

DISSOLVED NUTRIENT AND SUSPENDED PARTICULATE MATTER DATA FOR THE SAN
FRANCISCO BAY ESTUARY, CALIFORNIA, OCTOBER 1988 THROUGH SEPTEMBER 1991

By Stephen W. Hager

U.S. GEOLOGICAL SURVEY

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BRUCE BABBITT, Secretary

U.S. GEOLOGICAL SURVEY

Dallas L. Peck, Director

For additional information
write to:

U.S. Geological Survey, WRD
345 Middlefield Road
Menlo Park, California 94025

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CONTENTS

	Page
Abstract	6
Introduction	7
Acknowledgments	7
Methods	8
Results	12
Data tables	12
Nutrients	12
Suspended particulate matter	13
References	15

ILLUSTRATIONS

	Page
Figure 1. Location map of the San Francisco Bay estuarine system --	17
Figure 2. Comparison of the dissolved silica concentration in previously frozen samples....	18
Figure 3. Salinity comparison for the purpose of estimating sampling error. ...	19

TABLES

	Page
Table 1. Cruise dates and station coverage	20
Table 2. San Francisco Bay station locations; main channel	22
Table 3. Summary of measurements reported, abbreviations used in the data tables, and units for each variable	23

Data for northern San Francisco Bay

Table 4. Nutrient and suspended matter data for 06 October 1988	24
Table 5. Nutrient and suspended matter data for 02 November 1988	24
Table 6. Nutrient and suspended matter data for 30 November 1988	25
Table 7. Nutrient and suspended matter data for 28 February 1989	26
Table 8. Nutrient and suspended matter data for 12 April 1989	26
Table 9. Nutrient and suspended matter data for 14 June 1989	27
Table 10. Nutrient and suspended matter data for 09 August 1989	28
Table 11. Nutrient and suspended matter data for 04 October 1989	28
Table 12. Nutrient and suspended matter data for 12 December 1989	29
Table 13. Nutrient and suspended matter data for 27 February 1990	30
Table 14. Nutrient and suspended matter data for 18 April 1990	30
Table 15. Nutrient and suspended matter data for 30 May 1990	31
Table 16. Nutrient and suspended matter data for 30 July 1990	32
Table 17. Nutrient and suspended matter data for 29 October 1990	33
Table 18. Nutrient and suspended matter data for 08 November 1990	33
Table 19. Nutrient and suspended matter data for 06 December 1990	34
Table 20. Nutrient and suspended matter data for 06 February 1991	34

Table 21.	Nutrient and suspended matter data for 11 March 1991	-----	35
Table 22.	Nutrient and suspended matter data for 11 April 1991	-----	36
Table 23.	Nutrient and suspended matter data for 05 June 1991	-----	37
Table 24.	Nutrient and suspended matter data for 01 August 1991	-----	38

Data for southern San Francisco Bay

Table 25.	Nutrient and suspended matter data for 01 March 1989	-----	39
Table 26.	Nutrient and suspended matter data for 10 August 1989	-----	39
Table 27.	Nutrient and suspended matter data for 28 February 1990	----	40
Table 28.	Nutrient and suspended matter data for 18 April 1990	-----	40
Table 29.	Nutrient and suspended matter data for 31 May 1990	-----	41
Table 30.	Nutrient and suspended matter data for 31 July 1990	-----	41
Table 31.	Nutrient and suspended matter data for 07 December 1990	----	42
Table 32.	Nutrient and suspended matter data for 06 February 1991	----	42
Table 33.	Nutrient and suspended matter data for 05 March 1991	-----	43
Table 34.	Nutrient and suspended matter data for 11 March 1991	-----	43
Table 35.	Nutrient and suspended matter data for 19 March 1991	-----	44
Table 36.	Nutrient and suspended matter data for 01 April 1991	-----	45
Table 37.	Nutrient and suspended matter data for 05 April 1991	-----	45
Table 38.	Nutrient and suspended matter data for 08 April 1991	-----	46
Table 39.	Nutrient and suspended matter data for 11 April 1991	-----	47
Table 40.	Nutrient and suspended matter data for 15 April 1991	-----	47
Table 41.	Nutrient and suspended matter data for 19 April 1991	-----	48
Table 42.	Nutrient and suspended matter data for 25 April 1991	-----	48
Table 43.	Nutrient and suspended matter data for 05 June 1991	-----	49
Table 44.	Nutrient and suspended matter data for 02 August 1991	-----	50

Data for the Dumbarton Bridge study

Table 45.	Nutrient and alkalinity data for 13 November 1990 to 30 April 1991	-----	51
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CONVERSION FACTORS

<u>Multiply</u>	<u>by</u>	<u>to obtain</u>
μm (micrometers)	0.00003937	inches
mm (millimeters)	0.03937	inches
L (liters)	0.2642	gallons (U.S.) ₂
kPa (kiloPascals)	0.147	pounds per in ²
for NO_2^- , $\text{NO}_3^- + \text{NO}_2^-$, NH_4^+ and DON;		
μM (microMolar, micromoles per liter)	14.01	$\mu\text{g N}$ per liter
for DRP and DOP;		
μM	30.97	$\mu\text{g P}$ per liter
for SiO_2 ;		
μM	60.08	$\mu\text{g SiO}_2$ per liter

TRADE NAMES

The use of brand or trade names in this report is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.

DISSOLVED NUTRIENT AND SUSPENDED PARTICULATE MATTER DATA FOR
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ABSTRACT

The U.S. Geological Survey conducted hydrologic investigations in San Francisco Bay during Water Years 1988, 1989, 1990 and 1991. Dissolved inorganic plant nutrients, nitrate, nitrite, ammonium, silica, and reactive phosphorus were measured in surface and in near-bottom waters at previously established locations in both northern and southern reaches of the bay. Salinity, turbidity, and concentrations of suspended particulate matter also were measured. Additionally, in Water Year 1991, concentrations of dissolved organic nitrogen and phosphorus were measured. From November 1990 through April 1991, surface waters were sampled near the end of the old Dumbarton Bridge (east span). Salinity, dissolved inorganic nutrients, and alkalinity were measured for these samples. This report presents the sampling and analytical methods, and the data for these studies.

INTRODUCTION

As part of a continuing study of the San Francisco Bay estuary, cruises were conducted between October 1988 and September 1991 (table 1). The main objectives of these cruises were to examine the effects of persistent low levels of freshwater inflow to the bay on phytoplankton dynamics, and thus on the concentrations of the dissolved plant nutrients (nitrite, nitrate, ammonium, phosphate, silicate, organic nitrogen and organic phosphorus). Sampling during this low freshwater inflow period will enable comparisons with data collected during the 1976-1977 drought and with "normal" inflow periods. Salinity, and concentrations of suspended particulate matter and turbidity in the surface waters were also routinely measured. The basic hydrologic data for these cruises are given by Wienke and others (1990, 1991 and 1992).

In addition to the cruise data, a study was conducted between 13 November 1990 and 26 April 1991 in which surface waters from the end of the old Dumbarton Bridge (east span) were sampled. Concentrations of dissolved plant nutrients, salinity and alkalinity were measured.

This report presents the sampling and analytical methods used for these studies and the data.

Acknowledgments

I want to thank David H. Peterson for his advice and support, colleagues Jan Thompson, Andrea Alpine, Jim Cloern, Brian Cole, Linda Huzzey, Francis Parchaso and Fred Nichols for assistance in the field, and Sally Wienke for help with the suspended particulate matter samples. I thank Larry Schemel for measuring bottle salinities and alkalinities, and for implementing the study at Dumbarton Bridge. I also thank captain Byron Richards and engineer Scott Conard for excellent logistical support aboard the R.V. *Polaris*. Volunteers Cynthia Lee, Stanley Brown, Lars and Amy Olander, Norton Bell and Pamela Vorce ably assisted with sampling during the Dumbarton Bridge study.

METHODS

Data were collected at previously established stations throughout the bay (table 2, fig. 1). At each station, a two-liter sample for dissolved nutrients and suspended particulate matter (SPM) was collected from the vessel's bow pump, simultaneous with the lowering of the sensors for conductivity, temperature and depth (CTD, Sea-Bird Electronics model 9/11). Because the bow intake of the R.V. *Polaris* is about 1.5 meters below the surface, salinities calculated from conductivity and temperature (using Sea-Bird software) for the 1.5- to 2.5-meter interval (2-meter CTD salinities) are usually presented in this report. For stations at which the CTD was either not used or at which there was some malfunction, salinities were estimated from the linear regression of the CTD values for that cruise and readings averaged over one minute intervals from a continuous, on-line, inductive salinometer. Details of the pumping system and the on-line salinometer

are documented by Schemel and Dedini (1979). As a check on the adequacy of this sampling protocol, salinity bottles were also periodically taken from the bulk nutrient/SPM sample. These samples were analyzed in the laboratory using an Autosol 8400A salinometer. Where available, the bottle salinities are presented. Salinity is given in practical salinity units (psu) (Lewis, 1980).

The abundance of light scattering constituents in the water, referred to here as turbidity, was measured by a Turner Designs Model 10 fluorometer, fitted with an on-line nephelometry flow cell. Data were averaged over one minute intervals. Turbidity data are unitless in the data tables.

Concentrations of SPM were determined gravimetrically. An aliquot of water from either the nutrient sample or a Niskin bottle sample was vacuum filtered through a preweighed, 47 mm-diameter, 0.45 μm pore-size, Nuclepore, polycarbonate, membrane filter. The filter was air dried for a minimum of a week, then reweighed. After additional drying time, weighings were repeated until there was agreement between consecutive weighings. Weights were corrected for the weight of residual salt on the filter on the basis of experiments where small quantities of previously filtered saltwater of known salinity were filtered.

Samples for dissolved inorganic nutrient analysis were filtered within 15 minutes of sampling through 47mm diameter, 0.4 μm pore-sized, Nuclepore, polycarbonate, membrane filters under vacuum (less than 14 kPa). Filtered samples were stored in 30 mL, Nalgene, white, high-density polyethylene bottles that had been rinsed with acetone, and then rinsed with and stored filled with a 2.5 meq/L solution of sodium bicarbonate. These samples were refrigerated from the time of processing until analysis the next morning, except for the samples from the two day cruises (see table 1) for which the samples from the first day were refrigerated for an extra day.

Duplicate samples for dissolved organic nutrients were gravity filtered within a half hour of sampling through Gelman type A/E glass fiber filters. Aliquots of filtrate were then placed in quartz irradiation tubes. Back at the laboratory, 0.3 mL of 800 meq/L sodium bicarbonate solution was added to samples with salinities greater than 10 psu, and 10 mL of concentrated artificial seawater (four times the concentrations used by Strickland and Parsons, 1968, p. 76) to samples with salinities less than 10 psu. Just prior to irradiation, 0.1 mL of 30 percent hydrogen peroxide was added to each sample. Samples were irradiated for 6 hours in a La Jolla Scientific Model PO-14 irradiator. Samples were decanted into 30 mL high-density polyethylene bottles for analysis.

Concentrations of ammonium (NH_4), nitrate plus nitrite (N+N), nitrite (NO_2), dissolved reactive phosphate (DRP), and dissolved silica (DSi) were measured simultaneously on a Technicon AutoAnalyzer II system. Analyzer responses were usually linear over the ranges of concentrations encountered in this study, and thus blanks and single concentration upscale standards were analyzed at two- to four-hour intervals. Nitrate plus nitrite was non-linear at the highest concentrations observed in the southern reach of the Bay, and the highest concentrations are estimated to be low by as much as 3 percent. Standards were prepared in artificial river water (1.0 meq/L solution of sodium bicarbonate) and artificial seawater (Strickland and Parsons (1972, p. 76). The analyzer was maintained at constant temperature by

circulating 37°C water through tubes inserted through the centers of the glass mixing coils on each manifold.

The NH₄ method used at the start of the study was an automated version of the phenol-hypochlorite method of Solorzano (1969), similar to that of Head (1971), but with color development at 37°C as recommended by Berg and Abdullah (1977). Additionally, reaction time was increased by the addition of mixing coils.

The NH₄ method used beginning 02 April 1991 uses a 0.8 mL/min sample pump tube to which is added 0.23 mL/min salicylate reagent (140 g sodium salicylate and 0.90 g sodium nitroferricyanide to 1 L of distilled water), and 0.32 mL/min air. Immediately thereafter, 0.42 mL/min of oxidizing/complexing reagent (200 mL of stock solution [90 g sodium citrate dihydrate and 6 g sodium hydroxide to 1 L of distilled water], 0.120 g sodium dichloroisocyanurate and 8 drops of Brij-35 surfactant) is added. Following a ten turn mixing coil, the stream enters the 37°C heating bath, followed by two 20-turn coils thermostatted at 37°C. The stream then passes through a 10-turn coil at room temperature before entering the colorimeter. Absorbance is determined at 630 nm in a 15 mm flowcell.

The N+N method was the Technicon (1973) method number AII-100-70W with one twenty-turn coil added to increase reaction time for better color stability. Copper sulfate (0.121 g per 20 liters) was added to the ammonium chloride reagent, as suggested by Connors and Beland (1976). The pH of this reagent was not adjusted. Preparation of cadmium for the reduction columns was similar to that described by Wood and others (1967). Nitrate can be calculated by subtracting the corresponding concentration of NO₂ from the results of this analysis.

The NO₂ method was an adaptation of the Technicon (1973) method number AII-100-70W with the cadmium column removed. At the start of the study, all five analyses for nutrients were fitted onto a single proportioning pump by drawing the sample-plus-ammonium chloride mixture for the NO₂ analysis from the debubbler which preceded the cadmium column in the N+N analysis. However, the switch to the new NH₄ method reduced the number of pump tubes used by that analysis, allowing a return to the original published NO₂ method.

The DSI method was a modification of the Technicon (1976) method number AII-105-71W. The acid-molybdate reagent was diluted and its flow rate increased, keeping the acid- and molybdate-to-sample ratios unchanged. Additional mixing coils were added to give more complete color development.

The method for DRP was a modification of that of Atlas and others (1971), using ascorbic acid (70 g plus 50 mL acetone per liter of solution) as a reductant. To increase reaction time for maximum color development, ten-turn coils replaced the five-turn coils and a twenty-turn coil replaced the ten-turn coil in the manifold design.

For dissolved organic nitrogen and phosphorus (DON and DOP), the irradiated samples were analyzed for N+N, NH₄ and DRP using the methods above. The sum of the N+N and NH₄ measurements on the irradiated sample, corrected for appropriate blanks, is the total dissolved nitrogen (TDN) concentration. The DON concentration is the difference between TDN and the dissolved inorganic nitrogen (DIN = N+N plus NH₄ on the un-irradiated sample) concentration. The DOP concentration is the total dissolved phosphorus (TDP = DRP on the irradiated sample) concentration minus the DRP (un-irradiated) concentration.

At the Dumbarton Bridge site, samples of surface water were collected about 3 to 4 times per week in a plastic bucket, and poured into three bottles. A bottle for nutrient analyses was refrigerated until processing (filtration as above, and freezing). During November and December, samples were processed on the day of sampling. From January through April, processing of nearly all samples was within three days of sampling.

At least 19 hours before analysis, samples were removed from the freezer and allowed to thaw at room temperature. After being shaken twice, they were analyzed as above, except that a second order curve fitted to standards at 0, 40, 80, 120 and 160 μM was used to calculate concentrations of N+N when concentrations exceeded 80 μM .

Because freezing is reputed to affect nutrient samples adversely, four samples were split and one portion refrigerated until analysis and the second portion frozen for later analysis. Additionally, one of the splits to be frozen was first analyzed fresh. The results, given as the concentration of the frozen sample divided by the concentration of the fresh sample, multiplied by 100 to give percent, are shown in the table below.

Effect of Freezing on Observed Nutrient Concentrations.

[Concentration of frozen sample divided by the concentration of fresh sample, times 100]

SAMPLE NUMBER	DRP	DSi	N+N	NO2 percent	NH4	DIN
33	95.2	97.0	99.4	98.9	106.5	99.9
36	112.6	97.1	99.5	105.1	110.0	100.4
37	99.5	98.3	100.0	114.6	111.8	100.9
99 A/B	110.9	99.5	99.3	102.5	111.8	100.0
99 B/B	108.9	98.4	99.0	100.6	120.9	100.4
Mean	105.4	98.1	99.4	104.3	112.2	100.3
Standard Deviation	7.6	1.0	0.4	6.2	5.3	0.4

The NO2 and DRP data are variable, but show no systematic differences. The DSi and N+N data show systematically lower concentrations from the frozen samples, although the effect is small. The NH4 data show higher concentrations in the frozen samples. The DIN data show no systematic difference, with only a 0.4 percent coefficient of variation. This could indicate that the NH4 gain and nitrate loss on freezing are causally related, but the small number of samples precludes a firm conclusion.

