WATER
WATER
WATER
WATER
WATER
WATER
WATER
WATER
WATER
WATER

Project Completion
Report No. 549X

Mathematical Model of Heavy Metal Transfer and Transport in Lake Erie

Lester J. Walters, Jr.
Associate Professor
Department of Geology

and

David C. Drain
Graduate Student
Department of Mathematics
Bowling Green State University

United States
Department of the Interior

Contract No.
A-045-Ohio

State of Ohio
Water Resources Center
The Ohio State University

MATHEMATICAL MODEL OF HEAVY METAL TRANSFER AND TRANSPORT IN LAKE ERIE

by

Lester J. Walters, Jr.
Associate Professor
Department of Geology
Bowling Green State University

and

David C. Drain
Graduate Student
Department of Mathematics
Bowling Green State University

WATER RESOURCES CENTER
Engineering Experiment Station
THE OHIO STATE UNIVERSITY
Columbus, Ohio 43210

August 10, 1979

This study was supported in part by the Office of Water Resources Technology, U.S. Department of Interior under project A-045-OHIO

ABSTRACT

Numerical integration of mathematical functions representing the concentration of mercury, chromium and nickel in Lake Erie sediments indicate that 3.3×10^5 kg Hg, 1.8×10^7 kg Cr, and 1.2×10^7 kg Ni have been added to the sediments through man's activities. Most of the mercury, chromium and nickel are contained in the sediments of western Lake Erie.

A mathematical model of sediment transport in Lake Erie shows that most of the heavy metals in western Lake Erie sediments probably originated from the Detroit metropolitan area and was input via the Detroit River. The sediment dispersal patterns are as follows: 1) the Detroit River sediment spreads southeastward over most of the western basin, 2) the Maumee River sediment is held within 15 miles of the Ohio shore, and 3) the Cuyahoga River sediment travels northeastward along the south shore of the lake.

Attempts to model the transfer and transport of mercury within the ecosystem resulted in partial success. Very little transfer results between the sediments and other phases within the system. In contrast the exchange of mercury between the benthic organisms and other trophic and abiotic levels is very rapid.

KEY WORDS

Heavy metals, mercury, chromium, nickel, Lake Erie sediments, sediment transport.

PROJECT PERSONNEL

Name	Project Position	Department
	Faculty and Staff	
Lester J. Walters, Jr.	Principal Investigator	Geology
Cynthia Cherol	Laboratory Assistant	Geology
	Graduate Students	
Dale Borowiak	Research Assistant	Mathematics
David Drain	Research Assistant	Mathematics
David Johnson	Research Assistant	Geology
Andrea Levinson	Research Assistant	Geology
Mary Marsh	Research Assistant	Geology
Linus Nwankwo	Research Assistant	Geology
Leo Schifferli	Research Assistant	Geology
John Turmelle	Research Assistant	Geology
Gordon Yahney	Research Assistant	Geology
	Undergraduate Students	
Mary Dahl	Research Assistant	Geology
Linda Glass	Research Assistant	Geology
Bruce May	Research Assistant	Geology
Rolf Pestel	Research Assistant	Geology
David Potter	Research Assistant	Geology

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont.)

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

The major sources of mercury pollution in western Lake Erie and Lake St. Clair have been the chloralkali facilities at Wyandotte, Michigan and Sarnia, Ontario (Federal Water Quality Administration, 1970; Ontario Water Resources Commission, 1970). Mercury-rich sediments from Lake St. Clair are now being transported down the Detroit River into western Lake Erie (L. J. Walters, unpublished data; R. L. Thomas, personal communication, 1975). Thus, the Detroit River should act as a major source of mercury input into Lake Erie for many years. Small amounts of mercury are also being input from Maumee River and Bay (Walters et al., 1974a), Sandusky River and Bay (Walters and Herdendorf, 1975), and the Cleveland area (Walters et al., 1974b).

The fate of the 228 tons of mercury in western Lake Erie sediments reported by Walters et al. (1974a) was approximated by a set of simultaneous differential equations that described the movement of mercury in a multi-level and multi-area reservoir. The mercury reservoir in Lake Erie consists of 5 levels: water, fish, bottom fauna, active sediment and inactive sediment. The water, fish, and bottom fauna was divided into 3 areas corresponding to the western, central, and eastern basins. We assumed that each of these basins were well mixed with respect to water and fish. The active sediment levels were divided into 34 areas (Figure 1) ranging in size from 100 km^2 to 2000 km^2. The benthic organisms were assumed to be uniformly distributed in these 34 areas. The smaller sized areas are

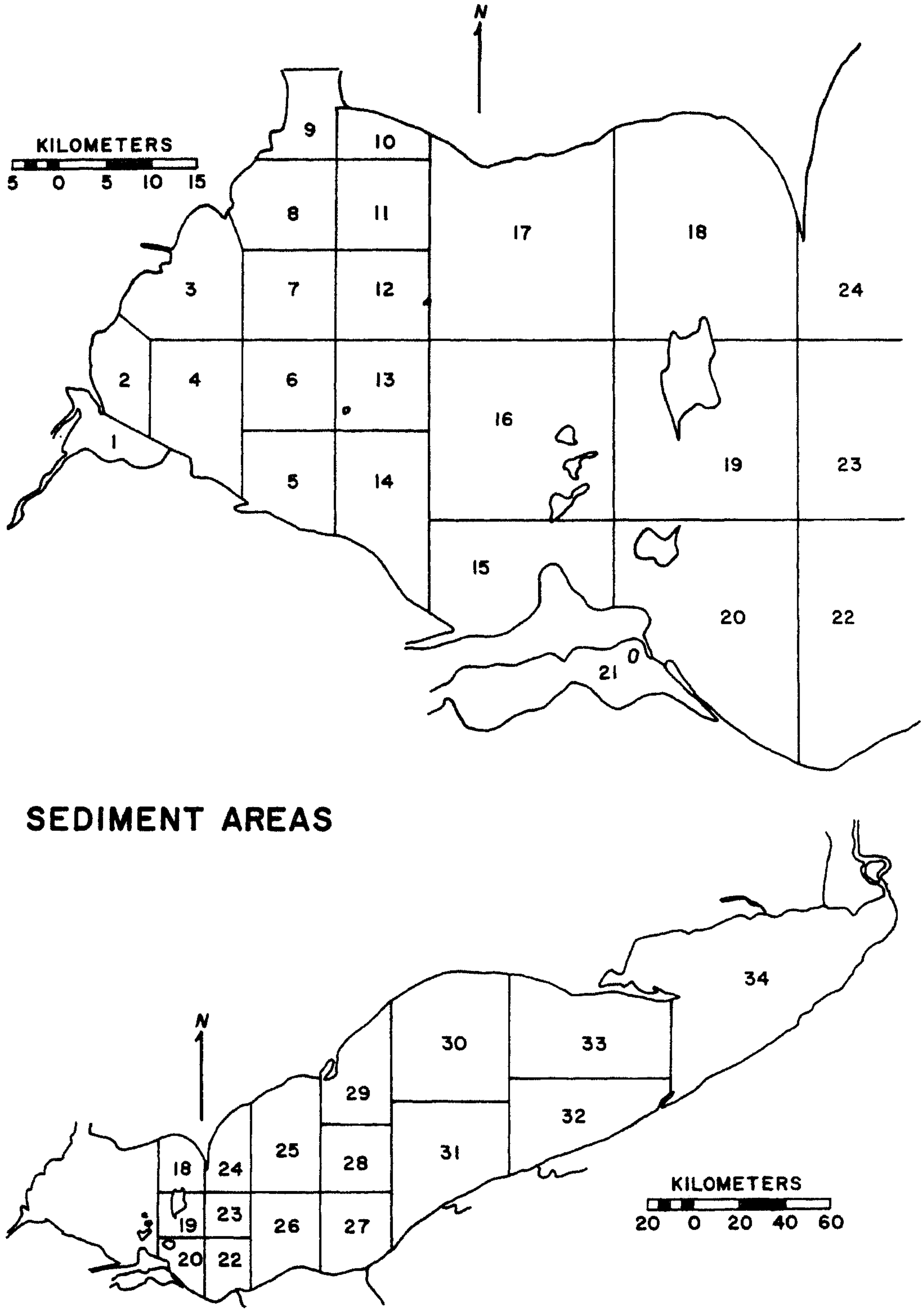

Figure 1. Sediment areas used for mercury model.

located along the western shore of Lake Erie while the larger areas are used for the central and eastern basins where sample control was more sparse.

PURPOSE

The objective of this project was to develop a mathematical model of mercury transfer between sediment, water, and biota and transport from western Lake Erie to the central and eastern basins and out of the Lake Erie system. This model based on the interactions between mercury in sediment, water, and biota, was needed to predict the fate of the large mercury reservoir in western Lake Erie sediments, and can be used to evaluate the effect of proposals for inactivating the mercury or dredging polluted sediments.

The research plan divided this objective into three parts. First, a model of the loading of mercury, chromium, and nickel in Lake Erie sediments was developed. This model provided an accurate estimate of the reservoir of mercury, chromium and nickel. Secondly, a model of sediment transport in Lake Erie was developed. Sediment transport was modeled as a stochastic process, which is dependent on wind direction and intensity, and water currents. Water currents were calculated using the model of Gedney and Lick (1972) as described in Durham and Butler (1976). Finally, a mathematical model of mercury transfer was developed based on the work of Jernelov and Asell (1975).

MERCURY, CHROMIUM AND NICKEL
IN LAKE ERIE SEDIMENTS

Sediment Samples

The main data base for our heavy metal transfer model consists of sediment cores that have been analyzed for mercury, chromium and nickel. Table 1 shows the source, time of collection and general location of these sediment cores. The latitude and longitude coordinates of these cores are listed in Appendix 1. Mercury, chromium, and nickel have been measured in 3761 depth intervals from 345 sediment cores from the St. Clair River, Lake St. Clair, Detroit River, Maumee River and Bay, Sandusky Bay, and Lake Erie. These cores represent 316 different sampling locations, because some stations were occupied at more than one time. Figure 2 shows the locations of the sediment cores from Lake Erie which were used for this study. The highest density of samples was along the west shore of western Lake Erie.

Sediment cores from cruises 1, 4, A, and D (Table 1) were collected using a hand-driven coring device with a 3.81 cm (1.5 in) plastic (cellulose-acetate-butyrate) liner as described by Walters *et al*. (1972). A gravity coring device with 5.08 cm (2 in) plastic (cellulose-acetate-butyrate) liner was used to collect the cores from cruises 2, 3, 7, B, and C (Table 1). These cores were kept refrigerated or frozen prior to sectioning into 2 cm intervals 0-16 cm, 4 cm intervals 16-40 cm and 10 cm intervals 40 cm to total depth. The individual sample intervals were kept frozen until chemical analysis.

TABLE 1

SAMPLING CRUISES

Cruise Number	Cruise Location & Date	Stations Cored: St. Clair River	Stations Cored: Lake St. Clair	Stations Cored: Detroit River	Stations Cored: Maumee River & Bay	Stations Cored: Sandusky Bay	Lake Erie: Western Basin	Lake Erie: Central Basin	Lake Erie: Eastern Basin	Total Stations	Sample Intervals Analyzed
1	1971 RV GS-1 July 20-31, 1971			4	1	1	44	13		69	401
2	1972 RV INLAND SEAS Sept. 6-13, 1972						12	14	7	37	644
3	1972 RV GS-1 Sept. 29-30, 1972					35				37	338
4	1972 RV GS-1 October 8-14, 1972			13	13		54			86	860
7	1973 RV MAPLE October 8-14, 1973						13	38		74	800
A	1976 RV SEA RAY June 11-14, 1976	6	9	3						8	26
B	1976 RV DAMBACH July 12-17, 1976								20	26	246
C	1976 RV HYDRA Aug. 21 - Sept. 14, 1976						7	28		53	394
D	1976 RV SANDBAGGER November 14, 1976			4						4	52
		6	9	24	14	36	130	93	27	374	3761

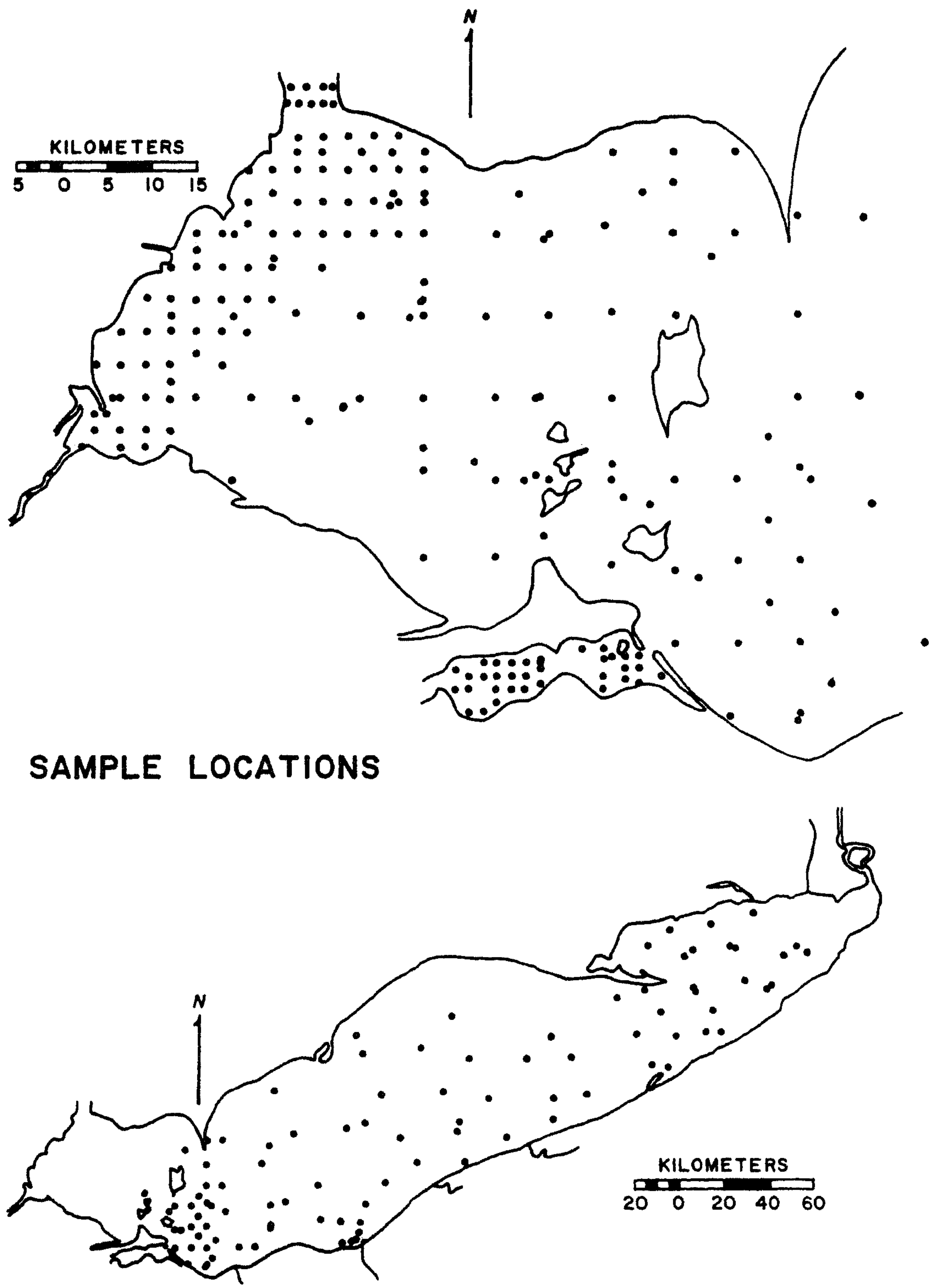

Figure 2. Sample locations map of sediment cores used for this study.

Methods of Chemical Analysis

Determination of mercury in the sediment samples was done using the cold-vapor FAAS method of Hatch and Ott (1968) as modified by Kovacik (1972) and Iskander *et al*. (1972). Two one-gram portions of the homogenized wet sediment were taken, one for water determination and nickel-chromium analyses, the other for mercury analysis.

The dried sediment samples used in the water determinations were extracted (Wolery, 1973; Walters *et al*., 1974b) to remove all of the chromium, nickel and other metals except that bound in silicates and anhydrous oxides, using a procedure based in part on that of Presley *et al*. (1972). The sediments were contacted successively with H_2O_2, HCl, and $NH_2OH \cdot HCl$. The solutions were analyzed for chromium and nickel as described by Walters *et al*. (1974b) by atomic absorption spectrophotometry. A Perkin-Elmer model 303 spectrophotometer was used with the instrument settings and conditions of Perkin-Elmer (1964) for all analyses of mercury, chromium and nickel prior to October, 1976. At that time a Perkin-Elmer model 603 atomic absorption spectrophotometer was obtained and the settings and conditions of Perkin-Elmer (1976) were utilized.

Results and Discussion

The results of the heavy metal analyses have been reported in part by Walters *et al*. (1972), Kovacik and Walters (1974), Walters *et al*. (1974a), Walters *et al*. (1974b), Walters and Wolery (1974) and Walters and Herdendorf (1975).

A complete tabulation of our results is contained in Appendix 2. These results of heavy metal analyses are similar to those obtained in some previous studies (Kennedy *et al.*, 1971; Shimp *et al.*, 1971; Kovacik, 1972; Wolery, 1973; and Allan, 1974). All metals showed some enrichment in the uppermost section of the sediment column with fairly constant and lower background levels underlying the enriched section (Walters *et al.*, 1974b).

Walters *et al.* (1974a) defined the term background as the metal concentration in sediments which is supported by natural processes of weathering of the source rock, transportation of the weathering products, and deposition as lake sediments. Walters *et al.* (1974a) reported that most sediment cores in western Lake Erie show background concentration levels of metals at depth and higher concentrations which are due to anthropogenic loading (Kemp *et al.*, 1976) near the surface.

Frequency Distribution Functions

The analytical results for mercury, chromium and nickel (Appendix 2) can be modeled by log-normal frequency distribution functions. These distribution functions are described by the following equation

$$f(x) = [(2\pi\sigma^2)^{-\frac{1}{2}}\exp-\{(x-\mu)^2/2\sigma^2\}] \quad (1)$$

where x = the logarithm to the base 10 of the analytical concentration of mercury, chromium or nickel on a dry weight basis

μ = the mean of all $\log_{10}$ values

σ = the standard deviation of all values

Walters *et al.* (1974a) proposed that mercury concentrations less than 0.0675 ppm, which were usually encountered in the deeper sections of the sediment cores from the western basin of Lake Erie, represented the background component which originates from natural sources. Therefore all values of mercury, chromium and nickel corresponding to intervals within this deeper background portion of the cores were modeled with a unimodal lognormal distribution function (Equation 1) to determine the nature of the background component. These results are shown in Table 2. The background means for each element were very nearly equal among the 4 areas. Therefore a Student-t test was performed for the mercury, chromium and nickel means. No significant difference ($P<.01$) was found between the central and eastern basin for mercury and the western and central basin with respect to nickel. The background values of mercury were slightly greater in Sandusky Bay and the western basin than central and eastern Lake Erie. The higher values observed in Sandusky Bay and western Lake Erie may be due to the combination of high rates of bioturbation of the bottom sediments in these areas by an abundance of benthic organisms (Skoch and Sikes, 1973; Herdendorf and Lindsey, 1975; and Pliodzinskos, personal communication, 1977), and input of sediment moderately to highly polluted with mercury. Upon taking the antilog of the background means we obtain 0.0298 ppm Hg, 15.77 ppm Cr, and 29.72 ppm Ni for the average background levels.

The sediment intervals above the background zone are enriched in mercury, chromium and nickel compared to the

Table 2

Parameters for unimodal log-normal distribution functions for mercury, chromium and nickel

Area	Mercury		Chromium		Nickel	
	μ $\log_{10}$	σ $\log_{10}$	μ $\log_{10}$	σ $\log_{10}$	μ $\log_{10}$	σ $\log_{10}$
Background Zone						
Eastern Basin	-1.6390	.3309	1.2598	.1643	1.5188	.1664
Central Basin	-1.6057	.2472	1.2007	.2305	1.4607	.2616
Western Basin	-1.4027	.2732	1.1614	.1901	1.4663	.2635
Sandusky Bay	-1.3202	.1547	1.2325	.1639	1.5037	.1451
Total	-1.5252	.2858	1.1978	.2084	1.4731	.2460
Surface Enriched Zone						
Eastern Basin	-1.0240	.4034	1.4844	.1560	1.6614	.1265
Central Basin	-0.8499	.3744	1.4679	.2452	1.6274	.2402
Western Basin	-0.3471	.4911	1.6233	.3779	1.6545	.2819
Sandusky Bay	-0.7041	.2575	1.3412	.1146	1.5755	.1111
Total	-0.5394	.5049	1.5479	.3351	1.6399	.2517

background levels. The means of mercury, chromium, and nickel in the surface enriched zone are given in Table 2. No significant difference (P>.01) was observed between the means of chromium and nickel for central and eastern basins. The greatest levels of enrichment for mercury and chromium were observed for the western basin cores. Sediment enrichment factors (Table 3) defined as surface mean/background mean were all significantly greater than 1.0 at the 0.01 level. The enrichment factors ranged from 4.1 to 11.4 for mercury, 1.3 to 2.9 for chromium, and 1.2 to 1.5 for nickel. The order of sediment enrichment factors observed in all areas was Hg>Cr>Ni. This order is the same, but the values were lower than those reported by Walters _et al_. (1974b) (Hg=47, Cr=6.9, and Ni=3.5) for sediment enrichment factors which were calculated as the ratio of maximum metal concentration to the background metal concentration. The values reported in Table 2 are not the maximum metal concentrations, but rather the average metal concentration in the surface enriched zone. Therefore they should be much nearer to 1.0 as shown in Table 3.

Depth Variation of Mercury, Chromium and Nickel

Since our objective is to model the movements of masses of heavy metals and not concentrations, the depth variation of these metals will be discussed in terms of mass of metal/unit area and not concentration. Walters _et al_. (1974a) proposed that the mercury concentration as a function of depth was of the form of a decreasing exponential term plus a constant,

Table 3

Sediment Enrichment Factors

Area	Mercury	Chromium	Nickel
Eastern Basin	4.1	1.7	1.4
Central Basin	5.7	1.9	1.5
Western Basin	11.4	2.9	1.5
Sandusky Bay	4.1	1.3	1.2
Total	9.7	2.2	1.5

which represented the contribution from the input of non-polluted sediments. This was modified by the sediment porosity (also an exponential term plus constant) and integrated to give the pollution component in μgHg/cm^2. Since there is some debate on the appropriateness of this psuedo-exponential model (Walters et al. 1974b), the variation of heavy metal content with depth will be modeled as a power series.

Given the concentration of metal on a dry weight basis and the water content, the depth variation is calculated as follows. The porosity of a sediment core interval is determined according to the equation of Berner (1971).

$$\phi(I) = W(I)\rho s/(\rho s + (1 - W(I))\rho w) \tag{2}$$

where $\phi(I)$ = sediment porosity of interval I

$W(I)$ = weight percent water in the wet sample of interval I

ρs = average density of sediment particles (assumed to be 2.6)

ρw = density of the interstitial water (assumed to be 1.0)

The mass of mercury, chromium, or nickel in the sediment core interval I was calculated according to

$$MX(I) = \int_{ZT}^{ZB} \overline{CX}(I)(1 - \phi(I))\,dZ \tag{3}$$

where MX = the mass of Hg, Cr, or Ni in interval I

$\overline{CX}$ = the average concentration of Hg, Cr, or Ni in interval I

Z = the depth in the sediment core below the sediment-water interface

ZT = the top of the interval

ZB = the bottom of the interval

All of the variables on the right side of Equation 3 are determined by analysis. However since the sediment intervals range from 2 to 10 cm in length and were homogenized before analysis, the coefficients for a power series that will represent the observed data cannot be determined in the normal fashion. The integrated form of a function CX(Z) which is a power series can be calculated for each sediment core using standard least squares methods. If the unknown function has the form

$$CX(Z) = A_1 + A_2Z + A_3Z^2 + A_4Z^3 + A_5Z^4 + A_6Z^5 \qquad (4)$$

Where CX(Z) = the metal concentration in μg metal/cm^3 as a function of depth.

