPOS	281,339.41
WF99E	F01	WF99E02D	1.73	10/6/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	472.06013
WF99E	F01	WF99E02D	1.73	10/6/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,424.98
WF99E	F01	WF99E02D	1.73	10/6/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	695.02162
WF99E	F01	WF99E02D	1.73	10/6/99	CYLINDROTHECA CLOSTERIUM	70.94864
WF99E	F01	WF99E02D	1.73	10/6/99	DICTYOCHA FIBULA	193.70209
WF99E	F01	WF99E02D	1.73	10/6/99	EUTREPTIA/EUTREPTIELLA SPP.	28.30524
WF99E	F01	WF99E02D	1.73	10/6/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	598.39326
WF99E	F01	WF99E02D	1.73	10/6/99	GYRODINIUM SP. GROUP 2 21-40UM W 21-50UM	919.10384
WF99E	F01	WF99E02D	1.73	10/6/99	LEPTOCYLINDRUS DANICUS	1,184.34
WF99E	F01	WF99E02D	1.73	10/6/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	91.415
WF99E	F01	WF99E02D	1.73	10/6/99	PROBOSCIA ALATA	1,264.12
WF99E	F01	WF99E02D	1.73	10/6/99	PROROCENTRUM MICANS	1,147.09
WF99E	F01	WF99E02D	1.73	10/6/99	PROTOPERIDINIUM DEPRESSUM	67,148.85
WF99E	F01	WF99E02D	1.73	10/6/99	PSEUDONITZSCHIA SPP.	4,134.65
WF99E	F01	WF99E02D	1.73	10/6/99	RHIZOSOLENIA DELICATULA	1,049.32
WF99E	F01	WF99E02D	1.73	10/6/99	RHIZOSOLENIA FRAGILISSIMA	4,313.29
WF99E	F01	WF99E02D	1.73	10/6/99	RHIZOSOLENIA SETIGERA	3,243.53
WF99E	F01	WF99E02D	1.73	10/6/99	THALASSIONEMA NITZSCHIOIDES	116.11549
WF99E	F01	WF99E02D	1.73	10/6/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	122.94827
WF99E	F01	WF99E02D	1.73	10/6/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	12,937.58
WF99E	F02	WF99E03A	12.34	10/6/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	125.29301
WF99E	F02	WF99E03A	12.34	10/6/99	CERATIUM FUSUS	3,562.66
WF99E	F02	WF99E03A	12.34	10/6/99	CERATIUM LINEATUM	575.70179
WF99E	F02	WF99E03A	12.34	10/6/99	CERATIUM LONGIPES	2,960.50
WF99E	F02	WF99E03A	12.34	10/6/99	CERATIUM TRIPOS	292,133.66

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99E	F02	WF99E03A	12.34	10/6/99	CORETHRON CRIOPHILUM	918.80424
WF99E	F02	WF99E03A	12.34	10/6/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	278.52615
WF99E	F02	WF99E03A	12.34	10/6/99	CYLINDROTHECA CLOSTERIUM	46.04422
WF99E	F02	WF99E03A	12.34	10/6/99	DICTYOCHA FIBULA	125.7087
WF99E	F02	WF99E03A	12.34	10/6/99	DICTYOCHA SPECULUM	72.31005
WF99E	F02	WF99E03A	12.34	10/6/99	EBRIA TRIPARTITA	146.75147
WF99E	F02	WF99E03A	12.34	10/6/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	1,618.10
WF99E	F02	WF99E03A	12.34	10/6/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	596.47964
WF99E	F02	WF99E03A	12.34	10/6/99	GYRODINIUM SPIRALE	2,625.20
WF99E	F02	WF99E03A	12.34	10/6/99	HETEROCAPSA ROTUNDATA	6.35799
WF99E	F02	WF99E03A	12.34	10/6/99	LEPTOCYLINDRUS DANICUS	164.70254
WF99E	F02	WF99E03A	12.34	10/6/99	PENNATE DIATOM SP. GROUP 1 <10 MICRONS L	38.77902
WF99E	F02	WF99E03A	12.34	10/6/99	PROTOPERIDINIUM DEPRESSUM	43,578.23
WF99E	F02	WF99E03A	12.34	10/6/99	PSEUDONITZSCHIA SPP.	1,322.21
WF99E	F02	WF99E03A	12.34	10/6/99	RHIZOSOLENIA DELICATULA	680.98486
WF99E	F02	WF99E03A	12.34	10/6/99	RHIZOSOLENIA FRAGILISSIMA	3,898.94
WF99E	F02	WF99E03A	12.34	10/6/99	RHIZOSOLENIA HEBETATA	167.436
WF99E	F02	WF99E03A	12.34	10/6/99	THALASSIONEMA NITZSCHIOIDES	100.47545
WF99E	F02	WF99E03A	12.34	10/6/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	71,810.54
WF99E	F02	WF99E03C	2.46	10/6/99	CALYCOMONAS WULFFII	20.86934
WF99E	F02	WF99E03C	2.46	10/6/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	69.09333
WF99E	F02	WF99E03C	2.46	10/6/99	CERATIUM FUSUS	2,455.81
WF99E	F02	WF99E03C	2.46	10/6/99	CERATIUM MACROCEROS	813.23994
WF99E	F02	WF99E03C	2.46	10/6/99	CERATIUM TRIPOS	190,884.65
WF99E	F02	WF99E03C	2.46	10/6/99	CHAETOCEROS DECIPIENS	686.92274
WF99E	F02	WF99E03C	2.46	10/6/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	469.2833
WF99E	F02	WF99E03C	2.46	10/6/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	209.44683
WF99E	F02	WF99E03C	2.46	10/6/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	115.15554
WF99E	F02	WF99E03C	2.46	10/6/99	CYLINDROTHECA CLOSTERIUM	42.31878
WF99E	F02	WF99E03C	2.46	10/6/99	DICTYOCHA FIBULA	346.6128
WF99E	F02	WF99E03C	2.46	10/6/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	594.8733
WF99E	F02	WF99E03C	2.46	10/6/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	1,096.44
WF99E	F02	WF99E03C	2.46	10/6/99	LEPTOCYLINDRUS DANICUS	555.04697
WF99E	F02	WF99E03C	2.46	10/6/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	27.21738
WF99E	F02	WF99E03C	2.46	10/6/99	PROBOSCIA ALATA	754.01025
WF99E	F02	WF99E03C	2.46	10/6/99	PROROCENTRUM MICANS	342.10285
WF99E	F02	WF99E03C	2.46	10/6/99	PROTOPERIDINIUM DEPRESSUM	26,701.54
WF99E	F02	WF99E03C	2.46	10/6/99	PSEUDONITZSCHIA SPP.	1,751.36
WF99E	F02	WF99E03C	2.46	10/6/99	RHIZOSOLENIA DELICATULA	688.47494
WF99E	F02	WF99E03C	2.46	10/6/99	RHIZOSOLENIA FRAGILISSIMA	2,756.52
WF99E	F02	WF99E03C	2.46	10/6/99	RHIZOSOLENIA SETIGERA	1,934.67
WF99E	F02	WF99E03C	2.46	10/6/99	THALASSIONEMA NITZSCHIOIDES	80.80272

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99E	F02	WF99E03C	2.46	10/6/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	44.00102
WF99E	F02	WF99E03C	2.46	10/6/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	16,321.96
WF99E	F02	WF99E03C	2.46	10/6/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	349.20814
WF99E	F27	WF99E074	9.29	10/6/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	301.17604
WF99E	F27	WF99E074	9.29	10/6/99	CERATIUM LONGIPES	9,123.55
WF99E	F27	WF99E074	9.29	10/6/99	CERATIUM TRIPOS	49,234.40
WF99E	F27	WF99E074	9.29	10/6/99	COSCINODISCUS SP. GROUP 2 DIAM 40-100 MI	1,206.98
WF99E	F27	WF99E074	9.29	10/6/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,569.28
WF99E	F27	WF99E074	9.29	10/6/99	DICTYOCHA FIBULA	581.10627
WF99E	F27	WF99E074	9.29	10/6/99	EBRIA TRIPARTITA	452.25296
WF99E	F27	WF99E074	9.29	10/6/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	1,495.98
WF99E	F27	WF99E074	9.29	10/6/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	919.10384
WF99E	F27	WF99E074	9.29	10/6/99	HETEROCAPSA ROTUNDATA	58.88029
WF99E	F27	WF99E074	9.29	10/6/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	91.415
WF99E	F27	WF99E074	9.29	10/6/99	PROROCENTRUM MICANS	32,118.53
WF99E	F27	WF99E074	9.29	10/6/99	PSEUDONITZSCHIA SPP.	119.84499
WF99E	F27	WF99E074	9.29	10/6/99	SKELETONEMA COSTATUM	35.47664
WF99E	F27	WF99E074	9.29	10/6/99	THALASSIONEMA NITZSCHIOIDES	445.10939
WF99E	F27	WF99E074	9.29	10/6/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	23,786.58
WF99E	F27	WF99E074	9.29	10/6/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	351.27447
WF99E	F27	WF99E075	2.4	10/6/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	411.62587
WF99E	F27	WF99E075	2.4	10/6/99	CERATIUM FUSUS	2,868.74
WF99E	F27	WF99E075	2.4	10/6/99	CERATIUM TRIPOS	36,755.07
WF99E	F27	WF99E075	2.4	10/6/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	493.37144
WF99E	F27	WF99E075	2.4	10/6/99	COSCINODISCUS SP. GROUP 2 DIAM 40-100 MI	1,261.47
WF99E	F27	WF99E075	2.4	10/6/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,772.09
WF99E	F27	WF99E075	2.4	10/6/99	DICTYOCHA FIBULA	202.44683
WF99E	F27	WF99E075	2.4	10/6/99	EBRIA TRIPARTITA	1,420.40
WF99E	F27	WF99E075	2.4	10/6/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	2,501.63
WF99E	F27	WF99E075	2.4	10/6/99	HETEROCAPSA TRIQUETRA	183.23867
WF99E	F27	WF99E075	2.4	10/6/99	PROROCENTRUM MICANS	31,170.78
WF99E	F27	WF99E075	2.4	10/6/99	PROROCENTRUM MINIMUM	448.6014
WF99E	F27	WF99E075	2.4	10/6/99	THALASSIONEMA NITZSCHIOIDES	667.4666
WF99E	F27	WF99E075	2.4	10/6/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	23,829.63
WF99E	F27	WF99E075	2.4	10/6/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	367.13287
WF99E	F23	WF99E09F	14.08	10/8/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	406.6535
WF99E	F23	WF99E09F	14.08	10/8/99	CERATIUM TRIPOS	2,784.76
WF99E	F23	WF99E09F	14.08	10/8/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	124.60146
WF99E	F23	WF99E09F	14.08	10/8/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,183.13