Because loss of DSi on freezing is of particular concern, and because the silica lost can return to solution with additional thawing time, a suite of samples originally analyzed after 19 hours of thawing was re-analyzed after 189 hours of thawing. The results are shown in

figure 2. There appears to be slight curvature above 130 μM , but only one sample (the one shown in the figure) had a concentration higher than that.

The bottle for salinity was stored in the dark at room temperature and analyzed with the Autosol 8400A as above.

The bottle for alkalinity was stored in the dark at room temperature until analysis. Alkalinity was determined by titration at 25°C (Gran, 1952). The method and apparatus were the same as those described by Schemel (1984) with the exception that a Brinkman semi-automated buret was used to add 0.010 mL aliquots of 0.5N HCl to the samples. The digital output of the buret was modified, as described in the instruction manual, so that titrant volumes could be read to 0.1 μL . Bicarbonate endpoints were usually reached with 0.58 to 0.61 mL of titrant. The largest error in the analysis was in the determination of the titrant concentration. We estimate this uncertainty to be about 0.2 percent of the reported concentrations. Other errors were described by Schemel (1984).

RESULTS

Data Tables

Table 3 summarizes measurements made, and identifies abbreviations and units used in the data tables. The data for northern San Francisco Bay are presented chronologically in tables 4 through 24, and the data from southern San Francisco Bay in tables 25 through 44. The data for the Dumbarton Bridge study are given in table 45. Notes at the end of each table give the specifics of the sampling for that cruise.

Nutrients

Sampling Error

Nutrient as a function of salinity plots are important to an understanding of the behavior of the nutrients in the estuary. Because the ordinary sampling protocol for the nutrient and SPM samples was to begin sampling as near as possible ($\pm 1/2$ minute) to the CTD measurements and to use the 2-meter CTD salinity value as the salinity of the sample, comparison of bottle salinities with 2-meter CTD salinities is used as a check on the adequacy of this protocol. In other words, the degree of agreement between the 2-meter CTD salinity and the bottle salinity indicates the amount of the scatter in nutrient / salinity plots that can be expected due to sampling error.

The results are shown in figure 3, plotted as the difference between the 2-meter CTD salinity and the corresponding bottle salinity versus the bottle salinity. The 2-meter CTD values appear to be slightly higher at low salinities. This difference is in the right direction to be caused by sampling error. The bow pump intake is actually at about 1.5 m depth, and thus, in waters where there is significant near-surface salinity gradient, the CTD values for 2 m, averaged from 1.5 m to 2.5 m, would be higher.

Analytical Precision, Dissolved Inorganic Nutrients

Over the course of these studies, duplicate analyses were occasionally performed on the filtered nutrient sample. The pooled standard deviations of the duplicate analyses (Ku, 1969) were as follows: DRP, $0.02 \mu\text{M}$ ($n = 31$); DSi, $0.22 \mu\text{M}$ ($n = 33$); N+N, $0.15 \mu\text{M}$ ($n = 31$); NO₂, $0.04 \mu\text{M}$ ($n = 34$); NH₃ (old method), $0.17 \mu\text{M}$ ($n = 26$); and NH₃ (new method), $0.05 \mu\text{M}$ ($n = 7$).

Analytical Precision, Dissolved Organic Nutrients

All concentrations of DON and DOP are averages of the two single analyses of duplicate irradiated samples (TDN and TDP) minus their corresponding dissolved inorganic nutrient (DIN and DRP) concentrations. Thus, the precision of these numbers includes errors associated with the filtration, irradiation and decanting steps involved in the total dissolved nutrient analysis. Additionally, because the DON and DOP concentrations are calculated as the differences TDN - DIN and TDP - DRP, the precision of the DON and DOP is calculated as the square root

of the sum of the squares of the precisions for the TDN and DIN, and TDP and DRP data sets.

For these data ($n = 74$), the pooled standard deviation for the total dissolved nutrients were: TDN, $0.49 \mu\text{M}$ and TDP, $0.08 \mu\text{M}$. From above, the pooled standard deviation for DIN is $0.23 \mu\text{M}$ (old NH_3 method) or $0.16 \mu\text{M}$ (new NH_3 method), and that for DRP is $0.02 \mu\text{M}$. Thus, the pooled standard deviation of the DON concentrations is estimated to be $0.54 \mu\text{M}$ (old NH_3 method) or $0.52 \mu\text{M}$ (new NH_3 method), and that for DOP is estimated to be $0.08 \mu\text{M}$.

Turbidity Blanks

The nutrient samples were filtered through $0.4 \mu\text{m}$ pore diameter filters, and, in most cases, this removed all visible turbidity from the waters. When concentrations of fine sediment were high, however, the filtrate was sometimes opalescent. This fine sediment reduced light transmittance, and thus, in the colorimetric analyses, appeared as additional nutrient. When opalescence was observed, turbidity blanks were run. However, difficulties in interpretation of the data led instead to a protocol of careful sample handling on the day of analysis, allowing fine sediment to sink to the bottom of the analysis bottle. This minimized the effects, although it did not eliminate them.

On one occasion (30 November-01 December 1988), prior to the establishment of this protocol, turbidity blanks were high and were subtracted from the reported concentrations. The maximum values subtracted (all at station 653) were: DRP, $1.21 \mu\text{M}$; SiO_2 , $0.35 \mu\text{M}$; N+N , $0.81 \mu\text{M}$; NO_2 , $0.60 \mu\text{M}$; and NH_3 (old method), $3.66 \mu\text{M}$.

Turbidity blanks were also high during one period of the Dumbarton bridge study (28 March - 22 April), and were subtracted from all of the concentrations except N+N , for which there were no data. The DRP concentrations were corrected using an algorithm which also corrected for baseline drift by assuming that the drift for each sample was proportional to the turbidity of that sample.

Suspended Particulate Matter

Sampling

Two types of sampling were used for SPM samples; the bow pump and Niskin bottles. On six occasions, samples from both sources were analyzed. Because of sampling error, this comparison does not indicate the relative sampling efficiencies of the two methods. Rather, the differences shown give some idea of how much variation to expect in this data set.

The data are shown in the table below:

Comparison of SPM concentrations from the bow pump and from
Niskin bottle samples

DATE	STA	SAL psu	----- SPM CONCENTRATION -----			
			BOW B	NISKIN N	DIFFERENCE (N-B)	RATIO (B/N)
			----- mg/L -----			
06 Feb 91	10	17.7	49.7	54.5	+4.8	0.91
	4	6.1	27.7	22.7	-5.0	1.22
	2	3.6	13.4	14.7	+1.3	0.91
	21	30.3	31.0	27.2	-3.8	1.14
11 Mar 91	12	18.7	12.7	13.0	+0.3	0.98
	10	16.9	28.9	28.1	-0.8	1.03

Analytical Precision

Samples for SPM were replicated on only two occasions. On 30 May 1990, 3 replicates of the sample from station 416 were filtered. The mean concentration and standard deviation were 323.3 +/- 1.2 mg/L. This is a coefficient of variation of only 0.36 percent. On 18 April 1990, seven duplicate filtrations were performed using waters of southern San Francisco Bay. The pooled standard deviation was 0.45 mg/L. Because of the low concentrations of SPM present at that time (1.4 to 10.2 mg/L, 4.5 mg/L mean), this pooled standard deviation was 10.0 percent of the mean. Most of the concentrations in this report fall between these two extremes.

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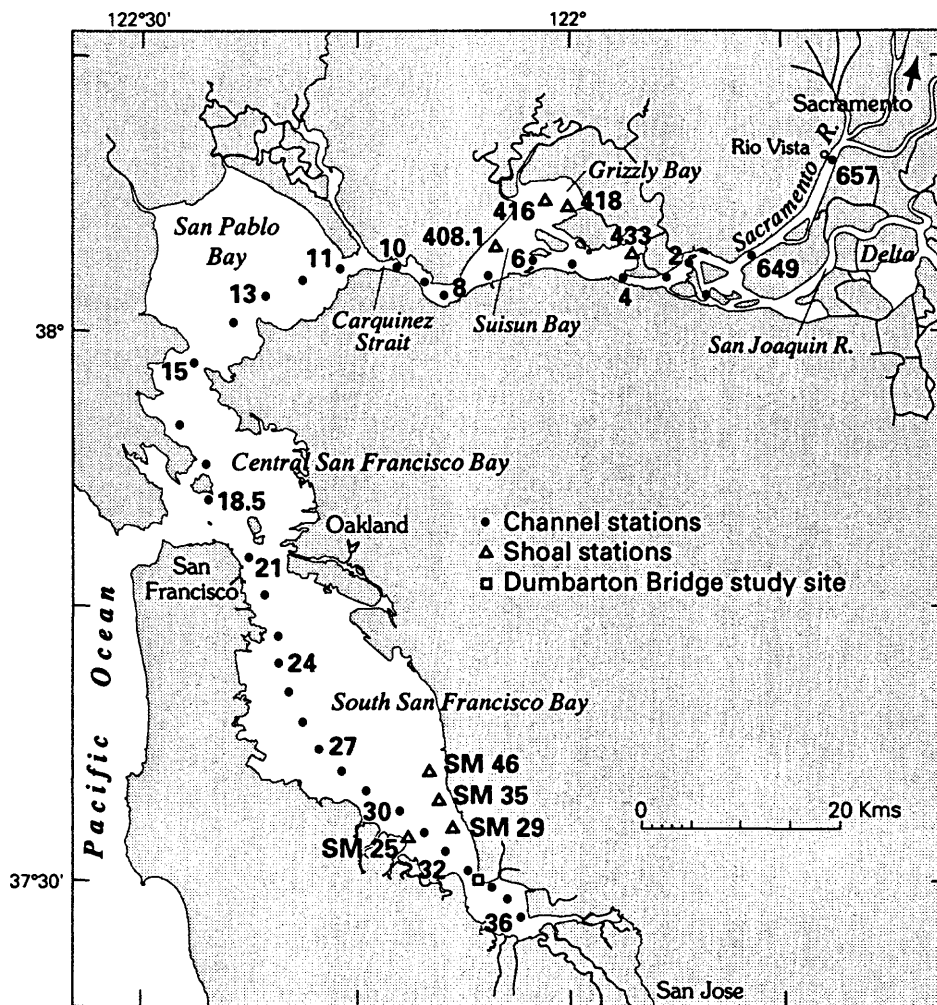


Figure 1. Location map of the San Francisco Bay estuarine system.

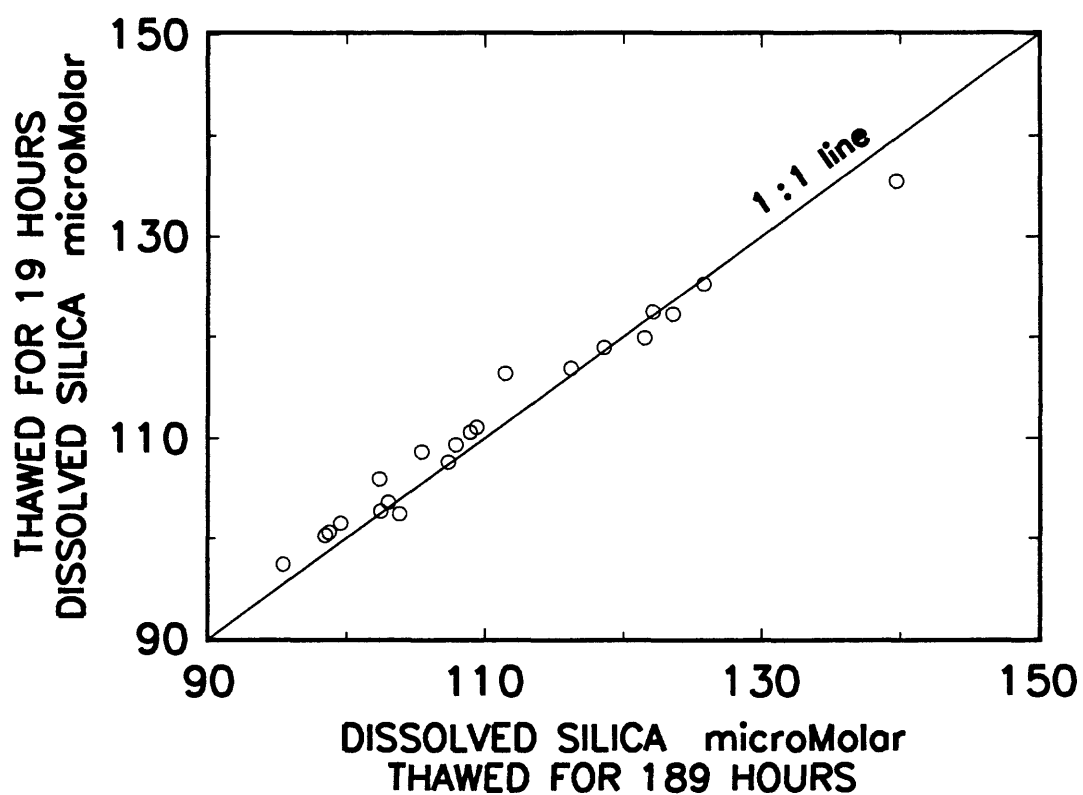


Figure 2. Comparison of the dissolved silica concentration in previously frozen samples thawed for 19 hours and then reanalyzed after 189 hours of thawing.

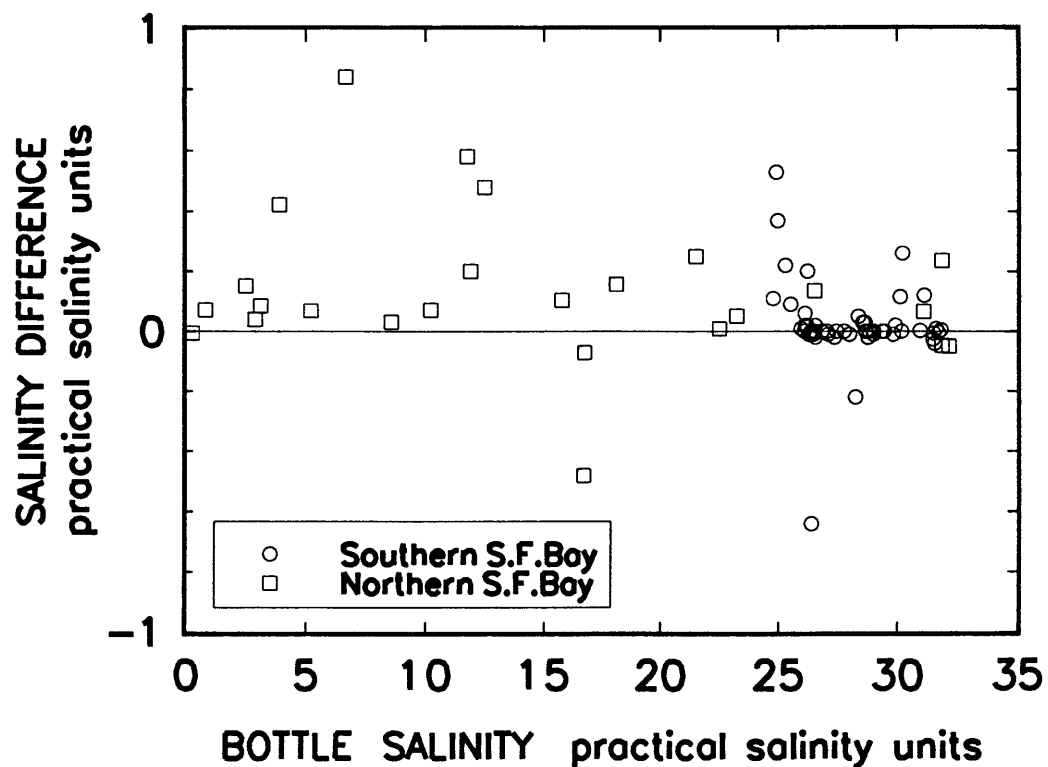


Figure 3. Salinity comparison for the purpose of estimating sampling error. The salinity difference is the salinity for two meters depth as measured by the conductivity-temperature-depth sensors minus the corresponding bottle salinity from the pumped sample.