Although $\overline{CX}(I)$ is determined by analysis, the values of Z are indeterminate because of the nature of the sample. However upon integrating Equation 4 for each core we find that

$$MX(I) = \int_{ZT}^{ZB} CX(Z) \; dZ \qquad (5)$$

or

$$MX(I) = A_1(ZB-ZT) + A_2(ZB^2-ZT^2)/2 + A_3(ZB^3-ZT^3)/3 + A_4(ZB^4-ZT^4)/4 + A_5(ZB^5-ZT^5)/5 + A_6(ZB^6-ZT^6)/6 \qquad (6)$$

where ZT = the top of the sediment interval

ZB = the bottom of the sediment interval

The mass of metal in the sediment interval I is calculated from Equation 3. Thus our problem is reduced to one of multiple linear regression of MX(I) on the new variables (ZB-ZT) to $(ZB^6-ZT^6)/6$. The linear regression was performed using the Biomed program BMD02R (Dixon, 1970).

Active Reservoir of Mercury, Chromium and Nickel

Jernelov (1970), Jernelov and Asell (1973), and Wolery and Walters (1974) have proposed that mercury in sediments 3-5 cm below the sediment-water interface is inactive and not normally transferred to the water and biota above. The results of Bongers and Khattak (1972), Jernelov (1970) and Wolery and Walters (1974) lead to the conclusion that the top 4 cm of the sediment column in Lake Erie can be considered active. Therefore instead of reporting surface metal concentration, the total loading of mercury, chromium and nickel in this active layer should be determined.

The loading of metal in the active layer is calculated by integrating Equation 4 between the limits of 0 and 4 cm. The coefficients A_1 to A_6 for Equation 4 were calculated in Equation 6. Therefore the loading in the active metal reservoir is given by

$$\text{Mass Active X} = \int_0^4 CX(Z)\,dZ \tag{7}$$

or

$$\text{Mass Active X} = 4\,A_1 + 8\,A_2 + 21.33\,A_3 + 64\,A_4 + 204.80\,A_5 + 682.66\,A_6 \tag{8}$$

Figure 3 shows the results of our analyses of mercury for Lake Erie surface (active layer) sediments. This picture of heavy metal loading has been developed over the last seven years. Starting with the work of Kovacik (1972), which was reported in Walters et al. (1972), Walters et al. (1974a) and Walters and Herdendorf (1973); continuing with that of Wolery (1973) reported in Walters and Wolery (1974); and Walters and Herdendorf (1975a, 1975b), Walters (1977), and Przywara et al. (1977), we have developed a picture of mercury distribution in western Lake Erie surface sediments which consists of 1) a high concentration south of the mouth of the Detroit River, 2) a lobe of sediment with elevated levels extending from south of the Detroit River mouth toward the Bass Islands, and 3) elevated levels in Pigeon Bay sediments. Figure 3 is consistent with this picture as well as that reported by Thomas and Jaquet (1975). The loading of chromium and nickel in the active sediment layer follow the general pattern of mercury. The differences between our current data and that reported in Wolery (1973), Walters and Wolery (1974), and Walters et al. (1974b) reflect the great increase in data now available (Table 1). The data of McGuire and Walters (1978) on Maumee Bay is included in our current picture.

The areal distribution of mercury, and chromium and nickel (not shown in figures) clearly show increasing gradients back to the following source areas: 1) the Detroit River, 2) the Cleveland area, and 3) the Buffalo area. Fifteen miles south of the mouth of the Detroit River the

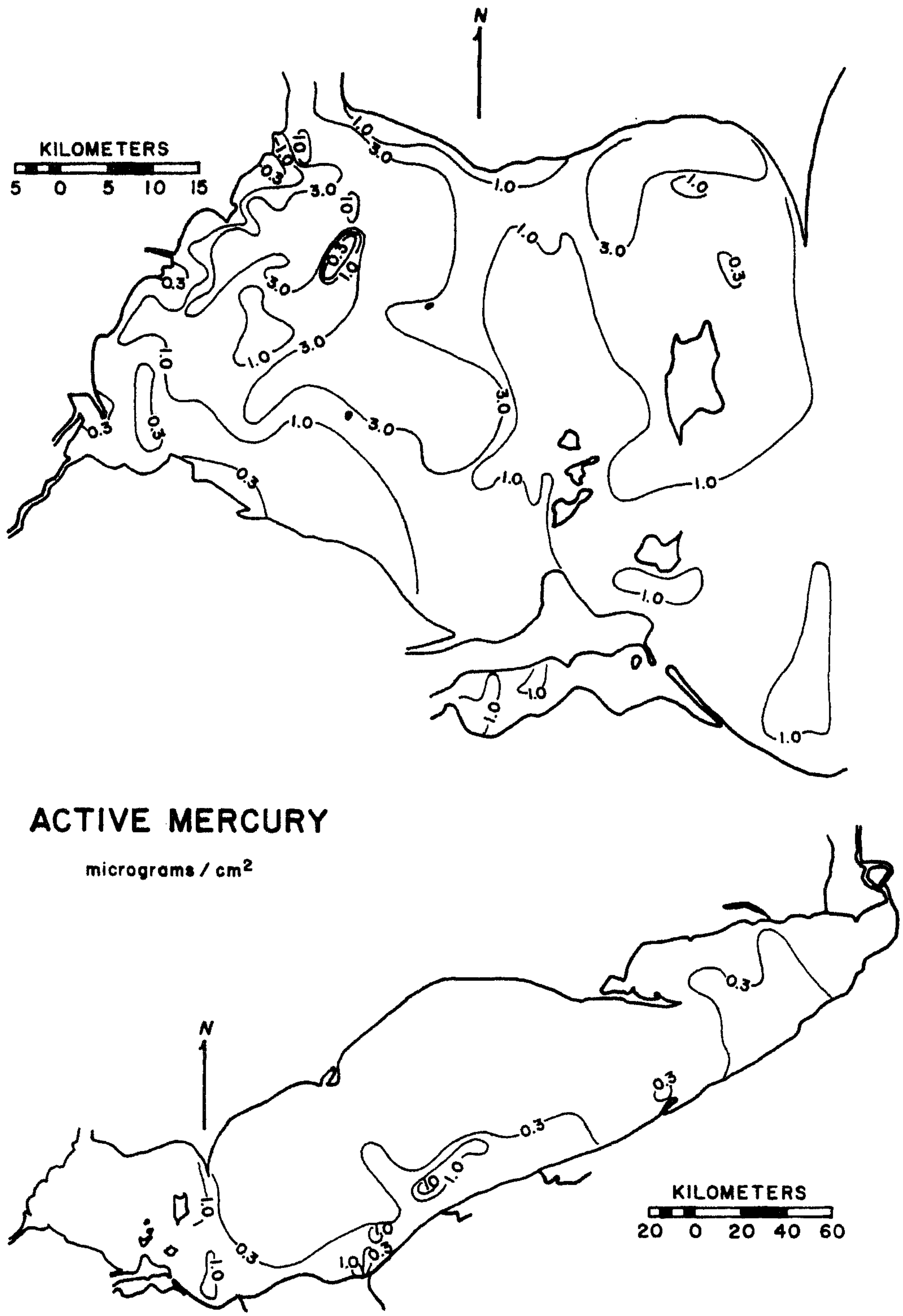

Figure 3. Mercury content in the active layer (top 4 cm) of the bottom sediment.

metal distribution patterns trifurcate into three distinct lobes: 1) a minor eastward lobe which follows a narrow path until it spreads out in Pigeon Bay north of Pelee Island; 2) a southern lobe toward the Bass Islands which fans out in the south-central part of the western basin; and 3) a southwest lobe which diminishes as it approaches Toledo. The better control now available for the central basin reveals that these metals are being transported out of the western basin and into the central basin. This same general pattern was shown for mercury by Thomas and Jaquet (1975). Cleveland and Buffalo are major sources of chromium and nickel in the central and eastern basins. Walters _et al_. (1974b) reported that both the Cleveland and Buffalo harbors had elevated levels of heavy metals. A plume of metal enriched sediments extending from Cleveland toward the western basin is shown in Figure 3. The metals in the Buffalo harbor sediments are dispersed to the west in the central basin and to the northeast through the Niagara River to be deposited in a plume in Lake Ontario around the river's mouth. These dispersal patterns around Cleveland and Buffalo follow the clockwise rotating bottom currents reported by FWPCA (1968).

Total Reservoir of Mercury, Chromium, and Nickel

The loading of mercury, chromium, and nickel in Lake Erie sediments was calculated by integrating Equation 4 for each sediment core between the limits of 0 and 60 cm or the total length of the core if it was less than 60 cm. Figure 4 shows the distribution of total mercury in Lake Erie

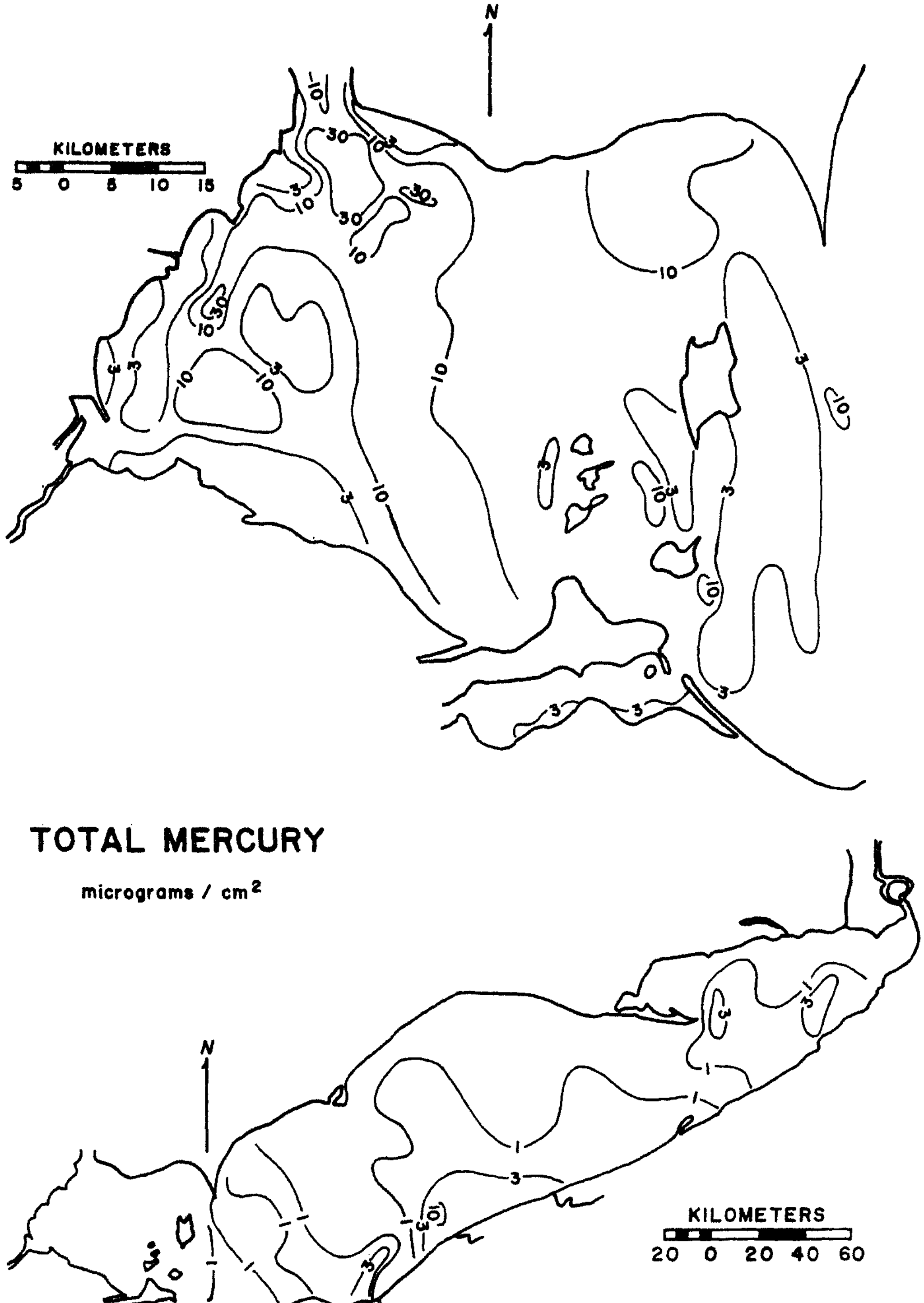

Figure 4. Total mercury content in the top 60 cm of Lake Erie bottom sediment.

sediments. The major deposition centers for mercury, chromium, and nickel are 1) south of the mouth of the Detroit River, and 2) west, north, and east of Cleveland. The eastern basin of Lake Erie is not a major deposition center for metals because very little metal is input along the Canadian shore of central Lake Erie. Kemp et al. (1977) have established that the greatest site of sediment deposition is in the eastern basin due to longshore drift of sediment derived from erosion of the till bluffs on the north shore. Kemp et al. (1976) found that these bluffs contain very low levels of mercury (.045 ppm). Some polluted sediment from the central basin is carried to the eastern basin by bottom currents (FWPCA, 1968), but this still is secondary to the metals deposited in the western and central basins (Fig. 4).

Total Pollution Loading

The estimation of total pollution loading of a metal is similar to the calculation performed in Equation 8 except that the mass of metal X must be corrected for that due to the natural loading of metal in the sediments, which is determined by the nature of the material in the source areas. In Table 2 we established that the average levels of metal in Lake Erie sediments as 0.0298 ppm Hg, 15.77 ppm Cr, and 29.72 ppm Ni (dry weight basis). In order to make an estimate of background level biased toward conservatism, we considered levels below 0.0717 ppm Hg, 25.84 ppm Cr, and 54.67 ppm Ni to be of a background nature from natural causes.

These levels were established after about one-half of the analytical work was complete. They are approximately equal to the background mean plus one standard deviation, which according to the complete results of Table 2, are 0.0576 ppm Hg, 25.48 ppm Cr, and 52.37 ppm Ni.

Equations 3 to 6 were used to calculate the coefficients (B_1-B_6) of the functions CBX(Z) predicting the background levels with depth. These functions are not constant with changing depth because of variations in water content of the sediments with increasing depth of burial. Figure 5 shows the relation between the observed data, CX(Z), CBX(Z) and the pollution load.

Equations 3 to 6 were used to calculate the coefficients of the concentration CX(Z) functions (A_1-A_6). The total pollution load was calculated by summing all positive differences between total concentration CX(Z) and background CBX(Z) as follows

$$\text{Pollution Load} = \sum_{z} [(A_1 Z + A_2 Z^2/2 + A_3 Z^3/3 + A_4 Z^4/4 + A_5 Z^5/5 + A_6 Z^6/6) - (B_1 Z + B_2 Z^2/2 + B_3 Z^3/3 + B_4 Z^4/4 + B_5 Z^5/5 + B_6 Z^6/6)]$$

$$\text{for } 0 < z < 60 \text{ cm and } CX(Z) > CBX(Z) \qquad (9)$$

Figures 6, 7, and 8 show the distribution of mercury, chromium and nickel calculated by equation 9 which have been added to Lake Erie sediments by man's activities.

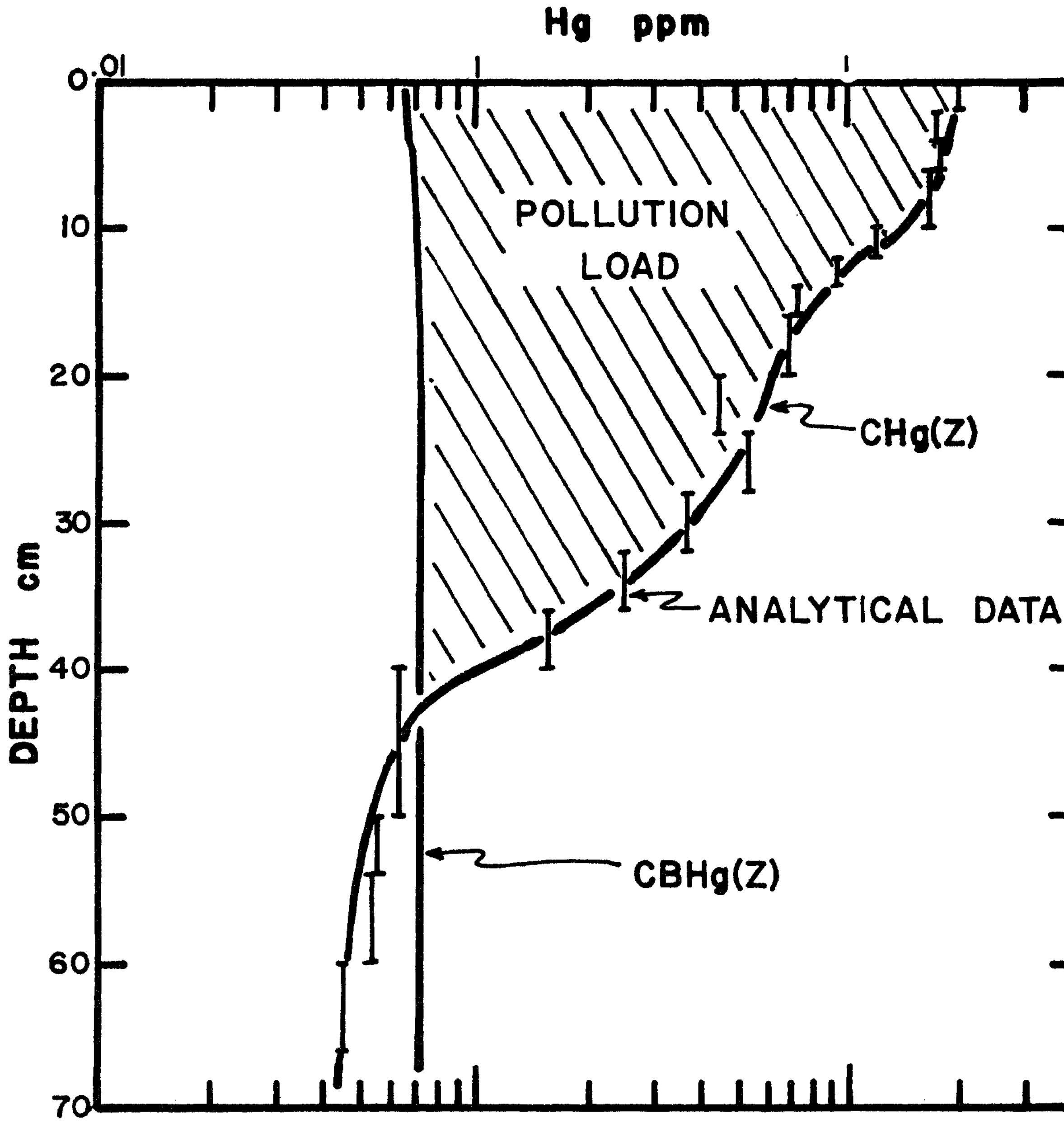

Figure 5. Relation between background and pollution mercury. Chromium and nickel pollution were calculated in a similar fashion.

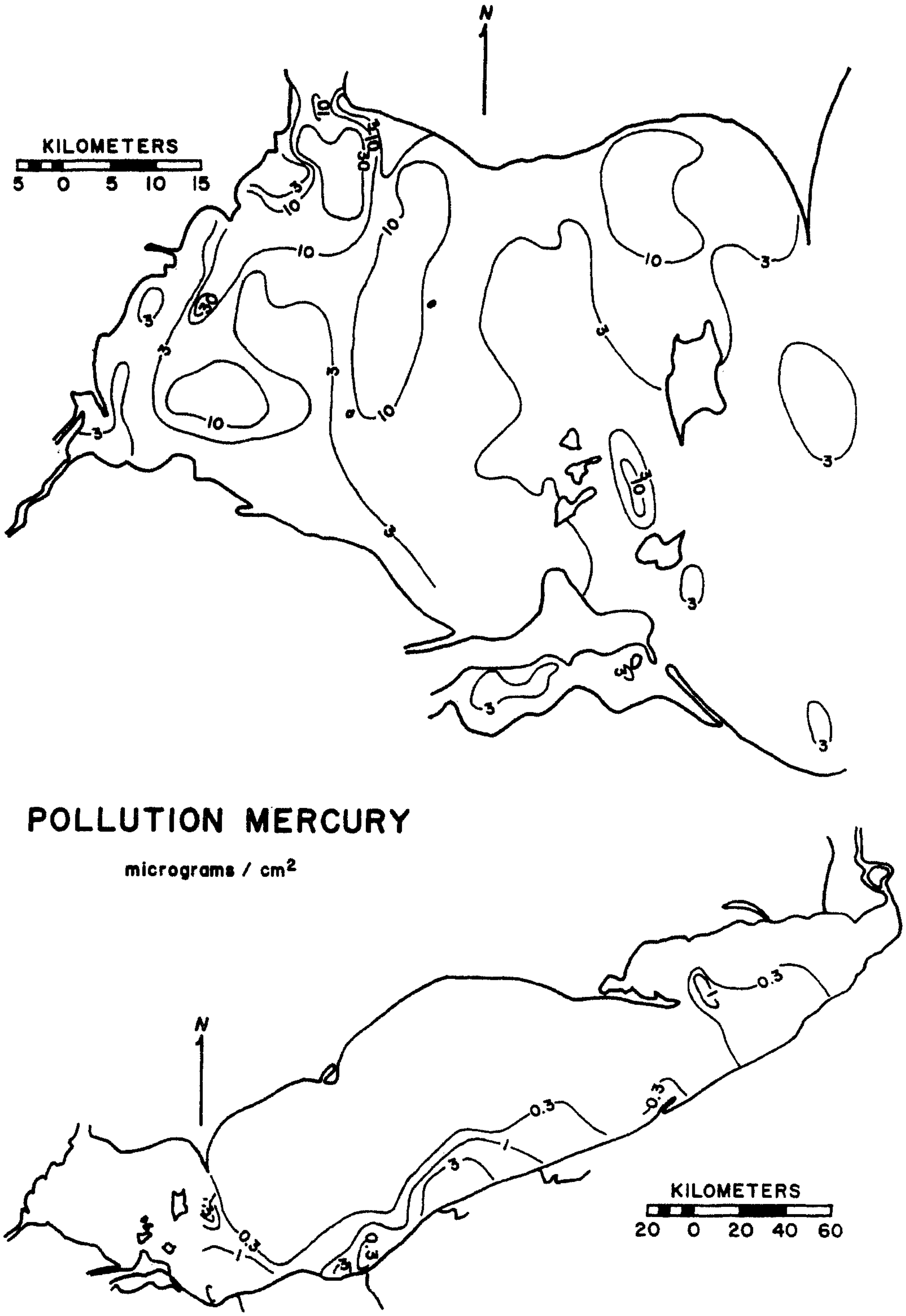

Figure 6. Pollution mercury in Lake Erie sediments.