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99E	F23	WF99E09F	14.08	10/8/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	107.01408
WF99E	F23	WF99E09F	14.08	10/8/99	CYLINDROTHECA CLOSTERIUM	140.45305
WF99E	F23	WF99E09F	14.08	10/8/99	EUTREPTIA/EUTREPTIELLA SPP.	33.62058
WF99E	F23	WF99E09F	14.08	10/8/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	829.2239
WF99E	F23	WF99E09F	14.08	10/8/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	363.89966
WF99E	F23	WF99E09F	14.08	10/8/99	GYRODINIUM SPIRALE	3,203.16
WF99E	F23	WF99E09F	14.08	10/8/99	GYROSIGMA SPP.	154.54519
WF99E	F23	WF99E09F	14.08	10/8/99	LEPTOCYLINDRUS DANICUS	468.91392
WF99E	F23	WF99E09F	14.08	10/8/99	LITHODESMIUM UNDULATUM	1,807.94
WF99E	F23	WF99E09F	14.08	10/8/99	PARALIA SULCATA	73.20822
WF99E	F23	WF99E09F	14.08	10/8/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	48.17737
WF99E	F23	WF99E09F	14.08	10/8/99	PROROCENTRUM MICANS	113.54153
WF99E	F23	WF99E09F	14.08	10/8/99	PSEUDONITZSCHIA SPP.	806.65139
WF99E	F23	WF99E09F	14.08	10/8/99	RHIZOSOLENIA DELICATULA	3,282.09
WF99E	F23	WF99E09F	14.08	10/8/99	RHIZOSOLENIA FRAGILISSIMA	60.99124
WF99E	F23	WF99E09F	14.08	10/8/99	RHIZOSOLENIA SETIGERA	770.52387
WF99E	F23	WF99E09F	14.08	10/8/99	SKELETONEMA COSTATUM	165.04312
WF99E	F23	WF99E09F	14.08	10/8/99	THALASSIONEMA NITZSCHIOIDES	245.19181
WF99E	F23	WF99E09F	14.08	10/8/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	808.0674
WF99E	F23	WF99E09F	14.08	10/8/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	12,327.35
WF99E	F23	WF99E09F	14.08	10/8/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	973.55769
WF99E	F23	WF99E0A1	2.73	10/8/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	1,116.77
WF99E	F23	WF99E0A1	2.73	10/8/99	CERATIUM TRIPOS	3,082.24
WF99E	F23	WF99E0A1	2.73	10/8/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	827.47097
WF99E	F23	WF99E0A1	2.73	10/8/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	460.3227
WF99E	F23	WF99E0A1	2.73	10/8/99	CYLINDROTHECA CLOSTERIUM	248.73078
WF99E	F23	WF99E0A1	2.73	10/8/99	EBRIA TRIPARTITA	396.37556
WF99E	F23	WF99E0A1	2.73	10/8/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	1,311.15
WF99E	F23	WF99E0A1	2.73	10/8/99	HETEROCAPSA ROTUNDATA	86.00905
WF99E	F23	WF99E0A1	2.73	10/8/99	HETEROCAPSA TRIQUETRA	153.6618
WF99E	F23	WF99E0A1	2.73	10/8/99	LEPTOCYLINDRUS DANICUS	667.29208
WF99E	F23	WF99E0A1	2.73	10/8/99	LITHODESMIUM UNDULATUM	5,336.19
WF99E	F23	WF99E0A1	2.73	10/8/99	PARALIA SULCATA	162.05717
WF99E	F23	WF99E0A1	2.73	10/8/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	39.99289
WF99E	F23	WF99E0A1	2.73	10/8/99	PROROCENTRUM TRIESTINUM	62.59332
WF99E	F23	WF99E0A1	2.73	10/8/99	PSEUDONITZSCHIA SPP.	367.63207
WF99E	F23	WF99E0A1	2.73	10/8/99	RHIZOSOLENIA DELICATULA	2,942.94
WF99E	F23	WF99E0A1	2.73	10/8/99	RHIZOSOLENIA FRAGILISSIMA	270.02617
WF99E	F23	WF99E0A1	2.73	10/8/99	RHIZOSOLENIA SETIGERA	568.55596
WF99E	F23	WF99E0A1	2.73	10/8/99	SKELETONEMA COSTATUM	93.28014
WF99E	F23	WF99E0A1	2.73	10/8/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	1,314.64
WF99E	F23	WF99E0A1	2.73	10/8/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1	19,576.47

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
					LENGTH	
WF99E	F23	WF99E0A1	2.73	10/8/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	2,565.61
WF99E	N04	WF99E0D1	24.55	10/8/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	234.03789
WF99E	N04	WF99E0D1	24.55	10/8/99	CERATIUM FUSUS	3,024.90
WF99E	N04	WF99E0D1	24.55	10/8/99	CERATIUM LONGIPES	10,054.53
WF99E	N04	WF99E0D1	24.55	10/8/99	CERATIUM TRIPOS	15,502.38
WF99E	N04	WF99E0D1	24.55	10/8/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	248.47804
WF99E	N04	WF99E0D1	24.55	10/8/99	DICTYOCHA FIBULA	106.7338
WF99E	N04	WF99E0D1	24.55	10/8/99	EBRIA TRIPARTITA	498.40122
WF99E	N04	WF99E0D1	24.55	10/8/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	824.31725
WF99E	N04	WF99E0D1	24.55	10/8/99	PROROCENTRUM MICANS	11,851.32
WF99E	N04	WF99E0D1	24.55	10/8/99	PROROCENTRUM MINIMUM	394.18525
WF99E	N04	WF99E0D1	24.55	10/8/99	PSEUDONITZSCHIA SPP.	132.07407
WF99E	N04	WF99E0D1	24.55	10/8/99	RHIZOSOLENIA FRAGILISSIMA	84.88249
WF99E	N04	WF99E0D1	24.55	10/8/99	THALASSIONEMA NITZSCHIOIDES	650.48372
WF99E	N04	WF99E0D1	24.55	10/8/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	54.19761
WF99E	N04	WF99E0D1	24.55	10/8/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	6,500.17
WF99E	N04	WF99E0D1	24.55	10/8/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	322.599
WF99E	N04	WF99E0D3	1.87	10/8/99	CALYCOMONAS OVALIS	18.20071
WF99E	N04	WF99E0D3	1.87	10/8/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	313.87379
WF99E	N04	WF99E0D3	1.87	10/8/99	CERATIUM LONGIPES	2,897.03
WF99E	N04	WF99E0D3	1.87	10/8/99	CERATIUM TRIPOS	24,567.02
WF99E	N04	WF99E0D3	1.87	10/8/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	399.7195
WF99E	N04	WF99E0D3	1.87	10/8/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,053.87
WF99E	N04	WF99E0D3	1.87	10/8/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	98.08556
WF99E	N04	WF99E0D3	1.87	10/8/99	DICTYOCHA FIBULA	123.01373
WF99E	N04	WF99E0D3	1.87	10/8/99	EBRIA TRIPARTITA	861.63224
WF99E	N04	WF99E0D3	1.87	10/8/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	3,293.50
WF99E	N04	WF99E0D3	1.87	10/8/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	583.69215
WF99E	N04	WF99E0D3	1.87	10/8/99	HETEROCAPSA ROTUNDATA	12.44336
WF99E	N04	WF99E0D3	1.87	10/8/99	PROROCENTRUM MICANS	14,569.58
WF99E	N04	WF99E0D3	1.87	10/8/99	PROROCENTRUM MINIMUM	363.44772
WF99E	N04	WF99E0D3	1.87	10/8/99	PSEUDONITZSCHIA SPP.	38.05478
WF99E	N04	WF99E0D3	1.87	10/8/99	THALASSIONEMA NITZSCHIOIDES	651.37946
WF99E	N04	WF99E0D3	1.87	10/8/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	31.23214
WF99E	N04	WF99E0D3	1.87	10/8/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	19,453.66
WF99E	N04	WF99E0D3	1.87	10/8/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	297.44357
WF99E	N18	WF99E0F2	14.6	10/8/99	CALYCOMONAS OVALIS	20.21853
WF99E	N18	WF99E0F2	14.6	10/8/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	152.54371
WF99E	N18	WF99E0F2	14.6	10/8/99	CERATIUM LONGIPES	1,609.11