Table 1: Cruise dates and station coverage

Date	Station Coverage		Shallows
	North Bay	South Bay	
Water Year 1989			
06 October 88	15 to 657	--	--
02 November 88	15 to 657	--	408,416,418,433
30 November 88	15 to 657	--	--
28 February 89	15 to 657	--	408,416,418,433
01 March 89	---	21,24,27,30,32	
12 April 89	15 to 657	--	--
14 June 89	17 to 657	--	--
09 August 89	17 to 657	--	--
10 August 89	---	21,24,27,30	
Water Year 1990			
04 October 89	17 to 657	--	--
12 December 89	17 to 657	--	--
27 February 90	18.5 to 657	--	408,433
28 February 90	--	21 to 30	--
18 April 90	18.5 to 657	32 to 21	408,416,433
30 May 90	18.5 to 657	--	408,416,433
31 May 90	--	21 to 30	--
30 July 90	18.5 to 657	--	--
31 July 90	--	21 to 30	--

continued...

Cruise dates and station coverage - Continued

Date	Station Coverage		Shallows
	North Bay	South Bay	
Water Year 1991			
29 October 90	2 to 657	--	--
08 November 90	15 to 3	--	408,416,433
06 December 90	18.5 to 657	--	408,416,433
07 December 90	--	21 to 30	--
06 February 91	18.5 to 657	32 to 21	408,416,433
05 March 91	--	21 to 33	--
11 March 91	18.5 to 657	32 to 21	--
19 March 91	--	21 to 33	SM 25,29,38,46
01 April 91	--	33 to 21	--
05 April 91	--	21 to 33	SM 25,29,35
08 April 91	--	24 to 30, 36	--
11 April 91	18.5 to 657	33 to 21	433
15 April 91	--	24 to 33	SM 25,29
19 April 91	--	21 to 33	--
25 April 91	--	33 to 24	SM 25,29,35,46
05 June 91	18.5 to 657	33 to 21	--
01 August 91	18.5 to 657	--	408,416,433
02 August 91	--	24 to 33	--

Table 2. San Francisco Bay station locations, main channel.
(N.= north, W.= west, deg.= degrees, min.= minutes).

Area	Station Number	N. Latitude		W. Longitude	
		Deg.	Min.	Deg.	Min.
Sacramento River	657	38	9.2	121	41.3
	655	38	7.2	121	42.3
	653	38	5.8	121	42.0
	651	38	4.7	121	45.8
	649	38	3.6	121	47.8
North Bay					
Chain Island	2	38	3.8	121	51.3
Pittsburgh	3	38	3.0	121	52.7
Simmon's Point	4	38	2.9	121	56.1
Middle Ground	5	38	3.6	121	58.8
Roe Island	6	38	3.9	122	2.1
Avon Pier	7	38	2.9	122	5.8
Martinez	8	38	1.8	122	9.1
Benicia	9	38	3.0	122	10.4
Crockett	10	38	3.6	122	12.5
Mare Island	11	38	3.7	122	15.8
N. of Pinole Point	13	38	1.9	122	21.9
Pt. San Pablo	15	37	58.2	122	26.2
Raccoon Strait	17	37	52.9	122	25.6
Southampton Shoal	17.5	37	52.9	122	25.8
Angel Island	18.5	37	50.8	122	25.2
Shallows	408.1	38	4.7	122	3.4
	416	38	7.0	122	2.3
	418	38	6.7	122	0.6
	433	38	4.3	121	56.0
South Bay					
Bay Bridge	21	37	48.0	122	22.2
Potrero Point	22	37	45.7	122	21.5
Hunters Point	23	37	43.6	122	20.2
Candlestick Point	24	37	42.0	122	20.3
Oyster Point	25	37	40.3	122	19.5
San Bruno Shoal	26	37	38.2	122	19.0
San Francisco Airport	27	37	37.1	122	17.5
N. San Mateo Bridge	28	37	36.0	122	16.2
S. San Mateo Bridge	29	37	34.9	122	14.8
	29.5	37	34.2	122	13.5
Redwood Creek	30	37	33.3	122	11.5
Coyote Hills	31	37	31.8	122	9.4
Ravenswood Point	32	37	31.1	122	8.1
Dumbarton Bridge	33	37	30.6	122	7.4
Calaveras Point	36	37	28.3	122	3.8
Shallows	SM25	37	31.2	122	9.4
	SM29	37	32.9	122	8.3
	SM35	37	34.0	122	9.2
	SM46	37	35.6	122	9.9

Table 3. Summary of measurements, abbreviations, and units.

Measurement	Column Title	Units
Local time	TIME	hours and minutes
Station	STA	--
Depth	DEP	m
Salinity (2 meter, CTD)	SAL	practical salinity units, scale of 1978
Dissolved reactive phosphorus	DRP	μM
Dissolved silica	DSi	μM
Nitrate plus nitrite	N+N	μM
Nitrite	NO2	μM
Ammonium	NH4	μM
Dissolved inorganic nitrogen	DIN	μM
Dissolved organic nitrogen	DON	μM
Dissolved organic phosphorus	DOP	μM
Suspended particulate matter	SPM	mg/L
Turbidity	TURB	relative
Alkalinity	ALK	meq/L

Data for northern San Francisco Bay

Table 4. Nutrient and suspended matter data for 06 October 1988

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
1535	15	1.5	29.23	3.60	68.3	20.20	0.80	2.38	--	--	--	1.722
1458	13	1.5	28.82	3.82	70.6	21.66	0.96	2.53	--	--	--	0.322
1415	11	1.5	26.98	4.28	95.2	25.82	1.33	2.03	--	--	--	0.467
1305	8	1.5	22.29	5.03	125.8	31.28	2.02	1.73	--	--	--	0.755
1240	7	1.5	19.00	5.26	147.8	34.57	2.46	1.01	--	--	--	1.716
1124	6	1.5	12.14	5.11	197.6	35.88	3.05	0.00	--	--	--	1.616
1055	5	1.5	7.86	4.66	227.5	32.14	2.39	0.58	--	--	--	1.070
1021	4	1.5	5.68	4.37	242.0	29.65	1.73	1.54	--	--	--	1.251
939	3	1.5	4.05	4.33	255.0	27.63	1.22	1.75	--	--	--	1.228
921	2	1.5	3.34	4.25	259.1	26.42	1.08	1.42	--	--	--	1.052
857	649	1.5	1.34	3.68	275.5	23.91	0.96	4.09	--	--	--	0.986
839	651	1.5	0.56	3.60	277.2	22.06	1.03	5.53	--	--	--	0.850
820	653	1.5	0.21	3.21	274.8	19.35	1.17	8.61	--	--	--	0.633
740	657	1.5	0.09	3.26	272.4	17.37	1.10	11.40	--	--	--	0.584

Table 5. Nutrient and suspended matter data for 02 November 1988

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
1000	15	1.5	30.19	3.51	61.8	21.26	1.15	5.18	--	--	13.0	0.472
1042	13	1.5	28.97	3.68	68.3	22.64	1.15	4.51	--	--	17.2	0.515
1122	11	1.5	25.33	4.30	100.9	28.96	1.78	3.46	--	--	36.4	1.118
1202	9	1.5	23.08	4.70	118.7	31.94	2.23	2.63	--	--	18.9	0.565
1224	8	1.5	21.30	4.90	133.4	34.06	2.53	2.01	--	--	19.2	0.678
1250	7	1.5	19.41	5.07	138.1	36.31	2.64	1.68	--	--	26.5	0.749
1332	6	1.5	13.71	4.97	178.5	37.16	3.35	0.59	--	--	41.0	1.293
1400	5	1.5	11.70	4.80	190.9	36.61	3.42	1.07	--	--	25.9	0.871
1438	4	1.5	8.59	4.65	210.6	34.40	3.01	0.94	--	--	17.9	0.664
1506	3	1.5	6.44	4.58	223.0	32.79	2.57	1.84	--	--	17.1	0.636
1523	2	1.5	5.52	4.45	230.6	31.50	2.23	2.30	--	--	13.5	0.518
1553	649	1.5	3.36	4.02	244.8	29.45	1.52	2.64	--	--	14.8	0.601

continued...

Nutrient and suspended matter data for 02 November 1988 - Continued

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
1612	651	1.5	2.10 ¹	3.77	251.3	29.23	1.40	3.83	--	--	13.2	0.532
1630	653	1.5	1.03	3.77	258.6	29.60	1.46	5.86	--	--	16.5	0.617
1648	655	1.5	0.50 ¹	3.67	260.9	30.30	1.85	8.94	--	--	14.3	0.590
1703	657 ²	1.5	0.14 ¹	4.21	260.4	30.40	2.10	12.29	--	--	16.8	0.571
1324	408 ²	0.0	--	4.90	172.1	37.33	3.31	0.71	--	--	--	--
1345	416	0.0	--	4.99	192.0	36.84	3.39	1.62	--	--	--	--
1405	418	0.0	--	4.89	194.0	36.40	3.23	0.46	--	--	--	--
1425	433	0.0	--	4.59	209.6	34.52	3.02	1.58	--	--	--	--

1 Salinities are calibrated on-line salinities.

2 Station 408.1.

Table 6. Nutrient and suspended matter data for 30 November 1988

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
1030	15	1.5	27.46	3.63	77.1	26.01	0.94	5.31	--	--	34.1	1.107
1115	13	1.5	26.88	3.62	80.8	26.72	0.97	5.49	--	--	29.0	0.943
1205	11	1.5	21.13	4.15	120.3	31.69	0.96	5.98	--	--	52.1	1.808
1236	10	1.5	17.94	4.32	139.9	33.92	0.93	6.20	--	--	56.8	1.684
1259	9	1.5	16.76	4.34	149.3	35.24	0.92	6.33	--	--	50.5	1.608
1324	8	1.5	14.02	4.47	169.6	36.11	0.93	6.44	--	--	43.6	1.423
1351	7	1.5	11.30	4.50	186.2	36.54	0.93	6.63	--	--	40.0	1.518
1435	6	1.5	8.23	4.32	207.5	35.98	0.99	6.83	--	--	34.6	1.260
1508	5	1.5	6.07	4.42	225.2	34.91	1.00	7.50	--	--	27.4	1.016
1540	4	1.5	3.34	4.29	246.1	33.28	0.96	8.39	--	--	20.3	0.815
1617	3	1.5	2.31	4.05	255.8	32.34	0.89	8.85	--	--	11.7	0.841
1639	2	1.5	2.02	4.17	258.6	32.06	0.88	8.95	--	--	18.3	0.866
1709	649	1.5	1.23	3.45	265.1	33.18	0.76	9.88	--	--	20.7	1.392
1731	651	1.5	0.44	3.37	264.1	36.53	0.86	10.84	--	--	41.8	2.031
1751	653	1.5	0.22	3.24	257.2	40.12	0.84	11.57	--	--	34.1	2.468
1808	655	1.5	0.27	3.22	255.0	40.97	0.84	11.67	--	--	42.6	2.154
1825	657	1.5	0.08	3.02	234.3	43.29	0.94	15.07	--	--	51.4	2.596

Table 7. Nutrient and suspended matter data for 28 February 1989

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM	
				-----		microMolar	-----		mg/L			
1028	15	1.5	27.26	3.13	76.2	28.02	0.46	4.62	--	--	12.2	0.435
1118	13	1.5	25.92	3.19	83.4	29.14	0.46	4.88	--	--	29.3	0.895
1211	11	1.5	22.21	3.57	114.3	33.95	0.51	6.17	--	--	37.3	1.153
1245	10	1.5	19.43	3.80	135.9	37.89	0.58	8.34	--	--	42.5	1.241
1302	9	1.5	17.92	3.91	148.5	39.35	0.59	8.94	--	--	45.6	1.326
1328	8	1.5	15.03	3.84	177.2	41.45	0.59	10.08	--	--	42.2	1.327
1356	7	1.5	12.72	4.03	190.8	43.02	0.64	10.99	--	--	33.6	1.165
1429	6	1.5	9.48	3.99	218.5	42.40	0.59	10.99	--	--	30.7	1.317
1505	5	1.5	6.93	3.94	239.9	40.47	0.60	11.02	--	--	31.9	1.118
1530	4	1.5	5.66	3.84	250.2	39.08	0.60	10.29	--	--	29.4	1.101
1642	3	1.5	3.24	3.62	26.8	36.76	0.62	9.53	--	--	27.2	0.903
1700	2	1.5	3.10	3.58	275.1	33.76	0.62	9.05	--	--	19.3	0.745
1719	649	1.5	1.23	--	--	--	--	--	--	--	9.5	--
1754	653	1.5	0.13	3.43	295.2	20.90	0.51	15.29	--	--	11.0	0.490
1808	655	1.5	0.10	--	--	--	--	--	--	--	11.8	0.449
1823	657 ¹	1.5	0.10	3.05	304.7	19.97	0.48	13.86	--	--	5.8	0.455
--	408 ¹	0.0	--	3.80	198.0	42.60	0.54	10.62	--	--	39.3	--
--	416	0.0	--	3.62	214.7	42.63	0.44	6.83	--	--	27.8	--
--	418	0.0	--	3.75	216.2	42.56	0.45	8.63	--	--	36.0	--
--	433	0.0	--	3.90	227.8	41.64	0.54	10.82	--	--	50.9	--

¹ Station 408.1.

Table 8. Nutrient and suspended matter data for 12 April 1989

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
1009	15	1.5	18.08	2.42	120.7	18.00	0.51	2.04	--	--	13.2	0.480
1058	13	1.5	21.72	2.33	96.7	16.36	0.48	1.99	--	--	15.4	0.596
1203	11	1.5	15.22	2.63	155.1	19.70	0.59	3.98	--	--	24.7	0.951
1240	10	1.5	10.20	2.72	176.9	20.74	0.63	6.19	--	--	42.8	1.470
1300	9	1.5	9.04	2.83	194.2	21.47	0.69	8.01	--	--	45.5	--
1335	8	1.5	4.81	2.62	217.9	21.42	0.67	6.70	--	--	92.8	--
1409 ¹	7	1.5	3.26	2.58	231.2	22.13	0.72	7.42	--	--	78.6	--
930 ¹	--	1.5	3.90	2.72	223.1	22.02	0.72	8.25	--	--	47.0	--
1449	6	1.5	0.63	2.30	257.0	20.98	0.61	4.56	--	--	84.9	2.484

continued...

Nutrient and suspended matter data for 12 April 1989 - Continued

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
1531	5	1.5	0.23	2.18	264.6	20.05	0.55	4.00	--	--	59.5	1.757
1559	4	1.5	0.11	2.15	272.7	18.66	0.53	5.57	--	--	45.2	1.473
1659	3	1.5	0.14	2.16	266.5	19.02	0.52	3.40	--	--	42.2	1.390
1717	2	1.5	0.12	2.17	267.7	18.21	0.49	4.02	--	--	26.7	0.948
1741	649	1.5	0.10	2.14	278.4	17.09	0.43	9.57	--	--	41.2	1.311
1800	651	1.5	0.10	2.24	279.5	16.93	0.48	9.94	--	--	--	1.101
1819	653	1.5	0.10	2.33	280.4	16.50	0.42	10.57	--	--	23.7	0.779
1851	657	1.5	0.10	2.42	276.8	17.70	0.45	9.52	--	--	19.7	0.737

1 Sample taken the next day (13 April), between stations 6 and 7. The salinity is the calibrated on-line salinity.

Table 9. Nutrient and suspended matter data for 14 June 1989.