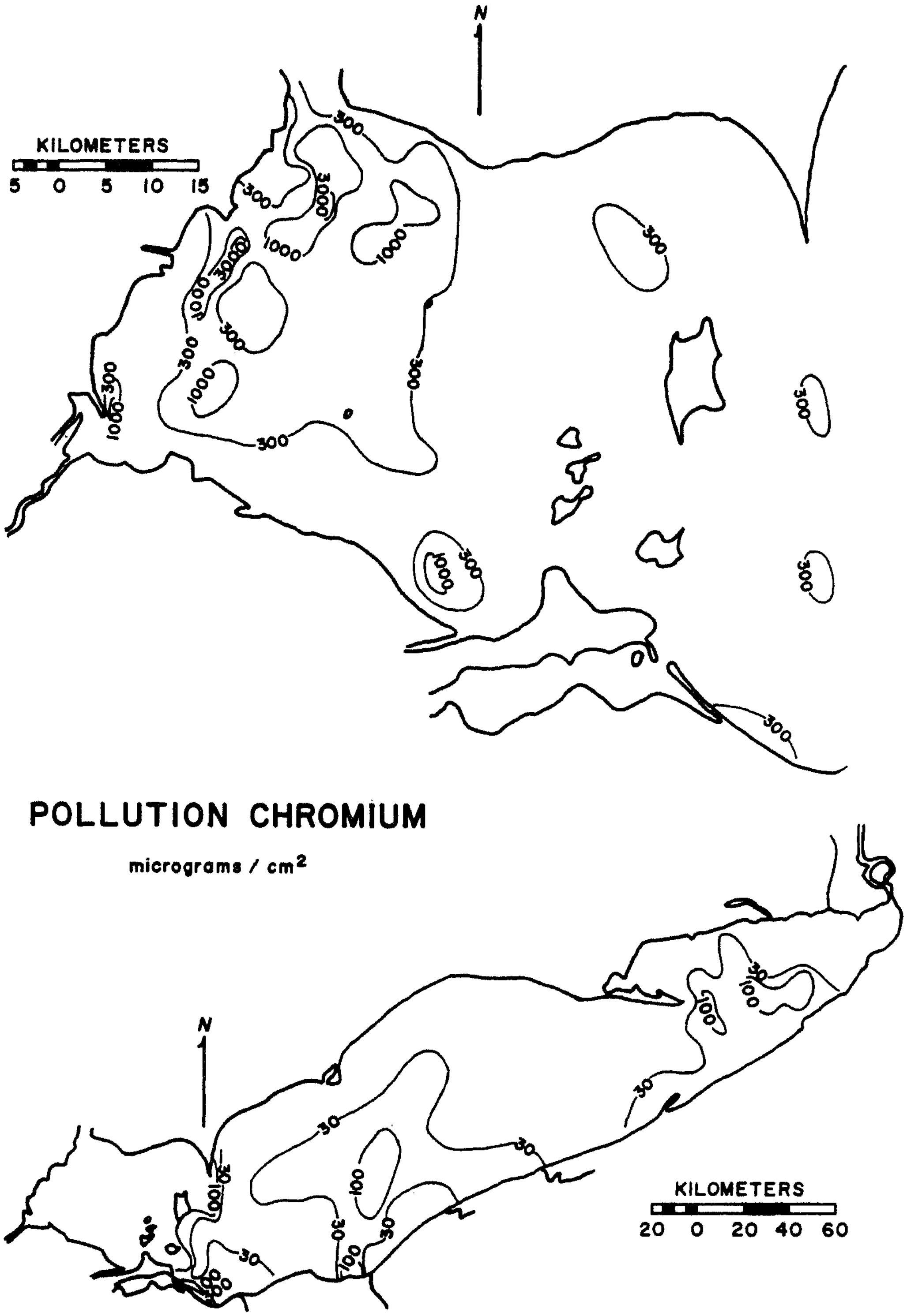

Figure 7. Pollution chromium in Lake Erie sediments.

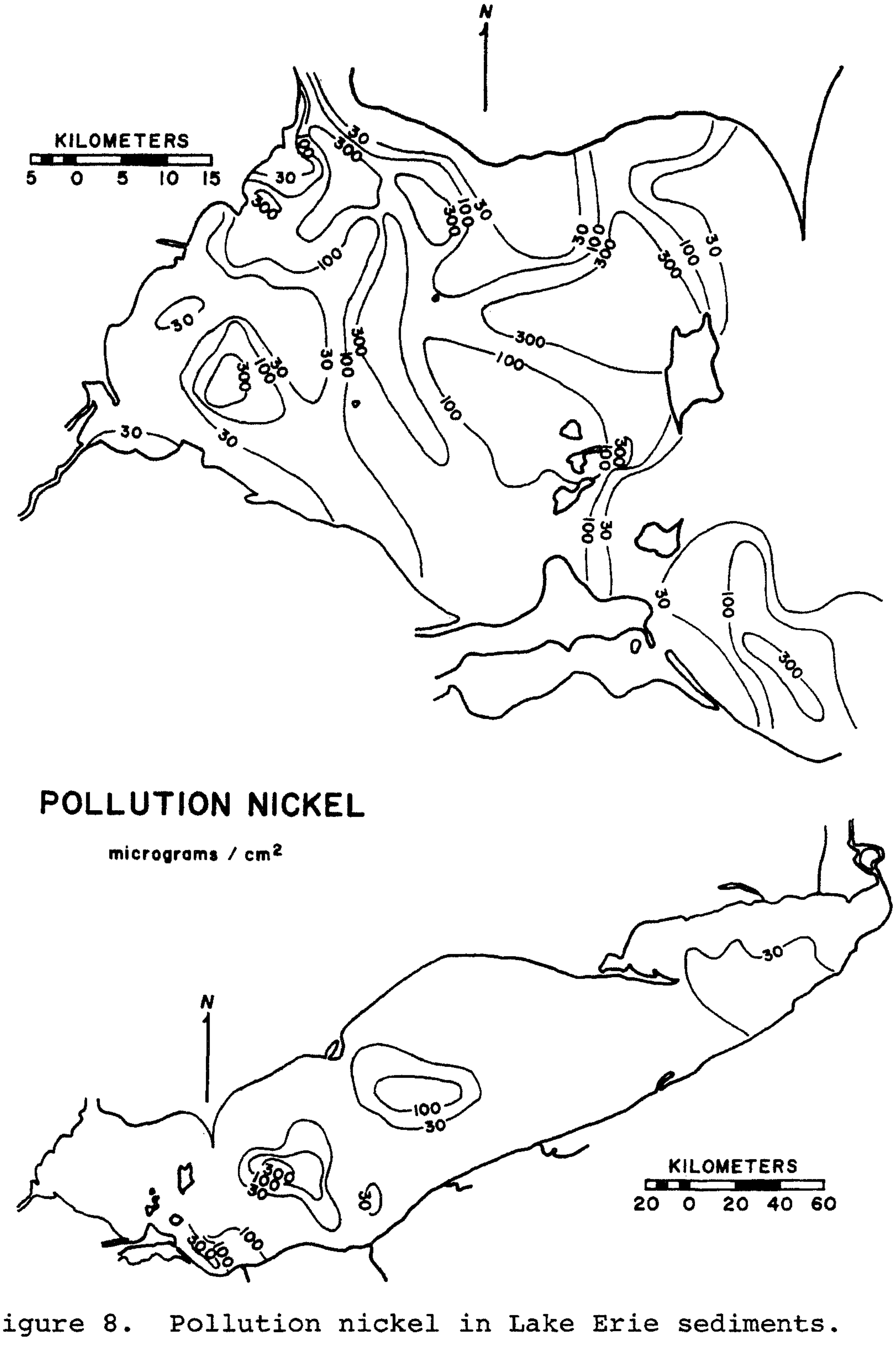

Figure 8. Pollution nickel in Lake Erie sediments.

The general patterns of these distributions are similar to those in Figure 3. However the mass of metal in the polluted area south of the Detroit River mouth is much greater. Figure 6 is similar to the pollution loading map reported by Walters *et al*. (1974a) for the western basin. The differences represent the added control of data since the 1971 RV GS-1 cruise. Very low levels of metal pollution were observed in the central and eastern basins, especially for nickel (fig. 8). In many cases, the pollution nickel loading of sediment cores in the eastern basin was 0.0. This was because of the conservatively biased estimate of background nickel that was used.

Mass of Mercury, Chromium, and Nickel in Lake Erie Sediments

In order to calculate the size of the active, pollution or total metal reservoirs for mercury, chromium or nickel in Lake Erie, one must either graphically integrate the maps such as Figures 3, 4, 6, 7, and 8 or integrate mathematical functions which approximate these surfaces. The latter technique was used in this study. The latitude and longitude coordinates for each of the sediment cores (Appendix 1) were converted to meters north and east of an arbitrary zero point. Then the values for active, pollution, and total metal were grided using program 6.1 of Davies (1973). These grided values, including zero values for the shoreline were sorted into 34 overlaping areas. The grid values in each overlaping area were used to calculate 34 functions W(X,Y) in μg metal/cm^2 for each active, pollution, and total mercury, chromium and nickel using program 6.3 of Davies (1973). These 306 functions were of the form

$$W(X,Y) = A_1 + A_2X + A_3Y + \ldots + A_nY^7 \quad \text{for } n = 1, 2, \ldots 36 \qquad (10)$$

which is a general 7th order equation in the space directions X and Y. The loadings of mercury, chromium, and nickel in Table 4 were calculated by integrating each of these 306 functions over the 34 contiguous areas as appropriate until the whole lake had been covered.

We estimate that 230 metric tons of mercury have been input to western Lake Erie by man's activities. This value is remarkably close to the 228 metric tons reported by Walters et al. (1974a) and was calculated independently and using a different procedure than they used. Comparison of the metal loadings in each of the basins should include the respective areas of the three basins. The western basin of Lake Erie contains 70% of the pollution mercury, 56% of the pollution chromium and 53% of the pollution nickel unevenly spread over 13% of the bottom surface. Major amounts of total chromium and nickel are found in the central and eastern basin, but due to the greater areas of these basins, the concentration levels are much lower and the pollution is more diffuse.

Table 4

Mercury, Chromium and Nickel Loadings in Lake Erie

Metal Reservoir	Western Basin 10^3Kg	Central Basin 10^3Kg	Eastern Basin 10^3Kg	Total 10^3Kg
Active Hg	62	52	11	130
Pollution Hg	230	75	22	330
Total Hg	300	230	73	600
Active Cr	5100	8800	3600	18000
Pollution Cr	10000	5200	2500	18000
Total Cr	33000	93000	25000	150000
Active Ni	5300	12000	5400	22000
Pollution Ni	6400	4800	780	12000
Total Ni	55000	160000	46000	260000
Surface (area km^2)	3280	16250	6220	25750

SEDIMENT TRANSPORT MODEL

Derivation of the Transport Model

Sediment transport accounts for a substantial portion of mercury transfer in Lake Erie, so it was necessary to find the rates of transfer between the thirty-four sediment regions (fig. 1) in the mercury model. A stochastic model for time averaged sediment transport was devised to determine these rates. We present below a description of the sediment transport model and the programs used to implement it.

The lake was divided into 2529 regions based on the two-mile grid of Durham and Butler (1976). For each region i, transition from model step k to k+1 is defined by the following three substeps:

1. Compute a new suspended sediment load for region i including sediment transported to region i during this time step and the sediment remaining suspended in region i:

   $A_i(k+1)=\sum_j P_{ji}S_j(k)R_j.$

2. Compute fallen sediment in region i at the end of time step k+1:

   $B_i(k+1)= B_i(k)+S_i(k)(1-R_i).$

3. Compute the new suspended sediment in region i:

   $S_i(k+1)=A_i(k+1)+N_i.$

The symbols in the above equations are to be interpreted as follows:

$A_i(k)$ = the suspended sediment transported to region i during step k from surrounding regions.

P_{ji} = the probability of water transfer from region j to region i in any model step.

$S_i(k)$ = the suspended sediment in region i at the end of step k.

R_i = the proportion of suspended sediment in region i which remains suspended during any model step.

$B_i(k)$ = the amount of sediment which has fallen to the bottom of region i by the end of step k.

N_i = the suspended sediment input to region i from outside the lake; that is, from shore erosion and rivers.

To substantiate the validity of the sediment transport model, we here offer a proof that it conserves mass. Without loss of generality we may assume that $N_i=0$ and $B_i(n)=0$ for i=1 to 2529. We show that the total mass in the model remains constant.

Total mass in the model at the end of step n+1 =

$$\sum_i (S_i(n+1)+B_i(n+1)) =$$

$$\sum_i (\sum_j P_{ji}A_j(n+1) + B_i(n+1)) =$$

$$\sum_i \sum_j P_{ji}S_j(n)R_j + \sum_i S_i(n)(1-R_i) =$$

$$\sum_j S_j(n)R_j\sum_i P_{ji} + \sum_i S_i(n)(1-R_i) =$$

$$\sum_j (S_j(n)R_j + S_j(n)(1-R_j)) =$$

$\sum_j S_j(n)$ = total mass in the model after step n.

Subroutine AMODEL implements the sediment transport model. A listing of AMODEL and its calling program ACOMP is given in Appendix 3.

The initial conditions necessary to start the sediment transport model are the probabilities of water transfer (P_{ji}), the fraction of suspended sediment remaining suspended after any time step (R_i), the suspended sediment input from outside the model (N_i), and the initial suspended sediment distribution. We assumed the initial suspended sediment was identically zero, and proceeded to find P_{ij}, N_i, and R_i as outlined below.

To find an initial approximation for R_i for a region i, we calculated the total suspended sediment in region i from turbidity data of the FWPCA (1968) and the amount of sediment falling during a model time unit. The latter was determined from observed time averaged sedimentation rates. Dividing the fallen sediment by the total suspended sediment yields $1-R_i$. R_i was usually in the range of 10^{-4} to 10^{-2}. Note that this R_i accounts for both sedimentation and resuspension because it is based on time-averaged sediment accumulation.

P_{ij} depends on the horizontal velocities of water in region i, and these velocities in turn depend on the wind speed and direction. Dale Borowiak (personal communication) found that the wind velocity and direction over Lake Erie throughout could be represented by five significantly different velocities and directions as shown in Table 5.

Table 5

Average Wind Velocities and Directions over Lake Erie

Time Period	Direction*	Velocity miles/hour
February	13.75	5.147
March	13.75	3.460
April-September	38.75	2.484
October	38.75	5.147
November-January	38.75	6.123

*in degrees measured counterclockwise from the negative x-axis (west).

Programs written by Y. P. Sheng of Case Western Reserve University, and the Water Experiment Station of the Army Corps of Engineers (Durham and Butler, 1976) were used to find the horizontal water velocities produced by the above wind conditions at depth of 0, 5, 10, 20, 40, and 60 feet at each grid point in the lake. Since the lake is ice covered during part of the year it was necessary to modify some of the velocities calculated by these programs by substituting the river-only velocities in the regions covered by ice. For this purpose, an ice cover model was derived from the maps of Rondy (1969). This model tells approximately which of the sediment regions used in the mercury model are covered by ice during a given month. Ice cover was assumed for regions 1-14 during January, regions 1-29 during February and regions 30-34 during March.

The velocities altered by ice cover were stored on tape and used to compute P_{ij} by first linearly interpolating the velocities over depth, and then integrating these velocities over depth for a model time unit. The subprogram PROB was used to do this integration, and is included with its calling program ZBMD in Appendix 3. Since six different wind directions were used to simulate a typical year, six sets of P_{ij} were computed.

Sediment input from outside the lake (N_i) was estimated from the sediment budget of Kemp et al. (1977) and Carter (1977). Sediment input to the model was assumed to be uniform with respect to time. We ran the sediment transport model for 3000 iterations (for each of the six wind conditions) which, at 2.5 hours per iteration, is about 312 days. At the end of this time, the total difference in suspended sediment between 60 iterations was less than 0.0006 percent. Correlation coefficients between sedimentation rates predicted by the model and average observed rates (Table 6) calculated by the method of Wolery and Walters (1974) or reported by Kemp et al. (1977) were 0.472 for the entire lake, 0.475 for the Western Basin, and 0.427 for the Central Basin. Maps of suspended sediment indicated that the model had not yet arrived at a realistic suspended sediment distribution. Because of this, we used the program ZCON, which altered both the suspended sediment distribution and the R_i, to obtain a better suspended sediment distribution; a listing of ZCON is included in Appendix 3. After this adjustment, correlations between observed and predicted sedimentation rates were 0.751 for the entire lake, 0.645 for the Western Basin; and 0.960 for the Central Basin. Seven sediment areas showed significant differences between the observed sedimentation rate and the calculated sedimentation rate (Table 6). The calculated sedimentation rates for areas 6, 7, 11, 12, and 13 in the Western Basin were up to an order of magnitude low. This suggests that greater sedimentation is occurring in this region because either the bottom currents at the sediment water interface are not as high as predicted or more likely, a significant bed load is being transported by the bottom currents and is deposited in this region. This bed load or traction load is not necessarily being transported in the same direction as the suspended load upon which the model calculations are based. Calculations of the

Table 6

Average sedimentation rates for the 34 sediment areas in Lake Erie

Western Basin			Central Basin			Eastern Basin		
Area	Observed $g/cm^2/yr$	Calculated $g/cm^2/yr$	Area	Observed $g/cm^2/yr$	Calculated $g/cm^2/yr$	Area	Observed $g/cm^2/yr$	Calculated $g/cm^2/yr$
1	0.945	0.952	22	0.756	0.835	34	0.289	0.289
2	0.457	0.439	23	0.245	0.453			
3	0.573	0.570	24	0.164	0.174			
4	0.756	0.749	25	0.074	0.072			
5	0.150	0.150	26	0.287	0.268			
6	0.543	0.271	27	0.139	0.130			
7	0.404	0.060	28	0.087	0.177			
8	0.625	0.621	29	0.051	0.061			
9	0.923	0.943	30	0.023	0.022			
10	0.527	0.525	31	0.179	0.183			
11	0.773	0.094	32	0.235	0.240			
12	0.666	0.048	33	0.151	0.163			
13	0.390	0.044						
14	0.349	0.350						
15	0.549	0.552						
16	0.430	0.427						
17	0.393	0.391						
18	0.522	0.520						
19	0.407	0.407						
20	0.464	0.463						
21	0.075	0.076						

sedimentation rates in areas 23 and 28 (Table 6) are high by about a factor of 2. These areas are both in the center of the basin and are isolated from the shore by other sediment areas. Thus these two differences may suggest that too much sediment transport from the shore to the center of the Central Basin is being predicted. We used the resulting suspended sediment distribution and water transfer probabilities to determine the time-averaged transfer rate of sediment from any of the mercury model regions to those adjacent to it. Program TRANX performed this calculation; a listing of TRANX is included in Appendix 3.

Sedimentation and Suspended Sediment Concentration

Two areas of high sediment accumulation were observed in Lake Erie. Figure 9 shows that very high sedimentation occurs along the west shore of Lake Erie (areas 1, 2, 3, 8, 9, and 10). This sediment is derived from both the Detroit River and the Maumee River. In addition high sedimentation occurs along the south shore of Lake Erie and in the Eastern Basin (areas 22, 26, 27, 31, 32, and 34). Most of this sediment is derived from shore erosion. The material eroded along the Canadian shore is transported to the Eastern Basin to be deposited off Long Point. The material eroded along the United States shore tends to be swept further off shore and deposited near the point of erosion as well as being transported in a general north-easterly direction to be deposited in the Eastern Basin.

Figure 10 shows the suspended sediment concentration calculated by our model. The general levels of suspended

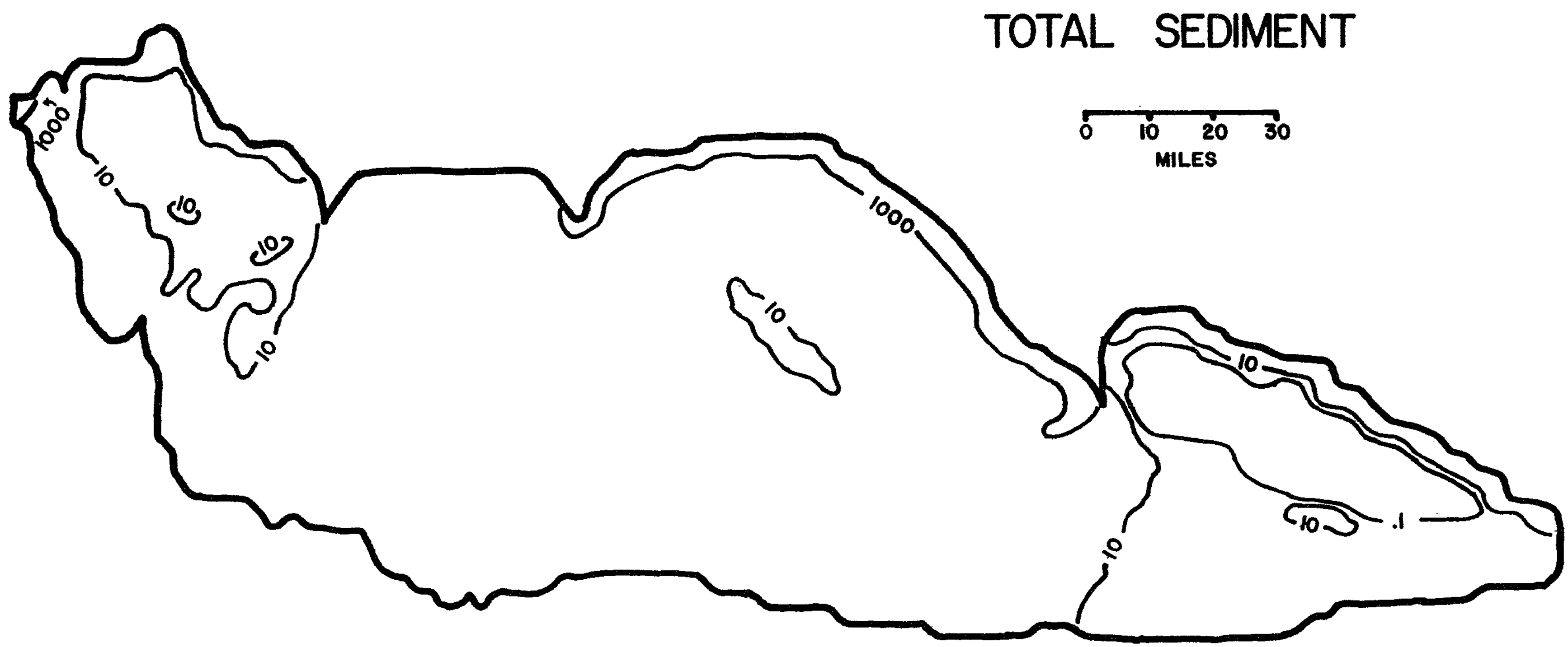

Figure 9. Total sediment accumulation in Lake Erie 1939-1970 (kg/m^2 x 10^6).