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99E	N18	WF99E0F2	14.6	10/8/99	CERATIUM TRIPOS	37,214.51
WF99E	N18	WF99E0F2	14.6	10/8/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	222.01715
WF99E	N18	WF99E0F2	14.6	10/8/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	325.00327
WF99E	N18	WF99E0F2	14.6	10/8/99	DICTYOCHA FIBULA	136.65161
WF99E	N18	WF99E0F2	14.6	10/8/99	EBRIA TRIPARTITA	319.05229
WF99E	N18	WF99E0F2	14.6	10/8/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	1,407.17
WF99E	N18	WF99E0F2	14.6	10/8/99	GYROSIGMA SPP.	137.68571
WF99E	N18	WF99E0F2	14.6	10/8/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	5.36521
WF99E	N18	WF99E0F2	14.6	10/8/99	PROROCENTRUM MICANS	7,890.10
WF99E	N18	WF99E0F2	14.6	10/8/99	PROTOPERIDINIUM DEPRESSUM	7,895.28
WF99E	N18	WF99E0F2	14.6	10/8/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	128.25283
WF99E	N18	WF99E0F2	14.6	10/8/99	PSEUDONITZSCHIA SPP.	63.41056
WF99E	N18	WF99E0F2	14.6	10/8/99	RHIZOSOLENIA DELICATULA	37.01322
WF99E	N18	WF99E0F2	14.6	10/8/99	THALASSIONEMA NITZSCHIOIDES	402.75542
WF99E	N18	WF99E0F2	14.6	10/8/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	95.41037
WF99E	N18	WF99E0F2	14.6	10/8/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	8,786.04
WF99E	N18	WF99E0F2	14.6	10/8/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	1,982.52
WF99E	N18	WF99E0F4	2.24	10/8/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	391.86377
WF99E	N18	WF99E0F4	2.24	10/8/99	CERATIUM FUSUS	1,326.49
WF99E	N18	WF99E0F4	2.24	10/8/99	CERATIUM TRIPOS	15,295.83
WF99E	N18	WF99E0F4	2.24	10/8/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	446.72435
WF99E	N18	WF99E0F4	2.24	10/8/99	EBRIA TRIPARTITA	1,094.64
WF99E	N18	WF99E0F4	2.24	10/8/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	722.96407
WF99E	N18	WF99E0F4	2.24	10/8/99	HETEROCAPSA ROTUNDATA	94.8503
WF99E	N18	WF99E0F4	2.24	10/8/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	7.35066
WF99E	N18	WF99E0F4	2.24	10/8/99	PLEUROSIGMA SPP.	188.63767
WF99E	N18	WF99E0F4	2.24	10/8/99	PROROCENTRUM MICANS	13,304.51
WF99E	N18	WF99E0F4	2.24	10/8/99	PSEUDONITZSCHIA SPP.	28.95876
WF99E	N18	WF99E0F4	2.24	10/8/99	RHIZOSOLENIA DELICATULA	50.71033
WF99E	N18	WF99E0F4	2.24	10/8/99	THALASSIONEMA NITZSCHIOIDES	682.7344
WF99E	N18	WF99E0F4	2.24	10/8/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	23.76689
WF99E	N18	WF99E0F4	2.24	10/8/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	10,420.58
WF99E	F25	WF99E1BB	6.21	10/22/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	437.75543
WF99E	F25	WF99E1BB	6.21	10/22/99	CERATIUM TRIPOS	2,098.42
WF99E	F25	WF99E1BB	6.21	10/22/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,417.13
WF99E	F25	WF99E1BB	6.21	10/22/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	345.59639
WF99E	F25	WF99E1BB	6.21	10/22/99	CYLINDROTHECA CLOSTERIUM	508.01609
WF99E	F25	WF99E1BB	6.21	10/22/99	EUTREPTIA/EUTREPTIELLA SPP.	50.66875
WF99E	F25	WF99E1BB	6.21	10/22/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	3,273.03
WF99E	F25	WF99E1BB	6.21	10/22/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	1,096.85

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99E	F25	WF99E1BB	6.21	10/22/99	LEPTOCYLINDRUS DANICUS	151.4333
WF99E	F25	WF99E1BB	6.21	10/22/99	LICMOPHORA SPP.	50.67429
WF99E	F25	WF99E1BB	6.21	10/22/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	27.2276
WF99E	F25	WF99E1BB	6.21	10/22/99	PROROCENTRUM MICANS	1,368.93
WF99E	F25	WF99E1BB	6.21	10/22/99	PROROCENTRUM TRIESTINUM	42.61423
WF99E	F25	WF99E1BB	6.21	10/22/99	PSEUDONITZSCHIA SPP.	286.04345
WF99E	F25	WF99E1BB	6.21	10/22/99	RHIZOSOLENIA FRAGILISSIMA	183.83684
WF99E	F25	WF99E1BB	6.21	10/22/99	RHIZOSOLENIA SETIGERA	387.07926
WF99E	F25	WF99E1BB	6.21	10/22/99	SKELETONEMA COSTATUM	74.09052
WF99E	F25	WF99E1BB	6.21	10/22/99	THALASSIONEMA NITZSCHIOIDES	150.11856
WF99E	F25	WF99E1BB	6.21	10/22/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	1,188.47
WF99E	F25	WF99E1BB	6.21	10/22/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	14,308.72
WF99E	F25	WF99E1BB	6.21	10/22/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	1,048.02
WF99E	F25	WF99E1BD	2.05	10/22/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	756.55794
WF99E	F25	WF99E1BD	2.05	10/22/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	420.99133
WF99E	F25	WF99E1BD	2.05	10/22/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	945.69742
WF99E	F25	WF99E1BD	2.05	10/22/99	CYLINDROTHECA CLOSTERIUM	526.57053
WF99E	F25	WF99E1BD	2.05	10/22/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	1,554.42
WF99E	F25	WF99E1BD	2.05	10/22/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	2,046.44
WF99E	F25	WF99E1BD	2.05	10/22/99	HETEROCAPSA ROTUNDATA	43.7001
WF99E	F25	WF99E1BD	2.05	10/22/99	LEPTOCYLINDRUS DANICUS	439.49962
WF99E	F25	WF99E1BD	2.05	10/22/99	LITHODESMIUM UNDULATUM	564.84372
WF99E	F25	WF99E1BD	2.05	10/22/99	PROROCENTRUM MICANS	2,341.22
WF99E	F25	WF99E1BD	2.05	10/22/99	PROROCENTRUM MINIMUM	1,274.26
WF99E	F25	WF99E1BD	2.05	10/22/99	RHIZOSOLENIA SETIGERA	481.46001
WF99E	F25	WF99E1BD	2.05	10/22/99	SKELETONEMA COSTATUM	111.90355
WF99E	F25	WF99E1BD	2.05	10/22/99	THALASSIONEMA NITZSCHIOIDES	100.54244
WF99E	F25	WF99E1BD	2.05	10/22/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	602.25278
WF99E	F25	WF99E1BD	2.05	10/22/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	4,607.28
WF99E	F25	WF99E1BD	2.05	10/22/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	1,824.98
WF99E	N16	WF99E1D3	21.55	10/22/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	1,188.57
WF99E	N16	WF99E1D3	21.55	10/22/99	CERATIUM TRIPOS	14,150.70
WF99E	N16	WF99E1D3	21.55	10/22/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	633.16001
WF99E	N16	WF99E1D3	21.55	10/22/99	COSCINODISCUS SP. GROUP 3 DIAM >100 MICR	5,678.37
WF99E	N16	WF99E1D3	21.55	10/22/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	262.66099
WF99E	N16	WF99E1D3	21.55	10/22/99	CYLINDROTHECA CLOSTERIUM	142.74191
WF99E	N16	WF99E1D3	21.55	10/22/99	DICTYOCHA FIBULA	194.85508
WF99E	N16	WF99E1D3	21.55	10/22/99	DICTYOCHA SPECULUM	336.2531
WF99E	N16	WF99E1D3	21.55	10/22/99	EBRIA TRIPARTITA	227.47247
WF99E	N16	WF99E1D3	21.55	10/22/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	2,708.80

Survey	Sta.	Sample Number	Depth (m)	Samplin g Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99E	N16	WF99E1D3	21.55	10/22/99	LEPTOCYLINDRUS DANICUS	340.39677
WF99E	N16	WF99E1D3	21.55	10/22/99	PENNATE DIATOM SP. GROUP 1 <10 MICRONS L	18.03285
WF99E	N16	WF99E1D3	21.55	10/22/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	15.30078
WF99E	N16	WF99E1D3	21.55	10/22/99	PLEUROSIGMA SPP.	392.65925
WF99E	N16	WF99E1D3	21.55	10/22/99	PROROCENTRUM MICANS	2,019.36
WF99E	N16	WF99E1D3	21.55	10/22/99	PSEUDONITZSCHIA SPP.	241.11671
WF99E	N16	WF99E1D3	21.55	10/22/99	RHIZOSOLENIA FRAGILISSIMA	309.92587
WF99E	N16	WF99E1D3	21.55	10/22/99	RHIZOSOLENIA SETIGERA	1,305.13
WF99E	N16	WF99E1D3	21.55	10/22/99	SKELETONEMA COSTATUM	107.24359
WF99E	N16	WF99E1D3	21.55	10/22/99	THALASSIONEMA NITZSCHIOIDES	97.33888
WF99E	N16	WF99E1D3	21.55	10/22/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	2,424.13
WF99E	N16	WF99E1D3	21.55	10/22/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	15,874.29
WF99E	N16	WF99E1D3	21.55	10/22/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	1,766.83
WF99E	N16	WF99E1D5	2.11	10/22/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	1,562.41
WF99E	N16	WF99E1D5	2.11	10/22/99	CERATIUM FUSUS	2,056.78
WF99E	N16	WF99E1D5	2.11	10/22/99	CERATIUM TRIPOS	15,811.24
WF99E	N16	WF99E1D5	2.11	10/22/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	471.6396
WF99E	N16	WF99E1D5	2.11	10/22/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	377.81777
WF99E	N16	WF99E1D5	2.11	10/22/99	CYLINDROTHECA CLOSTERIUM	106.32816
WF99E	N16	WF99E1D5	2.11	10/22/99	DICTYOCHA SPECULUM	166.98283
WF99E	N16	WF99E1D5	2.11	10/22/99	EBRIA TRIPARTITA	338.88756
WF99E	N16	WF99E1D5	2.11	10/22/99	EUTREPTIA/EUTREPTIELLA SPP.	42.42003
WF99E	N16	WF99E1D5	2.11	10/22/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	3,138.77
WF99E	N16	WF99E1D5	2.11	10/22/99	HETEROCAPSA ROTUNDATA	352.96703
WF99E	N16	WF99E1D5	2.11	10/22/99	PENNATE DIATOM SP. GROUP 1 <10 MICRONS L	80.59581
WF99E	N16	WF99E1D5	2.11	10/22/99	PLEUROSIGMA SPP.	1,169.96
WF99E	N16	WF99E1D5	2.11	10/22/99	PROROCENTRUM MICANS	3,438.21
WF99E	N16	WF99E1D5	2.11	10/22/99	PROROCENTRUM TRIESTINUM	107.03029
WF99E	N16	WF99E1D5	2.11	10/22/99	PSEUDONITZSCHIA SPP.	179.60735
WF99E	N16	WF99E1D5	2.11	10/22/99	RHIZOSOLENIA FRAGILISSIMA	923.4526
WF99E	N16	WF99E1D5	2.11	10/22/99	THALASSIONEMA NITZSCHIOIDES	29.00301
WF99E	N16	WF99E1D5	2.11	10/22/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	3,353.50
WF99E	N16	WF99E1D5	2.11	10/22/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	15,563.43
WF99E	N16	WF99E1D5	2.11	10/22/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	1,579.33
WF99E	F30	WF99E1FE	5.36	10/22/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	422.21381
WF99E	F30	WF99E1FE	5.36	10/22/99	CHAETOCEROS DEBILIS	512.43143
WF99E	F30	WF99E1FE	5.36	10/22/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	226.39618
WF99E	F30	WF99E1FE	5.36	10/22/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,366.81
WF99E	F30	WF99E1FE	5.36	10/22/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	777.76229
WF99E	F30	WF99E1FE	5.36	10/22/99	CYLINDROTHECA CLOSTERIUM	612.47503