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
937	17	1.5	29.40	2.85	55.7	20.53	0.67	9.29	--	--	10.0	--
1020	15	1.5	25.18	3.28	84.3	23.05	0.72	8.06	--	--	11.1	0.396
1053	13	1.5	24.40	3.52	99.4	24.31	0.73	7.16	--	--	20.2	0.639
1128	11	1.5	19.50	3.80	120.9	26.04	0.72	7.05	--	--	16.3	0.638
1148	10	1.5	17.11	3.86	134.7	26.87	0.68	7.27	--	--	21.3	0.697
1202	9	1.5	16.34	3.86	150.1	27.27	0.64	7.09	--	--	24.8	0.838
1221	8	1.5	12.49	3.84	165.6	27.33	0.57	6.63	--	--	20.6	0.783
1239	7	1.5	10.95	3.82	173.3	27.79	0.55	6.44	--	--	29.7	1.027
1312	6	1.5	7.79	3.61	196.0	26.35	0.44	4.99	--	--	63.2	1.682
1337	5	1.5	4.51	3.27	214.5	24.27	0.35	3.46	--	--	44.0	1.481
1355	4	1.5	1.83	3.07	227.3	22.50	0.29	2.47	--	--	67.4	2.131
1533	3	1.5	1.28	3.00	227.6	22.18	0.28	2.22	--	--	50.0	1.700
1545	2	1.5	1.28	2.92	231.4	21.41	0.30	1.92	--	--	52.4	1.831
1609	649	1.5	0.52	2.69	241.2	19.78	0.36	2.45	--	--	44.4	1.553
1628	651	1.5	0.26	2.43	257.9	19.37	0.52	4.63	--	--	45.2	1.493
1644	653	1.5	0.11	2.28	264.2	18.89	0.59	5.26	--	--	29.8	1.032
1701	655	1.5	0.10	2.10	270.9	18.45	0.64	6.77	--	--	20.8	0.784
1717	657	1.5	0.09	2.17	277.9	18.60	0.68	8.27	--	--	10.8	0.696

Table 10. Nutrient and suspended matter data for 09 August 1989

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
920	17	1.5	30.70	3.65	71.8	28.58	0.82	7.21	--	--	7.5	--
1015	15	1.5	26.31	4.32	105.1	30.87	1.07	6.96	--	--	14.3	0.480
1055	13	1.5	23.30	4.40	114.0	31.43	1.21	6.26	--	--	14.5	0.525
1135	11	1.5	17.18	4.57	148.0	31.85	1.62	5.64	--	--	18.9	0.687
1200	10	1.5	13.85	4.47	164.0	31.25	1.72	4.82	--	--	17.8	0.678
1216	9	1.5	13.65	4.44	167.6	31.33	1.76	4.68	--	--	17.6	0.674
1238	8	1.5	12.42	4.43	170.1	30.98	1.76	4.59	--	--	19.5	0.707
1302	7	1.5	8.97	4.25	188.7	29.43	1.68	4.04	--	--	24.1	0.872
1343	6	1.5	5.81	3.85	205.6	26.49	1.32	3.39	--	--	27.0	0.974
1418	5	1.5	3.36	3.45	218.2	23.53	0.85	2.83	--	--	27.0	1.010
1438	4	1.5	1.68	3.03	226.7	20.13	0.53	2.79	--	--	31.5	1.135
1538	3	1.5	0.89	2.73	230.6	17.58	0.45	2.62	--	--	31.0	1.130
1622	649	1.5	0.17	2.19	238.5	12.72	0.44	4.58	--	--	23.1	0.823
1638	651	1.5	0.08	2.05	242.3	11.39	0.41	5.88	--	--	19.3	0.721
1650	653	1.5	0.07	2.09	245.3	10.25	0.36	7.56	--	--	13.3	0.541
1705	655	1.5	0.07	2.07	247.7	9.47	0.34	8.60	--	--	11.2	0.488
1720	657	1.5	0.07	2.17	247.1	9.43	0.35	8.86	--	--	12.3	0.529

Table 11. Nutrient and suspended matter data for 04 October 1989

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
904	17	1.5	30.40	3.39	57.3	17.86	1.08	7.44	--	--	6.1	0.266
952	15	1.5	25.54	3.84	95.7	22.09	1.88	3.90	--	--	3.9	0.232
1033	13	1.5	24.62	3.88	97.4	22.36	2.05	3.90	--	--	1.9	0.174
1116	11	1.5	18.93	4.24	132.6	27.89	3.76	3.38	--	--	7.8	0.334
1143	10	1.5	17.07	4.31	139.1	29.59	4.36	2.78	--	--	10.7	0.370
1156	9	1.5	15.47	4.30	146.1	30.27	4.59	2.26	--	--	7.6	0.338
1218	8	1.5	13.51	4.28	164.8	31.65	5.07	1.75	--	--	10.0	0.404
1243	7	1.5	11.92	4.38	163.3	31.95	5.16	2.75	--	--	11.7	0.442
1310	6	1.5	7.34	4.05	188.7	31.53	4.79	1.78	--	--	14.1	0.502
1343	5	1.5	5.22	3.80	201.9	29.93	3.70	1.85	--	--	16.3	0.591
1403	4	1.5	3.64	3.57	212.3	28.27	2.37	2.61	--	--	17.1	0.644
1458	3	1.5	2.14	3.47	217.9	27.24	1.71	3.16	--	--	19.1	0.738
1516	2	1.5	1.86	3.36	220.4	26.89	1.48	3.34	--	--	22.3	0.811
1533	649	1.5	1.20	3.35	225.9	26.35	1.31	3.85	--	--	24.3	0.924

continued...

Nutrient and suspended matter data for 04 October 1989 - Continued

TIME local	STA	DEP m	SAL psu	Concentrations									TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM		
				-----		microMolar	-----		mg/L				
635 ¹	--	1.5	0.90	3.30	228.7	26.69	1.41	3.90	--	--	--	--	
1548	651	1.5	0.40	3.37	242.6	26.31	1.81	5.59	--	--	20.3	0.805	
1604	653	1.5	0.21	3.24	248.8	24.97	1.80	6.80	--	--	18.4	0.687	
1619	655	1.5	0.20	3.34	251.6	23.94	1.65	8.07	--	--	--	0.666	
1631	657	1.5	0.14	3.47	257.8	22.86	1.58	10.34	--	--	17.0	0.602	

1 Sample taken the next morning (05 October), near station 649. The salinity is the calibrated on-line salinity.

Table 12. Nutrient and suspended matter data for 12 December 1989

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP -----	SiO2	N+N microMolar	NO2	NH3	DON -----	DOP	SPM mg/L	
1002	17	1.5	31.90	2.52	37.0	15.50	0.81	7.57	--	--	40.5	0.494
1043	15	1.5	28.61	3.24	62.8	20.89	0.75	9.50	--	--	49.2	1.277
1116	13	1.5	29.14	3.12	57.8	20.06	0.77	8.82	--	--	90.5	1.599
1150	11	1.5	22.95	3.70	101.4	27.32	0.78	10.54	--	--	58.1	1.601
1210	10	1.5	23.85	3.68	96.9	26.85	0.79	10.31	--	--	47.5	1.420
1224	9	1.5	23.62	3.60	96.9	26.82	0.79	10.33	--	--	63.9	1.712
1241	8	1.5	23.14	3.70	100.3	27.23	0.80	10.62	--	--	75.1	1.938
1302	7	1.5	20.60	3.79	112.8	28.67	0.80	11.01	--	--	68.0	1.598
1338	6	1.5	16.54	3.85	139.7	30.60	0.71	12.18	--	--	49.4	1.489
1402	5	1.5	11.48	3.79	168.2	30.77	0.62	12.91	--	--	36.1	1.044
1420	4	1.5	8.83	3.68	189.2	29.84	0.59	12.37	--	--	34.7	0.970
1448	3	1.5	8.59	3.69	192.6	29.68	0.58	12.73	--	--	26.4	0.836
1512	2	1.5	8.10	3.71	199.0	29.54	0.58	12.65	--	--	23.3	0.750
1531	649	1.5	4.19	3.59	228.3	28.06	0.56	12.72	--	--	16.6	--
1548	651	1.5	3.10	3.56	239.6	27.16	0.55	12.81	--	--	23.2	0.680
1608	653	1.5	1.91	3.47	254.9	25.21	0.55	13.66	--	--	21.9	0.762
1627	655	1.5	0.60	3.35	269.5	21.76	0.54	16.15	--	--	12.1	0.500
1641	657	1.5	0.32	3.19	267.8	19.88	0.54	16.34	--	--	8.3	0.427

Table 13. Nutrient and suspended matter data for 27 February 1990

TIME local	STA	DEP m	SAL psu	Concentrations								SPM mg/L	TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP			
				-----		microMolar	-----						
901	17.5	1.5	28.82	2.89	58.8	24.13	0.55	5.95	--	--	31.0	0.853	
1003	15	1.5	24.60	3.09	88.3	27.11	0.54	8.19	--	--	40.8	1.135	
1035	13	1.5	23.75	3.19	93.7	27.81	0.54	8.84	--	--	58.7	1.177	
1117	11	1.5	18.17	3.46	132.4	31.70	0.64	12.79	--	--	60.6	1.758	
1137	10	1.5	14.37	3.51	160.2	33.59	0.68	14.74	--	--	65.4	1.749	
1152	9	1.5	12.91	3.48	171.4	34.36	0.69	15.24	--	--	61.1	1.733	
1209	8	1.5	11.92	3.48	180.8	34.80	0.70	14.83	--	--	63.7	1.790	
1233	7	1.5	9.92	3.51	193.3	35.35	0.71	16.51	--	--	72.2	1.974	
1307	6	1.5	8.52	3.53	205.8	35.82	0.73	15.78	--	--	58.9	1.697	
1339	5	1.5	5.53	3.61	233.4	36.13	0.79	15.09	--	--	41.2	--	
1433	4	1.5	4.79	3.64	238.8	36.47	0.80	14.91	--	--	69.1	2.134	
1454	3	1.5	3.87	3.67	248.1	36.79	0.82	14.65	--	--	57.3	1.696	
1513	2	1.5	3.10	3.70	254.1	37.14	0.84	14.67	--	--	69.1	1.898	
1532	649	1.5	1.98	3.50	263.2	37.46	0.86	14.12	--	--	45.3	1.524	
1544	651	1.5	1.30	3.78	267.4	37.18	0.85	15.14	--	--	59.0	1.772	
1600	653	1.5	0.34	3.92	273.3	36.22	0.70	16.86	--	--	53.3	1.771	
1615	655	1.5	0.26	3.85	277.4	35.20	0.66	16.54	--	--	32.8	1.240	
1630	657 ¹	1.5	0.15 ²	3.83	279.7	31.96	0.60	17.34	--	--	27.3	1.106	
--	408 ¹	0.0	9.02 ²	3.31	200.0	35.71	0.71	14.95	--	--	90.2	--	
--	433	0.0	4.92 ²	3.58	237.7	36.71	0.81	15.18	--	--	72.6	--	

1 Station 408.1.

2 The salinity is the bottle salinity.

Table 14. Nutrient and suspended matter data for 18 April 1990

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM	
				-----		microMolar	-----		mg/L			
1026	17.5	1.5	29.75	3.05	48.1	20.63	0.56	6.91	--	--	5.4	0.288
1142	15	1.5	26.03	3.22	78.0	25.58	0.73	5.79	--	--	7.6	0.349
1237	13	1.5	23.89	3.68	96.3	30.34	0.86	9.92	--	--	15.9	0.530
1338	11	1.5	19.76	4.27	125.9	37.44	1.02	12.08	--	--	43.3	1.498
1417	10	1.5	15.20	4.43	147.5	40.93	1.04	11.90	--	--	59.3	1.648
1436	9	1.5	13.85	4.47	166.1	42.23	1.09	12.07	--	--	51.0	1.488
1502	8	1.5	11.87	4.31	182.1	43.39	1.07	10.47	--	--	64.7	1.940
1531	7	1.5	10.09	4.41	190.6	43.08	1.08	10.92	--	--	41.6	1.263

continued...

Nutrient and suspended matter data for 18 April 1990 - Continued

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
1600	6	1.5	6.81	4.11	212.8	41.06	1.08	9.07	--	--	37.7	1.316
1633	5	1.5	4.45	3.89	225.4	38.78	1.06	8.28	--	--	37.2	1.262
1657	4	1.5	3.16	3.61	231.9	36.35	1.00	7.45	--	--	34.2	1.175
1724	3	1.5	1.78	3.22	238.8	31.46	0.89	7.38	--	--	30.1	1.106
1743	2	1.5	1.42	3.08	240.0	29.73	0.85	7.75	--	--	25.6	0.915
1806	649	1.5	0.33	2.68	247.3	21.68	0.66	10.32	--	--	24.5	0.766
1820	651	1.5	0.24	2.62	249.2	18.68	0.62	11.54	--	--	16.5	0.630
1837	653	1.5	0.16	2.57	250.2	17.36	0.59	12.12	--	--	13.0	0.482
1855	655	1.5	0.10	2.51	253.4	15.23	0.55	13.89	--	--	12.6	0.472
1906	657 ¹	1.5	0.09	2.54	251.5	17.04	0.56	13.57	--	--	11.8	0.464
--	408 ¹	0.0	9.49 ²	4.33	195.1	43.10	0.98	10.03	--	--	39.6	--
--	416	0.0	9.56 ²	4.36	196.2	45.19	0.88	6.91	--	--	164.5	--
--	433	0.0	6.61 ²	4.22	213.7	41.81	0.98	8.52	--	--	90.2	--

1 Station 408.1.

2 Bottle salinities are presented.

Table 15. Nutrient and suspended matter data for 30 May 1990

TIME local	STA	DEP m	SAL psu	Concentrations									TURB
				DRP -----	SiO2	N+N microMolar	NO2	NH3	DON -----	DOP	SPM mg/L		
755	17.5	1.5	31.53	2.70	29.3	17.60	0.66	6.01	--	--	10.2	0.370	
904	15	1.5	28.30	3.60	63.5	25.51	0.78	6.22	--	--	34.4	0.984	
956	13	1.5	22.88	4.34	105.7	33.54	0.82	6.54	--	--	15.0	0.500	
1050	11	1.5	19.68	4.60	126.1	36.49	0.80	7.21	--	--	33.2	1.045	
1127	10	1.5	17.27	4.71	138.2	38.24	0.78	7.29	--	--	53.2	1.354	
1145	9	1.5	15.39	4.80	151.9	39.26	0.72	7.60	--	--	40.9	1.253	
1211	8	1.5	12.92	4.93	166.4	39.84	0.71	7.17	--	--	78.2	1.985	
1245	7	1.5	10.86	4.90	175.0	39.78	0.65	7.80	--	--	117.2	2.907	
1325	6	1.5	7.40	4.44	194.1	38.23	0.57	5.75	--	--	75.0	1.818	
1401	5	1.5	4.83	4.14	208.2	36.49	0.54	4.98	--	--	52.0	1.510	
1427	4	1.5	3.18	3.95	219.2	35.30	0.54	4.81	--	--	65.9	1.771	
1521	3	1.5	1.52	3.64	233.6	34.15	0.67	5.44	--	--	47.8	1.432	
1542	2	1.5	1.24	3.51	238.0	33.78	0.73	5.69	--	--	48.2	1.345	
1608	649	1.5	0.22	3.19	267.6	31.59	1.05	8.94	--	--	41.9	1.204	
1624	651	1.5	0.16	3.11	277.0	30.10	1.07	10.48	--	--	36.9	1.034	

continued...