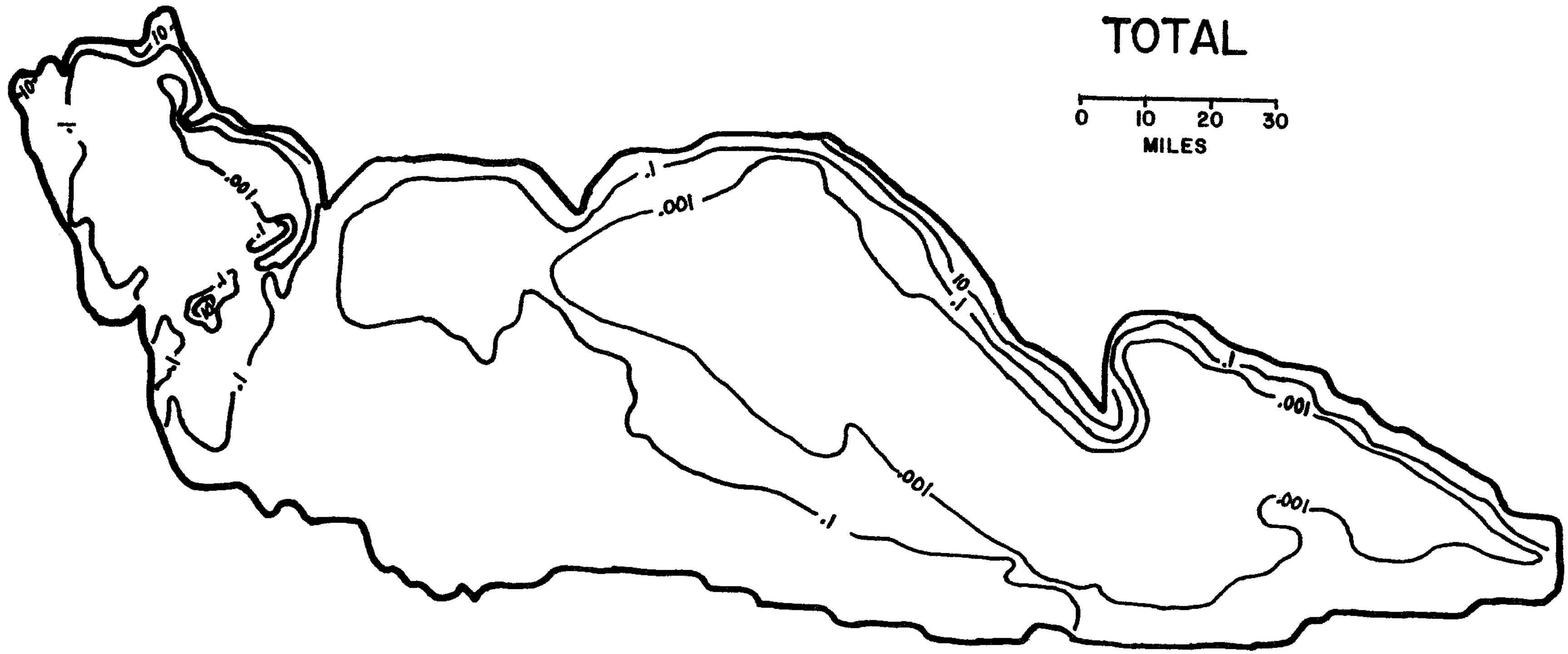

Figure 10. Suspended sediment concentration in Lake Erie (kg/m^2 x 10^6).

sediment are similar to those reported by FWPCA (1968) for western and central Lake Erie. The concentration contours also correlate well with the numerous Landstat photos that are available. Przywara (1977, p.152) noted a correlation between the observed sedimentation and the suspended sediment distribution shown in the Satellite photos of western Lake Erie.

Sediment Transport from Shore Erosion and River Sources

After establishing a reasonable estimate of the fallout ratio R_i for the sediment transport model (AMODEL), the input conditions were altered to isolate each sediment source that makes a significant input to Lake Erie. This isolation was possible because the sediment input is separate from the water input to the hydrodynamic model of Durham and Butler (1976). All water inputs were maintained at their normal levels. The sediment inputs were set to zero except for the source under investigation. Thus we have used AMODEL to calculate the sedimentation and suspended sediment transport from the Detroit, Maumee, and Cuyahoga Rivers and due to shore erosion. In addition the model was used to measure the velocity of sediment transport from three point sources of shore erosion.

Figures 11 and 12 show the total sediment accumulation (1939-1970) due to input from the Detroit River and the suspended sediment derived from that source. Most of the sedimentation (fig. 11) and suspended sediment (fig. 12) is concentrated about the mouth of the Detroit River. However,

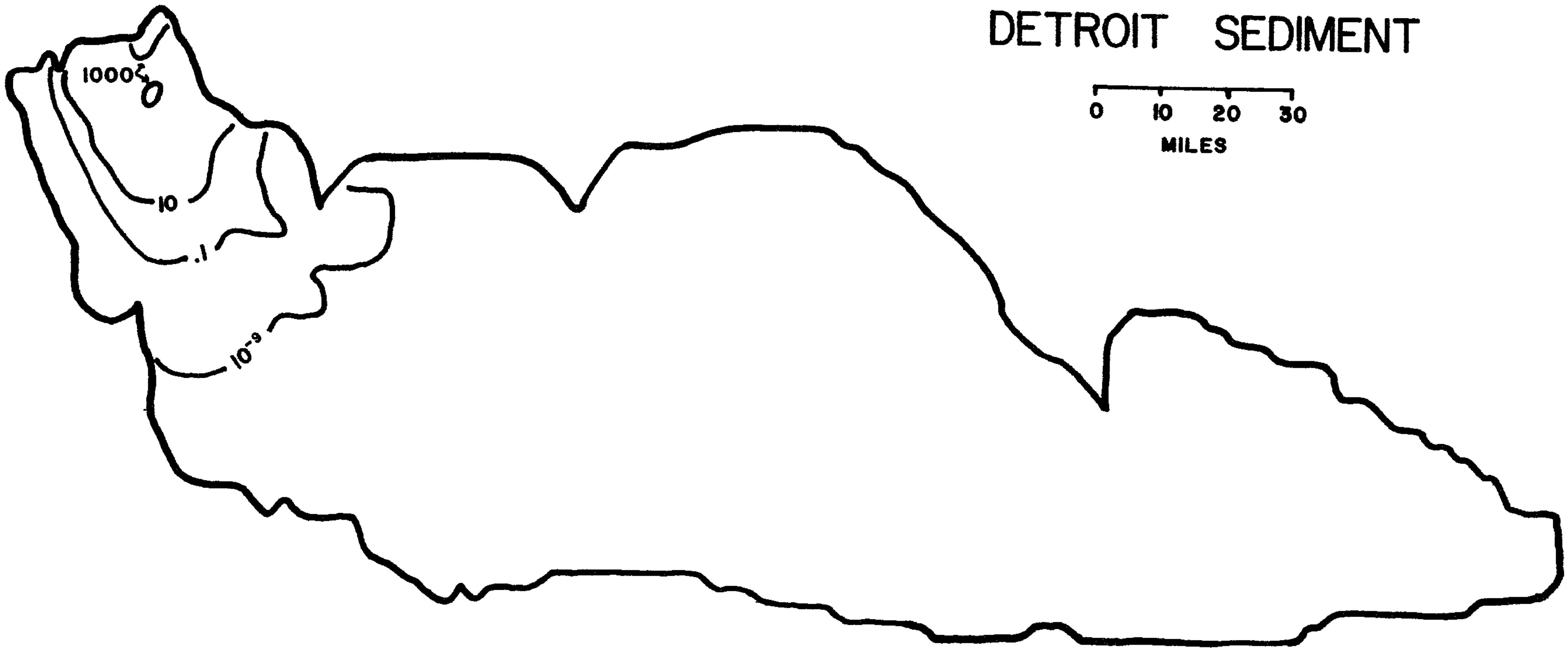

Figure 11. Sediment accumulation in Lake Erie 1939-1970 from the Detroit River ($kg/m^2 \times 10^6$).

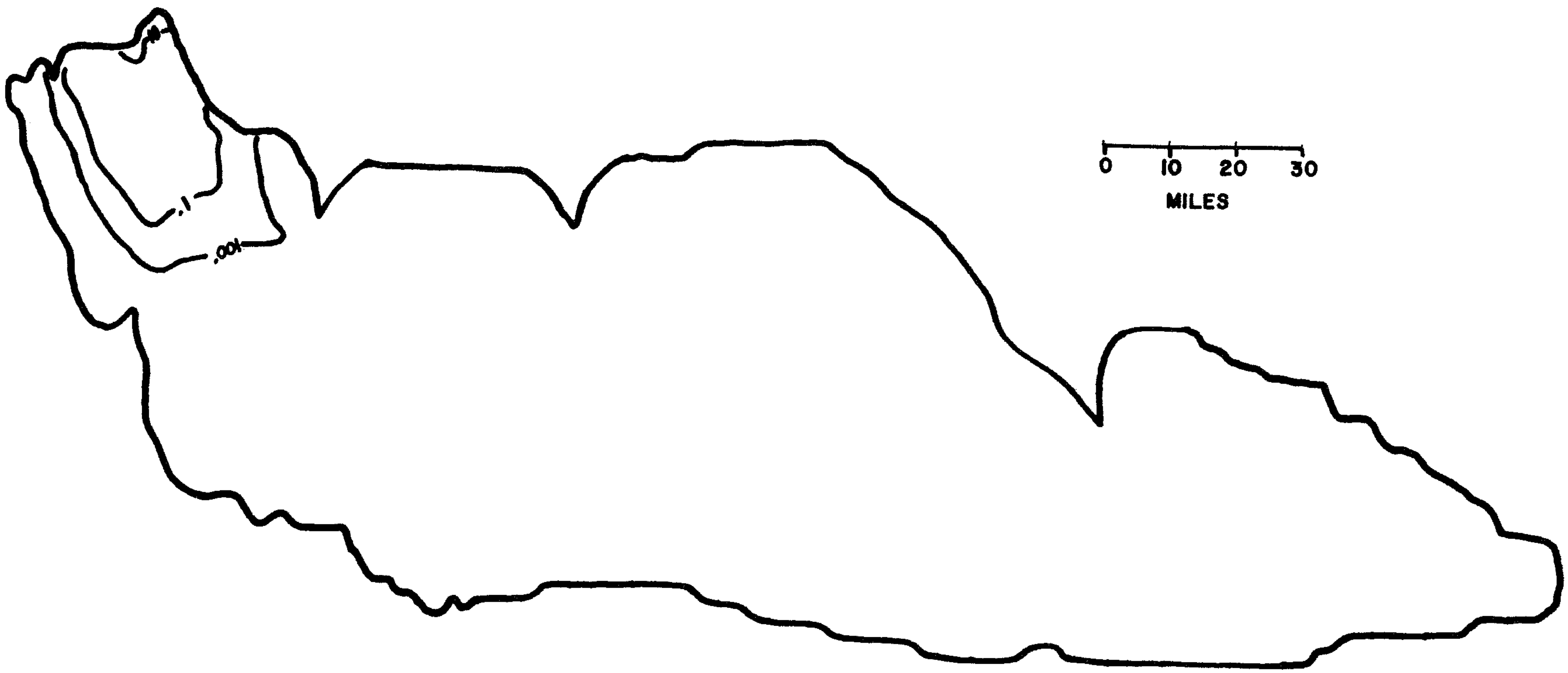

Figure 12. Suspended sediment concentration derived from the Detroit River ($kg/m^2 \times 10^6$).

two important features of the sediment distribution are predicted by the model. First, the polluted Detroit River sediment does not enter Maumee Bay as long as the conditions of the steady state hydrodynamic model of Durham and Butler (1976) are maintained, namely that we have a constant wind direction and velocity and a positive flow out of the Maumee River. In actuality these assumptions may not always be valid. In any case, the influence of the Detroit River water and sediment in Maumee Bay and along the Ohio shore of the Western Basin is minimal. Secondly, some suspended sediment (fig. 12) from the Detroit River does enter the Central Basin primarily via the Pelee Passage to be deposited east of Pelee Point along the Canadian shore. This prediction agrees with the mercury distribution in "quartz free" Lake Erie sediments measured by Thomas et al. (1976) who concluded that mercury polluted sediments are being transported through the Pelee Passage into the Central Basin of Lake Erie.

We predict that the sediment input by the Maumee River (figs. 13 and 14) does not encroach on the area just south of the mouth of the Detroit River, which contains highly polluted sediments (Kovacik and Walters, 1973; Wilson, 1978 and Thomas, 1976). The strong water flow of the Detroit River keeps the Maumee River water mass south of this area. In addition, very little sediment input by the Maumee River is transported (fig. 14) to the Central Basin.

The Cuyahoga River has a major influence on the sediment quality of the Central Basin. Walters et al. (1974)

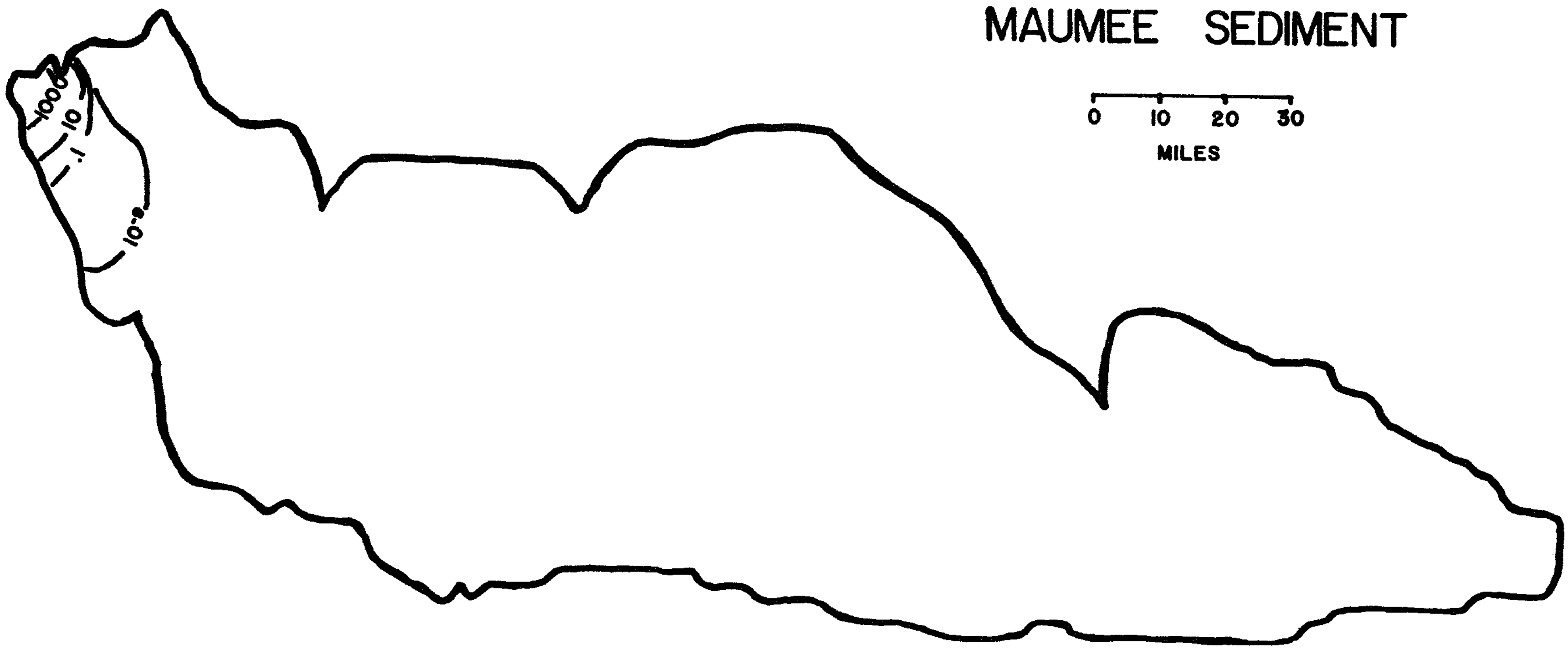

Figure 13. Sediment accumulation in Lake Erie 1939-1970 from the Maumee River ($kg/m^2 \times 10^6$).

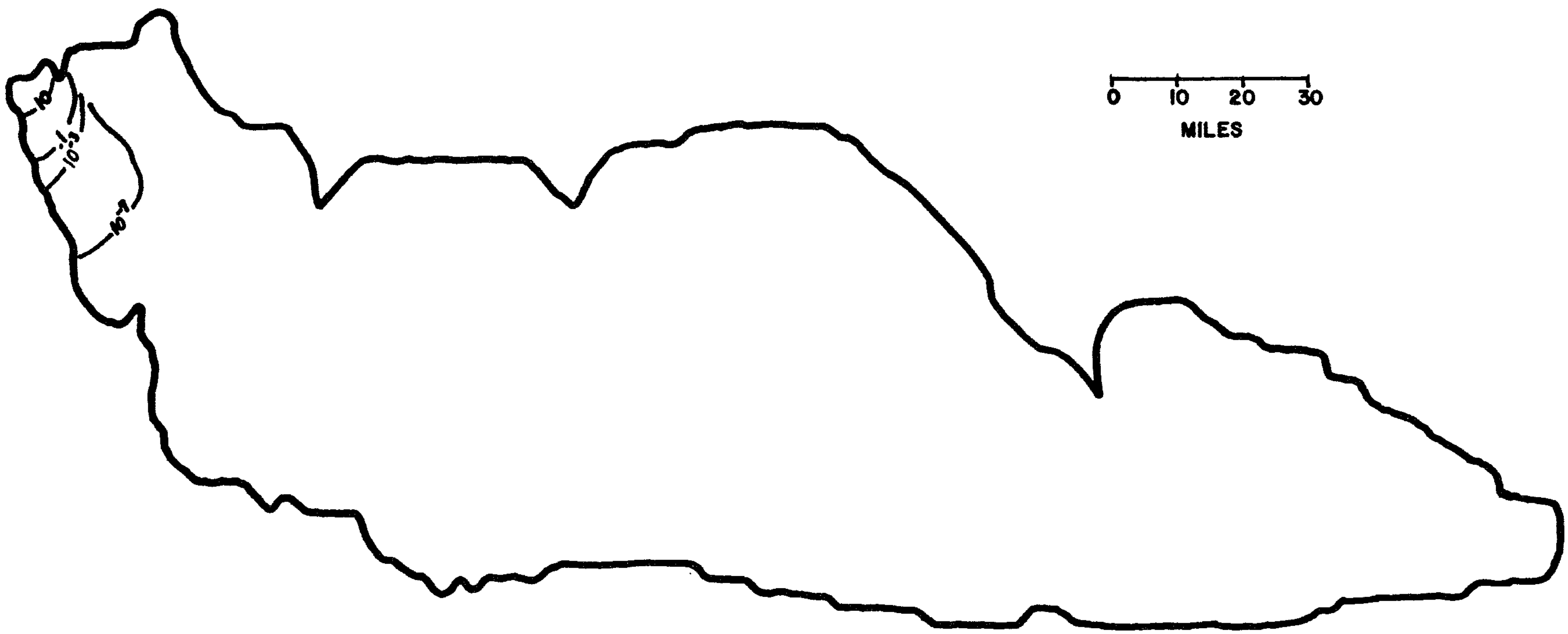

Figure 14. Suspended sediment concentration in Lake Erie derived from the Maumee River ($kg/m^2 \times 10^6$)

found highly polluted sediments in Cleveland Harbor. These sediments are also carried into central Lake Erie by the Cuyahoga River. Once they are in the lake proper, they are affected by the strong longshore currents in the Central Basin. These currents move the suspended sediment (fig. 15) in a fan shaped plume northeastward along the Ohio and Pennsylvania shore. The deposition of these polluted sediments (fig. 16) is essentially all in the United States side of the lake and extends past Ashtabula, Ohio to a point 24 miles southwest of Erie, Pennsylvania.

Kemp _et al_. (1977) estimated that 53% of the sediment input to Lake Erie was from shore erosion. Figure 17 shows that the sediment accumulation from shore erosion is comparable to that supplied by the Detroit and Maumee Rivers in the Western Basin and far exceeds the river sources in the Central and Eastern Basins. Sediment accumulation from shore erosion is uniformly heavy in the Western Basin, but decreases in amount going away from shore in the Central and Eastern Basins. The sediment supplied from shore erosion acts as a diluent for the polluted sediment from the river sources. Walters and Herdendorf (1975) and Kemp _et al_. (1975) observed background levels of 0.045 ppm Hg, 17.1 ppm Cr, and 31.9 ppm Ni for the non polluted sediment supplied to Sandusky Bay and the north shore of Lake Erie.

The rate of longshore transport was investigated using four point sources of shoreline and calculating the suspended and fallen sediment distributions after 10 days and averaging for the six wind conditions. These point sources are indicated

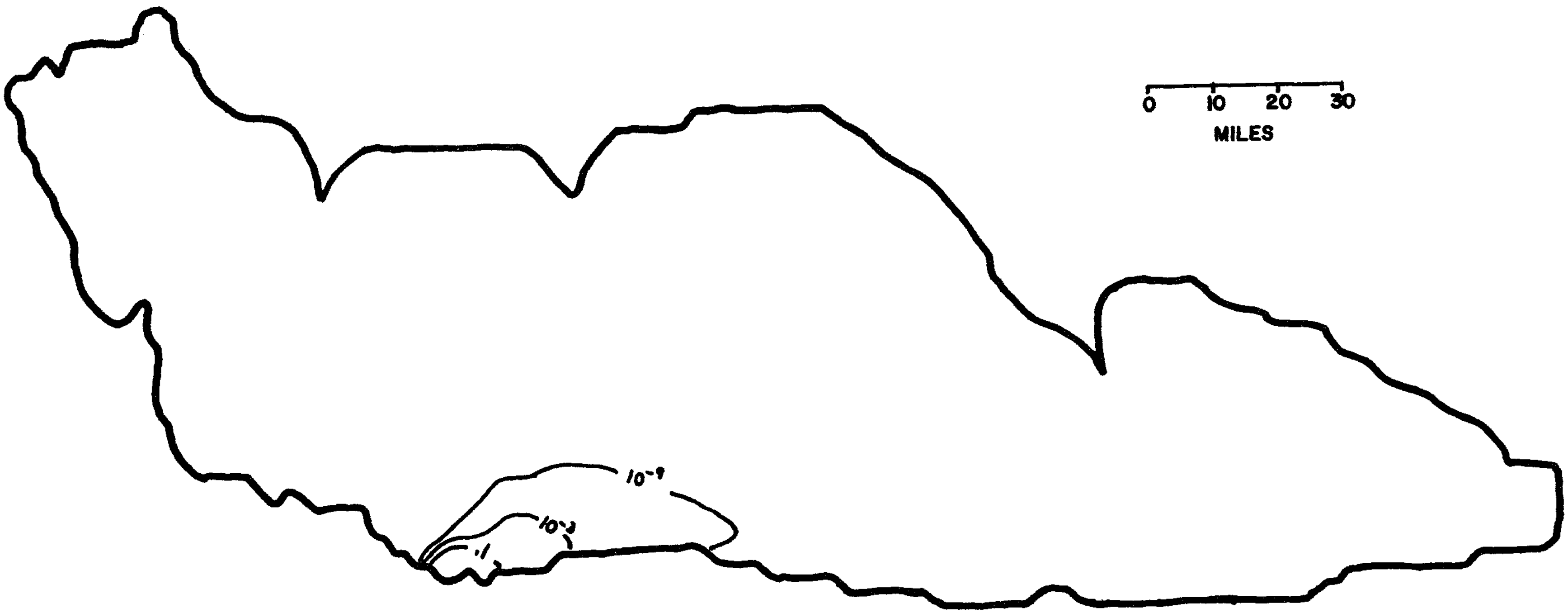

Figure 15. Suspended sediment concentration in Lake Erie input by the Cuyahoga River ($kg/m^2 \times 10^6$).