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99E	F30	WF99E1FE	5.36	10/22/99	DICTYOCHA SPECULUM	53.43667
WF99E	F30	WF99E1FE	5.36	10/22/99	EUTREPTIA/EUTREPTIELLA SPP.	27.14992
WF99E	F30	WF99E1FE	5.36	10/22/99	GRAMMATOPHORA MARINA	21.47255
WF99E	F30	WF99E1FE	5.36	10/22/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	1,147.94
WF99E	F30	WF99E1FE	5.36	10/22/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	440.7947
WF99E	F30	WF99E1FE	5.36	10/22/99	GYRODINIUM SP. GROUP 2 21-40UM W 21-50UM	440.7947
WF99E	F30	WF99E1FE	5.36	10/22/99	HETEROCAPSA TRIQUETRA	168.16756
WF99E	F30	WF99E1FE	5.36	10/22/99	LEPTOCYLINDRUS DANICUS	162.28553
WF99E	F30	WF99E1FE	5.36	10/22/99	LEPTOCYLINDRUS MINIMUS	15.48373
WF99E	F30	WF99E1FE	5.36	10/22/99	LITHODESMIUM UNDULATUM	1,094.99
WF99E	F30	WF99E1FE	5.36	10/22/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	65.65236
WF99E	F30	WF99E1FE	5.36	10/22/99	PROROCENTRUM MICANS	550.13521
WF99E	F30	WF99E1FE	5.36	10/22/99	PROROCENTRUM TRIESTINUM	411.7046
WF99E	F30	WF99E1FE	5.36	10/22/99	PROTOPERIDINIUM BIPES	116.01453
WF99E	F30	WF99E1FE	5.36	10/22/99	PSEUDONITZSCHIA SPP.	402.33676
WF99E	F30	WF99E1FE	5.36	10/22/99	PYRAMIMONAS SP. GROUP 1 10-20 MICRONS LE	17.69061
WF99E	F30	WF99E1FE	5.36	10/22/99	RHIZOSOLENIA DELICATULA	100.64871
WF99E	F30	WF99E1FE	5.36	10/22/99	RHIZOSOLENIA SETIGERA	622.228
WF99E	F30	WF99E1FE	5.36	10/22/99	SCENEDESMUS SPP.	216.63876
WF99E	F30	WF99E1FE	5.36	10/22/99	SKELETONEMA COSTATUM	250.96104
WF99E	F30	WF99E1FE	5.36	10/22/99	THALASSIONEMA NITZSCHIOIDES	18.56268
WF99E	F30	WF99E1FE	5.36	10/22/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	1,061.37
WF99E	F30	WF99E1FE	5.36	10/22/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	14,691.08
WF99E	F30	WF99E1FF	2.12	10/22/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	399.99203
WF99E	F30	WF99E1FF	2.12	10/22/99	CHAETOCEROS SOCIALIS	60.69547
WF99E	F30	WF99E1FF	2.12	10/22/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,609.03
WF99E	F30	WF99E1FF	2.12	10/22/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	111.1089
WF99E	F30	WF99E1FF	2.12	10/22/99	CYLINDROTHECA CLOSTERIUM	291.65477
WF99E	F30	WF99E1FF	2.12	10/22/99	EBRIA TRIPARTITA	92.95578
WF99E	F30	WF99E1FF	2.12	10/22/99	EUTREPTIA/EUTREPTIELLA SPP.	34.90704
WF99E	F30	WF99E1FF	2.12	10/22/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	573.96905
WF99E	F30	WF99E1FF	2.12	10/22/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	377.82403
WF99E	F30	WF99E1FF	2.12	10/22/99	GYRODINIUM SPIRALE	3,325.72
WF99E	F30	WF99E1FF	2.12	10/22/99	LEPTOCYLINDRUS DANICUS	69.55094
WF99E	F30	WF99E1FF	2.12	10/22/99	LICMOPHORA SPP.	17.45543
WF99E	F30	WF99E1FF	2.12	10/22/99	PENNATE DIATOM SP. GROUP 1 <10 MICRONS L	34.38894
WF99E	F30	WF99E1FF	2.12	10/22/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	18.75782
WF99E	F30	WF99E1FF	2.12	10/22/99	PROROCENTRUM MICANS	1,178.86
WF99E	F30	WF99E1FF	2.12	10/22/99	PROROCENTRUM MINIMUM	411.7046
WF99E	F30	WF99E1FF	2.12	10/22/99	PROROCENTRUM TRIESTINUM	117.43228
WF99E	F30	WF99E1FF	2.12	10/22/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	149.46568
WF99E	F30	WF99E1FF	2.12	10/22/99	PSEUDONITZSCHIA SPP.	295.59435
WF99E	F30	WF99E1FF	2.12	10/22/99	SKELETONEMA COSTATUM	193.23392

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99E	F30	WF99E1FF	2.12	10/22/99	THALASSIONEMA NITZSCHIOIDES	39.77717
WF99E	F30	WF99E1FF	2.12	10/22/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	788.44611
WF99E	F30	WF99E1FF	2.12	10/22/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	15,191.92
WF99E	F30	WF99E1FF	2.12	10/22/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	4,717.11
WF99E	F31	WF99E20A	6.37	10/22/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	694.73284
WF99E	F31	WF99E20A	6.37	10/22/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	428.96726
WF99E	F31	WF99E20A	6.37	10/22/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,589.93
WF99E	F31	WF99E20A	6.37	10/22/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	3,999.98
WF99E	F31	WF99E20A	6.37	10/22/99	CYLINDROTHECA CLOSTERIUM	1,289.44
WF99E	F31	WF99E20A	6.37	10/22/99	EBRIA TRIPARTITA	1,234.98
WF99E	F31	WF99E20A	6.37	10/22/99	EUTREPTIA/EUTREPTIELLA SPP.	102.88537
WF99E	F31	WF99E20A	6.37	10/22/99	GRAMMATOPHORA MARINA	40.68542
WF99E	F31	WF99E20A	6.37	10/22/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	1,631.30
WF99E	F31	WF99E20A	6.37	10/22/99	GYRODINIUM SPIRALE	3,675.85
WF99E	F31	WF99E20A	6.37	10/22/99	HETEROCAPSA ROTUNDATA	267.52649
WF99E	F31	WF99E20A	6.37	10/22/99	LITHODESMIUM UNDULATUM	1,383.16
WF99E	F31	WF99E20A	6.37	10/22/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	69.10872
WF99E	F31	WF99E20A	6.37	10/22/99	PROROCENTRUM MICANS	1,042.38
WF99E	F31	WF99E20A	6.37	10/22/99	PROROCENTRUM MINIMUM	390.04146
WF99E	F31	WF99E20A	6.37	10/22/99	PROTOPERIDINIUM BIPES	219.82011
WF99E	F31	WF99E20A	6.37	10/22/99	PROTOPERIDINIUM DEPRESSUM	20,339.68
WF99E	F31	WF99E20A	6.37	10/22/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	330.4025
WF99E	F31	WF99E20A	6.37	10/22/99	PSEUDONITZSCHIA SPP.	108.90472
WF99E	F31	WF99E20A	6.37	10/22/99	PYRAMIMONAS SP. GROUP 1 10-20 MICRONS LE	33.51952
WF99E	F31	WF99E20A	6.37	10/22/99	RHIZOSOLENIA SETIGERA	589.4875
WF99E	F31	WF99E20A	6.37	10/22/99	SKELETONEMA COSTATUM	153.13094
WF99E	F31	WF99E20A	6.37	10/22/99	THALASSIONEMA NITZSCHIOIDES	87.92973
WF99E	F31	WF99E20A	6.37	10/22/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	1,787.60
WF99E	F31	WF99E20A	6.37	10/22/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	11,440.23
WF99E	F31	WF99E20A	6.37	10/22/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	2,553.66
WF99E	F31	WF99E20B	1.97	10/22/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	515.16953
WF99E	F31	WF99E20B	1.97	10/22/99	CHOANOFLAGELLATE SPP.	25.79706
WF99E	F31	WF99E20B	1.97	10/22/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	990.47318
WF99E	F31	WF99E20B	1.97	10/22/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	893.66144
WF99E	F31	WF99E20B	1.97	10/22/99	CYLINDROTHECA CLOSTERIUM	869.33045
WF99E	F31	WF99E20B	1.97	10/22/99	EBRIA TRIPARTITA	153.92874
WF99E	F31	WF99E20B	1.97	10/22/99	EUTREPTIA/EUTREPTIELLA SPP.	57.8038
WF99E	F31	WF99E20B	1.97	10/22/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	271.10252
WF99E	F31	WF99E20B	1.97	10/22/99	GYRODINIUM SPIRALE	11,032.89
WF99E	F31	WF99E20B	1.97	10/22/99	HETEROCAPSA ROTUNDATA	213.76518