Nutrient and suspended matter data for 30 May 1990 - Continued

Concentrations												
TIME local	STA	DEP m	SAL psu	DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	TURB
				-----		microMolar		-----				
1642	653	1.5	0.11	3.18	284.5	31.12	1.10	14.09	--	--	26.4	0.907
1657	655	1.5	0.11	3.23	284.7	29.97	1.07	15.51	--	--	28.6	0.879
1717	657 ¹	1.5	0.11 ₂	3.24	277.2	30.65	1.04	14.90	--	--	21.7	0.795
--	408 ¹	0.0	8.44 ₂	4.47	187.2	38.70	0.55	6.01	--	--	142.0	--
--	416	0.0	8.72 ₂	4.53	184.5	39.13	0.53	5.88	--	--	323.3	--
--	433	0.0	5.70 ₂	4.23	200.0	37.41	0.47	5.20	--	--	163.1	--

1 Station 408.1.
2 Bottle salinities are presented.

Table 16. Nutrient and suspended matter data for 30 July 1990

Concentrations												
TIME local	STA	DEP m	SAL psu	DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	TURB
				-----		microMolar		-----				
940	17.5	1.5	30.68	3.74	62.1	25.22	1.10	6.92	--	--	9.5	--
1050	15	1.5	28.25	4.29	83.5	31.02	1.40	4.63	--	--	10.8	--
1140	13	1.5	26.10	4.59	98.3	34.89	1.83	2.53	--	--	9.9	--
1240	11	1.5	23.54	4.96	114.6	39.15	2.36	2.48	--	--	10.4	--
1253	10	1.5	21.04	5.24	133.2	42.98	2.93	0.74	--	--	13.7	--
1310	9	1.5	18.40	5.44	145.0	44.89	3.22	1.26 ₁	--	--	16.9	--
1335	8	1.5	16.70	5.52 ₁	154.3 ₁	45.97 ₁	3.38 ₁	0.78 ₁	--	--	20.9	--
1410	7	1.5	14.69	5.68	165.5	47.13	3.57	1.13	--	--	34.1	--
1450	6.1	1.5	10.23	5.43	190.3	46.01	3.32	0.38	--	--	46.2	--
1605	5	1.5	7.46	5.03	203.0	42.61	2.66	0.27	--	--	35.4	--
1722	4.1	1.5	5.85	4.78	210.2	39.98	2.39	0.25	--	--	35.0	--
1750	3	1.5	4.07	4.38	217.3	35.67	1.75	0.37	--	--	30.2	--
1810	2	1.5	3.14	4.12	221.2	33.32	1.36	0.68	--	--	28.0	--
1830	649	1.5	1.76	3.59	227.1	28.72	0.82	1.13	--	--	34.9	--
1842	651	1.5	0.59	2.86	230.6 ₁	22.71 ₁	1.14 ₁	2.03 ₁	--	--	35.0	--
1900	653	1.5	0.21	2.68 ₁	230.1 ₁	20.40 ₁	1.28 ₁	3.34 ₁	--	--	23.7	--
1916	655	1.5	0.17	2.47	228.9	18.09	1.22	5.21	--	--	19.9	--
1935	657	1.5	0.08	2.33	227.3	15.91	1.06	7.14	--	--	15.2	--

1 Water was from the surface Niskin bottles.

Table 17. Nutrient and suspended matter data for 29 October 1990

[Samples were collected aboard the RV Saul Rantz. The cruise was terminated prematurely due to engine problems. All salinities are bottle salinities. All nutrient concentrations are averages from the analysis of two subsamples of the bulk station sample]

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
--	2	1.0	5.94	4.36	216.7	30.45	1.86	1.98	--	--	9.9	--
--	649	1.0	4.42	4.25	226.6	30.63	1.40	2.10	--	--	14.4	--
--	651	1.0	3.31	4.18	235.9	31.18	1.16	2.58	--	--	18.9	--
--	653	1.0	1.80	4.14	249.9	32.24	1.18	4.09	--	--	21.2	--
--	655	1.0	1.10	4.12	256.7	32.18	1.44	5.28	--	--	15.9	--
--	657	1.0	0.58	4.17	261.9	31.24	1.90	7.26	--	--	13.4	--

Table 18. Nutrient and suspended matter data for 08 November 1990

[Samples were collected aboard the RV Saul Rantz. The cruise was the continuation of the cruise begun on 29 October. All salinities are bottle salinities]

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
1216	15	1.0	27.80	3.80	78.0	17.35	0.98	6.11	--	--	21.9	--
1235	13	1.0	25.72	3.92	86.9	19.94	1.25	6.34	--	--	11.4	--
1253	11	1.0	22.60	4.28	107.5	22.79	1.48	6.55	--	--	22.1	--
1305	10	1.0	20.42	--	--	--	--	--	--	--	20.7	--
1315	9	1.0	18.24	4.60	135.3	26.18	1.62	6.96	--	--	17.9	--
1327	8	1.0	15.95	4.58	149.8	27.38	1.69	6.13	--	--	12.7	--
1353	7	1.0	15.34	4.69	154.3	27.86	1.70	6.76	--	--	22.7	--
1427	6	1.0	10.91	4.52	182.4	30.06	1.64	4.37	--	--	14.9	--
1439	5	1.0	7.51	4.45	204.1	30.83	1.41	3.97	--	--	13.2	--
1451	4	1.0	6.06	4.32	214.1	31.19	1.29	3.44	--	--	13.9	--
1503	3 ₁	1.0	4.70	4.20	223.7	31.33	1.12	2.69	--	--	11.7	--
945	408 ¹	1.0	15.06	4.63	155.8	28.23	1.69	6.13	--	--	25.2	--
1015	416	1.0	11.62	4.54	177.9	29.47	1.66	4.90	--	--	14.0	--
855	433	1.0	9.22	4.40	192.7	30.31	1.58	4.46	--	--	26.3	--

1 Station 408.1.

Table 19. Nutrient and suspended matter data for 06 December 1990

TIME local	STA	DEP m	SAL psu	Concentrations							SPM ¹ mg/L	TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP		
				-----		microMolar	-----		-----			
1006	17.5	1.5	31.17	3.18	46.0	19.73	0.80	7.69	3.60	0.36	14.5	0.684
1104	15	1.5	27.88	3.50	73.1	23.14	0.81	8.76	--	--	16.0	0.724
1142	13	1.5	26.52	3.59	80.4	24.31	0.79	9.43	--	--	27.2	1.165
1223	11	1.5	22.43	3.96	107.7	27.34	0.78	10.90	--	--	44.7	1.780
1250	10	1.5	20.79 ₂	4.08	118.9	28.37	0.74	11.67	--	--	37.8	1.525
1308	9	1.5	18.12 ₂	4.21	133.4	29.40	0.71	13.28	3.63	0.56	27.3	1.328
1331	8	1.5	15.96	4.23	148.0	30.21	0.64	13.22	--	--	17.0	1.450
1356	7	1.5	15.18 ₂	4.28	152.8	30.45	0.62	13.69	--	--	36.5	1.606
1433	6	1.5	11.90 ₂	4.44	173.9	31.25	0.61	12.18	4.13	0.45	30.3	1.345
1503	5	1.5	8.66	4.56	197.5	31.73	0.62	11.06	--	--	21.9	0.907
1523	4	1.5	8.16 ₂	4.24	202.5	31.80	0.53	10.70	--	--	22.2	0.810
1541	3	1.5	5.22 ₂	4.17	221.1	32.08	0.54	9.76	4.14	0.74	13.6	0.806
1602	2	1.5	4.70	4.18	223.1	32.28	0.53	9.78	--	--	15.4	0.836
1624	649	1.5	2.98 ₂	4.11	243.0	32.39	0.59	10.13	--	--	13.9 ₃	0.777
1638	651	1.5	1.60 ₂	4.17	260.7	32.02	0.67	12.08	--	--	16.4 ₃	0.810
1652	653	1.5	1.47 ₂	4.32	266.4	31.78	0.73	12.85	--	--	18.5 ₃	0.866
1708	655	1.5	0.89 ₂	4.24	272.6	31.27	0.72	13.77	--	--	20.0 ₃	0.854
1719	657 ₄	1.5	0.26 ₂	4.42	289.0	28.17	0.76	17.71	0.83	0.89	23.0	1.104
--	408 ₄	0.0	13.81 ₂	4.22	162.1	30.87	0.56	13.24	--	--	40.3	--
--	416	0.0	13.07 ₂	4.11	165.6	30.90	0.52	12.98	--	--	34.4	--
--	433	0.0	9.17 ₂	4.15	192.0	31.60	0.49	11.58	--	--	11.3	--
848 ₅	--	1.5	9.00	4.19	199.8	31.96	0.53	10.93	--	--	--	1.480

1 Water was from the surface Niskin bottles, except as noted.

2 Bottle salinities are presented.

3 Water from the pumped nutrient sample.

4 Station 408.1.

5 Sample taken the next day (07 December). The salinity is the calibrated on-line salinity.

Table 20. Nutrient and suspended matter data for 06 February 1991

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM	
				-----		micro	Molar	-----		mg/L		
1212	17.5	1.5	29.90	2.62	41.6	15.45	0.64	8.42	4.00	0.41	25.4	1.138
1323	15	1.5	25.34	3.23	77.8	22.36	0.82	10.88	--	--	38.7	--
continued...												

continued...

Nutrient and suspended matter data for 06 February 1991 - Continued

TIME local	STA	DEP m	SAL psu	Concentrations								SPM mg/L	TURB
				DRP -----	SiO2	N+N microMolar	NO2	NH3	DON	DOP			
1400	13	1.5	25.41	3.20	75.3	22.25	0.86	10.96	--	--	76.8	--	
1443	11	1.5	20.91	3.56	109.0	27.07	0.99	14.31	--	--	53.0	--	
1513	10	1.5	17.67	3.69	131.9	29.31	1.06	16.03	--	--	49.7	--	
1529	9	1.5	15.86 ¹	3.72	146.0	30.37	1.06	16.68	6.25	0.58	51.0	--	
1551	8	1.5	13.55	3.72	161.8	31.37	1.08	16.78	--	--	45.0	--	
1626	7	1.5	12.33	3.88	173.7	31.95	1.07	17.67	--	--	38.3	--	
1649	6	1.5	10.27 ¹	3.99	193.7	32.54	1.15	16.87	8.09	0.47	36.3	1.679	
1718	5	1.5	7.18	3.77	223.0	32.95	1.14	15.52	--	--	30.0	1.316	
1737	4	1.5	6.11 ¹	3.74	235.6	33.17	1.18	14.51	--	--	27.7	1.212	
1817	3	1.5	4.30 ¹	3.66	260.1	33.96	1.22	13.71	6.33	0.72	16.2	0.949	
1831	2	1.5	3.58	3.71	269.3	33.77	1.23	13.52	--	--	13.4	0.880	
1849	649	1.5	1.60	3.78	295.0	33.36	1.23	13.27	--	--	18.1	1.223	
1906	651	1.5	0.90	3.98	306.2	32.20	1.19	14.64	--	--	18.1	0.898	
1921	653	1.5	0.26	4.46	317.1	29.56	1.10	16.99	--	--	14.4 ³	0.891	
1948	657 ²	1.5	0.10 ¹	4.62	309.6	30.64	1.07	24.03	5.62	0.84	11.2	--	
1515	408 ²	0.0	11.18 ¹	3.81	183.7	32.33	1.10	17.14	--	--	45.9	--	
1545	416	0.0	11.21 ¹	3.73	181.5	32.37	1.09	16.22	--	--	26.9	--	
1615	433	0.0	8.64 ¹	3.69	206.0	32.40	1.11	15.04	--	--	7.6	--	

1 Bottle salinities are presented.

2 Station 408.1.

3 Water from the surface Niskin bottle.

Table 21. Nutrient and suspended matter data for 11 March 1991

TIME local	STA	DEP m	SAL psu	Concentrations								SPM mg/L	TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP			
				-----		microMolar	-----						
1025	18.5	37.0	31.21 ¹	2.00	28.8	12.28	0.50	5.83	4.28	0.31	8.6	--	
1025	18.5	1.5	29.37	3.02	50.7	18.24	0.65	8.02	--	--	4.4	0.615	
1147	15	1.5	24.47	3.14	83.6	23.96	0.80	7.95	--	--	6.4	0.974	
1229	14	1.5	23.24 ¹	3.17	92.2	25.22	0.82	7.83	--	--	18.4 ²	1.027	
1211	13	1.5	21.75 ¹	3.19	106.5	27.92	0.88	7.89	6.39	0.49	8.6 ²	1.278	
1300	12	1.5	18.68	3.48	130.1	32.55	1.04	10.04	--	--	12.7	1.163	
1324	11	1.5	18.27	3.58	134.6	33.91	1.09	11.53	--	--	14.9	1.252	
1352	10	1.5	16.93 ¹	3.66	144.3	35.01	1.16	12.15	--	--	28.9	1.601	
1415	9	1.5	16.22 ¹	3.69	145.9	35.36	1.16	12.62	5.26	0.50	73.3	1.837	
continued...													

continued...

Nutrient and suspended matter data for 11 March 1991 - Continued

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
1434	8	1.5	12.42	3.88	180.7	39.64	1.31	14.04	--	--	21.9 ²	1.497
1519	7	1.5	10.29	4.09	202.4	42.04	1.36	15.72	--	--	44.9	1.908
1539	6.5	1.5	6.72 ₁	4.11	241.2	46.71	1.42	16.02	--	--	40.6 ²	1.613
1554	6	1.5	5.97 ₁	4.12	241.0	46.73	1.42	16.06	4.43	0.68	45.7	1.847
1619	5	1.5	3.54	4.03	263.8	49.34	1.43	15.31	--	--	51.1 ₂	2.068
1644	4	1.5	2.08 ₁	3.79	276.8	50.63	1.38	14.24	--	--	88.1 ₂	2.997
1719	3	1.5	0.88 ₁	3.25	282.9	52.52	1.19	12.88	8.47	0.77	59.1 ₂	2.560
1733	2	1.5	0.50	2.98	281.7	53.94	1.12	11.62	--	--	66.6 ₂	3.035
1756	649	1.5	0.15 ₁	2.68	270.2	54.99	0.97	10.93	--	--	70.8	4.225
1812	651	1.5	0.18 ₁	3.52	266.7	55.84	1.15	13.51	--	--	101.5 ₂	4.366
1828	653	1.5	0.10 ₁	3.08	261.3	55.22	0.97	13.96	--	--	109.2 ₂	4.703
1843	655	1.5	0.16 ₁	3.38	264.5	53.66	1.02	16.78	--	--	97.9 ₂	4.278
1856	657	1.5	0.12	3.56	260.6	56.61	1.13	15.13	13.68	0.92	90.5 ₂	4.086

1 Bottle salinities are presented.

2 Water was from the surface Niskin bottles.

Table 22. Nutrient and suspended matter data for 11 April 1991

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
1217	18.5	1.5	30.34 ₂	2.24	54.4	22.29	0.68	2.64	--	--	9.9 ¹	0.746
1217	18.5	35.0	32.17 ₂	2.11	38.6	23.44	0.44	1.58	--	--	14.5 ₁	--
1333	15	1.5	23.63 ₂	2.63	91.4	26.87	1.01	3.68	--	--	38.5 ₁	1.597
1413	13	1.5	23.30 ₂	2.67	94.3	27.28	1.01	3.62	6.23	0.30	27.6 ₁	1.332
1459	11	1.5	15.13	3.25	163.7	40.12	1.61	6.01	--	--	37.3 ₁	1.518
1526	10	1.5	12.45 ₂	3.35	178.6	41.82	1.82	7.81	--	--	34.4	1.559
1544	9	1.5	12.32 ₂	3.32	183.0	42.24	1.85	7.88	7.05	0.36	31.5	1.434
1606	8	1.5	8.56	3.38	206.6	45.58	2.07	10.24	--	--	37.5	1.650
1657	7	1.5	5.90 ₂	3.44	224.1	47.19	2.13	10.42	--	--	52.6 ₁	2.334
1710	6	1.5	2.92 ₂	3.27	247.8	49.56	2.13	8.65	8.69	0.54	143.8 ₁	4.790
1747	5	1.5	1.31	3.23	262.4	49.22	1.88	8.09	--	--	111.6	4.056
1816	4	1.5	0.53	3.18	270.6	48.61	1.63	7.52	--	--	137.7	4.541
1850	3	1.5	0.22	3.19	277.8	47.48	1.37	8.59	9.51	0.62	77.4	3.107
1904	2	1.5	0.18	3.25	282.6	46.02	1.26	9.50	--	--	70.7	2.710
1925	649	1.5	0.14	3.84	296.4	40.60	1.42	14.09	--	--	50.6	1.989

continued...