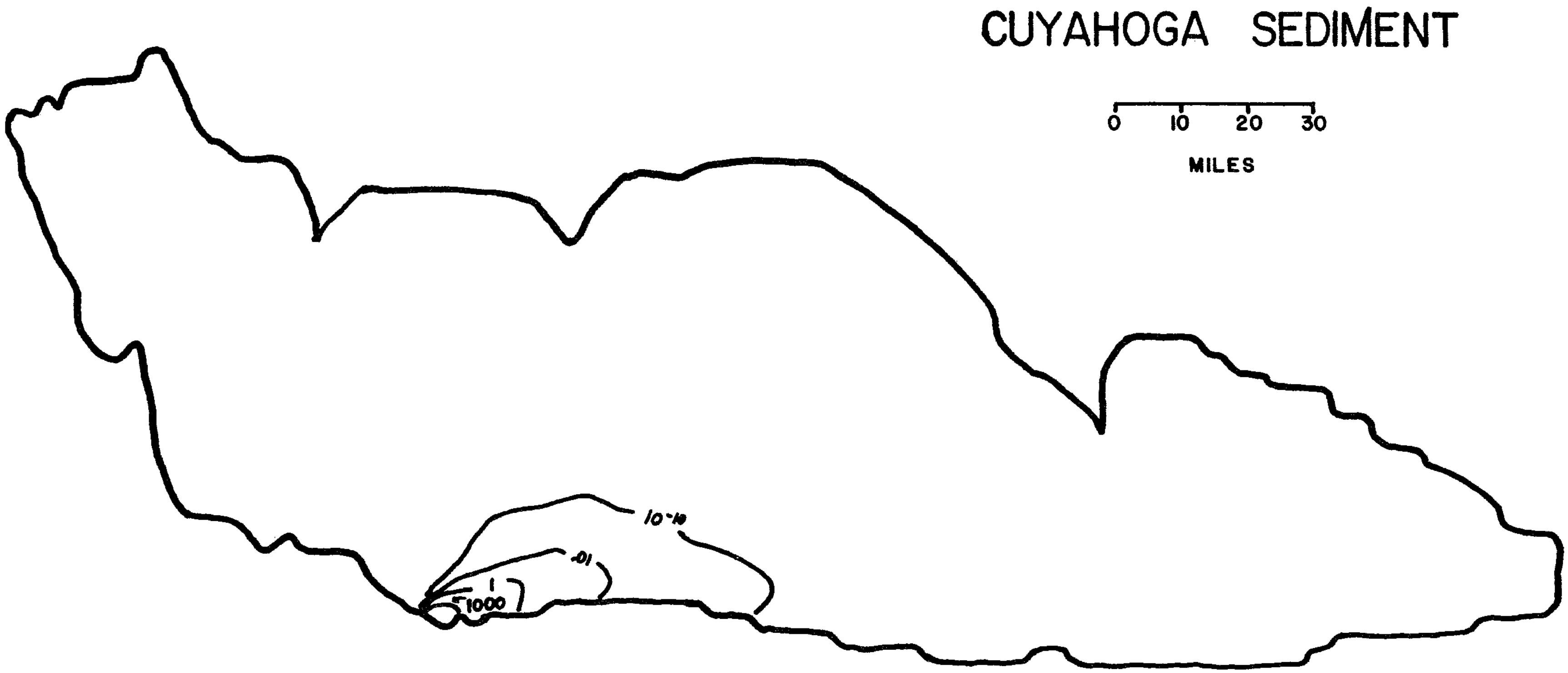

Figure 16. Sediment accumulation in Lake Erie 1939-1970 from the Cuyahoga River ($kg/m^2 \times 10^6$)

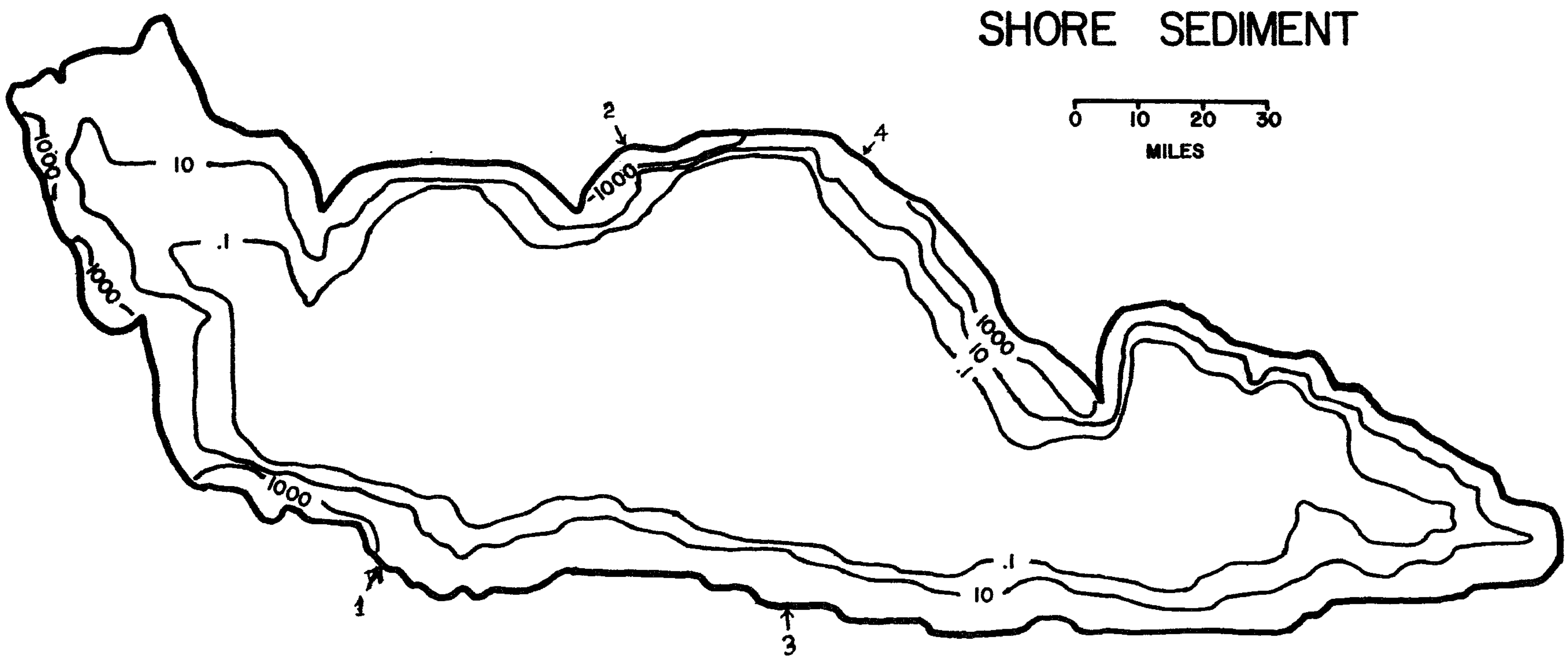

Figure 17. Sediment accumulation in Lake Erie 1939-1970 from shore erosion ($kg/m^2 \times 10^6$).

by numbered arrows in Figure 17. The location of center of gravity of fallen sediment about the four sediment distributions were used as a measure of the longshore sediment transport rate. These results are shown in Table 7. The greatest longshore current velocity (1.9 cm/sec) was observed at point three along the south shore of Lake Erie. All of the longshore currents for these four point sources in the central basin were in a northeasterly direction.

MODEL OF MERCURY TRANSFER AND TRANSPORT IN LAKE ERIE

Jernelov and Asell (1975) developed a model for mercury transfer in a 6 km^2 lake with a mean depth of 5m. Their expressions for the transfer rates between sediment, water, and biomass will serve as the basis for this study. The flow pathways of mercury in the Lake Erie model are shown in Figure 18. The following crucial factors were not included in the Jernelov and Asell (1975) model: 1) active sedimentation and the resulting effect of burial, and 2) transport of mercury loaded sediment by bottom currents (e.g. resuspension of bottom sediment due to storm action). Due to the effects of bio-turbation, methylation, resuspension, and sedimentation, the active sediment offers the greatest potential for variability in mercury concentration. This sediment also contains the largest fraction of mercury in the total system (Walters <u>et al</u>., 1974a).

The mathematical model of mercury transfer and transport (Program HGTRANS, Appendix 3) is defined by the following

Table 7

Longshore Sediment Transport

Point Source	Coordinates X	Coordinates Y	Model Index	Center of Gravity X	Center of Gravity Y	Velocity cm/sec
1	32	6	2205	32.2996	5.97286	0.56
2	50	30	241	50.2376	30.3687	0.82
3	63	4	2411	64.0211	3.97841	1.90
4	69	29	324	69.3697	28.7646	0.81

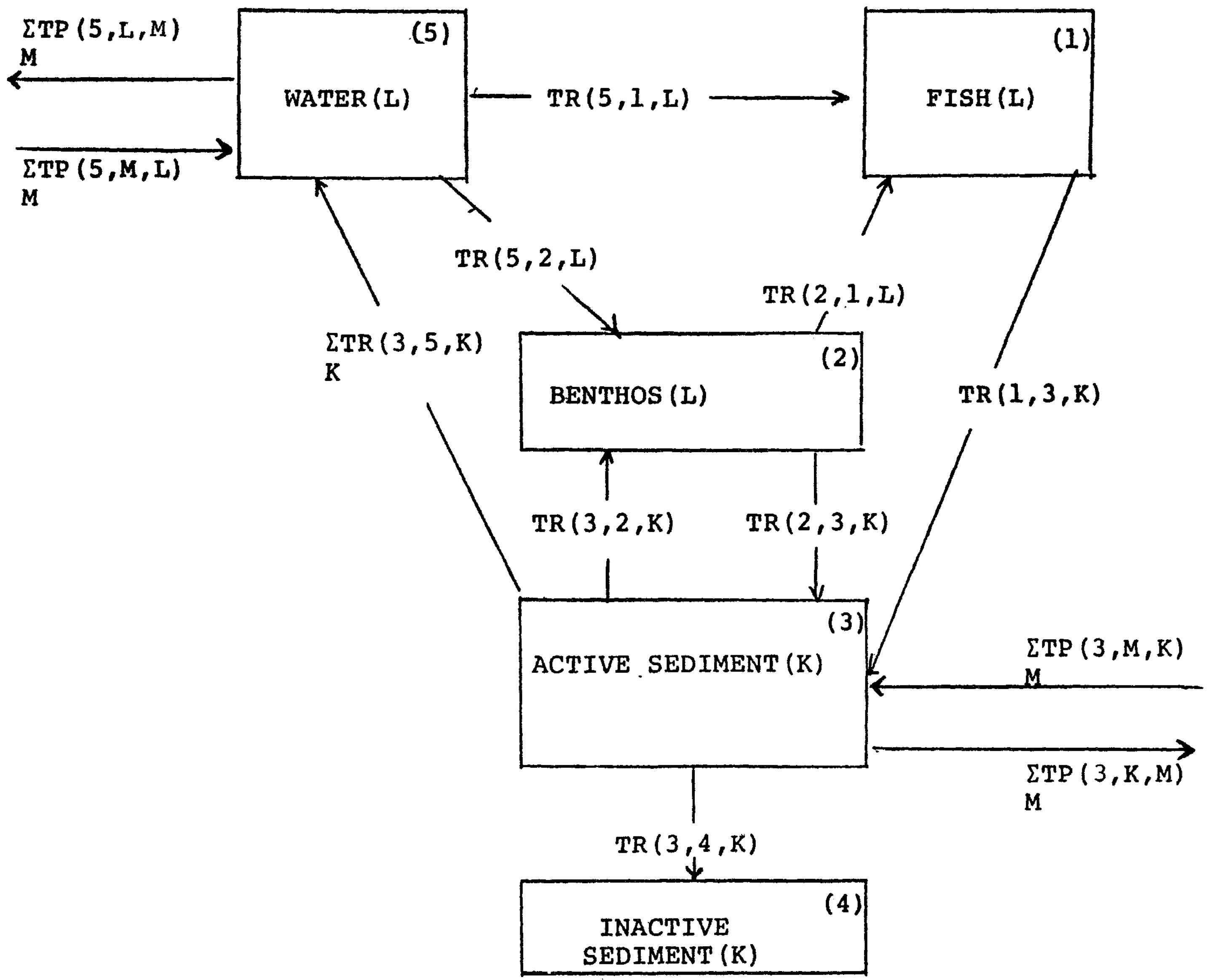

Figure 18. Flow diagram of mercury in Lake Erie sediments, water, and biota.

74 simultaneous differential equations. These equations are linear algebraic functions of the transfer rates TR(I,J,K) of mercury from level I to level J for sediment area K and the transport rates TP(I,K,M) or TP(I,L,M) for mercury in level I from area K or L to area M which must be contiguous. These transfer and transport rates are identified in Figure 18, and the sediment areas are identified in Figure 1.

$$\frac{dHg(1,L)}{dt} = TR(5,1,L) + TR(2,1,L) - \sum_{k} TR(1,3,K)$$

for L = 1,2,3 and all K = 1,2,...,34 within water area L (11)

$$\frac{dHg(2,L)}{dt} = TR(5,2,L) + \sum_{k} TR(3,2,K) - TR(2,1,L) - \sum_{k} TR(2,3,K)$$

for L = 1,2,3 and all K = 1,2,...,34 within water area L (12)

$$\frac{dHg(3,K)}{dt} = TR(2,3,K) - TR(3,4,K) - TR(3,5,K) - TR(3,2,K) + TR(1,3,K) + \sum_{M} TP(3,M,K) - \sum_{M} TP(3,K,M)$$

for K = 1,2,...,34 and areas M contiguous to area K (13)

$$\frac{dHg(4,K)}{dt} = TR(3,4,K) \qquad \text{for } K = 1,2,\ldots,34 \qquad (14)$$

$$\frac{dHg(5,L)}{dt} = 0 \text{ (assumed)}$$

The transfer rates in equations (11-14) are defined where possible by using the relationships proposed by Jernelov and Asell (1975). These transfer rates are functions of the following variables and constants:

A(K) = Area of segment K in m^2.

DOB(L) = f(x,y) = Dissolved oxygen concentration in the bottom waters (Beeton, 1969) in gO_2/gH_2O.

DOSM(L) = f(x,y) = Dissolved oxygen concentration in surface and mid waters in gO_2/gH_2O.

ZC = 0.04 m = the critical depth of active sediment.

CHG(K) = C4 X QSED = the dimensionless concentration of Hg^{+2} in the active layer of sediment in region K.

QF(L) = the standing crop of fish in Kilocalories. Fishing records in FWPCA (1968) were used to estimate QF as follows: QF(1) = 1.8030E13 Kcal, QF(2) = 8.2472E13 Kcal, and QF(3) = 2.6296E13 Kcal.

QB(L) = the standing crop of benthos in the lake in Kilocalories. QB was estimated using the data of Alley and Powers (1970), and the specific energy content of benthos as follows: QB(1) = 1.2111E10, QB(2) = 5.5398E10, and QB(3) = 1.7664E10. All of these numbers are based on the estimates of 4.63 g/m^2 of benthos and the specific energy content of 700 Kcal/Kg (Alley and Powers, 1970).

W(L) = the volume of water in lake region L. Although a time dependent model of lake levels was developed using Fourier Series, this was simplified to a constant in order to shorten the computations.

RAEEF = .15 = the ratio between assimilation efficiency of methylmercury and energy for fish.

RAEEB = .6 = the ratio between assimilation efficiency of methylmercury and energy for benthos.

AEWF = .75 = assimilation efficiency of methylmercury from water for fish.

AEWB = .5 = assimilation efficiency of methylmercury from water for benthos.

FMEHG = 1 = fraction of methylmercury produced as monomethylmercury.

AEOWF = .75 = assimilation efficiency of oxygen from water for fish.

AEOWB = .5 = assimilation efficiency of oxygen from water for benthos.

F(K) = fraction of sediment in area L treated as area K.

COX = .2 gO_2/Kcal = specific oxygen consumption of fish and benthos.

QMETH = .3 to 1 = order of methylation reaction in sediments.

QEF = 1000 Kcal/Kg = specific energy content of fish.

QEB = 700 Kcal/Kg = specific energy content of benthos.

QESED = 100 Kcal/Kg = specific energy content of sediment.

BAHG = .3 to 1 = biochemical availability of inorganic mercury.

GAMMA = 63×10^{-9} $(gHg/gsed)^{-KMETH}$ $year^{-1}$ = constant relating methylation rate to microbial activity.

RMBF = .346 $year^{-1}$ = rate constant for metabolic breakdown of methylmercury in fish.

RMBB = 1.15 $year^{-1}$ = rate constant for metabolic breakdown of methylmercury in benthos.

RRSED = 11.5 $year^{-1}$ = rate constant for release of methylmercury from sediment.

DENS = 1100 Kg/m^3 = density of sediment.

QRESF(L) = $(936+19700)\times10^5 \times \frac{Area}{6}$ Kcal/yr = energy lost by fish in respiration.

QRESB(L) = $113\times10^8 \times \frac{Area}{6}$ Kcal/yr = energy lost by benthos in respiration.

QASSF(L) = $(125+2370)\times10^6 \times Area/6$ Kcal/yr = energy assimilated by fish.

QASSB(L) = $203\times10^8 \times Area/6$ Kcal/yr = energy assimilated by benthos.

QDF(L) = $(312+2810)\times10^5 \times Area/6$ Kcal/yr = energy lost by natural death of fish.

QDB(L) = $657\times10^7 \times Area/6$ Kcal/yr = energy lost by natural death of benthos.

The following values were determined for QRESF(L), QRESB(L), QASSF(L), QASSB(L), QDF(L), and QDB(L).

(All are in Kcal/year)

REGION	1	2	3
QRESF	1.28518E12	5.87988E11	1.87444E12
QRESB	7.03745E12	3.21918E13	1.02642E13
QASSF	1.55384E12	7.10784E13	2.26629E12
QASSB	1.26425E13	5.78313E13	1.84392E13
QDF	1.94433E11	8.89406E11	2.83582E11
QDB	4.09169E12	1.87168E13	5.96775E12

SIGMA(K) = the sedimentation rate in meter/yr in region K. Sediment density was used to convert the values in Table 6 to m/year.

CDMETH was assumed to be zero in this model since it is known to be very small, but no accurate estimate of it could be found.

DOSM and DOB, dissolved oxygen in surface and mid-waters, and dissolved oxygen in bottom waters respectively, were calculated from a model provided by Dale Borowiak, and the numbers derived from it are given below:

MONTH	DOSM	DOB
JANUARY	1.42984E-05	1.32896E-05
FEBRUARY	1.48671E-05	1.38583E-05
MARCH	1.45760E-05	1.35672E-05
APRIL	1.34758E-05	1.24670E-05
MAY	1.18542E-05	1.08454E-05
JUNE	1.01628E-05	9.15398E-06
JULY	8.33269E-06	7.86246E-06
AUGUST	8.33269E-06	7.32386E-06
SEPTEMBER	8.71189E-06	7.70306E-06
OCTOBER	9.89445E-06	8.88562E-06
NOVEMBER	1.15469E-05	1.05381E-05
DECEMBER	1.31934E-05	1.21846E-05

DOSM and DOB were found to be independent of lake region.

The following expressions define the transfer rates between levels which are used in equations (11-15). These expressions are either taken from Jernelov and Asell (1975) or are formulated to be consistent with the criterion listed previously.

TRANSU(M,K,IM) = the rate of sediment transport from region M to region K in month IM.

WTRSU(L,M,IM) = the amount of water transferred from region L to region M in month IM.

C1(L) = the concentration of mercury in fish.

C2(L) = the concentration of mercury in benthos.

C3(K) = the concentration of mercury in the active sediment.

Variables used for the transfer rates

C1(L) = HG(1,L)/QF(L) for L = 1,2,3 (15)

C2(L) = HG(2,L)/QB(L) for L = 1,2,3 (16)

C3(K) = HG(3,K)/(A(K)*Zc DENS QESED) for K = 1,2,...,34 (17)

TR(1,3,K) = (QDF(L)+QASSF(L)*(1.-RAEEF)) x C1(L) x F(K) for K = 1,2,...,34 and L = 1,2,3 corresponding to K (18)

TR(2,1,L) = QASSB(L) x C2(L) x RAEEF for L = 1,2,3 (19)

TR(2,3,K) = (QDB(L)+QASSB(L)*(1.-RAEEB))*C2(L)*F(K) for K = 1,2,...,34 and L = 1,2,3, corresponding to K (20)

TR(3,2,K) = QASSB(L) x C3(K) x RAEEB x F(K) for K = 1,2,...,34 and L = 1,2,3 corresponding to K (21)

TR(3,4,K) = HG(3,K) x SIGMA(K)/Zc for K = 1,2,...,34 (22)

TP(3,M,K) = HG(3,K)*TRANSV(M,K,IM)(Zc x A(K) x DENS)

for K = 1,2,...,34

and M contiguous

to K (23)

It was assumed that at the beginning of the model, all sediment regions contained the usual background level of mercury (0.03 ppm).

Mercury input to the lake was taken from Walters and Wolery (1974), and a report by the Federal Water Quality Administration (1970). On the basis of the information from these sources, the following model for mercury input was chosen: Input to sediment region 9 is taken to be 102.1 Kg per month from January 1938 to January 1958, and 204.1 Kg per month for the rest of the model. This accounts for the input from Wyandott, Michigan. Input to the sediment of region 32 (from Detrex, Ashtabula) was taken to be 344.7 Kg per month from January 1963 to May 1970. Input to region 21 (the Sandusky Bay) is assumed to be 1.0057E-02 from January 1941 to the end of the model run. The concentration of mercury in the water was assumed to be constant, which is justified by the work of Chau and Saitoh (1973) and our own data that show that essentially all mercury in the water is associated with particulate material. Therefore, the mercury input was in terms of the sediment of areas 1-34.

The model was greatly simplified by eliminating the water as a variable and eliminating distinction between methylmercury and Hg^{2+} in the sediments. Thus the original

111 differential equations were decreased to 74.

Three model runs were attempted. In the first, the model time unit was chosen to correspond to 0.02 days in the hope that mass gain could be prevented. (Mass gain occurs in the model when a large negative derivative for one of the 74 variables causes a negative mass. The FCT subroutine used in the model is programmed to set to zero any negative mass so that the model virtually gains mass in this case.) Equal error weights were used, and the total error bound was chosen to be 100 Kg--about 2.8% of the total mass in the model when it starts. When the model was run with these parameters, RKGS changed the time step to about 2.60403E-06, which at .103985 seconds per step would require 11.09 hours of CPU time to run through one model month. At this rate, it would take 449 days for the total model to run.

For the second model run, a time step of 2.8571E-03 was tried with a total error bound of 3E+03. It was hoped that with these parameters the total model could be completed within ten hours of CPU time. This run used 4000 seconds of computer time without completing a single month of the model. Loss of mass for this run was probably high, but was not output.

Before the third run, it was determined that most of the change in Y occured in Y(41) to Y(74). Because of this, the error weighting was changed to allot these variables only one tenth of the weight of the rest of the model variables. The total error bound was fixed at 1E05 (which is very high), and the time interval was the same as the last run-- 2.8571E-03. When the model was run this last time, RKGS changed the model time step to about 2.79E-06, and even at this step size mass gain was of the order of 10^4 for each step. At this rate, it would take 419 days of CPU time for the model to run, and the result would not make sense because of mass gained.

In summary, the machine at BGSU is too slow to run the mercury model without sacrificing a great degree of accuracy.

REFERENCES

Berner, R. A. (1971) Principles of chemical sedimentology. New York: McGraw-Hill.

Bongers, L. H. and M. N. Khattak (1972) Sand and gravel overlay for control of mercury in sediments. Water Pollution Control Research Series. Washington: U.S. Environmental Protection Agency.

Carter, C. H. (1977) Sediment load measurements along the United States shore of Lake Erie. Rept. of Invest. No. 102, Ohio Dept. Nat. Res., Div. Geol. Surv., 24 p.

Chao, Y. K., and H. Saitoh (1973) Mercury in the International Great Lakes, Proc. 16th Conf. Great Lakes Res., Internat. Assoc. Great Lakes Res., p. 221-232.

Davis, J. C. (1973) Statistics and data analysis in geology. John Wiley and Sons, Inc., New York, 550 p.

Dixon, W. J., ed. (1970) BMD Biomedical computer programs. Berkeley: Univ. Calif. Press.

Durham, D. L. and H. L. Butler (1976) Lake Erie international jetport model feasibility investigation: Results of numerical steady-state, wind-driven circulation analysis. Misc. paper H-76-3, Report 17-7, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Gedney, R. T. and W. Lick (1972) Wind-driven currents in Lake Erie. J. Geophys. Res. 77:2714-2723.