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99E	F31	WF99E20B	1.97	10/22/99	LEPTOCYLINDRUS DANICUS	287.9296
WF99E	F31	WF99E20B	1.97	10/22/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	51.76954
WF99E	F31	WF99E20B	1.97	10/22/99	PROROCENTRUM MICANS	390.4235
WF99E	F31	WF99E20B	1.97	10/22/99	PROROCENTRUM MINIMUM	48.61506
WF99E	F31	WF99E20B	1.97	10/22/99	PROTOPERIDINIUM BIPES	164.66788
WF99E	F31	WF99E20B	1.97	10/22/99	PSEUDONITZSCHIA SPP.	81.58084
WF99E	F31	WF99E20B	1.97	10/22/99	RHIZOSOLENIA DELICATULA	142.85805
WF99E	F31	WF99E20B	1.97	10/22/99	RHIZOSOLENIA SETIGERA	1,324.76
WF99E	F31	WF99E20B	1.97	10/22/99	SKELETONEMA COSTATUM	30.18706
WF99E	F31	WF99E20B	1.97	10/22/99	THALASSIONEMA NITZSCHIOIDES	52.69473
WF99E	F31	WF99E20B	1.97	10/22/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	1,456.26
WF99E	F31	WF99E20B	1.97	10/22/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	7,477.28
WF99E	F31	WF99E20B	1.97	10/22/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	478.23887
WN99F	N04	WN99F032	21.21	10/27/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	2,133.29
WN99F	N04	WN99F032	21.21	10/27/99	CERATIUM TRIPOS	5,059.80
WN99F	N04	WN99F032	21.21	10/27/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	452.79237
WN99F	N04	WN99F032	21.21	10/27/99	COSCINODISCUS SP. GROUP 2 DIAM 40-100 MI	3,473.13
WN99F	N04	WN99F032	21.21	10/27/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,055.39
WN99F	N04	WN99F032	21.21	10/27/99	CYLINDROTHECA CLOSTERIUM	1,227.01
WN99F	N04	WN99F032	21.21	10/27/99	DICTYOCHA FIBULA	1,393.47
WN99F	N04	WN99F032	21.21	10/27/99	EBRIA TRIPARTITA	976.03572
WN99F	N04	WN99F032	21.21	10/27/99	EUTREPTIA/EUTREPTIELLA SPP.	163.17365
WN99F	N04	WN99F032	21.21	10/27/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	3,443.81
WN99F	N04	WN99F032	21.21	10/27/99	HETEROCAPSA ROTUNDATA	621.24716
WN99F	N04	WN99F032	21.21	10/27/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	87.68377
WN99F	N04	WN99F032	21.21	10/27/99	PROROCENTRUM MICANS	4,126.01
WN99F	N04	WN99F032	21.21	10/27/99	PSEUDONITZSCHIA SPP.	172.43004
WN99F	N04	WN99F032	21.21	10/27/99	RHIZOSOLENIA FRAGILISSIMA	888.04222
WN99F	N04	WN99F032	21.21	10/27/99	RHIZOSOLENIA SETIGERA	8,400.08
WN99F	N04	WN99F032	21.21	10/27/99	THALASSIONEMA NITZSCHIOIDES	222.75217
WN99F	N04	WN99F032	21.21	10/27/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	4,917.68
WN99F	N04	WN99F032	21.21	10/27/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	13,522.47
WN99F	N04	WN99F032	21.21	10/27/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	336.93673
WN99F	N04	WN99F034	2.28	10/27/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	1,953.84
WN99F	N04	WN99F034	2.28	10/27/99	CERATIUM FUSUS	2,197.66
WN99F	N04	WN99F034	2.28	10/27/99	CERATIUM TRIPOS	11,262.80
WN99F	N04	WN99F034	2.28	10/27/99	CHAETOCEROS DECIPIENS	1,106.49
WN99F	N04	WN99F034	2.28	10/27/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	503.94368
WN99F	N04	WN99F034	2.28	10/27/99	COSCINODISCUS SP. GROUP 3 DIAM >100 MICR	9,039.03
WN99F	N04	WN99F034	2.28	10/27/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	750.98214
WN99F	N04	WN99F034	2.28	10/27/99	DICTYOCHA FIBULA	2,481.42

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WN99F	N04	WN99F034	2.28	10/27/99	DICTYOCHA SPECULUM	535.26004
WN99F	N04	WN99F034	2.28	10/27/99	EBRIA TRIPARTITA	1,450.83
WN99F	N04	WN99F034	2.28	10/27/99	EUTREPTIA/EUTREPTIELLA SPP.	45.32552
WN99F	N04	WN99F034	2.28	10/27/99	GUINARDIA FLACCIDA	3,403.04
WN99F	N04	WN99F034	2.28	10/27/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	3,513.45
WN99F	N04	WN99F034	2.28	10/27/99	GYRODINIUM SPIRALE	6,477.49
WN99F	N04	WN99F034	2.28	10/27/99	HETEROCAPSA ROTUNDATA	502.85714
WN99F	N04	WN99F034	2.28	10/27/99	LEPTOCYLINDRUS DANICUS	541.85608
WN99F	N04	WN99F034	2.28	10/27/99	PLEUROSIGMA SPP.	625.04942
WN99F	N04	WN99F034	2.28	10/27/99	PROROCENTRUM MICANS	1,836.85
WN99F	N04	WN99F034	2.28	10/27/99	RHIZOSOLENIA SETIGERA	5,193.90
WN99F	N04	WN99F034	2.28	10/27/99	THALASSIONEMA NITZSCHIOIDES	433.85329
WN99F	N04	WN99F034	2.28	10/27/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	3,622.57
WN99F	N04	WN99F034	2.28	10/27/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	13,997.20
WN99F	N04	WN99F034	2.28	10/27/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	375
WN99F	N18	WN99F05A	6.2	10/27/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	3,382.11
WN99F	N18	WN99F05A	6.2	10/27/99	CERATIUM TRIPOS	15,878.19
WN99F	N18	WN99F05A	6.2	10/27/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	977.28671
WN99F	N18	WN99F05A	6.2	10/27/99	CYLINDROTHECA CLOSTERIUM	480.50265
WN99F	N18	WN99F05A	6.2	10/27/99	DICTYOCHA FIBULA	1,311.86
WN99F	N18	WN99F05A	6.2	10/27/99	DICTYOCHA SPECULUM	251.53479
WN99F	N18	WN99F05A	6.2	10/27/99	EUTREPTIA/EUTREPTIELLA SPP.	256.02797
WN99F	N18	WN99F05A	6.2	10/27/99	GUINARDIA FLACCIDA	9,595.14
WN99F	N18	WN99F05A	6.2	10/27/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	5,403.52
WN99F	N18	WN99F05A	6.2	10/27/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	6,224.67
WN99F	N18	WN99F05A	6.2	10/27/99	HETEROCAPSA ROTUNDATA	88.61538
WN99F	N18	WN99F05A	6.2	10/27/99	LEPTOCYLINDRUS DANICUS	1,527.81
WN99F	N18	WN99F05A	6.2	10/27/99	PROROCENTRUM MICANS	7,121.32
WN99F	N18	WN99F05A	6.2	10/27/99	PROROCENTRUM MINIMUM	645.98601
WN99F	N18	WN99F05A	6.2	10/27/99	PSEUDONITZSCHIA SPP.	1,084.03
WN99F	N18	WN99F05A	6.2	10/27/99	RHIZOSOLENIA SETIGERA	2,928.92
WN99F	N18	WN99F05A	6.2	10/27/99	THALASSIONEMA NITZSCHIOIDES	87.37745
WN99F	N18	WN99F05A	6.2	10/27/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	6,439.33
WN99F	N18	WN99F05A	6.2	10/27/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	19,471.17
WN99F	N18	WN99F05A	6.2	10/27/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	528.67133
WN99F	N18	WN99F05B	2.2	10/27/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	2,273.97
WN99F	N18	WN99F05B	2.2	10/27/99	CERATIUM FUSUS	13,722.11
WN99F	N18	WN99F05B	2.2	10/27/99	CERATIUM MACROCEROS	1,701.17
WN99F	N18	WN99F05B	2.2	10/27/99	CERATIUM TRIPOS	4,387.91
WN99F	N18	WN99F05B	2.2	10/27/99	CHAETOCEROS DECIPIENS	862.15813
WN99F	N18	WN99F05B	2.2	10/27/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,215.32

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WN99F	N18	WN99F05B	2.2	10/27/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	96.35464
WN99F	N18	WN99F05B	2.2	10/27/99	CYLINDROTHECA CLOSTERIUM	1,418.77
WN99F	N18	WN99F05B	2.2	10/27/99	DICTYOCHA FIBULA	1,208.43
WN99F	N18	WN99F05B	2.2	10/27/99	DICTYOCHA SPECULUM	695.11145
WN99F	N18	WN99F05B	2.2	10/27/99	EBRIA TRIPARTITA	1,128.57
WN99F	N18	WN99F05B	2.2	10/27/99	EUTREPTIA/EUTREPTIELLA SPP.	105.95096
WN99F	N18	WN99F05B	2.2	10/27/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	3,484.26
WN99F	N18	WN99F05B	2.2	10/27/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	1,146.78
WN99F	N18	WN99F05B	2.2	10/27/99	HETEROCAPSA ROTUNDATA	832.61538
WN99F	N18	WN99F05B	2.2	10/27/99	LEPTOCYLINDRUS DANICUS	316.65481
WN99F	N18	WN99F05B	2.2	10/27/99	LEPTOCYLINDRUS MINIMUS	20.14145
WN99F	N18	WN99F05B	2.2	10/27/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	76.04016
WN99F	N18	WN99F05B	2.2	10/27/99	PROROCENTRUM MICANS	2,862.49
WN99F	N18	WN99F05B	2.2	10/27/99	PSEUDONITZSCHIA SPP.	448.59865
WN99F	N18	WN99F05B	2.2	10/27/99	RHIZOSOLENIA SETIGERA	4,047.01
WN99F	N18	WN99F05B	2.2	10/27/99	THALASSIONEMA NITZSCHIOIDES	120.73293
WN99F	N18	WN99F05B	2.2	10/27/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	5,491.90
WN99F	N18	WN99F05B	2.2	10/27/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	15,297.94
WF99E	F24	WF99E22B	10.25	10/28/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	426.31333
WF99E	F24	WF99E22B	10.25	10/28/99	CHAETOCEROS SP. GROUP 1 DIAM <10 MICRONS	64.39083
WF99E	F24	WF99E22B	10.25	10/28/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	421.16786
WF99E	F24	WF99E22B	10.25	10/28/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	804.65223
WF99E	F24	WF99E22B	10.25	10/28/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	64.59293
WF99E	F24	WF99E22B	10.25	10/28/99	CYLINDROTHECA CLOSTERIUM	522.22294
WF99E	F24	WF99E22B	10.25	10/28/99	EBRIA TRIPARTITA	151.31103
WF99E	F24	WF99E22B	10.25	10/28/99	EUTREPTIA/EUTREPTIELLA SPP.	56.82079
WF99E	F24	WF99E22B	10.25	10/28/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	500.51359
WF99E	F24	WF99E22B	10.25	10/28/99	GYRODINIUM SP. GROUP 2 21-40UM W 21-50UM	615.01222
WF99E	F24	WF99E22B	10.25	10/28/99	LITHODESMIUM UNDULATUM	1,018.51
WF99E	F24	WF99E22B	10.25	10/28/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	10.17783
WF99E	F24	WF99E22B	10.25	10/28/99	PROROCENTRUM MICANS	1,343.24
WF99E	F24	WF99E22B	10.25	10/28/99	PSEUDONITZSCHIA SPP.	240.58044
WF99E	F24	WF99E22B	10.25	10/28/99	RHIZOSOLENIA SETIGERA	1,302.23
WF99E	F24	WF99E22B	10.25	10/28/99	SCENEDESMUS SPP.	60.4524
WF99E	F24	WF99E22B	10.25	10/28/99	SKELETONEMA COSTATUM	94.95583
WF99E	F24	WF99E22B	10.25	10/28/99	THALASSIONEMA NITZSCHIOIDES	38.84895
WF99E	F24	WF99E22B	10.25	10/28/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	1,332.77
WF99E	F24	WF99E22B	10.25	10/28/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	6,696.63
WF99E	F24	WF99E22B	10.25	10/28/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	2,350.53
WF99E	F24	WF99E22D	2.14	10/28/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	232.53455