Nutrient and suspended matter data for 11 April 1991 - Continued

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
1944	651	1.5	0.14	3.69	301.9	37.98	1.14	15.91	--	--	48.1	1.651
2001	653	1.5	0.14	3.88	301.2	37.18	1.15	16.59	--	--	22.1	1.487
2015	655	1.5	0.14	4.30	305.6	31.34	1.07	19.64	--	--	44.3	1.568
2030	657	1.5	0.14	4.14	304.6	30.60	0.99	18.00	3.84	0.55	34.8	1.484
1840	433	0.0	--	3.33	263.8	49.09	1.86	7.20	--	--	152.5	--

1 Water from the surface Niskin bottles.

2 Bottle salinities are presented.

Table 23. Nutrient and suspended matter data for 05 June 1991

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
1051	18.5	1.5	30.26 ₁	3.17	63.9	28.01	0.57	4.24	--	--	8.6	0.426
1051	18.5	32.0	31.87 ₁	2.89	49.2	25.68	0.58	5.74	--	--	14.0	--
1205	15	1.5	25.54 ₁	3.86	97.7	36.13	0.62	4.03	--	--	14.7	0.844
1248	13	1.5	22.52 ₁	4.26	117.1	40.24	0.63	4.64	6.45	0.22	10.7	0.553
1331	11	1.5	18.41	4.87	149.2	46.37	0.67	6.74	--	--	20.5	0.852
1400	10	1.5	15.83 ₁	4.80	170.8	49.12	0.57	6.94	--	--	30.7	1.132
1420	9	1.5	12.96 ₁	4.74	182.2	49.86	0.57	6.50	7.48	0.34	29.7	1.154
1439	8	1.5	11.79	4.75	188.0	49.78	0.55	6.37	--	--	29.8	1.152
1503	7	1.5	9.36 ₁	4.71	202.0	49.07	0.53	6.66	--	--	30.1	1.179
1535	6	1.5	7.50 ₁	4.66	219.9	47.41	0.54	6.68	8.51	0.48	33.1	1.340
1602	5	1.5	5.14	4.56	229.8	45.74	0.53	6.64	--	--	35.6	1.419
1623	4	1.5	3.90 ₁	4.42	238.6	44.04	0.57	6.56	--	--	59.3	2.146
1645	3	1.5	2.65 ₁	4.16	253.3	42.09	0.66	6.15	7.92	0.73	47.9	1.780
1701	2	1.5	2.16	4.28	250.7	41.30	0.55	5.75	--	--	52.7	1.933
1724	649	1.5	0.96 ₂	4.35	277.5	38.93	1.13	7.98	--	--	47.8	1.897
1736	651	1.5	0.39 ₂	4.31	289.6	35.37	1.47	10.92	--	--	51.5	1.910
1751	653	1.5	0.17 ₂	4.27	296.7	29.95	1.65	15.03	--	--	27.8	1.162
1803	655	1.5	0.12 ₂	3.97	297.4	24.35	1.53	17.25	--	--	24.2	1.038
1816	657	1.5	0.10	3.77	292.3	21.09	1.27	17.84	1.34	0.47	20.3	0.844

1 Bottle salinities are presented.

2 Salinities are calibrated on-line salinities.

Table 24. Nutrient and suspended matter data for 01 August 1991

TIME local	STA	DEP m	Concentrations										TURB
			SAL psu	DRP	SiO2	N+N microMolar	NO2	NH3	DON	DOP	SPM mg/L		
827	18.5	1.5	31.88 ¹	2.57	37.6	13.29	0.64	7.38	--	--	14.3	0.567	
827	18.5	38.0	32.28 ¹	2.59	37.8	13.88	0.64	7.63	--	--	10.3	--	
943	15	1.5	27.04 ¹	4.12	84.7	25.95	0.87	5.99	--	--	11.3	0.526	
1022	13	1.5	26.67 ¹	4.21	88.3	26.99	0.88	5.91	5.46	0.22	19.5	0.762	
1102	11	1.5	21.56	4.99	127.5	34.95	0.99	5.87	--	--	18.8	0.708	
1129	10	1.5	19.05 ¹	5.24	143.5	38.19	1.03	5.94	--	--	32.3	1.146	
1143	9	1.5	16.68 ¹	5.40	155.7	40.23	1.02	6.13	6.66	0.44	33.2	1.216	
1202	8	1.5	14.41	5.47	171.0	42.04	1.01	5.10	--	--	52.9	1.778	
1230	7	1.5	11.68 ¹	5.46	190.2	43.23	0.98	4.54	--	--	67.2	2.227	
1305	6	1.5	8.60 ¹	5.23	207.8	42.28	0.83	3.27	7.64	0.66	60.5	2.084	
1330	5	1.5	5.96	5.05	223.7	40.39	0.65	3.09	--	--	51.3	1.770	
1349	4	1.5	4.50 ¹	4.88	232.9	38.80	0.51	3.21	--	--	48.8	1.810	
1423	3	1.5	3.20 ¹	4.67	240.6	36.62	0.38	2.47	6.78	0.64	36.3	1.739	
1443	2	1.5	2.19	4.52	245.6	35.00	0.31	2.09	--	--	44.7	1.612	
1508	649	1.5	1.16	4.24	257.3	34.51	0.39	1.64	--	--	41.9	1.679	
1522	651	1.5	0.60	3.84	261.4	32.43	0.66	1.39	--	--	54.1	1.958	
1537	653	1.5	0.21	3.58	263.4	29.57	1.53	2.11	--	--	34.5	1.415	
1552	655	1.5	0.12	3.40	263.9	27.14	1.82	3.62	--	--	30.2	1.272	
1603	657 ²	1.5	0.10 ¹	3.38	263.6	25.51	1.61	5.24	6.06	0.51	25.2	1.115	
1315	408 ²	0.0	9.96 ¹	5.27	200.2	43.00	0.92	2.94	--	--	71.2	--	
1330	416	0.0	11.03 ¹	5.33	190.3	42.41	0.96	2.06	--	--	240.8	--	
1400	433	0.0	7.47 ¹	5.20	214.6	41.85	0.74	2.24	--	--	103.0	--	

1 Bottle salinities are presented.

2 Station 408.1.

Data for southern San Francisco Bay

Table 25. Nutrient and suspended matter data for 01 March 1989

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
1220	--	1.5	29.60	4.30	29.4	15.75	0.51	1.03	--	--	--	--
1246	21	1.5	29.60	6.22	53.6	33.08	0.68	4.61	--	--	10.9	0.371
1340	24	1.5	29.69	6.33	58.9	39.74	0.80	5.88	--	--	12.6	0.344
--	--	1.5	29.30	6.67	40.1	35.94	0.72	2.02	--	--	--	--
1433	27	1.5	29.07	7.87	41.7	40.45	0.81	3.74	--	--	19.3	0.593
--	--	1.5	28.20	8.51	9.5	24.02	0.71	0.86	--	--	--	--
1531	30	1.5	28.35	8.35	11.1	23.54	0.70	0.87	--	--	20.2	0.550
1608	32	1.5	27.82	10.33	4.5	27.32	0.86	2.50	--	--	20.2	0.535

Table 26. Nutrient and suspended matter data for 10 August 1989

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
1607	21	1.5	31.00	3.81	67.8	28.19	0.86	8.53	--	--	--	0.258
1645	24	1.5	31.09	5.58	82.3	32.21	1.22	10.08	--	--	--	0.330
1725	27	1.5	31.10	9.87	113.0	37.16	1.38	7.04	--	--	--	0.472
1810	30	1.5	31.16	10.99	122.4	39.00	1.18	4.76	--	--	--	0.538

Table 27. Nutrient and suspended matter data for 28 February 1990

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP -----	SiO2	N+N microMolar	NO2	NH3	DON	DOP	SPM mg/L	
1527	21	1.5	29.46	2.98	55.1	24.13	0.54	6.20	--	--	18.4	0.577
1546	22	1.5	29.88	2.97	52.4	23.99	0.55	6.16	--	--	15.5	0.535
1610	23	1.5	29.57	4.28	58.2	28.41	0.66	8.76	--	--	18.7	0.603
1630	24	1.5	29.21	5.71	64.8	34.11	0.83	10.84	--	--	21.8	0.692
1649	25	1.5	28.83	8.96	77.1	47.22	1.27	14.03	--	--	30.3	0.914
1713	26	1.5	28.90	8.62	75.5	46.57	1.38	12.56	--	--	33.4	0.971
1729	27	1.5	28.87	8.24	73.9	44.64	1.30	11.40	--	--	29.2	0.878
1758	28.5	1.5	28.63	9.27	77.0	50.15	1.39	11.05	--	--	35.6	1.081
1827	29	1.5	28.46	9.92	78.7	53.26	1.43	11.29	--	--	31.3	0.966
1854	30	1.5	27.91	11.83	83.5	65.68	1.45	8.75	--	--	36.9	1.406

Table 28. Nutrient and suspended matter data for 18 April 1990

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP -----	SiO2	N+N microMolar	NO2	NH3	DON	DOP	SPM mg/L	
957	21	1.5	30.42	3.70	36.0	21.69	0.59	6.57	--	--	3.3 ¹	0.181
944	22	1.5	30.62	3.44	36.5	20.26	0.53	9.46	--	--	-- ¹	0.194
922	23	1.5	30.09	4.54	31.8	25.29	0.71	3.73	--	--	1.5 ¹	0.148
904	24	1.5	30.04	4.59	27.1	24.20	0.71	2.83	--	--	-- ¹	0.162
843	25	1.5	29.91	4.11	14.3	17.51	0.60	1.01	--	--	4.7 ¹	0.173
827	26	1.5	29.64	4.15	7.7	12.57	0.52	2.08	--	--	-- ¹	--
807	27	1.5	29.48	4.54	5.7	10.09	0.44	2.27	--	--	2.0 ¹	0.164
754	28	1.5	29.07	5.07	2.4	6.40	0.35	2.91	--	--	-- ¹	0.179
735	29	1.5	29.08	5.37	1.4	4.80	0.29	2.41	--	--	3.2 ¹	0.179
708	30	1.5	28.62	7.15	1.1	4.00	0.25	3.14	--	--	6.6 ¹	0.223
650	31	1.5	28.37	8.11	0.7	3.12	0.15	1.40	--	--	--	0.255
608	32	1.5	28.22	8.86	1.1	3.88	0.18	1.01	--	--	-- ¹	0.280
636 ²	SM32	1.5	28.15 ³	9.01	1.1	3.42	0.20	0.63	--	--	10.2 ¹	--
1607 ²	--	1.5	28.36 ³	8.36	1.1	0.94	0.21	1.70	--	--	--	0.450

¹ Water was taken from the surface Niskin bottles.

² Sample taken the next day (19 April), near station 30.

³ The bottle salinity is presented.

Table 29. Nutrient and suspended matter data for 31 May 1990

TIME local	STA	DEP m	SAL psu	Concentrations								SPM mg/L	TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP			
				-----		microMolar		-----					
1322	21	1.5	30.78 ¹	4.46	33.0	19.16	0.95	9.28	--	--	11.7	0.447	
1333	22	1.5	30.92	3.71	33.5	19.55	0.52	7.94	--	--	9.2	0.363	
1354	23	1.5	30.64	5.10	30.5	19.16	1.10	9.25	--	--	24.6	0.618	
1407	24	1.5	30.79	4.54	29.0	19.13	1.00	8.56	--	--	21.4	0.534	
1421	25	1.5	30.65	5.19	29.7	18.66	1.06	8.21	--	--	40.2	1.149	
1439	26	1.5	30.54	5.63	28.7	18.77	1.06	7.40	--	--	32.5	0.977	
1450	27	1.5	30.47	6.09	30.8	19.19	1.12	7.95	--	--	29.2	0.845	
1505	28	1.5	30.33	7.21	37.1	21.43	1.34	8.96	--	--	25.9	0.801	
1531	29	1.5	30.21	8.08	43.6	24.17	1.37	8.10	--	--	78.2	2.014	
1551	30	1.5	29.86	9.67	53.1	29.31	1.50	8.11	--	--	29.3	0.875	

¹ The bottle salinity is presented.

Table 30. Nutrient and suspended matter data for 31 July 1990

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
----- microMolar -----												
1755	21	1.5	31.69	3.91 ¹	56.9 ¹	25.08 ¹	1.26 ¹	9.17 ¹	--	--	8.5 ¹	--
1845	23	1.5	31.64	4.00 ¹	55.3 ¹	25.29 ¹	1.36 ¹	9.36 ¹	--	--	10.0 ¹	--
1915	24	1.5	31.66	4.56 ¹	60.7 ¹	28.39 ¹	1.81 ¹	9.77 ¹	--	--	22.6 ¹	--
1935	25	1.5	31.52	6.80	82.1	41.35	4.14	2.52	--	--	19.2	--
1954	26	1.5	31.55	7.26 ¹	87.9 ¹	43.55 ¹	4.08 ¹	0.22 ¹	--	--	18.9 ¹	--
2010	27	1.5	31.57	8.48 ¹	96.0 ¹	45.13 ¹	3.61 ¹	0.76 ¹	--	--	18.0 ¹	--
2045	28.5	1.5	31.55	11.08	110.1	50.39	3.66	0.18	--	--	16.6	--
2130	29	1.5	31.54	11.35 ¹	111.2 ¹	50.20 ¹	3.61 ¹	0.42 ¹	--	--	12.2 ¹	--
2200	30	1.5	31.59	12.44 ¹	116.3 ¹	50.69 ¹	3.11 ¹	0.13 ¹	--	--	17.0 ¹	--

¹ Water was from the surface Niskin bottles.

Table 31. Nutrient and suspended matter data for 07 December 1990

TIME local	STA	DEP m	SAL psu	Concentrations							SPM mg/L	TURB
				DRP -----	SiO2	N+N micro	NO2 Molar	NH3	DON	DOP		
1524	21	1.5	31.13 ¹	3.47	48.0	20.52	0.83	7.98	3.14	0.36	8.5	0.474
1535	22	1.5	31.42	3.47	45.4	20.69	0.88	8.65	--	--	34.3	1.091
1552	23	1.5	31.00	3.68	50.6	21.76	0.90	8.44	--	--	12.6	0.811
1605	24	1.5	30.97 ¹	4.41	55.4	24.26	1.15	9.26	3.01	0.43	28.4	1.165
1619	25	1.5	31.18	6.15	66.1	29.74	1.61	9.04	--	--	20.1	1.018
1635	26	1.5	31.62	9.30	85.7	40.95	2.78	6.17	--	--	15.3	0.705
1649	27	1.5	31.73 ¹	9.91	89.6	43.86	3.51	4.60	6.02	0.72	27.8	1.057
1702	28.5	1.5	31.83	10.20	91.0	45.16	4.06	3.47	--	--	13.0	0.651
1807	29	1.5	31.83 ¹	10.07	90.3	44.60	4.02	3.80	--	--	12.4	0.697
1830	30	1.5	31.83 ¹	11.16	95.7	49.57	4.72	3.80	4.55	0.99	18.2	0.892

¹ Bottle salinities are presented.

Table 32. Nutrient and suspended matter data for 06 February 1991

TIME local	STA	DEP m	SAL psu	Concentrations								SPM mg/L	TURB
				DRP -----	SiO2	N+N microMolar	NO2	NH3	DON	DOP			
1137	21	1.5	30.31	4.16	44.8	21.04	1.11	10.74	--	--	31.0 ¹	1.211	
1122	22	1.5	30.23	4.54	47.4	22.81	1.13	11.98	--	--	27.7	1.036	
1103	23	1.5	30.13 ²	7.63	63.3	35.51	1.18	13.06	--	--	25.5 ¹	1.161	
1047	24	1.5	30.19 ²	7.72	68.4	39.16	1.26	13.26	6.24	0.61	27.6 ¹	1.314	
1031	25	1.5	30.22	9.32	79.2	47.05	1.26	11.52	--	--	41.3	1.525	
1014	26	1.5	30.22 ²	8.28	73.2	42.70	1.26	11.78	--	--	17.9 ¹	0.903	
1002	27	1.5	30.23 ²	8.41	74.4	42.80	1.30	11.09	6.23	0.62	10.7 ¹	0.796	
947	28	1.5	30.01	8.69	76.1	43.32	1.23	10.69	--	--	12.2 ¹	0.762	
930	29	1.5	29.99 ²	9.73	79.4	47.21	1.33	13.38	--	--	13.9 ¹	0.810	
906	30	1.5	29.96 ²	10.80	83.2	53.43	1.39	13.46	5.93	0.69	10.6 ¹	0.723	
847	31	1.5	29.80	12.16	88.2	63.40	1.44	11.98	--	--	15.9 ¹	0.790	
835	32	1.5	29.72	13.10	91.0	70.06	1.49	11.31	--	--	27.7 ¹	--	

¹ Water was from the surface Niskin bottles.

² Bottle salinities are presented.