Hatch, W. R. and W. L. Ott (1968) Determination of submicrogram quantities of mercury by atomic absorption spectrophotometry. Anal. Chem., 40:2085-2087.

Herdendorf, C. E. and W. K. Lindsay (1975) Benthic macroinvertebrate populations of Sandusky Bay. Proc. Sandusky River Basin Symp. Internat. Joint Comm., International Reference Group on Great Lakes Pollution from Land Use Activities, p. 359-377.

Iskander, I. K., J. K. Syers, L. W. Jacobs, D. R. Keeney, and J. T. Gilmour (1972) Determination of total mercury in sediments and soils. Analyst, 97:383-393.

Jernelov, A. and B. Asell (1975) The feasibility of restoring mercury-contaminated waters. in Heavy metals in the aquatic environments. ed. P. A. Krenkel. Pergamon Press, New York, p. 299-309.

Kemp, A. L. W., R. L. Thomas, C. I. Dell, and J. M. Jaquet (1976) Cultural impact on the geochemistry of sediments in Lake Erie. Jour. Fisheries Res. Board Canada, 33:440-462.

Kemp, A. L. W., G. A. MacInnis, and N. S. Harper (1977) Sedimentation rates and a revised sedimentation budget for Lake Erie. J. Great Lakes Res. 3:221-233.

Kennedy, E. J., R. R. Ruch, and N. F. Shimp (1971) Distribution of mercury in unconsolidated sediments from southern Lake Michigan. Illinois State Geol. Surv. Environ. Geol. Notes, No. 44, Urbana, Illinois, 18 p.

Kovacik, T. L. (1972) Distribution of mercury in western Lake Erie waters and bottom sediments. Unpublished M.A. thesis, Bowling Green State University, Bowling Green, Ohio.

Ontario Water Resources Commission (1970) Report on the mercury pollution of the St. Clair River system. Open file report, 57 p.

Presley, B. J., Y. Kolodny, A. Nessenbaum, and I. R. Kaplan (1972) Early diagenesis in a reducing fjord, Saanich Inlet, British Columbia-II. Trace element distribution in interstitial water and sediment. Geochim. Cosmochim. Acta, 36:1073-1090.

Perkin-Elmer (1964) Analytical methods for atomic absorption spectrophotometry. Norwalk, Connecticut, Perkin-Elmer.

Perkin-Elmer (1976) Analytical methods for atomic absorption spectrophotometry. Norwalk, Connecticut, Perkin-Elmer.

Rondy, D. R. (1969) Great Lakes ice atlas. U. S. Lake Survey, Res. Rept. 5-6.

Shimp, N. F., J. A. Schleicher, R. R. Ruch, D. B. Heck, and H. W. Leland (1971) Trace element and organic carbon accumulation in the most recent sediments of southern Lake Michigan. Illinois State Geol. Surv. Environ. Geol. Notes, No. 41, Urbana, Illinois, 25 p.

Skoch, E. J. and C. S. Sikes (1973) Mercury concentrations in chronomid larvae and sediments from Sandusky Bay of Lake Erie: Evidence of seasonal cycling of mercury. Proc. 16th Conf. Great Lakes Res. Internat. Assoc. Great Lakes Res. Ann Arbor, p. 183-189.

Walters, L. J. Jr., C. E. Herdendorf, L. J. Charlesworth, Jr., H. K. Anders, W. B. Jackson, E. J. Skoch, D. K. Webb, T. L. Kovacik, and C. S. Sikes (1972) Mercury contamination and its relation to other physico-chemical parameters in the western basin of Lake Erie. Proc. 15th Conf. Great Lakes Res., Internat. Assoc. Great Lakes Res., p. 306-316.

Walters, L. J. Jr., and C. E. Herdendorf (1973) Mercury concentration in surface sediments as related to water masses in western Lake Erie. Compass 50(4):5-10.

Walters, L. J. Jr., and T. L. Kovacik, and C. E. Herdendorf (1974a) Mercury occurrence in sediment cores from western Lake Erie, Ohio J. Sci. 74:1-19.

Walters, L. J. Jr., and T. J. Wolery (1974) Transfer of heavy metal pollutants from Lake Erie bottom sediments to the overlying water. Project Completion Report No. 421X. State of Ohio, Water Resources Center, Ohio State University, 84 p.

Walters, L. J. Jr., and C. E. Herdendorf (1975a) Use of mercury pollution in Sandusky Bay sediments to determine sedimentation rates. Proc. Sandusky River Basin Symp. Internat. Joint Comm., Internat. Reference Group on Great Lakes Pollution from Land Use Activities, p. 425-453.

Walters, L. J. Jr. (1977) Man's input of mercury, chromium and nickel to Lake Erie sediments. Abs. 20th Conf. Great Lakes Res., Internat. Assoc. Great Lakes Res.

Wolery, T. J. (1973) Vertical distribution of mercury, nickel and chromium in Lake Erie sediments, M.S. Thesis, Bowling Green State University, Bowling Green, Ohio 194 p.

Wolery, T. J., and L. J. Walters, Jr. (1974) Pollutant mercury and sedimentation in the western Lake Erie, Proc. 17th Conf. Great Lakes Res., Ann Arbor: Internat. Assoc. Great Lakes Res., p. 235-249.

APPENDIX 1

SAMPLE LOCATIONS

CRUISE	STATION	LATITUDE	LONGITUDE	LOCATION	DATE
1	1	41 00 00	83 10 00	WESTERN LAKE ERIE	7/23/71
1	1A	41 00 00	83 08 00	WESTERN LAKE ERIE	7/23/71
1	2	41 00 00	83 05 00	WESTERN LAKE ERIE	7/22/71
1	2A	41 00 00	83 02 30	WESTERN LAKE ERIE	7/22/71
1	3	41 00 00	83 00 00	WESTERN LAKE ERIE	7/22/71
1	4	41 00 00	82 45 00	WESTERN LAKE ERIE	7/27/71
1	5	41 00 00	82 40 00	WESTERN LAKE ERIE	7/27/71
1	6	41 00 00	82 35 00	WESTERN LAKE ERIE	7/27/71
1	7	41 56 00	82 30 00	CENTRAL LAKE ERIE	7/28/71
1	8	41 55 00	82 35 00	WESTERN LAKE ERIE	7/27/71
1	9	41 55 00	82 40 00	WESTERN LAKE ERIE	7/27/71
1	10	41 55 30	82 45 24	WESTERN LAKE ERIE	7/27/71
1	11	41 55 00	82 50 00	WESTERN LAKE ERIE	7/19/71
1	12	41 55 00	82 55 00	WESTERN LAKE ERIE	7/19/71
1	13	41 55 00	83 00 00	WESTERN LAKE ERIE	7/22/71
1	14	41 55 00	83 05 00	WESTERN LAKE ERIE	7/22/71
1	15	41 55 00	83 10 00	WESTERN LAKE ERIE	7/22/71
1	16	41 55 00	83 15 00	WESTERN LAKE ERIE	7/23/71
1	17	41 55 18	83 18 54	WESTERN LAKE ERIE	7/23/71
1	18	41 50 00	83 20 00	WESTERN LAKE ERIE	7/23/71
1	19	41 50 00	83 15 00	WESTERN LAKE ERIE	7/23/71
1	20	41 50 12	83 10 06	WESTERN LAKE ERIE	7/22/71
1	21	41 50 00	83 05 00	WESTERN LAKE ERIE	7/22/71
1	22	41 50 00	83 00 00	WESTERN LAKE ERIE	7/22/71
1	23	41 50 00	82 55 00	WESTERN LAKE ERIE	7/22/71
1	24	41 50 00	82 50 00	WESTERN LAKE ERIE	7/19/71
1	25	41 50 18	82 45 00	WESTERN LAKE ERIE	7/27/71
1	26	41 50 00	82 40 00	WESTERN LAKE ERIE	7/27/71
1	27	41 49 48	82 35 00	CENTRAL LAKE ERIE	7/28/71
1	28	41 50 00	82 30 00	CENTRAL LAKE ERIE	7/28/71
1	29	41 45 00	82 30 00	CENTRAL LAKE ERIE	7/28/71
1	30	41 44 48	82 35 24	CENTRAL LAKE ERIE	7/28/71
1	31	41 45 00	82 45 00	WESTERN LAKE ERIE	7/27/71
1	32	41 45 00	82 50 42	WESTERN LAKE ERIE	7/19/71
1	33	41 45 00	82 55 00	WESTERN LAKE ERIE	7/22/71
1	34	41 45 00	83 00 00	WESTERN LAKE ERIE	7/26/71
1	35	41 45 00	83 05 00	WESTERN LAKE ERIE	7/26/71
1	36	41 45 00	83 10 00	WESTERN LAKE ERIE	7/26/71
1	37	41 45 00	83 13 36	WESTERN LAKE ERIE	7/26/71
1	38	41 45 00	83 20 00	WESTERN LAKE ERIE	7/26/71

APPENDIX 1 (CONTINUED)

CRUISE	STATION	LATITUDE	LONGITUDE	LOCATION	DATE
1	39	41 45 12	83 24 36	WESTERN LAKE ERIE	7/23/71
1	40	41 40 00	83 15 00	WESTERN LAKE ERIE	7/26/71
1	41	41 40 18	83 10 00	WESTERN LAKE ERIE	7/26/71
1	42	41 40 18	83 05 00	WESTERN LAKE ERIE	7/26/71
1	43	41 40 36	83 00 00	WESTERN LAKE ERIE	7/26/71
1	44	41 40 00	82 55 00	WESTERN LAKE ERIE	7/29/71
1	45	41 40 00	82 50 00	WESTERN LAKE ERIE	7/19/71
1	46	41 40 00	82 45 00	WESTERN LAKE ERIE	7/20/71
1	47	41 40 00	82 40 00	WESTERN LAKE ERIE	7/20/71
1	48	41 40 00	82 35 00	CENTRAL LAKE ERIE	7/20/71
1	49	41 40 42	82 30 00	CENTRAL LAKE ERIE	7/28/71
1	50	41 35 06	82 30 00	CENTRAL LAKE ERIE	7/28/71
1	51	41 35 00	82 35 00	CENTRAL LAKE ERIE	7/20/71
1	52	41 34 30	82 40 00	CENTRAL LAKE ERIE	7/21/71
1	53	41 34 54	82 45 00	WESTERN LAKE ERIE	7/21/71
1	54	41 35 06	82 49 42	WESTERN LAKE ERIE	7/21/71
1	55	41 35 18	82 55 00	WESTERN LAKE ERIE	7/29/71
1	56	41 35 18	83 00 12	WESTERN LAKE ERIE	7/29/71
1	57	41 29 12	82 45 00	SANDUSKY BAY	7/29/71
1	58	41 30 00	82 40 00	CENTRAL LAKE ERIE	7/21/71
1	59	41 30 00	82 35 00	CENTRAL LAKE ERIE	7/20/71
1	60	41 30 00	82 30 00	CENTRAL LAKE ERIE	7/28/71
1	61	41 25 42	82 30 00	CENTRAL LAKE ERIE	7/28/71
1	62	41 25 30	82 35 42	CENTRAL LAKE ERIE	7/28/71
1	D-1	42 04 00	83 10 36	DETROIT RIVER	7/23/71
1	D-2	42 04 00	83 09 24	DETROIT RIVER	7/23/71
1	D-3	42 04 00	83 08 00	DETROIT RIVER	7/23/71
1	D-4	42 04 00	83 07 18	DETROIT RIVER	7/23/71
1	M-1	41 40 00	83 30 00	MAUMEE RIVER	7/26/71
2	1	41 50 00	83 15 00	WESTERN LAKE ERIE	9/ 6/72
2	2	41 57 30	83 12 00	WESTERN LAKE ERIE	9/ 6/72
2	3	41 57 30	83 02 30	WESTERN LAKE ERIE	9/ 6/72
2	4	41 57 30	83 00 00	WESTERN LAKE ERIE	9/ 6/72
2	5	41 57 30	82 52 30	WESTERN LAKE ERIE	9/ 6/72
2	6	41 52 00	83 00 00	WESTERN LAKE ERIE	9/ 6/72
2	7	41 50 00	83 05 00	WESTERN LAKE ERIE	9/ 6/72
2	9	41 42 00	83 00 00	WESTERN LAKE ERIE	9/ 6/72
2	10	41 40 18	82 51 00	WESTERN LAKE ERIE	9/ 6/72
2	11	41 41 00	82 45 00	WESTERN LAKE ERIE	9/ 7/72
2	12	41 38 30	82 42 00	WESTERN LAKE ERIE	9/ 7/72
2	13	41 40 00	82 29 00	CENTRAL LAKE ERIE	9/ 7/72
2	14	42 00 00	82 10 00	CENTRAL LAKE ERIE	9/ 8/72
2	14A	41 30 00	82 30 00	CENTRAL LAKE ERIE	9/ 7/72
2	15	41 40 00	82 10 00	CENTRAL LAKE ERIE	9/ 7/72

APPENDIX 1 (CONTINUED)

CRUISE	STATION	LATITUDE	LONGITUDE	LOCATION	DATE
2	16	41 30 00	82 15 00	CENTRAL LAKE ERIE	9/ 7/72
2	17	41 45 00	81 55 00	CENTRAL LAKE ERIE	9/ 8/72
2	18	42 00 00	81 40 00	CENTRAL LAKE ERIE	9/ 8/72
2	19	41 40 00	81 40 00	CENTRAL LAKE ERIE	9/ 8/72
2	20	41 37 42	81 40 00	CLEVELAND HARBOR	9/ 8/72
2	21	41 50 00	81 20 00	CENTRAL LAKE ERIE	9/10/72
2	22	42 00 00	81 10 00	CENTRAL LAKE ERIE	9/10/72
2	24	42 05 00	80 40 00	CENTRAL LAKE ERIE	9/10/72
2	25	42 00 00	80 40 00	CENTRAL LAKE ERIE	9/12/72
2	26	42 20 00	80 40 00	CENTRAL LAKE ERIE	9/10/72
2	27	42 20 00	80 20 00	CENTRAL LAKE ERIE	9/10/72
2	28	42 15 00	80 00 00	EASTERN LAKE ERIE	9/10/72
2	28A	42 08 18	80 05 30	ERIE HARBOR	9/10/72
2	29	42 30 06	79 53 30	EASTERN LAKE ERIE	9/11/72
2	30	42 40 00	79 53 30	EASTERN LAKE ERIE	9/11/72
2	31	42 40 00	79 40 00	EASTERN LAKE ERIE	9/11/72
2	32	42 52 42	78 53 18	BUFFALO HARBOR	9/11/72
2	33	42 45 00	79 05 00	EASTERN LAKE ERIE	9/11/72
2	34	42 40 00	79 20 00	EASTERN LAKE ERIE	9/11/72
2	35	42 30 00	79 30 00	EASTERN LAKE ERIE	9/12/72
2	36	42 20 00	79 50 00	EASTERN LAKE ERIE	9/12/72
2	37	41 57 30	82 42 30	WESTERN LAKE ERIE	9/13/72
3	11	41 27 36	82 50 42	SANDUSKY BAY	9/29/72
3	13	41 28 30	82 50 42	SANDUSKY BAY	9/29/72
3	14	41 28 48	82 50 42	SANDUSKY BAY	9/29/72
3	15	41 29 18	82 50 42	SANDUSKY BAY	9/29/72
3	27	41 27 12	82 51 54	SANDUSKY BAY	9/29/72
3	29	41 28 00	82 51 54	SANDUSKY BAY	9/29/72
3	31	41 28 48	82 51 54	SANDUSKY BAY	9/29/72
3	43	41 27 12	82 53 00	SANDUSKY BAY	9/29/72
3	45	41 28 00	82 53 00	SANDUSKY BAY	9/29/72
3	47	41 28 48	82 53 00	SANDUSKY BAY	9/29/72
3	59	41 26 24	82 54 06	SANDUSKY BAY	9/29/72
3	61	41 27 12	82 54 06	SANDUSKY BAY	9/29/72
3	63	41 28 00	82 54 06	SANDUSKY BAY	9/29/72
3	65	41 28 48	82 54 06	SANDUSKY BAY	9/29/72
3	78	41 25 48	82 55 18	SANDUSKY BAY	9/29/72
3	83	41 28 00	82 55 18	SANDUSKY BAY	9/29/72
3	85	41 28 48	82 55 18	SANDUSKY BAY	9/29/72
3	100	41 25 48	82 56 24	SANDUSKY BAY	9/29/72
3	101	41 26 24	82 56 24	SANDUSKY BAY	9/29/72
3	103	41 27 18	82 56 24	SANDUSKY BAY	9/29/72
3	105	41 28 00	82 56 24	SANDUSKY BAY	9/29/72
3	122	41 27 12	82 57 36	SANDUSKY BAY	9/29/72

APPENDIX 1 (CONTINUED)

CRUISE	STATION	LATITUDE	LONGITUDE	LOCATION	DATE
3	125	41 28 24	82 57 36	SANDUSKY BAY	9/29/72
3	137	41 29 12	82 48 54	SANDUSKY BAY	9/29/72
3	138	41 29 42	82 47 24	SANDUSKY BAY	9/29/72
3	139	41 28 30	82 47 24	SANDUSKY BAY	9/29/72
3	140	41 29 42	82 45 42	SANDUSKY BAY	9/29/72
3	141	41 28 48	82 45 42	SANDUSKY BAY	9/29/72
3	142	41 28 00	82 45 42	SANDUSKY BAY	9/29/72
3	143	41 27 12	82 45 42	SANDUSKY BAY	9/29/72
3	144	41 29 18	82 44 00	SANDUSKY BAY	9/29/72
3	145	41 28 30	82 44 00	SANDUSKY BAY	9/29/72
3	146	41 27 48	82 44 00	SANDUSKY BAY	9/29/72
3	147	41 29 18	82 42 54	SANDUSKY BAY	9/29/72
3	148	41 28 30	82 42 54	SANDUSKY BAY	9/29/72
3	149	41 27 36	82 42 54	SANDUSKY BAY	9/29/72
3	150	41 28 00	82 41 06	SANDUSKY BAY	9/29/72
4	1	42 04 00	83 07 12	DETROIT RIVER	10/19/72
4	2	42 03 00	83 07 12	DETROIT RIVER	10/19/72
4	3	42 03 00	83 08 00	DETROIT RIVER	10/19/72
4	4	42 03 00	83 09 00	DETROIT RIVER	10/19/72
4	5	42 03 00	83 10 00	DETROIT RIVER	10/19/72
4	6	42 03 00	83 10 54	DETROIT RIVER	10/19/72
4	7	42 05 00	83 11 00	DETROIT RIVER	10/19/72
4	8	42 06 00	83 11 00	DETROIT RIVER	10/19/72
4	9	42 07 00	83 10 36	DETROIT RIVER	10/19/72
4	10	42 08 00	83 10 24	DETROIT RIVER	10/19/72
4	11	42 09 00	83 10 30	DETROIT RIVER	10/19/72
4	12	42 10 00	83 09 42	DETROIT RIVER	10/19/72
4	13	42 11 00	83 09 12	DETROIT RIVER	10/19/72
4	14	42 12 00	83 08 54	DETROIT RIVER	10/19/72
4	15	42 09 00	83 07 12	DETROIT RIVER	10/19/72
4	16	42 06 00	83 06 48	DETROIT RIVER	10/19/72
4	17	42 01 00	83 10 00	WESTERN LAKE ERIE	10/20/72
4	18	42 01 00	83 08 00	WESTERN LAKE ERIE	10/20/72
4	19	42 01 00	83 06 00	WESTERN LAKE ERIE	10/20/72
4	20	42 01 00	83 04 00	WESTERN LAKE ERIE	10/20/72
4	21	42 01 00	83 02 00	WESTERN LAKE ERIE	10/20/72
4	22	42 01 00	83 00 00	WESTERN LAKE ERIE	10/20/72
4	23	41 59 00	83 00 00	WESTERN LAKE ERIE	10/20/72
4	24	41 59 00	83 02 00	WESTERN LAKE ERIE	10/20/72
4	25	41 59 00	83 04 00	WESTERN LAKE ERIE	10/20/72
4	26	41 59 00	83 06 00	WESTERN LAKE ERIE	10/20/72
4	27	41 59 00	83 08 00	WESTERN LAKE ERIE	10/20/72
4	28	41 59 00	83 10 00	WESTERN LAKE ERIE	10/20/72
4	29	41 59 00	83 12 00	WESTERN LAKE ERIE	10/20/72

APPENDIX 1 (CONTINUED)

CRUISE	STATION	LATITUDE	LONGITUDE	LOCATION	DATE
4	30	41 59 00	83 14 00	WESTERN LAKE ERIE	10/20/72
4	31	41 57 00	83 14 00	WESTERN LAKE ERIE	10/20/72
4	32	41 57 00	83 12 00	WESTERN LAKE ERIE	10/20/72
4	33	41 57 00	83 10 00	WESTERN LAKE ERIE	10/20/72
4	34	41 57 00	83 08 00	WESTERN LAKE ERIE	10/20/72
4	35	41 57 00	83 06 00	WESTERN LAKE ERIE	10/20/72
4	36	41 57 00	83 04 00	WESTERN LAKE ERIE	10/20/72
4	37	41 57 00	83 02 00	WESTERN LAKE ERIE	10/20/72
4	38	41 57 00	83 00 00	WESTERN LAKE ERIE	10/20/72
4	39	41 55 00	83 02 00	WESTERN LAKE ERIE	10/20/72
4	40	41 55 00	83 04 00	WESTERN LAKE ERIE	10/20/72
4	41	41 55 00	83 06 00	WESTERN LAKE ERIE	10/20/72
4	42	41 55 00	83 08 00	WESTERN LAKE ERIE	10/20/72
4	43	41 53 00	83 08 00	WESTERN LAKE ERIE	10/20/72
4	44	41 43 00	83 22 00	MAUMEE BAY	10/21/72
4	45	41 42 00	83 22 00	MAUMEE BAY	10/21/72
4	46	41 42 00	83 24 00	MAUMEE BAY	10/21/72
4	47	41 43 00	83 24 00	MAUMEE BAY	10/21/72
4	48	41 43 00	83 20 00	MAUMEE BAY	10/21/72
4	49	41 45 00	83 20 00	MAUMEE BAY	10/21/72
4	50	41 45 00	83 22 00	MAUMEE BAY	10/21/72
4	51	41 45 00	83 24 00	MAUMEE BAY	10/21/72
4	52	41 44 00	83 25 00	MAUMEE BAY	10/21/72
4	53	41 44 00	83 26 00	MAUMEE BAY	10/21/72
4	54	41 42 00	83 27 00	MAUMEE RIVER	10/21/72
4	55	41 40 30	83 29 48	MAUMEE RIVER	10/21/72
4	56	41 37 30	83 32 30	MAUMEE RIVER	10/21/72
4	57	41 45 00	83 18 00	WESTERN LAKE ERIE	10/22/72
4	58	41 47 42	83 18 00	WESTERN LAKE ERIE	10/22/72
4	59	41 47 00	83 16 00	WESTERN LAKE ERIE	10/22/72
4	60	41 49 00	83 16 00	WESTERN LAKE ERIE	10/22/72
4	61	41 49 00	83 14 00	WESTERN LAKE ERIE	10/22/72
4	62	41 49 30	83 12 00	WESTERN LAKE ERIE	10/22/72
4	63	41 51 00	83 12 00	WESTERN LAKE ERIE	10/22/72
4	64	41 53 00	83 12 00	WESTERN LAKE ERIE	10/22/72
4	65	41 55 00	83 12 00	WESTERN LAKE ERIE	10/22/72
4	66	41 55 42	83 14 00	WESTERN LAKE ERIE	10/22/72
4	67	41 55 00	83 16 00	WESTERN LAKE ERIE	10/22/72
4	68	41 55 00	83 18 00	WESTERN LAKE ERIE	10/22/72
4	69	41 53 00	83 18 00	WESTERN LAKE ERIE	10/22/72
4	70	41 53 00	83 20 00	WESTERN LAKE ERIE	10/22/72
4	71	41 53 00	83 16 00	WESTERN LAKE ERIE	10/22/72
4	72	41 53 00	83 14 00	WESTERN LAKE ERIE	10/22/72
4	73	41 51 00	83 14 00	WESTERN LAKE ERIE	10/22/72