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99E	F24	WF99E22D	2.14	10/28/99	CHAETOCEROS DEBILIS	162.49143
WF99E	F24	WF99E22D	2.14	10/28/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	243.50047
WF99E	F24	WF99E22D	2.14	10/28/99	CYLINDROTHECA CLOSTERIUM	593.43516
WF99E	F24	WF99E22D	2.14	10/28/99	EUTREPTIA/EUTREPTIELLA SPP.	23.67533
WF99E	F24	WF99E22D	2.14	10/28/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	1,668.38
WF99E	F24	WF99E22D	2.14	10/28/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	1,537.53
WF99E	F24	WF99E22D	2.14	10/28/99	LEPTOCYLINDRUS DANICUS	141.51653
WF99E	F24	WF99E22D	2.14	10/28/99	LITHODESMIUM UNDULATUM	636.56833
WF99E	F24	WF99E22D	2.14	10/28/99	PENNATE DIATOM SP. GROUP 1 <10 MICRONS L	19.99194
WF99E	F24	WF99E22D	2.14	10/28/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	25.44458
WF99E	F24	WF99E22D	2.14	10/28/99	PROROCENTRUM MICANS	959.45991
WF99E	F24	WF99E22D	2.14	10/28/99	PSEUDONITZSCHIA SPP.	100.24185
WF99E	F24	WF99E22D	2.14	10/28/99	RHIZOSOLENIA SETIGERA	542.59645
WF99E	F24	WF99E22D	2.14	10/28/99	SKELETONEMA COSTATUM	281.90013
WF99E	F24	WF99E22D	2.14	10/28/99	THALASSIONEMA NITZSCHIOIDES	32.37413
WF99E	F24	WF99E22D	2.14	10/28/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	966.6727
WF99E	F24	WF99E22D	2.14	10/28/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	17,534.17
WF99E	F24	WF99E22D	2.14	10/28/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	391.75495
WF99E	F13	WF99E278	8.79	10/28/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	1,733.96
WF99E	F13	WF99E278	8.79	10/28/99	COSCINODISCUS SP. GROUP 2 DIAM 40-100 MI	1,715.24
WF99E	F13	WF99E278	8.79	10/28/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	769.00374
WF99E	F13	WF99E278	8.79	10/28/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	109.74448
WF99E	F13	WF99E278	8.79	10/28/99	CYLINDROTHECA CLOSTERIUM	705.77946
WF99E	F13	WF99E278	8.79	10/28/99	DICTYOCHA SPECULUM	158.34141
WF99E	F13	WF99E278	8.79	10/28/99	EBRIA TRIPARTITA	642.69999
WF99E	F13	WF99E278	8.79	10/28/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	2,267.68
WF99E	F13	WF99E278	8.79	10/28/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	3,918.44
WF99E	F13	WF99E278	8.79	10/28/99	HETEROCAPSA ROTUNDATA	278.91738
WF99E	F13	WF99E278	8.79	10/28/99	LITHODESMIUM UNDULATUM	1,081.54
WF99E	F13	WF99E278	8.79	10/28/99	PROROCENTRUM MICANS	2,445.21
WF99E	F13	WF99E278	8.79	10/28/99	PROROCENTRUM MINIMUM	608.94862
WF99E	F13	WF99E278	8.79	10/28/99	PSEUDONITZSCHIA SPP.	255.4689
WF99E	F13	WF99E278	8.79	10/28/99	RHIZOSOLENIA SETIGERA	1,843.76
WF99E	F13	WF99E278	8.79	10/28/99	THALASSIONEMA NITZSCHIOIDES	165.01258
WF99E	F13	WF99E278	8.79	10/28/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	3,424.56
WF99E	F13	WF99E278	8.79	10/28/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	13,576.28
WF99E	F13	WF99E278	8.79	10/28/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	2,662.39
WF99E	F13	WF99E279	2.01	10/28/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	1,852.53
WF99E	F13	WF99E279	2.01	10/28/99	COSCINODISCUS SP. GROUP 2 DIAM 40-100 MI	3,530.98
WF99E	F13	WF99E279	2.01	10/28/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,371.99

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99E	F13	WF99E279	2.01	10/28/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	112.95931
WF99E	F13	WF99E279	2.01	10/28/99	CYLINDROTHECA CLOSTERIUM	415.11679
WF99E	F13	WF99E279	2.01	10/28/99	DICTYOCHA SPECULUM	488.93946
WF99E	F13	WF99E279	2.01	10/28/99	EBRIA TRIPARTITA	1,323.05
WF99E	F13	WF99E279	2.01	10/28/99	EUTREPTIA/EUTREPTIELLA SPP.	165.61247
WF99E	F13	WF99E279	2.01	10/28/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	2,334.11
WF99E	F13	WF99E279	2.01	10/28/99	GYRODINIUM SP. GROUP 2 21-40UM W 21-50UM	1,344.41
WF99E	F13	WF99E279	2.01	10/28/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	22.24858
WF99E	F13	WF99E279	2.01	10/28/99	PLEUROSIGMA SPP.	2,287.68
WF99E	F13	WF99E279	2.01	10/28/99	PROROCENTRUM MINIMUM	837.12225
WF99E	F13	WF99E279	2.01	10/28/99	RHIZOSOLENIA DELICATULA	153.48736
WF99E	F13	WF99E279	2.01	10/28/99	RHIZOSOLENIA SETIGERA	1,897.77
WF99E	F13	WF99E279	2.01	10/28/99	THALASSIONEMA NITZSCHIOIDES	84.92321
WF99E	F13	WF99E279	2.01	10/28/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	3,201.17
WF99E	F13	WF99E279	2.01	10/28/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	15,331.77
WF99E	F13	WF99E279	2.01	10/28/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	1,027.64
WF99E	F06	WF99E29D	16.66	10/28/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	936.15157
WF99E	F06	WF99E29D	16.66	10/28/99	CERATIUM FUSUS	1,890.56
WF99E	F06	WF99E29D	16.66	10/28/99	CERATIUM TRIPOS	9,688.98
WF99E	F06	WF99E29D	16.66	10/28/99	CHAETOCEROS DEBILIS	535.22819
WF99E	F06	WF99E29D	16.66	10/28/99	CHAETOCEROS DECIPIENS	951.87036
WF99E	F06	WF99E29D	16.66	10/28/99	CHAETOCEROS DIDYMUS	95.12186
WF99E	F06	WF99E29D	16.66	10/28/99	COSCINODISCUS SP. GROUP 3 DIAM >100 MICR	7,775.95
WF99E	F06	WF99E29D	16.66	10/28/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	525.06166
WF99E	F06	WF99E29D	16.66	10/28/99	DICTYOCHA FIBULA	1,334.17
WF99E	F06	WF99E29D	16.66	10/28/99	DICTYOCHA SPECULUM	306.97663
WF99E	F06	WF99E29D	16.66	10/28/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	3,572.04
WF99E	F06	WF99E29D	16.66	10/28/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	13,927.24
WF99E	F06	WF99E29D	16.66	10/28/99	HETEROCAPSA ROTUNDATA	216.29495
WF99E	F06	WF99E29D	16.66	10/28/99	PENNATE DIATOM SP. GROUP 1 <10 MICRONS L	16.46279
WF99E	F06	WF99E29D	16.66	10/28/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	20.95288
WF99E	F06	WF99E29D	16.66	10/28/99	PROROCENTRUM MICANS	6,320.70
WF99E	F06	WF99E29D	16.66	10/28/99	PROROCENTRUM MINIMUM	1,182.56
WF99E	F06	WF99E29D	16.66	10/28/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	500.86904
WF99E	F06	WF99E29D	16.66	10/28/99	PSEUDONITZSCHIA SPP.	247.63889
WF99E	F06	WF99E29D	16.66	10/28/99	RHIZOSOLENIA DELICATULA	144.54867
WF99E	F06	WF99E29D	16.66	10/28/99	RHIZOSOLENIA SETIGERA	5,361.75
WF99E	F06	WF99E29D	16.66	10/28/99	THALASSIONEMA NITZSCHIOIDES	53.31834
WF99E	F06	WF99E29D	16.66	10/28/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	6,368.22
WF99E	F06	WF99E29D	16.66	10/28/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	14,225.77
WF99E	F06	WF99E29D	16.66	10/28/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	322.599