Table 33. Nutrient and suspended matter data for 05 March 1991

TIME local	STA	DEP m	Concentrations								SPM mg/L	TURB
			SAL psu	DRP	SiO2	N+N microMolar	NO2	NH3	DON	DOP		
805	21	1.5	29.52	7.88	66.6	37.73	0.90	7.08	6.15	0.53	53.3 ¹	2.106
823	22	1.5	30.17	4.78	50.8	25.72	0.96	8.19	--	--	62.3	1.965
829	23	1.5	29.79	6.93	64.5	36.80	1.28	9.37	--	--	48.7	--
900	24	1.5	29.83 ²	6.07	60.2	33.01	1.41	9.37	5.35	0.46	59.7 ¹	1.722
919	25	1.5	29.75	7.01	65.6	37.77	1.60	10.14	--	--	49.3	1.766
937	26	1.5	29.53	8.21	71.8	43.38	1.92	10.96	--	--	58.9	2.054
952	27	1.5	29.37 ²	8.80	74.3	46.24	1.98	10.64	--	--	31.2 ¹	1.238
1007	28	1.5	29.20	9.37	76.4	48.92	2.05	10.38	--	--	39.0	1.412
1023	29	1.5	28.81	10.11	78.7	52.28	2.10	10.41	--	--	31.3	1.218
1023	29	13.0	29.22	9.38	76.3	48.92	2.07	10.45	--	--	97.2 ¹	--
1040	29.5	1.5	28.75 ²	9.94	78.9	51.46	2.07	11.08	--	--	25.6 ¹	1.065
1056	30	1.5	28.04 ²	10.34	80.6	53.65	2.06	10.97	6.99	0.65	30.0 ¹	1.173
1056	30	14.0	28.96	10.73	80.7	55.18	2.11	9.83	--	--	94.9	--
1116	31	1.5	26.76 ²	13.43	87.8	71.77	2.29	10.40	--	--	31.5 ¹	1.202
1135	32	1.5	25.76 ²	13.81	89.0	75.16	2.29	10.28	6.32	1.63	30.9 ¹	1.065
1150	33	1.5	25.38	14.72	91.1	81.38	2.39	11.22	--	--	32.5 ¹	1.357
1150	33	9.0	26.53	13.81	89.0	75.16	2.29	10.28	--	--	76.5	--

1 Water was from the surface Niskin bottles.

2 Bottle salinities are presented.

Table 34. Nutrient and suspended matter data for 11 March 1991

TIME local	STA	DEP m	SAL psu	Concentrations								SPM mg/L	TURB
				DRP -----	SiO2	N+N microMolar	NO2	NH3	DON	DOP			
958	21	1.5	28.53	3.89	56.2	21.46	0.78	12.42	--	--	10.5	0.780	
944	22	1.5	28.20	3.50	58.4	20.84	0.73	10.16	--	--	8.7	0.755	
928	23	1.5	28.77 ¹	4.38	56.2	24.28	0.89	10.89	--	--	11.3	0.794	
913	24	1.5	28.76 ¹	5.31	61.1	28.92	1.06	11.01	--	--	8.6	0.721	
858	25	1.5	28.91	6.01	63.1	31.88	1.20	14.16	--	--	11.3	0.824	
841	26	1.5	29.31 ¹	6.00	62.2	32.80	1.25	9.72	--	--	11.8	0.825	
828	27	1.5	29.48 ¹	6.59	65.6	36.61	1.43	7.86	--	--	21.1	1.138	
814	28	1.5	29.35	8.18	71.6	42.85	1.77	10.67	--	--	25.2	1.198	
757	29	1.5	29.09 ¹	8.97	73.8	46.17	1.84	11.03	--	--	21.1	1.071	
734	30	1.5	28.70 ¹	9.94	77.2	50.64	1.92	10.28	--	--	30.6	1.391	
continued...													

continued...

Nutrient and suspended matter data for 11 March 1991 - Continued

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
715	31	1.5	28.02	11.14	81.1	57.12	1.98	9.31	--	--	34.7	1.554
654	32	1.5	27.36	12.05	83.0	61.74	1.94	7.67	--	--	65.4	2.209

1 Bottle salinities are presented.

Table 35. Nutrient and suspended matter data for 19 March 1991

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
805	21	1.5	28.68 ¹	6.74	67.9	36.61	1.00	9.71	--	--	73.4 ²	2.077
825	22	1.5	28.22	6.59	66.1	36.09	1.50	13.81	--	--	65.8	2.206
842	23	1.5	28.98	7.97	71.8	42.59	1.63	13.37	--	--	82.9	2.480
856	24	1.5	29.02 ¹	7.92	71.2	42.53	1.54	13.06	4.85	0.14	76.2 ²	2.282
915	25	1.5	28.91	7.66	69.9	40.44	1.38	11.26	--	--	84.9	2.491
932	26	1.5	28.79	8.01	70.7	41.50	1.43	13.03	--	--	81.4	2.557
944	27	1.5	28.60 ¹	8.32	72.2	43.59	1.45	11.51	5.12	0.10	43.3 ²	1.573
1000	28	1.5	28.43 ¹	8.95	74.3	47.09	1.45	9.94	--	--	69.0	2.284
1012	29	1.5	28.20	9.42	76.6	49.31	1.54	9.70	--	--	77.3 ²	2.349
1012	29	14.0	28.56	8.58	73.1	45.42	1.51	10.27	--	--	307.3	--
1025	29.5	1.5	28.03	9.80	77.4	51.59	1.58	9.49	--	--	61.7 ²	2.117
1040	30	1.5	28.00	9.78	76.8	49.90	1.68	14.25	4.34	0.23	74.5 ²	2.142
1040	30	13.0	28.03 ¹	9.81	77.4	52.12	1.61	9.50	--	--	329.0	--
1057	31	1.5	27.21	11.80	84.3	65.07	1.74	9.33	--	--	50.3 ²	1.827
1110	32	1.5	26.86 ¹	12.16	85.2	67.81	1.68	9.38	2.61	0.54	51.8 ²	1.930
1125	33	1.5	26.26	13.25	88.8	73.94	1.68	9.94	--	--	48.7 ²	1.780
1125	33	11.0	27.27	11.57	83.7	62.92	1.57	9.51	--	--	327.0	--
1300	SM25	0.0	28.02	9.76	76.8	52.02	1.55	10.50	--	--	177.0	--
1340	SM29	0.0	27.71	10.85	81.8	56.23	1.41	7.30	--	--	121.8	--
1450	SM35	0.0	--	--	--	--	--	--	--	--	105.7	--
1530	SM46	0.0	28.26	--	--	--	--	--	--	--	104.4	--

1 Bottle salinities are presented.

2 Water was from the surface Niskin bottles.

Table 36. Nutrient and suspended matter data for 01 April 1991

TIME local	STA	DEP m	SAL psu	Concentrations								SPM mg/L	TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP			
				-----		microMolar		-----					
1419	21	1.5	24.72	3.46	86.3	28.59	1.14	7.59	--	--	19.6	0.963	
1406	22	1.5	25.26	3.29	77.2	26.62	1.09	5.91	--	--	13.0	0.752	
1343	23	1.5	25.10 ₁	3.74	79.2	28.88	1.19	6.77	--	--	33.6	1.338	
1315	24	1.5	24.90 ₁	3.89	82.3	29.84	1.21	6.89	5.15	0.13	26.8	1.093	
1256	25	1.5	26.50	5.81	76.9	36.57	1.45	8.97	--	--	49.7	1.680	
1235	26	1.5	27.35 ₁	6.26	73.3	37.26	1.57	9.27	--	--	43.7	1.532	
1222	27	1.5	27.79 ₁	6.46	71.2	37.47	1.65	9.16	5.09	0.15	67.3	2.182	
1207	28	1.5	27.84	7.06	72.1	40.47	1.84	9.92	--	--	93.0	2.450	
1145	29	1.5	27.52	7.85	74.7	45.20	2.07	10.53	--	--	92.8 ₂	2.130	
1145	29	14.0	27.65	7.69	74.1	43.93	2.06	11.04	--	--	156.8 ₂	--	
1115	29.5	1.5	27.35 ₁	8.25	76.1	47.86	2.13	9.90	--	--	54.2	1.778	
1051	30	1.5	26.56 ₁	8.95	79.5	53.67	2.20	8.85	6.60	0.17	55.0	1.664	
1051	30	12.0	27.32	8.25	76.0	47.34	2.15	10.40	--	--	249.4	--	
1030	31	1.5	25.66 ₁	9.99	84.2	60.86	2.31	8.36	--	--	59.5	1.647	
1013	32	1.5	25.34 ₁	10.78	87.7	66.93	2.37	7.93	6.44	0.38	48.6	1.749	
955	33	1.5	23.95	11.93	92.9	77.24	2.57	8.34	--	--	78.1	2.608	

1 Bottle salinities are presented.

2 Water was from the surface Niskin bottle.

Table 37. Nutrient and suspended matter data for 05 April 1991

TIME	STA	DEP	SAL	Concentrations								SPM	TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP			
				-----		microMolar	-----			mg/L			
local		m	psu										
839	21	1.5	25.38	5.22	80.8	36.19	1.27	6.71	--	--	38.0 ¹	1.281	
857	22	1.5	25.36	4.98	82.0	34.62	1.44	8.10	--	--	28.2	0.977	
924	23	1.5	25.05 ₂	4.75	83.7	34.27	1.43	6.79	--	--	9.4 ₁	0.457	
954	24	1.5	25.45 ₂	4.68	84.4	34.11	1.42	6.79	5.17	0.09	16.2 ¹	0.412	
1022	25	1.5	26.97	6.57	75.8	40.66	1.82	7.67	--	--	46.4	1.543	
1040	26	1.5	27.10 ₂	6.65	74.8	40.51	1.76	7.51	--	--	32.8 ₁	1.199	
1053	27	1.5	27.12 ₂	7.97	76.5	47.31	2.15	8.52	5.65	--	39.6 ¹	1.348	
1107	28	1.5	27.02	8.70	79.1	51.85	2.30	7.81	--	--	37.9 ₁	1.353	
1124	29	1.5	26.80	9.05	80.9	54.41	2.28	7.18	--	--	46.7 ¹	1.144	
1124	29	14.0	27.20	7.98	76.7	46.51	2.07	8.24	--	--	83.6 ₁	--	
1142	29.5	1.5	26.42 ₂	9.41	82.7	56.99	2.22	6.03	--	--	59.4 ₁	2.278	
1221	30	1.5	26.44 ₂	9.57	83.4	57.47	2.20	6.26	8.36	0.11	55.4 ¹	1.648	

continued...

Nutrient and suspended matter data for 05 April 1991 - Continued

Concentrations												
TIME local	STA	DEP m	SAL psu	DRP	SiO2	N+N microMolar	NO2	NH3	DON	DOP	SPM mg/L	TURB
1221	30	13.0	26.94	8.76	79.4	50.27	2.17	9.59	--	--	111.4 ¹	--
1249	31	1.5	25.76 ²	10.78	88.0	65.73	2.17	4.87	--	--	50.7 ¹	1.593
1308	32	1.5	25.51 ²	10.96	88.7	67.03	2.14	4.72	6.26	0.38	58.1 ¹	1.223
1322	33	1.5	24.42	13.72	97.3	83.92	2.63	6.15	--	--	36.8 ¹	1.404
1322	33	11.0	25.61	10.81	88.4	65.83	2.15	4.96	--	--	188.6	--
1402	SM25	0.0	26.11	9.77	84.5	59.34	2.24	6.18	--	--	95.8	--
1448	SM29	0.0	27.00	7.97	75.2	48.20	1.54	0.42	--	--	95.8	--
1502	SM35	0.0	27.29	7.89	74.7	48.75	1.73	2.17	--	--	59.7	--

1 Water was from the surface Niskin bottles.

2 Bottle salinities are presented.

Table 38. Nutrient and suspended matter data for 08 April 1991

Concentrations												
TIME local	STA	DEP m	SAL psu	DRP	SiO2	N+N microMolar	NO2	NH3	DON	DOP	SPM mg/L	TURB
1149	24	1.5	26.25 ¹	6.04	78.4	40.72	1.67	5.73	5.07	0.24	30.8	1.121
1213	25	1.5	26.60	7.24	78.6	46.11	1.78	5.53	--	--	59.4	1.901
1232	26	1.5	26.45 ¹	6.70	79.0	43.57	1.55	4.77	--	--	50.5	1.700
1246	27	1.5	26.40 ¹	6.87	79.2	43.51	1.50	6.57	4.21	0.29	57.5	1.974
1330	28 ²	1.5	26.82 ¹	7.75	78.0	47.15	1.42	3.15	--	--	60.0	2.115
--	30 ²	1.5	27.00 ¹	8.31	80.8	49.53	1.24	3.02	7.77	0.28	--	--
753	36	1.5	24.84	13.22	97.4	77.83	2.06	6.03	--	--	54.1	1.888
753	36	8.0	24.87	12.60	95.7	73.38	1.95	5.88	--	--	80.8	--

1 Bottle salinities are presented.

2 Sample taken near the mouth of Redwood Creek.

Table 39. Nutrient and suspended matter data for 11 April 1991

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
1141	21	1.5	26.69	2.69	68.2	23.11	0.86	5.64	--	--	91.1	1.195
1127	22	1.5	26.69	2.93	66.9	24.58	0.95	4.85	--	--	28.1	1.075
1109	23	1.5	26.39 ¹	3.19	68.9	25.88	1.00	4.81	--	--	37.4	--
1048	24	1.5	25.98 ¹	3.81	73.0	28.75	1.13	5.81	3.91	0.27	47.8	1.583
1030	25	1.5	26.00	5.87	78.3	39.33	1.48	4.64	--	--	67.3	2.120
1009	26	1.5	26.56 ¹	7.79	80.9	46.45	1.16	3.86	--	--	160.0	4.464
957	27	1.5	26.52 ¹	7.55	80.9	45.81	1.18	3.51	5.30	0.19	212.6	5.366
946	28	1.5	26.45	7.46	81.3	45.26	1.15	3.80	--	--	225.1	--
914	29	1.5	26.69	7.60	79.8	46.18	1.23	3.54	--	--	203.6 ²	5.607
914	29	14.0	26.56	7.55	79.5	46.48	1.24	3.77	--	--	241.9 ²	--
859	29.5	1.5	26.61 ¹	7.56	79.7	46.35	1.23	3.44	--	--	207.5 ²	5.387
835	30	1.5	26.56 ¹	8.13	83.2	47.62	0.99	2.70	5.16	0.10	308.9 ²	6.611
835	30	14.0	26.56	8.13	83.4	47.45	1.01	2.90	--	--	408.0 ²	--
807	31	1.5	26.51 ¹	7.52	81.2	45.52	0.85	1.33	--	--	289.2 ²	6.323
746	32	1.5	26.28 ¹	9.43	89.3	54.06	1.06	3.16	5.67	0.16	250.3 ²	5.948
656	33	1.5	25.34	13.70	100.3	78.49	1.65	5.01	--	--	212.2 ²	5.483
656	33	12.0	26.29	11.67	95.4	66.68	1.16	3.36	--	--	491.3	--

1 Bottle salinities are presented.

2 Water was from the surface Niskin bottles.

Table 40. Nutrient and suspended matter data for 15 April 1991

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
829	24	1.5	26.39 ¹	7.10	82.0	43.56	1.14	4.27	5.07	--	168.3	4.473
852	25	1.5	26.44	7.62	83.3	44.70	1.07	4.99	--	--	214.4	5.473
808	26	1.5	26.48	7.93	83.8	46.66	0.98	4.14	--	--	185.8	4.733
918	27	1.5	26.47	8.37	85.3	48.90	0.95	3.77	5.12	0.06	235.1	5.738
931	28	1.5	26.47	8.59	85.8	49.99	0.93	3.23	--	--	139.0 ²	3.974
945	29	1.5	26.45	8.85	87.0	51.25	0.96	3.45	--	--	208.7 ²	--
945	29	13.0	26.44	8.78	86.9	50.39	0.95	3.68	--	--	471.3 ²	--
1007	29.5	1.5	26.44	8.94	87.0	51.82	0.94	2.95	--	--	141.5 ²	3.613
1022	30	1.5	26.48 ¹	8.76	86.6	51.51	0.91	2.70	6.16	0.00	--	4.109
1022	30	14.0	26.54 ¹	8.29	86.3	47.19	1.00	5.27	--	--	655.3 ²	--
1043	31	1.5	26.35	9.62	90.4	54.86	0.95	2.80	--	--	108.8 ²	3.084

continued...