APPENDIX 1 (CONTINUED)

CRUISE	STATION	LATITUDE	LONGITUDE	LOCATION	DATE
4	74	41 51 00	83 16 00	WESTERN LAKE ERIE	10/22/72
4	75	41 51 00	83 18 00	WESTERN LAKE ERIE	10/22/72
4	76	41 51 00	83 20 00	WESTERN LAKE ERIE	10/22/72
4	77	41 51 00	83 22 00	WESTERN LAKE ERIE	10/22/72
4	78	41 49 00	83 24 00	WESTERN LAKE ERIE	10/22/72
4	79	41 47 00	83 26 00	WESTERN LAKE ERIE	10/22/72
4	80	41 47 00	83 24 00	WESTERN LAKE ERIE	10/22/72
4	81	41 47 00	83 22 00	WESTERN LAKE ERIE	10/22/72
4	82	41 49 00	83 22 00	WESTERN LAKE ERIE	10/22/72
4	83	41 49 00	83 20 00	WESTERN LAKE ERIE	10/22/72
4	84	41 49 00	83 18 00	WESTERN LAKE ERIE	10/22/72
4	85	41 47 00	83 20 00	WESTERN LAKE ERIE	10/22/72
4	86	41 43 00	83 26 00	MAUMEE BAY	10/22/72
7	23	42 02 48	80 27 06	CENTRAL LAKE ERIE	10/22/73
7	24	42 05 54	80 29 00	CENTRAL LAKE ERIE	10/22/73
7	25	42 14 54	80 33 36	CENTRAL LAKE ERIE	10/22/73
7	26	42 24 00	80 38 12	CENTRAL LAKE ERIE	10/23/73
7	27	42 32 54	80 45 30	CENTRAL LAKE ERIE	10/23/73
7	28	42 35 30	81 01 00	CENTRAL LAKE ERIE	10/23/73
7	29	42 36 18	81 17 54	CENTRAL LAKE ERIE	10/23/73
7	30	42 25 36	81 12 18	CENTRAL LAKE ERIE	10/23/73
7	31	42 15 12	81 06 24	CENTRAL LAKE ERIE	10/21/73
7	32	42 04 54	81 00 42	CENTRAL LAKE ERIE	10/21/73
7	33	41 55 54	80 55 00	CENTRAL LAKE ERIE	10/21/73
7	34	41 50 00	81 08 54	CENTRAL LAKE ERIE	10/21/73
7	35	41 45 48	81 23 00	CENTRAL LAKE ERIE	10/21/73
7	36	41 56 06	81 28 42	CENTRAL LAKE ERIE	10/21/73
7	37	42 06 36	81 34 30	CENTRAL LAKE ERIE	10/21/73
7	38	42 16 54	81 40 18	CENTRAL LAKE ERIE	10/24/73
7	39	42 21 30	81 42 24	CENTRAL LAKE ERIE	10/24/73
7	40	42 11 30	81 55 18	CENTRAL LAKE ERIE	10/24/73
7	41	42 08 06	82 08 24	CENTRAL LAKE ERIE	10/24/73
7	42	41 57 54	82 02 30	CENTRAL LAKE ERIE	10/24/73
7	43	41 47 18	81 56 42	CENTRAL LAKE ERIE	10/19/73
7	44	41 31 48	81 42 30	CENTRAL LAKE ERIE	10/19/73
7	45	41 36 24	81 53 48	CENTRAL LAKE ERIE	10/19/73
7	46	41 40 54	82 05 12	CENTRAL LAKE ERIE	10/19/73
7	48	42 02 48	82 21 54	CENTRAL LAKE ERIE	10/24/73
7	49	41 55 54	82 24 30	CENTRAL LAKE ERIE	10/24/73
7	50	41 48 48	82 30 06	CENTRAL LAKE ERIE	10/16/73
7	51	41 38 30	82 24 12	CENTRAL LAKE ERIE	10/14/73
7	52	41 31 54	82 27 12	CENTRAL LAKE ERIE	10/14/73
7	53	41 25 12	82 30 12	CENTRAL LAKE ERIE	10/14/73
7	54	41 34 00	82 38 06	CENTRAL LAKE ERIE	10/14/73

APPENDIX 1 (CONTINUED)

CRUISE	STATION	LATITUDE	LONGITUDE	LOCATION	DATE
7	55	41 44 18	82 44 00	WESTERN LAKE ERIE	10/14/73
7	56	41 54 42	82 50 24	WESTERN LAKE ERIE	10/16/73
7	57	41 49 54	83 01 06	WESTERN LAKE ERIE	10/15/73
7	58	41 41 06	82 56 00	WESTERN LAKE ERIE	10/15/73
7	59	41 43 36	83 09 00	WESTERN LAKE ERIE	10/15/73
7	60	41 53 30	83 11 48	WESTERN LAKE ERIE	10/15/73
7	61	41 56 48	83 02 42	WESTERN LAKE ERIE	10/15/73
7	65	41 39 00	82 44 00	WESTERN LAKE ERIE	10/14/73
7	66	41 58 00	82 40 00	WESTERN LAKE ERIE	10/16/73
7	67	41 40 00	82 52 00	WESTERN LAKE ERIE	10/14/73
7	68	41 45 00	82 51 00	WESTERN LAKE ERIE	10/14/73
7	70	41 46 00	83 20 00	WESTERN LAKE ERIE	10/15/73
7	71	42 18 00	81 22 18	CENTRAL LAKE ERIE	10/23/73
7	72	41 57 48	81 11 00	CENTRAL LAKE ERIE	10/21/73
7	74	41 40 00	82 35 00	CENTRAL LAKE ERIE	10/14/73
7	75	41 54 00	83 18 00	WESTERN LAKE ERIE	10/15/73
7	78	41 53 36	82 37 00	WESTERN LAKE ERIE	10/12/73
7	79	41 45 42	82 32 30	CENTRAL LAKE ERIE	10/12/73
7	80	41 42 30	82 32 30	CENTRAL LAKE ERIE	10/12/73
7	81	41 37 30	82 32 30	CENTRAL LAKE ERIE	10/12/73
7	82	41 32 30	82 32 30	CENTRAL LAKE ERIE	10/13/73
7	83	41 27 30	82 27 30	CENTRAL LAKE ERIE	10/13/73
7	84	41 45 00	82 25 00	CENTRAL LAKE ERIE	10/12/73
7	85	41 35 00	82 20 00	CENTRAL LAKE ERIE	10/12/73
7	86	41 30 00	82 20 00	CENTRAL LAKE ERIE	10/13/73
7	87	41 35 00	82 15 00	CENTRAL LAKE ERIE	10/12/73
7	93	41 42 30	81 31 12	CENTRAL LAKE ERIE	10/20/73
7	94	41 45 18	81 34 00	CENTRAL LAKE ERIE	10/20/73
7	95	41 36 24	81 33 30	CENTRAL LAKE ERIE	10/20/73
7	96	41 39 12	81 36 30	CENTRAL LAKE ERIE	10/20/73
7	97	41 32 48	81 38 30	CENTRAL LAKE ERIE	10/20/73
7	98	41 35 30	81 41 36	CENTRAL LAKE ERIE	10/20/73
7	99	41 37 30	81 44 30	CENTRAL LAKE ERIE	10/20/73
7	100	41 36 06	81 47 36	CENTRAL LAKE ERIE	10/20/73
7	101	41 34 30	81 43 30	CENTRAL LAKE ERIE	10/20/73
7	102	41 33 18	81 42 12	CENTRAL LAKE ERIE	10/20/73
7	103	41 42 30	81 43 00	CENTRAL LAKE ERIE	10/20/73
7	104	41 31 06	81 44 18	CENTRAL LAKE ERIE	10/20/73
7	105	41 32 48	81 47 36	CENTRAL LAKE ERIE	10/20/73
7	106	41 30 36	81 47 36	CENTRAL LAKE ERIE	10/20/73
7	107	41 35 00	82 10 00	CENTRAL LAKE ERIE	10/12/73
A	2	42 04 48	83 10 00	DETROIT RIVER	6/11/76
A	3	42 04 48	83 08 30	DETROIT RIVER	6/11/76
A	6	42 06 54	83 10 42	DETROIT RIVER	6/11/76

APPENDIX 1 (CONTINUED)

CRUISE	STATION	LATITUDE	LONGITUDE	LOCATION	DATE
A	31	42 27 18	82 34 00	LAKE ST. CLAIR	6/12/76
A	32	42 27 18	82 30 30	LAKE ST. CLAIR	6/12/76
A	36	42 29 19	82 40 12	LAKE ST. CLAIR	6/12/76
A	37	42 29 21	82 45 48	LAKE ST. CLAIR	6/12/76
A	38	42 29 20	82 51 45	LAKE ST. CLAIR	6/12/76
A	38	42 29 20	82 51 45	LAKE ST. CLAIR	6/12/76
A	40	42 33 00	82 40 00	LAKE ST. CLAIR	6/12/76
A	41	42 33 39	82 42 57	LAKE ST. CLAIR	6/12/76
A	42	42 33 40	82 48 47	LAKE ST. CLAIR	6/12/76
A	44	42 40 16	82 42 51	LAKE ST. CLAIR	6/12/76
A	45	43 00 42	82 25 18	ST. CLAIR RIVER	6/12/76
A	46	42 56 03	82 26 48	ST. CLAIR RIVER	6/12/76
A	47	42 53 42	82 27 48	ST. CLAIR RIVER	6/12/76
A	48	42 49 36	82 28 45	ST. CLAIR RIVER	6/12/76
A	49	42 43 06	82 28 45	ST. CLAIR RIVER	6/12/76
A	50	42 36 54	82 35 06	ST. CLAIR RIVER	6/12/76
B	5	42 38 30	79 16 18	EASTERN LAKE ERIE	7/17/76
B	6	42 37 54	79 24 00	EASTERN LAKE ERIE	7/17/76
B	7	42 30 48	79 28 42	EASTERN LAKE ERIE	7/16/76
B	9	42 32 18	79 37 00	EASTERN LAKE ERIE	7/16/76
B	10	42 40 48	79 41 30	EASTERN LAKE ERIE	7/16/76
B	11	42 48 12	79 33 30	EASTERN LAKE ERIE	7/16/76
B	12	42 46 12	79 47 30	EASTERN LAKE ERIE	7/16/76
B	13	42 45 12	80 00 48	EASTERN LAKE ERIE	7/16/76
B	14	42 38 30	79 56 00	EASTERN LAKE ERIE	7/15/76
B	15	42 31 00	79 53 36	EASTERN LAKE ERIE	7/15/76
B	16	42 20 00	79 45 30	EASTERN LAKE ERIE	7/15/76
B	17	42 19 48	80 00 00	EASTERN LAKE ERIE	7/14/76
B	18	42 25 18	80 04 48	EASTERN LAKE ERIE	7/14/76
B	19	42 30 54	80 09 12	EASTERN LAKE ERIE	7/14/76
B	20	42 29 05	80 18 18	EASTERN LAKE ERIE	7/14/76
B	21	42 20 18	80 12 48	EASTERN LAKE ERIE	7/14/76
B	22	42 12 48	80 07 42	EASTERN LAKE ERIE	7/14/76
B	63	42 25 00	79 48 00	EASTERN LAKE ERIE	7/15/76
B	64	42 12 00	80 03 00	EASTERN LAKE ERIE	7/14/76
B	80	42 41 30	80 08 00	EASTERN LAKE ERIE	7/15/76
C	23	42 02 48	80 27 06	CENTRAL LAKE ERIE	9/12/76
C	24	42 05 54	80 29 00	CENTRAL LAKE ERIE	9/12/76
C	25	42 14 54	80 33 36	CENTRAL LAKE ERIE	9/12/76
C	26	42 24 00	80 38 12	CENTRAL LAKE ERIE	9/12/76
C	27	42 32 54	80 45 30	CENTRAL LAKE ERIE	9/12/76
C	28	42 35 30	81 01 00	CENTRAL LAKE ERIE	10/26/76
C	29	42 36 18	81 17 54	CENTRAL LAKE ERIE	9/12/76
C	30	42 25 48	81 12 18	CENTRAL LAKE ERIE	9/13/76

APPENDIX 1 (CONTINUED)

CRUISE	STATION	LATITUDE	LONGITUDE	LOCATION	DATE
C	31	42 15 12	81 06 24	CENTRAL LAKE ERIE	9/13/76
C	32	42 04 54	81 00 42	CENTRAL LAKE ERIE	9/ 9/76
C	33	41 55 54	80 55 00	CENTRAL LAKE ERIE	9/ 9/76
C	34	41 50 00	81 08 54	CENTRAL LAKE ERIE	9/ 9/76
C	35	41 45 48	81 23 00	CENTRAL LAKE ERIE	9/ 8/76
C	36	41 56 06	81 28 42	CENTRAL LAKE ERIE	9/ 8/76
C	37	42 06 36	81 34 30	CENTRAL LAKE ERIE	9/13/76
C	38	42 16 54	81 40 18	CENTRAL LAKE ERIE	9/13/76
C	39	42 21 30	81 42 24	CENTRAL LAKE ERIE	9/13/76
C	40	42 11 30	81 55 18	CENTRAL LAKE ERIE	9/13/76
C	40	42 11 30	81 55 18	CENTRAL LAKE ERIE	10/24/76
C	41	42 08 06	82 08 24	CENTRAL LAKE ERIE	9/14/76
C	41	42 08 06	82 08 24	CENTRAL LAKE ERIE	10/24/76
C	42	41 57 54	82 02 30	CENTRAL LAKE ERIE	8/21/76
C	42	41 57 54	82 02 30	CENTRAL LAKE ERIE	9/ 8/76
C	43	41 47 18	81 56 42	CENTRAL LAKE ERIE	9/14/76
C	44	41 31 48	81 42 30	CENTRAL LAKE ERIE	9/15/76
C	45	41 36 24	81 53 48	CENTRAL LAKE ERIE	10/23/76
C	46	41 40 54	82 05 12	CENTRAL LAKE ERIE	9/14/76
C	47	41 50 18	82 12 48	CENTRAL LAKE ERIE	8/21/76
C	47	41 50 18	82 12 48	CENTRAL LAKE ERIE	9/ 8/76
C	48	42 02 48	82 21 54	CENTRAL LAKE ERIE	9/14/76
C	48	42 02 48	82 21 54	CENTRAL LAKE ERIE	10/24/76
C	49	41 55 54	82 24 30	CENTRAL LAKE ERIE	9/14/76
C	49	41 55 54	82 24 30	CENTRAL LAKE ERIE	10/24/76
C	50	41 48 48	82 30 06	CENTRAL LAKE ERIE	10/24/76
C	51	41 38 30	82 24 12	CENTRAL LAKE ERIE	10/23/76
C	52	41 31 54	82 27 12	CENTRAL LAKE ERIE	10/23/76
C	53	41 25 12	82 30 12	CENTRAL LAKE ERIE	10/23/76
C	54	41 34 00	82 38 06	CENTRAL LAKE ERIE	10/23/76
C	55	41 44 18	82 44 00	WESTERN LAKE ERIE	10/19/76
C	56	41 54 42	82 50 24	WESTERN LAKE ERIE	10/19/76
C	57	41 49 54	83 01 06	WESTERN LAKE ERIE	10/18/76
C	58	41 41 06	82 56 00	WESTERN LAKE ERIE	10/18/76
C	59	41 43 36	83 09 00	WESTERN LAKE ERIE	10/18/76
C	60	41 53 30	83 11 48	WESTERN LAKE ERIE	10/18/76
C	65	41 39 00	82 44 00	WESTERN LAKE ERIE	10/23/76
C	66	41 58 00	82 40 00	WESTERN LAKE ERIE	10/19/76
C	67	41 40 00	82 52 00	WESTERN LAKE ERIE	10/19/76
C	68	41 45 00	82 51 00	WESTERN LAKE ERIE	10/19/76
C	69	41 33 00	82 55 00	WESTERN LAKE ERIE	10/18/76
C	70	41 46 00	83 20 00	WESTERN LAKE ERIE	10/18/76
C	73	41 58 40	81 45 25	CENTRAL LAKE ERIE	9/ 8/76
C	74	41 40 00	82 35 00	CENTRAL LAKE ERIE	10/29/76

APPENDIX 1 (CONTINUED)

CRUISE	STATION	LATITUDE	LONGITUDE	LOCATION	DATE
C	75	41 54 00	83 18 00	WESTERN LAKE ERIE	10/18/76
C	76	41 36 30	83 04 00	WESTERN LAKE ERIE	10/18/76
C	78	42 07 00	81 15 00	CENTRAL LAKE ERIE	9/ 8/76
C	79	42 15 00	80 48 00	CENTRAL LAKE ERIE	9/ 9/76
C	81	41 36 36	82 50 40	CENTRAL LAKE ERIE	10/18/76
C	82	41 34 30	82 10 00	CENTRAL LAKE ERIE	10/23/76
C	CLH	41 31 47	81 40 00	CLEVELAND HARBOR	10/23/76
D	1	42 20 42.6	82 55 42	DETROIT RIVER	11/14/76
D	2	42 20 43.8	82 55 45	DETROIT RIVER	11/14/76
D	3	42 20 40.8	82 55 43.8	DETROIT RIVER	11/14/76
D	4	42 20 38.4	82 55 45	DETROIT RIVER	11/14/76

APPENDIX 2

ANALYTICAL RESULTS

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
1	1	0.0	1.0	57	3.800	280.0	140.0
1	1	3.0	4.0	51	5.800	210.0	110.0
1	1	9.0	10.0	48	4.900	160.0	100.0
1	1	15.0	16.0	42	2.800	130.0	65.0
1	1	25.0	26.5	31	0.600	40.0	22.0
1	1-A	0.0	2.0	43	0.970	57.0	78.0
1	1-A	5.0	6.0	44	0.870	59.0	87.0
1	1-A	10.0	11.0	45	0.980	63.0	86.0
1	1-A	19.0	20.0	46	1.600	110.0	110.0
1	1-A	35.0	36.5	48	0.680	83.0	81.0
1	2	0.0	1.0	52	2.300	140.0	65.0
1	2	1.0	2.0	50	3.400	140.0	64.0
1	2	3.0	4.0	42	3.000	95.0	56.0
1	2	5.0	6.0	33	2.200	100.0	42.0
1	2	8.5	9.5	40	2.100	200.0	89.0
1	2-A	0.0	1.0	28	0.520	11.0	30.0
1	2-A	1.0	2.0	21	0.300	8.2	0.0
1	2-A	2.0	3.0	21	0.170	6.0	24.0
1	2-A	3.0	4.0	22	0.350	12.0	25.0
1	2-A	5.0	6.5	24	0.320	14.0	40.0
1	3	0.0	1.0	24	0.240	55.0	25.0
1	3	1.0	2.0	23	0.240	38.0	18.0
1	3	3.0	4.0	17	0.280	43.0	18.0
1	3	5.0	6.0	21	0.210	50.0	21.0
1	3	8.0	9.0	25	0.590	64.0	30.0
1	4	0.0	2.0	52	1.600	38.0	88.0
1	4	5.0	6.0	48	1.100	33.0	76.0
1	4	10.0	11.0	42	0.720	27.0	61.0
1	4	19.0	20.0	30	0.090	14.0	48.0
1	4	39.0	40.0	25	0.054	12.0	46.0
1	4	57.0	58.0	22	0.048	18.0	51.0
1	5	0.0	2.0	57	1.300	42.0	79.0
1	5	5.0	6.0	56	1.400	40.0	73.0
1	5	10.0	11.0	42	1.000	39.0	74.0
1	5	19.0	20.0	32	0.081	18.0	51.0
1	5	39.0	40.0	26	0.039	9.5	45.0
1	5	56.0	57.0	23	0.047	10.0	46.0
1	6	0.0	2.0	47	1.000	30.0	48.0
1	6	5.0	6.0	34	0.690	23.0	36.0
1	6	9.0	10.0	33	0.330	24.0	38.0
1	6	15.0	16.0	20	0.066	8.9	17.0
1	6	32.0	33.6	27	0.037	12.0	38.0
1	7	0.0	1.0	22	0.130	66.0	61.0
1	7	1.0	2.0	18	0.160	46.0	48.0
1	8	0.0	2.0	44	0.480	40.0	61.0
1	8	5.0	6.0	34	0.120	17.0	59.0
1	8	15.0	16.0	29	0.083	13.0	45.0
1	8	22.5	23.5	30	0.044	15.0	28.0
1	8	45.0	46.0	30	0.044	19.0	37.0
1	9	0.0	2.0	59	1.300	60.0	71.0
1	9	5.0	6.0	55	0.870	44.0	58.0
1	9	10.0	11.0	56	0.750	49.0	67.0
1	9	19.0	20.0	41	0.068	24.0	39.0
1	9	42.0	43.7	32	0.120	17.0	36.0
1	10	0.0	2.0	57	1.600	80.0	83.0
1	10	2.0	4.0	59	1.800	100.0	100.0
1	10	9.0	10.0	50	1.100	60.0	88.0
1	10	22.0	23.0	34	0.170	21.0	61.0
1	10	48.0	49.5	36	0.340	22.0	63.0
1	11	0.0	2.0	41	0.052	17.0	32.0
1	11	5.0	6.0	39	0.073	17.0	34.0
1	11	15.0	16.0	33	0.053	19.0	40.0
1	11	26.0	27.2	31	0.058	16.0	33.0
1	11	55.0	56.5	32	0.037	16.0	34.0
1	12	0.0	2.0	36	0.088	15.0	0.0
1	12	5.0	6.0	38	0.089	17.0	0.0
1	12	10.0	11.0	35	0.069	13.0	0.0
1	12	19.0	20.0	28	0.140	17.0	0.0
1	12	59.0	60.0	33	0.079	15.0	63.0
1	13	0.0	2.0	43	1.900	130.0	110.0
1	13	5.0	6.0	31	0.120	16.0	43.0
1	13	9.0	10.0	28	0.044	11.0	44.0
1	13	15.0	16.0	28	0.067	15.0	53.0
1	13	19.0	20.0	29	0.044	17.0	48.0
1	13	39.0	40.0	26	0.045	17.0	62.0
1	13	57.0	58.0	26	0.034	7.2	42.0
1	14	0.0	2.0	51	2.000	160.0	76.0
1	14	2.0	4.0	37	0.870	150.0	54.0
1	14	4.0	6.0	23	0.170	50.0	28.0
1	14	6.0	8.0	64	0.560	32.0	37.0
1	14	8.0	10.0	23	0.210	30.0	37.0