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WF99E	F06	WF99E29F	2.57	10/28/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	1,475.15
WF99E	F06	WF99E29F	2.57	10/28/99	CERATIUM LINEATUM	1,412.10
WF99E	F06	WF99E29F	2.57	10/28/99	CHAETOCEROS SP. GROUP 2 DIAM 10-30 MICRO	250.48088
WF99E	F06	WF99E29F	2.57	10/28/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,397.37
WF99E	F06	WF99E29F	2.57	10/28/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	122.92899
WF99E	F06	WF99E29F	2.57	10/28/99	CYLINDROTHECA CLOSTERIUM	564.69329
WF99E	F06	WF99E29F	2.57	10/28/99	DICTYOCHA FIBULA	4,316.79
WF99E	F06	WF99E29F	2.57	10/28/99	DICTYOCHA SPECULUM	1,596.28
WF99E	F06	WF99E29F	2.57	10/28/99	EBRIA TRIPARTITA	359.95643
WF99E	F06	WF99E29F	2.57	10/28/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	3,810.18
WF99E	F06	WF99E29F	2.57	10/28/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	10,241.44
WF99E	F06	WF99E29F	2.57	10/28/99	HETEROCAPSA ROTUNDATA	187.45562
WF99E	F06	WF99E29F	2.57	10/28/99	PLEUROSIGMA SPP.	621.35091
WF99E	F06	WF99E29F	2.57	10/28/99	PROROCENTRUM MICANS	35,150.13
WF99E	F06	WF99E29F	2.57	10/28/99	PSEUDONITZSCHIA SPP.	763.09464
WF99E	F06	WF99E29F	2.57	10/28/99	RHIZOSOLENIA DELICATULA	835.17011
WF99E	F06	WF99E29F	2.57	10/28/99	RHIZOSOLENIA SETIGERA	4,130.53
WF99E	F06	WF99E29F	2.57	10/28/99	THALASSIONEMA NITZSCHIOIDES	123.2246
WF99E	F06	WF99E29F	2.57	10/28/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	4,266.56
WF99E	F06	WF99E29F	2.57	10/28/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	16,377.10
WF99E	F06	WF99E29F	2.57	10/28/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	1,863.91
WN99G	N04	WN99G03B	8.22	11/23/99	AMPHIDINIUM SPP.	72.68279
WN99G	N04	WN99G03B	8.22	11/23/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	307.05189
WN99G	N04	WN99G03B	8.22	11/23/99	CERATIUM FUSUS	1,049.39
WN99G	N04	WN99G03B	8.22	11/23/99	CORETHRON CRIOPHILUM	6,495.25
WN99G	N04	WN99G03B	8.22	11/23/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,324.05
WN99G	N04	WN99G03B	8.22	11/23/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	354.29064
WN99G	N04	WN99G03B	8.22	11/23/99	CYLINDROTHECA CLOSTERIUM	108.49924
WN99G	N04	WN99G03B	8.22	11/23/99	DICTYOCHA FIBULA	148.11087
WN99G	N04	WN99G03B	8.22	11/23/99	DICTYOCHA SPECULUM	511.17722
WN99G	N04	WN99G03B	8.22	11/23/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	3,050.34
WN99G	N04	WN99G03B	8.22	11/23/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	3,513.88
WN99G	N04	WN99G03B	8.22	11/23/99	GYRODINIUM SPIRALE	3,093.03
WN99G	N04	WN99G03B	8.22	11/23/99	HETEROCAPSA ROTUNDATA	420.20319
WN99G	N04	WN99G03B	8.22	11/23/99	LEPTOCYLINDRUS DANICUS	7,762.15
WN99G	N04	WN99G03B	8.22	11/23/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	11.63024
WN99G	N04	WN99G03B	8.22	11/23/99	PROROCENTRUM MICANS	14,252.91
WN99G	N04	WN99G03B	8.22	11/23/99	PROROCENTRUM MINIMUM	437.59797
WN99G	N04	WN99G03B	8.22	11/23/99	PROTOPERIDINIUM BIPES	184.96656
WN99G	N04	WN99G03B	8.22	11/23/99	PROTOPERIDINIUM DEPRESSUM	17,114.73
WN99G	N04	WN99G03B	8.22	11/23/99	PSEUDONITZSCHIA SPP.	962.19216

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WN99G	N04	WN99G03B	8.22	11/23/99	RHIZOSOLENIA DELICATULA	1,363.98
WN99G	N04	WN99G03B	8.22	11/23/99	RHIZOSOLENIA FRAGILISSIMA	1,531.25
WN99G	N04	WN99G03B	8.22	11/23/99	RHIZOSOLENIA SETIGERA	44,145.90
WN99G	N04	WN99G03B	8.22	11/23/99	RHIZOSOLENIA STOLTERFOTHII	9,837.05
WN99G	N04	WN99G03B	8.22	11/23/99	SKELETONEMA COSTATUM	74.59811
WN99G	N04	WN99G03B	8.22	11/23/99	THALASSIONEMA NITZSCHIOIDES	162.7737
WN99G	N04	WN99G03B	8.22	11/23/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	413.64495
WN99G	N04	WN99G03B	8.22	11/23/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	9,049.63
WN99G	N04	WN99G03B	8.22	11/23/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	358.12772
WN99G	N04	WN99G03C	2.31	11/23/99	CALYCOMONAS OVALIS	21.05599
WN99G	N04	WN99G03C	2.31	11/23/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	249.64042
WN99G	N04	WN99G03C	2.31	11/23/99	CERATIUM FUSUS	3,024.90
WN99G	N04	WN99G03C	2.31	11/23/99	CERATIUM TRIPOS	2,583.73
WN99G	N04	WN99G03C	2.31	11/23/99	CHAETOCEROS SPP. (10-20UM)	44.30415
WN99G	N04	WN99G03C	2.31	11/23/99	CORETHRON CRIOPHILUM	9,361.40
WN99G	N04	WN99G03C	2.31	11/23/99	COSCINODISCUS SP. GROUP 3 DIAM >100 MICR	4,147.17
WN99G	N04	WN99G03C	2.31	11/23/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	530.08648
WN99G	N04	WN99G03C	2.31	11/23/99	CRYPTOMONAS SP. GROUP 2 LENGTH >10 MICRO	113.47292
WN99G	N04	WN99G03C	2.31	11/23/99	CYLINDROTHECA CLOSTERIUM	52.12553
WN99G	N04	WN99G03C	2.31	11/23/99	DICTYOCHA FIBULA	142.31174
WN99G	N04	WN99G03C	2.31	11/23/99	DICTYOCHA SPECULUM	409.30217
WN99G	N04	WN99G03C	2.31	11/23/99	GUINARDIA FLACCIDA	6,245.36
WN99G	N04	WN99G03C	2.31	11/23/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	3,810.18
WN99G	N04	WN99G03C	2.31	11/23/99	GYRODINIUM SPIRALE	2,971.92
WN99G	N04	WN99G03C	2.31	11/23/99	HETEROCAPSA ROTUNDATA	115.35731
WN99G	N04	WN99G03C	2.31	11/23/99	LEPTOCYLINDRUS DANICUS	9,633.55
WN99G	N04	WN99G03C	2.31	11/23/99	PLEUROSIGMA SPP.	2,298.08
WN99G	N04	WN99G03C	2.31	11/23/99	PROROCENTRUM MICANS	21,701.08
WN99G	N04	WN99G03C	2.31	11/23/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	534.26031
WN99G	N04	WN99G03C	2.31	11/23/99	PSEUDONITZSCHIA SPP.	880.49382
WN99G	N04	WN99G03C	2.31	11/23/99	RHIZOSOLENIA DELICATULA	616.741
WN99G	N04	WN99G03C	2.31	11/23/99	RHIZOSOLENIA FRAGILISSIMA	565.88325
WN99G	N04	WN99G03C	2.31	11/23/99	RHIZOSOLENIA SETIGERA	39,081.21
WN99G	N04	WN99G03C	2.31	11/23/99	RHIZOSOLENIA STOLTERFOTHII	4,931.42
WN99G	N04	WN99G03C	2.31	11/23/99	SKELETONEMA COSTATUM	39.09671
WN99G	N04	WN99G03C	2.31	11/23/99	THALASSIONEMA NITZSCHIOIDES	142.18223
WN99G	N04	WN99G03C	2.31	11/23/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	343.2515
WN99G	N04	WN99G03C	2.31	11/23/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	4,944.39
WN99G	N18	WN99G05F	6.82	11/23/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	311.10492
WN99G	N18	WN99G05F	6.82	11/23/99	CERATIUM FUSUS	5,265.57
WN99G	N18	WN99G05F	6.82	11/23/99	CORETHRON CRIOPHILUM	17,653.75

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WN99G	N18	WN99G05F	6.82	11/23/99	COSCINODISCUS SP. GROUP 3 DIAM >100 MICR	5,414.37
WN99G	N18	WN99G05F	6.82	11/23/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	308.02393
WN99G	N18	WN99G05F	6.82	11/23/99	DICTYOCHA SPECULUM	854.98675
WN99G	N18	WN99G05F	6.82	11/23/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	3,156.83
WN99G	N18	WN99G05F	6.82	11/23/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	2,644.77
WN99G	N18	WN99G05F	6.82	11/23/99	HETEROCAPSA ROTUNDATA	225.90806
WN99G	N18	WN99G05F	6.82	11/23/99	LEPTOCYLINDRUS DANICUS	5,923.42
WN99G	N18	WN99G05F	6.82	11/23/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	14.58941
WN99G	N18	WN99G05F	6.82	11/23/99	PROROCENTRUM MICANS	25,031.15
WN99G	N18	WN99G05F	6.82	11/23/99	PSEUDONITZSCHIA SPP.	1,034.58
WN99G	N18	WN99G05F	6.82	11/23/99	RHIZOSOLENIA DELICATULA	4,126.60
WN99G	N18	WN99G05F	6.82	11/23/99	RHIZOSOLENIA FRAGILISSIMA	5,614.82
WN99G	N18	WN99G05F	6.82	11/23/99	RHIZOSOLENIA HEBETATA	247.4683
WN99G	N18	WN99G05F	6.82	11/23/99	RHIZOSOLENIA SETIGERA	29,244.72
WN99G	N18	WN99G05F	6.82	11/23/99	RHIZOSOLENIA STOLTERFOTHII	6,438.24
WN99G	N18	WN99G05F	6.82	11/23/99	SKELETONEMA COSTATUM	34.02861
WN99G	N18	WN99G05F	6.82	11/23/99	THALASSIONEMA NITZSCHIOIDES	55.68804
WN99G	N18	WN99G05F	6.82	11/23/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	636.82186
WN99G	N18	WN99G05F	6.82	11/23/99	THALASSIOTHRIX LONGISSIMA	444.93482
WN99G	N18	WN99G05F	6.82	11/23/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	5,898.69
WN99G	N18	WN99G05F	6.82	11/23/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	336.93673
WN99G	N18	WN99G060	2.25	11/23/99	CALYCOMONAS OVALIS	21.30815
WN99G	N18	WN99G060	2.25	11/23/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	206.69737
WN99G	N18	WN99G060	2.25	11/23/99	CORETHRON CRIOPHILUM	6,315.68
WN99G	N18	WN99G060	2.25	11/23/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	390.49331
WN99G	N18	WN99G060	2.25	11/23/99	CYLINDROTHECA CLOSTERIUM	52.74979
WN99G	N18	WN99G060	2.25	11/23/99	DICTYOCHA FIBULA	144.01607
WN99G	N18	WN99G060	2.25	11/23/99	DICTYOCHA SPECULUM	745.56718
WN99G	N18	WN99G060	2.25	11/23/99	GUINARDIA FLACCIDA	1,580.04
WN99G	N18	WN99G060	2.25	11/23/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	3,262.61
WN99G	N18	WN99G060	2.25	11/23/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	2,050.04
WN99G	N18	WN99G060	2.25	11/23/99	GYRODINIUM SPIRALE	3,007.51
WN99G	N18	WN99G060	2.25	11/23/99	HETEROCAPSA ROTUNDATA	175.10825
WN99G	N18	WN99G060	2.25	11/23/99	LEPTOCYLINDRUS DANICUS	8,176.51
WN99G	N18	WN99G060	2.25	11/23/99	LEPTOCYLINDRUS MINIMUS	372.05934
WN99G	N18	WN99G060	2.25	11/23/99	PROROCENTRUM MICANS	16,843.85
WN99G	N18	WN99G060	2.25	11/23/99	PROTOPERIDINIUM SP. GROUP 1 10-30W 10-40	270.32932
WN99G	N18	WN99G060	2.25	11/23/99	PSEUDONITZSCHIA SPP.	1,425.66
WN99G	N18	WN99G060	2.25	11/23/99	RHIZOSOLENIA DELICATULA	3,120.64
WN99G	N18	WN99G060	2.25	11/23/99	RHIZOSOLENIA FRAGILISSIMA	114.53206
WN99G	N18	WN99G060	2.25	11/23/99	RHIZOSOLENIA SETIGERA	18,327.70
WN99G	N18	WN99G060	2.25	11/23/99	RHIZOSOLENIA STOLTERFOTHII	5,406.35