Nutrient and suspended matter data for 15 April 1991 - Continued

Concentrations												
TIME local	STA	DEP m	SAL psu	DRP	SiO2	N+N microMolar	NO2	NH3	DON	DOP	SPM mg/L	TURB
1057	32	1.5	26.12 ¹	10.86	94.7	61.82	1.04	2.96	5.64	0.31	124.5 ²	3.525
1118	33	1.5	26.07	10.98	95.0	61.96	1.06	2.98	--	--	141.3 ²	3.809
1118	33	11.0	26.11	11.14	95.9	63.61	1.05	2.98	--	--	329.7	--
1255	SM25	0.0	26.48	8.76	86.8	48.55	0.98	5.25	--	--	220.4	--
1255	SM25	-- ⁽³⁾	26.48	--	--	--	--	--	--	--	310.8	--
1333	SM29	0.0	26.57	8.19	85.1	48.23	0.80	2.05	--	--	265.5	--
1333	SM29	-- ⁽³⁾	26.59	--	--	--	--	--	--	--	330.2	--

1 Bottle salinities are presented.

2 Water was from the surface Niskin bottles.

3 Bottom sample, depth unknown.

Table 41. Nutrient and suspended matter data for 19 April 1991

Concentrations												
TIME local	STA	DEP m	SAL psu	DRP	SiO2	N+N microMolar	NO2	NH3	DON	DOP	SPM mg/L	TURB
857	21	1.5	28.31	3.70	64.3	29.54	0.86	4.50	--	--	66.4	1.997
916	22	1.5	28.21	3.73	64.4	29.44	0.83	4.23	--	--	50.4	1.703
938	23	1.5	27.38	5.32	73.9	36.30	1.00	4.92	--	--	61.2	2.116
1001	24	1.5	27.08 ¹	5.50	75.5	37.06	1.00	4.72	5.02	0.15	73.0	2.235
1025	25	1.5	26.58	6.87	82.3	43.16	1.01	4.54	--	--	164.6	4.646
1042	26	1.5	26.45	7.86	85.7	46.60	0.97	4.91	--	--	89.7	3.043
1056	27	1.5	26.47 ¹	8.46	87.8	48.66	0.93	4.99	6.43	0.22	90.3	2.826
1110	28	1.5	26.42	9.07	89.9	52.64	0.91	3.94	--	--	78.6	2.776
1126	29	1.5	26.44	9.41	91.3	54.55	0.92	6.63	--	--	68.8	--
1137	29.5	1.5	26.35	9.77	92.5	56.47	0.96	3.80	--	--	61.6	2.152
1200	30	1.5	26.20 ¹	10.84	96.2	64.11	1.06	3.53	7.03	0.48	62.7	2.226
1225	31	1.5	25.92	11.98	99.5	71.93	1.21	3.60	--	--	50.4	1.979
1241	32	1.5	25.61 ¹	13.79	104.4	83.24	1.50	4.35	6.03	1.25	35.9	1.576
1250	33	1.5	25.06	16.43	111.1	103.46	2.03	5.44	--	--	36.9	1.652

1 Bottle salinities are presented.

Table 42. Nutrient and suspended matter data for 25 April 1991

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
1308	24	1.5	28.69 ¹	3.84	62.9	30.15	0.80	5.30	3.84	0.80	34.1	1.079
1256	25	1.5	28.21	4.29	65.9	32.20	0.83	4.43	--	--	33.0	1.143
1241	26	1.5	27.75	4.93	69.5	34.93	0.85	3.55	--	--	41.1	1.240
1228	27	1.5	27.47 ¹	5.29	72.1	36.15	0.86	3.32	6.05	0.56	56.6	1.682
1214	28	1.5	26.96	6.46	77.7	39.97	0.92	4.70	--	--	52.3	--
1154	29	1.5	26.68	7.40	82.2	44.18	0.96	5.36	--	--	62.9 ²	2.018
1154	29	13.0	26.81	6.90	79.8	41.81	0.93	5.14	--	--	125.8 ²	--
1134	29.5	1.5	26.65 ¹	7.75	83.5	45.83	0.96	5.03	--	--	53.6 ²	1.570
1107	30	1.5	26.60 ¹	8.13	84.8	47.43	0.97	4.84	5.08	0.26	49.4 ²	1.681
1107	30	12.0	26.61	7.84	83.9	45.48	0.95	4.56	--	--	165.2 ²	--
1007	31	1.5	26.36 ¹	9.66	91.1	54.71	1.04	4.60	--	--	29.5 ²	1.541
804	32	1.5	26.16 ¹	10.76	94.7	60.19	1.11	4.28	6.42	0.48	49.1 ²	1.600
749	33	1.5	25.76	12.67	99.9	72.08	1.37	4.35	--	--	47.9 ²	1.526
749	33	11.0	26.03	12.07	99.2	67.50	1.26	4.23	--	--	220.1	--
838	SM25	0.0	26.32	9.76	92.0	54.89	1.04	4.71	--	--	160.7	--
914	SM29	0.0	26.57	8.15	85.9	48.31	0.77	1.65	--	--	102.3	--
1030	SM35	0.0	26.46	8.88	88.3	51.39	0.91	3.25	--	--	85.9	--
1054	SM46	0.0	26.54	8.42	87.0	49.30	0.83	2.53	--	--	104.6	--

1 Bottle salinities are presented.

2 Water was from the surface Niskin bottles.

Table 43. Nutrient and suspended matter data for 05 June 1991

TIME local	STA	DEP m	SAL psu	Concentrations								TURB
				DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM mg/L	
				-----		microMolar		-----				
1018	21	1.5	30.70	4.15	60.9	29.98	0.79	6.52	--	--	11.5	0.507
1007	22	1.5	30.72	4.15	60.2	30.49	0.80	5.27	--	--	6.9	0.351
951	23	1.5	30.59 ¹	4.35	61.5	31.07	0.81	5.70	--	--	9.7	0.564
939	24	1.5	30.49 ¹	4.80	63.8	33.37	0.82	3.75	--	--	12.2	0.511
924	25	1.5	30.00	6.11	71.8	37.28	0.85	3.16	--	--	9.7	0.464
907	26	1.5	29.58 ¹	6.68	74.9	39.11	0.86	3.54	--	--	16.7	0.678
855	27	1.5	29.44 ¹	7.19	77.6	40.94	0.85	3.62	--	--	20.4	0.782
841	28	1.5	29.36	7.51	78.9	41.92	0.86	3.62	--	--	16.5	0.664
826	29	1.5	29.24	8.00	81.3	43.57	0.89	3.95	--	--	18.4	0.712
809	29.5	1.5	29.07	8.82	85.8	46.93	0.84	2.38	--	--	18.2	0.726

continued...

Nutrient and suspended matter data for 05 June 1991 - Continued

Concentrations													
TIME	STA	DEP	SAL	DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM	TURB	
local		m	psu	-----		microMolar			-----		mg/L		
750	30	1.5	29.00 ¹	8.84	85.9	46.81	0.84	2.40	--	--	20.6	0.814	
730	31	1.5	28.85	9.61	90.3	48.52	0.82	1.57	--	--	22.1	0.858	
712	32	1.5	28.84 ¹	9.76	91.4	48.52	0.80	1.37	--	--	22.7	--	
655	33	1.5	28.84	9.99	92.9	48.89	0.78	1.00	--	--	22.2	--	

¹ Bottle salinities are presented.

Table 44. Nutrient and suspended matter data for 02 August 1991

Concentrations													
TIME	STA	DEP	SAL	DRP	SiO2	N+N	NO2	NH3	DON	DOP	SPM	TURB	
local		m	psu	-----		microMolar			-----		mg/L		
1523	24	1.5	31.64 ¹	4.21	56.3	21.61	1.24	9.44	--	--	26.9	0.914	
1535	25	1.5	31.50	5.25	66.7	25.42	1.47	8.98	--	--	34.0	1.182	
1550	26	1.5	31.43	7.08	83.1	29.41	1.47	5.21	--	--	37.7	1.279	
1601	27	1.5	31.48 ¹	7.75	88.4	27.78	1.20	5.18	--	--	28.8	1.016	
1613	28	1.5	31.44	9.08	95.2	23.73	0.93	4.83	--	--	30.4	1.065	
1624	29	1.5	31.48	9.45	96.8	21.68	0.83	5.00	--	--	21.6	0.879	
1640	29.5	1.5	31.54	9.52	96.0	20.46	0.79	5.22	--	--	23.8	0.886	
1652	30	1.5	31.52 ¹	9.88	96.5	19.33	0.74	5.64	--	--	19.7	0.780	
1652	30	11.0	31.53	9.75	96.6	19.01	0.69	4.45	--	--	31.5	--	
1712	31	1.5	31.51	10.66	101.4	17.19	0.58	3.15	--	--	15.2	0.665	
1725	32	1.5	31.53 ¹	10.74	100.2	14.69	0.49	2.30	--	--	13.8	0.591	
1736	33	1.5	31.62	10.81	98.6	12.83	0.45	2.36	--	--	13.9	0.641	

¹ Bottle salinities are presented.

Data for the Dumbarton Bridge study

Table 45: Nutrient and alkalinity data for 13 November 1990 to 30 April 1991.

DATE	TIME local	SAL psu	Concentrations						
			DRP	DSi	N+N	NO2	NH4	DIN	ALK
			-----		microMolar	-----	-----		meq/L
13 NOV 90	1215	31.51	19.66	125.3	73.51	3.11	3.11	76.62	--
16 NOV 90	900	31.57	19.27	122.2	71.82	3.21	3.67	75.49	--
20 NOV 90	940	31.18	25.66	135.5	86.12	3.33	4.25	90.37	--
30 NOV 90	915	31.14	19.23	119.9	85.55	3.46	2.26	87.81	--
07 DEC 90	900	30.61	21.65	122.5	97.92	3.39	5.11	103.0	2.53
11 DEC 90	915	29.65	18.54	116.9	93.82	2.63	5.56	99.38	2.45
14 DEC 90	945	31.02	15.87	107.6	72.69	3.29	4.46	77.15	2.45
18 DEC 90	945	30.18	15.94	102.4	70.78	2.86	7.27	78.05	--
21 DEC 90	845	28.88	20.92	118.9	97.56	2.55	8.85	106.4	2.43
29 DEC 90	956	30.54	--	--	--	--	--	--	2.40
29 DEC 90	1010	30.53	--	--	--	--	--	--	2.40
05 JAN 91	1003	29.28	--	--	--	--	--	--	2.45
05 JAN 91	1019	29.27	--	--	--	--	--	--	2.45
10 JAN 91	1215	29.35	17.60	103.6	88.12	1.62	13.03	101.2	2.45
12 JAN 91	1000	30.01	15.71	101.5	80.32	1.63	11.90	92.22	2.42
15 JAN 91	930	29.83	16.64	102.7	83.93	1.69	12.94	96.87	2.43
18 JAN 91	945	29.03	19.67	110.6	108.7	1.71	12.35	121.0	2.45
19 JAN 91	947	29.05	--	--	--	--	--	--	2.46
22 JAN 91	1015	28.72	21.25	111.1	117.6	1.81	12.87	130.4	2.47
25 JAN 91	945	29.89	16.16	100.6	83.34	1.51	11.49	94.83	2.42
26 JAN 91	1015	30.07	15.03	97.4	74.88	1.43	12.09	86.97	2.41
29 JAN 91	930	29.75	16.09	100.3	87.41	1.22	11.48	98.89	2.44
01 FEB 91	930	28.74	20.41	109.4	125.5	1.45	10.08	135.6	2.47
02 FEB 91	1015	28.12	24.38	116.4	148.2	1.83	11.10	159.3	2.48
05 FEB 91	1045	27.37	19.62	105.9	116.2	1.58	11.52	127.7	2.42
06 FEB 91	1630	26.83	21.09	108.6	137.4	1.64	11.94	149.4	2.40
08 FEB 91	1000	28.08	17.23	96.6	105.4	1.43	11.36	116.7	2.40
09 FEB 91	1015	28.66	15.38	94.4	91.13	1.19	11.54	102.7	2.39
12 FEB 91	915	28.92	14.08	90.1	80.53	1.17	13.34	93.87	2.38
15 FEB 91	845	27.97	17.64	96.2	103.4	1.29	10.99	114.4	2.42
17 FEB 91	915	27.30	21.61	102.9	121.0	1.65	11.99	133.0	2.44
19 FEB 91	945	27.80	19.66	100.4	112.1	1.51	11.12	123.2	2.48
22 FEB 91	930	28.58	16.02	91.1	82.96	1.23	8.02	90.98	2.44
22 FEB 91	1245	27.42	21.21	100.9	116.6	1.65	9.01	125.6	2.49
23 FEB 91	1007	28.54	15.98	91.5	83.83	1.20	7.94	91.77	2.44
26 FEB 91	915	29.15	13.20	82.1	65.75	1.20	8.68	74.43	2.40
01 MAR 91	1045	27.86	16.46	88.7	84.34	1.75	9.69	94.03	2.39
02 MAR 91	1000	26.71	18.42	94.1	99.93	1.93	8.62	108.6	2.41
06 MAR 91	915	24.54	15.68	92.8	90.35	2.39	14.39	104.7	2.44

continued...

Data for 13 November 1990 to 30 April 1991 - Continued

DATE	TIME local	SAL psu	Concentrations						
			DRP	DSi	N+N microMolar	NO2	NH4	DIN	ALK meq/L
09 MAR 91	1000	25.38	15.49	92.8	88.22	2.04	11.97	100.2	2.31
12 MAR 91	915	27.98	11.45	80.6	62.57	1.83	10.90	73.47	2.33
14 MAR 91	900	26.37	14.77	89.8	81.02	1.85	10.10	91.12	2.34
18 MAR 91	930	25.31	15.72	94.8	96.19	1.98	12.99	109.18	2.31
19 MAR 91	915	25.04	16.27	95.6	99.35	2.00	12.21	111.6	2.30
22 MAR 91	915	24.50	17.14	95.6	103.5	2.93	12.08	115.6	2.32
22 MAR 91	1000	24.38	18.89	97.8	104.0	3.40	13.27	117.2	2.32
26 MAR 91	800	25.88	12.03	82.4	61.89	2.28	12.22	74.11	2.18
26 MAR 91	900	26.77	10.79	78.9	55.86	2.02	11.91	67.77	2.23
26 MAR 91	1000	26.75	10.60	78.6	55.04	1.93	11.88	66.92	2.23
26 MAR 91	1100	24.69	14.50	84.7	65.93	2.70	13.88	79.81	2.17
26 MAR 91	1200	24.20	14.39	87.6	72.53	2.61	13.86	86.39	2.18
26 MAR 91	1300	22.96	17.10	91.8	77.71	3.23	15.18	92.89	2.16
26 MAR 91	1400	22.79	14.62	90.5	76.73	2.87	14.07	90.80	2.28
26 MAR 91	1500	22.37	14.86	91.6	78.30	2.92	14.31	92.61	2.15
26 MAR 91	1600	21.76	14.50	91.6	79.88	2.80	14.50	94.38	2.13
28 MAR 91	1045	25.93	10.01	79.2	61.43	2.18	10.24	71.67	2.22
29 MAR 91	915	24.40	11.41	84.1	72.34	2.43	10.33	82.67	2.20
30 MAR 91	1100	24.64	11.07	83.4	72.87	2.44	9.03	81.90	2.22
02 APR 91	915	23.58	13.64	94.9	92.09	2.94	8.38	100.5	2.27
05 APR 91	900	24.48	13.38	90.7	80.72	2.50	6.20	86.92	2.35
05 APR 91	1130	23.89	14.74	96.5	99.63	2.80	5.19	104.8	2.34
08 APR 91	845	26.06	10.99	89.7	62.59	1.35	3.23	65.82	2.34
09 APR 91	830	26.22	10.74	90.4	61.23	1.21	3.10	64.33	2.33
12 APR 91	845	26.23	11.44	90.7	64.32	1.05	2.82	67.14	2.34
13 APR 91	1030	26.29	11.91	89.0	59.46	1.15	2.38	61.84	2.30
15 APR 91	1315	26.00	12.29	97.3	71.49	1.17	1.95	73.44	2.36
16 APR 91	900	24.71	17.48	110.3	119.1	2.01	5.01	124.1	2.45
19 APR 91	945	25.00	17.20	109.2	109.7	2.47	5.53	115.2	2.48
22 APR 91	1115	25.61	14.07	102.0	81.61	1.72	3.81	85.42	2.44
23 APR 91	900	26.26	11.80	92.9	61.63	1.39	4.45	66.08	2.33
26 APR 91	915	25.90	14.52	99.2	73.98	1.91	4.84	78.82	2.40
27 APR 91	1015	25.98	--	--	--	--	--	--	2.40
30 APR 91	900	24.99	--	--	--	--	--	--	2.50