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WN99G	N18	WN99G060	2.25	11/23/99	SKELETONEMA COSTATUM	98.91233
WN99G	N18	WN99G060	2.25	11/23/99	THALASSIONEMA NITZSCHIOIDES	14.3885
WN99G	N18	WN99G060	2.25	11/23/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	8,339.34
WN99H	N04	WN99H037	25.71	12/20/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	284.10256
WN99H	N04	WN99H037	25.71	12/20/99	CERATIUM FUSUS	841.4957
WN99H	N04	WN99H037	25.71	12/20/99	CERATIUM TRIPOS	2,156.30
WN99H	N04	WN99H037	25.71	12/20/99	CORETHRON CRIOPHILUM	1,736.16
WN99H	N04	WN99H037	25.71	12/20/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	163.77854
WN99H	N04	WN99H037	25.71	12/20/99	CYLINDROTHECA CLOSTERIUM	87.0046
WN99H	N04	WN99H037	25.71	12/20/99	DICTYOCHA FIBULA	118.76881
WN99H	N04	WN99H037	25.71	12/20/99	DICTYOCHA SPECULUM	68.31809
WN99H	N04	WN99H037	25.71	12/20/99	DINOPHYSIS NORVEGICA	1,204.47
WN99H	N04	WN99H037	25.71	12/20/99	EBRIA TRIPARTITA	1,388.83
WN99H	N04	WN99H037	25.71	12/20/99	GUINARDIA FLACCIDA	13,052.36
WN99H	N04	WN99H037	25.71	12/20/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	611.50997
WN99H	N04	WN99H037	25.71	12/20/99	GYMNODINIUM SP. GROUP 2 21-40UM W 21-50U	563.55029
WN99H	N04	WN99H037	25.71	12/20/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	37.30475
WN99H	N04	WN99H037	25.71	12/20/99	PLEUROSIGMA SPP.	718.00549
WN99H	N04	WN99H037	25.71	12/20/99	PROROCENTRUM MICANS	6,505.90
WN99H	N04	WN99H037	25.71	12/20/99	PSEUDONITZSCHIA SPP.	36.74159
WN99H	N04	WN99H037	25.71	12/20/99	RHIZOSOLENIA DELICATULA	128.67806
WN99H	N04	WN99H037	25.71	12/20/99	RHIZOSOLENIA FRAGILISSIMA	377.8144
WN99H	N04	WN99H037	25.71	12/20/99	RHIZOSOLENIA HEBETATA	158.1925
WN99H	N04	WN99H037	25.71	12/20/99	RHIZOSOLENIA SETIGERA	1,988.78
WN99H	N04	WN99H037	25.71	12/20/99	THALASSIONEMA NITZSCHIOIDES	308.5179
WN99H	N04	WN99H037	25.71	12/20/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	889.55444
WN99H	N04	WN99H037	25.71	12/20/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	7,885.27
WN99H	N04	WN99H039	2.02	12/20/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	303.20656
WN99H	N04	WN99H039	2.02	12/20/99	CERATIUM FUSUS	862.15743
WN99H	N04	WN99H039	2.02	12/20/99	CORETHRON CRIOPHILUM	889.39508
WN99H	N04	WN99H039	2.02	12/20/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	120.66509
WN99H	N04	WN99H039	2.02	12/20/99	DICTYOCHA FIBULA	609.44883
WN99H	N04	WN99H039	2.02	12/20/99	DICTYOCHA SPECULUM	139.99109
WN99H	N04	WN99H039	2.02	12/20/99	GUINARDIA FLACCIDA	1,335.04
WN99H	N04	WN99H039	2.02	12/20/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	783.15591
WN99H	N04	WN99H039	2.02	12/20/99	HETEROCAPSA ROTUNDATA	61.64835
WN99H	N04	WN99H039	2.02	12/20/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	47.85628
WN99H	N04	WN99H039	2.02	12/20/99	PLEUROSIGMA SPP.	245.2117
WN99H	N04	WN99H039	2.02	12/20/99	PROROCENTRUM MICANS	8,287.02
WN99H	N04	WN99H039	2.02	12/20/99	PROROCENTRUM MINIMUM	44.86475
WN99H	N04	WN99H039	2.02	12/20/99	RHIZOSOLENIA SETIGERA	2,445.13
WN99H	N04	WN99H039	2.02	12/20/99	THALASSIONEMA NITZSCHIOIDES	352.56539

Survey	Sta.	Sample Number	Depth (m)	Sampling Date	Plankton`	Estimated Carbon Equivalence (ng carbon/L)
WN99H	N04	WN99H039	2.02	12/20/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	957.73835
WN99H	N04	WN99H039	2.02	12/20/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	3,826.84
WN99H	N04	WN99H039	2.02	12/20/99	UNID. MICRO-PHYTOFLAG SP. GROUP 2 LENGTH	183.89423
WN99H	N18	WN99H064	12.77	12/20/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	609.07837
WN99H	N18	WN99H064	12.77	12/20/99	CERATIUM LINEATUM	583.04579
WN99H	N18	WN99H064	12.77	12/20/99	CORETHRON CRIOPHILUM	3,722.10
WN99H	N18	WN99H064	12.77	12/20/99	COSCINODISCUS SP. GROUP 3 DIAM >100 MICR	7,420.14
WN99H	N18	WN99H064	12.77	12/20/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	1,047.23
WN99H	N18	WN99H064	12.77	12/20/99	CYLINDROTHECA CLOSTERIUM	233.15795
WN99H	N18	WN99H064	12.77	12/20/99	DICTYOCHA FIBULA	127.31232
WN99H	N18	WN99H064	12.77	12/20/99	DICTYOCHA SPECULUM	73.23248
WN99H	N18	WN99H064	12.77	12/20/99	GUINARDIA FLACCIDA	5,587.11
WN99H	N18	WN99H064	12.77	12/20/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	1,638.75
WN99H	N18	WN99H064	12.77	12/20/99	GYRODINIUM SPIRALE	5,317.37
WN99H	N18	WN99H064	12.77	12/20/99	HETEROCAPSA ROTUNDATA	193.49782
WN99H	N18	WN99H064	12.77	12/20/99	PENNATE DIATOM SP. GROUP 2 10-30 MICRONS	39.98823
WN99H	N18	WN99H064	12.77	12/20/99	PLEUROSIGMA SPP.	1,282.76
WN99H	N18	WN99H064	12.77	12/20/99	PROROCENTRUM MICANS	4,712.09
WN99H	N18	WN99H064	12.77	12/20/99	PROTOPERIDINIUM SP. GROUP 2 31-75W 41-80	1,686.21
WN99H	N18	WN99H064	12.77	12/20/99	RHIZOSOLENIA DELICATULA	10,638.82
WN99H	N18	WN99H064	12.77	12/20/99	RHIZOSOLENIA FRAGILISSIMA	2,936.19
WN99H	N18	WN99H064	12.77	12/20/99	RHIZOSOLENIA SETIGERA	5,116.41
WN99H	N18	WN99H064	12.77	12/20/99	THALASSIONEMA NITZSCHIOIDES	419.74834
WN99H	N18	WN99H064	12.77	12/20/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	2,311.13
WN99H	N18	WN99H064	12.77	12/20/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	10,994.59
WN99H	N18	WN99H066	2.44	12/20/99	CENTRIC DIATOM SP. GROUP 1 DIAM <10 MICR	252.07761
WN99H	N18	WN99H066	2.44	12/20/99	CERATIUM LINEATUM	5,801.03
WN99H	N18	WN99H066	2.44	12/20/99	CORETHRON CRIOPHILUM	924.27332
WN99H	N18	WN99H066	2.44	12/20/99	COSCINODISCUS SP. GROUP 3 DIAM >100 MICR	36,913.44
WN99H	N18	WN99H066	2.44	12/20/99	CRYPTOMONAS SP. GROUP 1 LENGTH <10 MICRO	193.97357
WN99H	N18	WN99H066	2.44	12/20/99	CYLINDROTHECA CLOSTERIUM	138.95488
WN99H	N18	WN99H066	2.44	12/20/99	DICTYOCHA FIBULA	126.45697
WN99H	N18	WN99H066	2.44	12/20/99	EUTREPTIA/EUTREPTIELLA SPP.	18.47886
WN99H	N18	WN99H066	2.44	12/20/99	GUINARDIA FLACCIDA	8,324.36
WN99H	N18	WN99H066	2.44	12/20/99	GYMNODINIUM SP. GROUP 1 5-20UM W 10-20UM	325.54716
WN99H	N18	WN99H066	2.44	12/20/99	HETEROCAPSA ROTUNDATA	128.13187
WN99H	N18	WN99H066	2.44	12/20/99	PROROCENTRUM MICANS	2,621.04
WN99H	N18	WN99H066	2.44	12/20/99	RHIZOSOLENIA DELICATULA	2,466.14
WN99H	N18	WN99H066	2.44	12/20/99	RHIZOSOLENIA FRAGILISSIMA	3,519.87
WN99H	N18	WN99H066	2.44	12/20/99	RHIZOSOLENIA HEBETATA	168.43264
WN99H	N18	WN99H066	2.44	12/20/99	RHIZOSOLENIA SETIGERA	3,388.02

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WN99H	N18	WN99H066	2.44	12/20/99	SKELETONEMA COSTATUM	11.58033
WN99H	N18	WN99H066	2.44	12/20/99	THALASSIONEMA NITZSCHIOIDES	252.68379
WN99H	N18	WN99H066	2.44	12/20/99	THALASSIOSIRA SP. GROUP 3 10-20 MICRONS	1,236.09
WN99H	N18	WN99H066	2.44	12/20/99	THALASSIOTHRIX LONGISSIMA	302.83292
WN99H	N18	WN99H066	2.44	12/20/99	UNID. MICRO-PHYTOFLAG SP. GROUP 1 LENGTH	5,302.55

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