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
1	14	10.0	12.0	17	0.130	57.0	15.0
1	14	12.0	14.0	22	0.190	39.0	33.0
1	14	14.0	16.0	21	0.130	25.0	36.0
1	14	16.0	19.0	21	0.140	95.0	37.0
1	15	0.0	1.0	59	4.100	300.0	120.0
1	15	1.0	2.0	53	2.700	0.0	0.0
1	15	4.0	5.0	51	0.0	170.0	100.0
1	15	6.0	7.0	71	4.500	460.0	160.0
1	15	9.8	10.8	36	0.810	110.0	57.0
1	16	0.0	1.0	59	3.000	130.0	110.0
1	16	3.0	4.0	54	3.600	210.0	93.0
1	16	9.0	10.0	43	1.100	150.0	77.0
1	16	15.0	16.0	32	0.530	130.0	48.0
1	16	27.0	28.4	34	0.250	83.0	26.0
1	18	0.0	1.0	54	1.300	92.0	110.0
1	18	1.0	2.0	27	0.600	49.0	58.0
1	18	2.0	3.0	43	0.640	60.0	67.0
1	18	3.0	4.0	33	0.350	31.0	46.0
1	18	7.0	8.0	28	0.054	23.0	80.0
1	19	0.0	1.0	45	1.300	55.0	54.0
1	19	1.0	2.0	34	0.700	38.0	48.0
1	19	3.0	4.0	24	0.180	20.0	79.0
1	19	5.0	6.0	24	0.110	0.0	23.0
1	19	8.8	9.8	28	0.067	31.0	18.0
1	20	0.0	1.0	36	0.510	170.0	53.0
1	20	1.0	2.0	32	0.500	150.0	47.0
1	20	2.0	3.0	23	0.140	120.0	24.0
1	20	3.0	4.5	21	0.140	130.0	20.0
1	21	0.0	1.0	43	0.340	23.0	39.0
1	21	3.0	4.0	28	0.210	18.0	63.0
1	21	9.0	10.0	36	0.200	22.0	68.0
1	21	28.0	29.0	38	0.130	24.0	65.0
1	21	60.0	61.4	33	0.230	17.0	59.0
1	22	0.0	2.0	46	0.430	36.0	70.0
1	22	5.0	6.0	43	0.420	25.0	64.0
1	22	9.0	10.0	44	0.390	29.0	73.0
1	22	15.0	16.0	42	0.200	25.0	64.0
1	22	19.0	20.0	37	0.110	20.0	57.0
1	22	59.0	60.0	33	0.055	22.0	64.0
1	23	0.0	2.0	62	0.120	17.0	0.0
1	23	5.0	6.0	42	0.065	20.0	62.0
1	23	9.0	10.0	39	0.069	15.0	0.0
1	23	15.0	16.0	36	0.052	16.0	59.0
1	23	19.0	20.0	42	0.049	19.0	71.0
1	23	39.0	40.0	31	0.049	19.0	60.0
1	23	58.0	59.0	33	0.053	16.0	64.0
1	24	0.0	2.0	26	0.057	18.0	69.0
1	24	5.0	6.0	29	0.068	19.0	39.0
1	24	15.0	16.0	27	0.076	18.0	62.0
1	24	27.0	28.0	24	0.034	15.0	88.0
1	24	57.0	58.5	34	0.047	19.0	78.0
1	25	0.0	2.0	58	1.100	64.0	83.0
1	25	5.0	6.0	50	0.660	43.0	68.0
1	25	10.0	11.0	40	0.170	21.0	40.0
1	25	19.0	20.0	40	0.082	20.0	60.0
1	25	54.0	55.0	40	0.094	21.0	87.0
1	26	0.0	1.0	29	0.310	75.0	32.0
1	26	3.0	4.0	23	0.170	22.0	61.0
1	26	9.0	10.0	19	0.160	22.0	73.0
1	26	15.0	16.0	20	0.180	25.0	61.0
1	26	20.0	21.3	18	0.150	36.0	69.0
1	28	0.0	1.0	48	0.270	18.0	38.0
1	28	1.0	2.0	41	0.210	170.0	43.0
1	28	2.0	3.0	26	0.090	14.0	41.0
1	29	0.0	1.0	56	0.450	18.0	38.0
1	29	1.0	2.0	27	0.160	89.0	25.0
1	29	5.0	6.0	25	0.180	21.0	27.0
1	29	9.0	10.0	23	0.480	7.9	33.0
1	29	22.0	23.1	21	0.270	0.0	47.0
1	31	0.0	1.0	27	0.150	14.0	40.0
1	31	1.0	2.0	44	0.130	23.0	62.0
1	31	2.0	3.0	37	0.081	16.0	93.0
1	31	3.0	4.0	41	0.082	20.0	74.0
1	31	4.0	5.5	39	0.052	23.0	88.0
1	32	0.0	2.0	50	0.067	20.0	40.0
1	32	5.0	6.0	36	0.072	24.0	46.0
1	32	9.0	10.0	34	0.079	22.0	43.0
1	32	15.0	16.0	35	0.078	25.0	44.0
1	32	19.0	20.0	34	0.051	20.0	79.0
1	32	39.0	40.0	32	0.047	18.0	39.0
1	32	54.0	55.0	40	0.080	23.0	54.0
1	33	0.0	2.0	62	1.700	78.0	93.0
1	33	5.0	6.0	50	0.670	24.0	38.0
1	33	10.0	11.0	50	0.160	14.0	26.0
1	33	19.0	20.0	44	0.099	25.0	39.0
1	33	39.0	40.0	41	0.091	18.0	39.0
1	33	56.0	57.0	35	0.063	20.0	40.0
1	34	0.0	2.0	58	1.800	97.0	100.0
1	34	5.0	6.0	54	0.380	60.0	72.0
1	34	17.0	18.5	47	0.065	18.0	38.0
1	34	29.0	30.0	37	0.040	23.0	46.0
1	34	37.0	38.5	39	0.027	20.0	46.0
1	35	0.0	2.0	58	1.800	110.0	110.0
1	35	5.0	6.0	52	0.920	64.0	74.0
1	35	10.0	11.0	47	0.480	29.0	53.0
1	35	19.0	20.0	44	0.260	18.0	36.0
1	35	52.0	53.0	38	0.052	21.0	37.0
1	36	0.0	1.0	48	1.000	28.0	42.0
1	36	1.0	2.0	37	0.570	26.0	26.0
1	36	5.0	6.0	21	0.280	8.3	12.0
1	36	9.0	10.0	20	0.150	31.0	64.0
1	36	12.0	13.0	34	0.150	180.0	30.0
1	37	0.0	2.0	33	1.400	67.0	69.0
1	37	5.0	6.0	32	0.450	46.0	59.0
1	37	15.0	16.0	37	0.250	32.0	62.0
1	37	28.0	29.0	31	0.110	22.0	46.0
1	37	52.0	53.0	34	0.073	33.0	64.0
1	38	0.0	2.0	42	0.200	21.0	37.0
1	38	5.0	6.0	31	0.150	23.0	58.0
1	38	10.0	11.0	36	0.240	19.0	30.0
1	38	15.0	16.0	34	0.230	28.0	40.0
1	38	29.0	30.7	23	0.036	7.5	19.0
1	39	0.0	1.0	37	0.320	180.0	41.0
1	39	1.0	2.0	35	0.290	0.0	31.0
1	39	5.0	6.0	26	0.220	9.8	32.0
1	39	9.0	10.0	25	0.220	150.0	23.0
1	39	17.0	18.5	23	0.160	50.0	22.0
1	40	0.0	1.0	29	0.035	15.0	46.0
1	40	1.0	2.0	29	0.028	0.0	49.0
1	40	2.0	3.0	25	0.022	190.0	52.0
1	40	3.0	4.0	24	0.006	25.0	48.0
1	40	6.0	7.5	32	0.029	27.0	62.0
1	43	0.0	2.0	62	1.800	100.0	110.0
1	43	5.0	6.0	50	0.500	67.0	85.0
1	43	10.0	11.0	52	0.330	31.0	54.0
1	43	15.0	16.0	41	0.140	18.0	36.0
1	43	30.0	31.5	36	0.032	13.0	34.0
1	44	0.0	2.0	62	1.100	72.0	75.0
1	44	5.0	6.0	52	0.420	46.0	60.0
1	44	10.0	11.0	50	0.350	39.0	56.0
1	44	19.0	20.0	38	0.120	14.0	0.0
1	44	37.0	38.0	40	0.088	18.0	34.0
1	45	0.0	2.0	34	0.080	12.0	24.0
1	45	5.0	6.0	30	0.053	14.0	27.0
1	45	9.0	10.0	32	0.075	8.0	22.0
1	45	15.0	16.0	26	0.062	11.0	22.0
1	45	19.0	20.0	29	0.070	16.0	34.0
1	45	57.0	58.0	66	0.200	18.0	39.0
1	46	0.0	1.0	49	0.430	22.0	28.0
1	46	3.0	4.0	27	0.230	13.0	24.0
1	46	9.0	10.0	29	0.260	18.0	35.0
1	46	20.0	21.0	30	0.100	0.0	32.0
1	46	47.0	48.8	42	0.160	19.0	42.0
1	47	0.0	2.0	62	0.530	39.0	40.0
1	47	5.0	6.0	40	0.320	20.0	32.0
1	47	15.0	16.0	23	0.021	11.0	23.0
1	47	25.0	26.0	26	0.010	11.0	29.0
1	47	46.0	47.0	21	0.005	5.9	20.0
1	48	0.0	2.0	36	0.170	16.0	30.0
1	48	5.0	6.0	29	0.083	9.8	20.0
1	48	9.0	10.0	31	0.055	9.5	24.0
1	48	15.0	16.0	29	0.032	11.0	26.0
1	48	19.0	20.0	28	0.039	11.0	22.0
1	48	59.0	60.0	27	0.037	13.0	29.0
1	49	2.0	5.0	39	0.100	14.0	26.0
1	49	5.0	6.0	30	0.080	13.0	25.0
1	49	10.0	11.0	28	0.052	13.0	24.0
1	49	19.0	20.0	29	0.110	14.0	25.0
1	49	24.6	33.0	28	0.064	15.0	26.0
1	49	33.0	36.0	20	0.061	13.0	25.0
1	49	36.0	40.0	22	0.0	13.0	22.0
1	49	40.0	48.0	21	0.034	13.0	23.0
1	49	48.0	57.0	20	0.066	11.0	22.0
1	50	0.0	1.0	52	0.440	120.0	53.0
1	50	1.0	2.0	44	0.320	15.0	48.0
1	50	5.0	6.0	41	0.230	13.0	34.0
1	50	9.0	10.0	37	0.170	48.0	32.0
1	50	20.0	21.0	32	0.160	69.0	34.0

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
1	51	0.0	2.0	44	0.520	45.0	56.0
1	51	2.0	4.0	47	0.500	38.0	40.0
1	51	4.0	6.0	34	0.200	21.0	29.0
1	51	6.0	8.0	28	0.070	11.0	20.0
1	51	8.0	10.0	30	0.053	12.0	21.0
1	51	10.0	12.0	29	0.074	13.0	19.0
1	51	12.0	14.0	28	0.064	12.0	18.0
1	51	14.0	16.0	29	0.032	12.0	20.0
1	51	16.0	20.0	29	0.070	14.0	21.0
1	51	20.0	24.0	24	0.035	13.0	22.0
1	51	28.0	32.0	25	0.100	14.0	21.0
1	51	32.0	36.0	25	0.075	14.0	22.0
1	51	40.0	47.0	24	0.048	13.0	22.0
1	51	47.0	55.0	28	0.055	16.0	27.0
1	52	0.0	2.0	47	0.610	50.0	99.0
1	52	5.0	6.0	42	0.510	49.0	98.0
1	52	9.0	10.0	36	0.160	35.0	87.0
1	52	15.0	16.0	33	0.270	23.0	65.0
1	52	19.0	20.0	30	0.051	15.0	52.0
1	52	60.0	61.0	23	0.029	9.2	0.0
1	53	0.0	1.0	34	0.340	18.0	29.0
1	53	1.0	2.0	27	0.230	12.0	26.0
1	53	5.0	6.0	20	0.140	63.0	13.0
1	53	9.0	10.0	19	0.120	28.0	29.0
1	53	12.0	13.0	25	0.120	12.0	41.0
1	55	0.0	2.0	61	0.790	64.0	77.0
1	55	5.0	6.0	46	0.530	52.0	83.0
1	55	15.0	16.0	21	0.160	12.0	25.0
1	55	23.6	25.0	29	0.077	21.0	62.0
1	55	50.0	51.3	60	0.073	30.0	64.0
1	56	0.0	1.0	45	0.750	0.0	65.0
1	56	3.0	4.0	43	0.550	0.0	54.0
1	56	9.0	10.0	28	0.019	100.0	44.0
1	56	15.0	16.0	35	0.390	29.0	45.0
1	56	26.0	27.5	22	0.200	15.0	41.0
1	57	0.0	2.0	52	0.340	28.0	59.0
1	57	5.0	6.0	53	0.450	27.0	55.0
1	57	10.0	11.0	47	0.390	23.0	83.0
1	57	19.0	20.0	47	0.310	25.0	53.0
1	57	34.0	35.0	39	0.120	17.0	43.0
1	58	0.0	1.0	48	0.076	17.0	53.0
1	58	1.0	2.0	20	0.019	4.3	14.0
1	58	2.0	3.0	19	0.018	4.2	15.0
1	58	3.0	4.0	19	0.024	2.2	17.0
1	58	6.0	7.3	27	0.069	9.6	27.0
1	58	0.0	2.0	50	0.140	13.0	21.0
1	58	2.0	4.0	23	0.100	7.9	14.0
1	58	4.0	6.0	18	0.047	5.1	6.8
1	58	6.0	8.0	16	0.038	4.9	5.7
1	58	8.0	10.5	18	0.067	6.5	9.5
1	59	0.0	2.0	46	0.300	16.0	0.0
1	59	5.0	6.0	36	0.068	10.0	43.0
1	59	10.0	11.0	34	0.049	9.5	41.0
1	59	19.0	20.0	34	0.045	14.0	48.0
1	59	39.0	40.0	28	0.046	15.0	53.0
1	59	59.0	60.0	33	0.053	18.0	100.0
1	60	0.0	2.0	65	0.670	61.0	120.0
1	60	5.0	6.0	56	0.250	36.0	110.0
1	60	10.0	11.0	41	0.088	21.0	57.0
1	60	19.0	20.0	37	0.130	15.0	60.0
1	60	32.0	33.0	31	0.032	10.0	80.0
1	61	0.0	2.0	65	0.570	35.0	83.0
1	61	5.0	6.0	60	0.560	32.0	73.0
1	61	10.0	11.0	56	0.490	31.0	97.0
1	61	19.0	20.0	44	0.210	17.0	66.0
1	61	53.0	54.5	36	0.085	15.0	48.0
1	62	0.0	1.0	38	0.210	10.0	41.0
1	62	1.0	2.0	42	0.260	14.0	43.0
1	62	5.0	6.0	34	0.240	140.0	21.0
1	62	11.0	12.0	43	0.160	78.0	32.0
1	62	18.0	19.2	22	0.056	8.2	32.0
1	D-1	0.0	1.0	34	1.900	140.0	80.0
1	D-1	1.0	2.0	34	2.000	87.0	110.0
1	D-1	5.0	6.0	20	1.300	46.0	52.0
1	D-1	9.0	10.0	26	1.300	83.0	67.0
1	D-1	16.0	17.6	25	0.740	44.0	67.0
1	D-1	0.0	2.0	30	1.400	71.0	76.0
1	D-1	2.0	4.0	28	2.000	56.0	73.0
1	D-1	4.0	6.0	16	0.480	26.0	24.0
1	D-1	6.0	8.0	22	0.420	24.0	20.0
1	D-1	8.0	10.0	18	0.310	26.0	24.0
1	D-1	10.0	12.0	20	0.250	21.0	20.0
1	D-1	12.0	14.0	23	0.430	26.0	28.0
1	D-1	14.0	16.0	18	0.220	15.0	14.0
1	D-1	16.0	20.0	18	0.140	7.1	9.1
1	D-1	20.0	24.0	25	0.150	7.4	9.5

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
1	D-2	0.0	1.0	37	0.970	100.0	56.0
1	D-2	1.0	2.0	28	0.720	39.0	55.0
1	D-2	8.0	9.0	33	0.660	16.0	50.0
1	D-2	12.0	13.0	21	0.310	8.7	33.0
1	D-2	17.0	18.0	18	0.130	72.0	13.0
1	D-2	0.0	2.0	62	0.910	70.0	49.0
1	D-2	2.0	4.0	28	0.670	46.0	35.0
1	D-2	4.0	6.0	21	0.340	31.0	27.0
1	D-2	6.0	8.0	26	0.250	16.0	17.0
1	D-2	8.0	10.0	18	0.099	7.2	8.2
1	D-2	10.0	12.0	17	0.043	6.3	7.5
1	D-2	12.0	14.0	18	0.031	7.3	7.5
1	D-3	0.0	1.0	35	0.007	32.0	43.0
1	D-3	1.0	2.0	27	0.005	21.0	38.0
1	D-3	2.0	3.0	26	0.007	30.0	48.0
1	D-3	3.0	4.0	24	0.003	94.0	36.0
1	D-3	6.0	7.0	26	0.006	48.0	55.0
1	D-4	0.0	1.0	48	2.000	57.0	58.0
1	D-4	1.0	2.0	34	0.810	23.0	29.0
1	D-4	2.0	3.0	27	0.660	18.0	27.0
1	D-4	3.0	4.0	22	0.540	87.0	31.0
1	D-4	0.0	2.0	87	0.820	26.0	33.0
1	D-4	2.0	4.0	57	0.410	21.0	30.0
1	D-4	4.0	6.0	42	0.350	32.0	37.0
1	D-4	6.0	8.0	37	0.490	29.0	40.0
1	D-4	8.0	10.0	37	0.400	19.0	34.0
1	D-4	10.0	12.0	40	0.480	18.0	35.0
1	D-4	12.0	14.0	39	0.280	17.0	31.0
1	D-4	14.0	16.0	36	0.380	14.0	28.0
1	D-4	16.0	20.0	37	0.320	15.0	26.0
1	D-4	20.0	24.0	38	0.320	14.0	26.0
1	D-4	28.0	32.0	40	0.280	18.0	33.0
1	D-4	32.0	36.0	40	0.230	19.0	32.0
1	D-4	40.0	50.0	31	0.290	14.0	21.0
1	D-4	50.0	61.0	29	0.190	12.0	20.0
1	M-1	0.0	2.0	50	0.660	42.0	54.0
1	M-1	5.0	6.0	42	0.720	39.0	52.0
1	M-1	19.0	20.0	38	1.500	46.0	51.0
1	M-1	29.0	30.0	41	0.500	47.0	55.0
1	M-1	56.0	57.5	36	0.870	40.0	46.0
2	GS1	0.0	10.0	30	2.100	100.0	72.0
2	1	0.0	6.0	25	0.130	0.0	0.0
2	GS2	0.0	10.0	21	0.140	24.0	16.0
2	2	0.0	2.0	33	0.410	66.0	36.0
2	2	2.0	4.0	21	0.120	23.0	19.0
2	2	4.0	6.0	16	0.120	29.0	20.0
2	2	6.0	8.0	24	0.210	31.0	23.0
2	2	8.0	10.0	14	0.030	19.0	11.0
2	2	10.0	12.0	14	0.031	12.0	17.0
2	2	12.0	14.0	12	0.025	8.2	26.0
2	2	14.0	16.0	18	0.059	21.0	42.0
2	2	16.0	18.0	20	0.017	26.0	51.0
2	2	18.0	20.0	17	0.032	20.0	38.0
2	2	20.0	21.5	17	0.013	20.0	40.0
2	2	21.5	25.0	20	0.029	31.0	71.0
2	GS3	0.0	10.0	51	2.700	130.0	75.0
2	3	0.0	2.0	56	2.100	140.0	110.0
2	3	2.0	4.0	52	2.600	160.0	120.0
2	3	4.0	6.0	52	1.400	150.0	110.0
2	3	6.0	8.0	54	1.700	140.0	110.0
2	3	8.0	10.0	54	2.100	170.0	120.0
2	3	10.0	12.0	59	2.100	160.0	110.0
2	3	12.0	14.0	53	1.300	120.0	100.0
2	3	14.0	16.0	50	1.000	110.0	97.0
2	3	16.0	20.0	55	1.000	110.0	85.0
2	3	20.0	24.0	51	0.730	84.0	79.0
2	3	24.0	28.0	46	0.530	47.0	78.0
2	3	28.0	32.0	48	0.750	46.0	79.0
2	3	32.0	36.0	45	0.120	34.0	69.0
2	3	36.0	40.0	45	0.230	23.0	61.0
2	3	40.0	50.0	40	0.160	0.0	52.0
2	3	50.0	56.0	23	0.030	0.0	0.0
2	3	56.0	62.0	22	0.011	9.8	0.0
2	4	0.0	2.0	54	2.000	87.0	67.0
2	4	2.0	4.0	56	1.700	100.0	79.0
2	4	4.0	6.0	55	1.800	130.0	82.0
2	4	6.0	8.0	54	1.700	110.0	72.0
2	4	8.0	10.0	55	1.700	110.0	70.0
2	4	10.0	12.0	54	1.200	0.0	61.0
2	4	12.0	14.0	53	0.940	81.0	56.0
2	4	14.0	16.0	51	0.740	63.0	49.0
2	4	16.0	20.0	54	0.710	51.0	48.0
2	4	20.0	24.0	54	0.450	29.0	38.0
2	4	24.0	28.0	48	0.540	19.0	35.0
2	4	28.0	32.0	46	0.370	14.0	29.0
2	4	32.0	36.0	41	0.250	17.0	34.0
2	4	36.0	40.0	37	0.160	15.0	25.0
2	4	40.0	50.0	35	0.063	12.0	23.0
2	4	50.0	54.0	26	0.055	11.0	24.0
2	4	54.0	60.0	29	0.054	13.0	26.0

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
2	4	60.0	66.0	23	0.045	12.0	26.0
2	GS5	0.0	10.0	28	1.000	32.0	35.0
2	5	0.0	2.0	52	1.400	88.0	79.0
2	5	2.0	4.0	45	0.460	36.0	58.0
2	5	4.0	6.0	39	0.180	21.0	47.0
2	5	6.0	8.0	33	0.065	15.0	45.0
2	5	8.0	10.0	31	0.086	13.0	42.0
2	5	10.0	12.0	31	0.079	16.0	46.0
2	5	12.0	14.0	30	0.076	14.0	35.0
2	5	14.0	16.0	32	0.100	14.0	48.0
2	5	16.0	20.0	31	0.051	14.0	47.0
2	5	20.0	24.0	31	0.048	15.0	47.0
2	5	24.0	28.0	29	0.087	13.0	50.0
2	5	28.0	32.0	26	0.040	14.0	48.0
2	5	32.0	36.0	24	0.040	11.0	48.0
2	5	36.0	40.0	26	0.043	14.0	52.0
2	5	40.0	50.0	25	0.038	13.0	45.0
2	5	50.0	59.0	22	0.041	14.0	51.0
2	5	59.0	67.0	38	0.074	20.0	43.0
2	5	67.0	76.0	43	0.100	17.0	54.0
2	5	76.0	87.0	46	0.084	19.0	54.0
2	5	87.0	93.0	25	0.056	13.0	52.0
2	GS6	0.0	10.0	55	2.000	110.0	74.0
2	6	0.0	2.0	61	2.200	120.0	80.0
2	6	2.0	4.0	70	1.800	120.0	87.0
2	6	4.0	6.0	67	1.200	110.0	74.0
2	6	6.0	8.0	66	1.200	110.0	70.0
2	6	8.0	10.0	64	1.100	95.0	69.0
2	6	10.0	12.0	56	0.360	54.0	49.0
2	6	12.0	14.0	56	0.170	44.0	48.0
2	6	14.0	16.0	54	0.057	29.0	42.0
2	6	16.0	20.0	54	0.029	22.0	32.0
2	6	20.0	24.0	45	0.015	17.0	24.0
2	6	24.0	28.0	44	0.023	17.0	22.0
2	6	28.0	32.0	42	0.011	15.0	21.0
2	6	32.0	36.0	43	0.004	18.0	27.0
2	6	36.0	40.0	40	0.006	19.0	27.0
2	6	40.0	50.0	41	.0.002	17.0	24.0
2	6	50.0	60.0	38	0.003	14.0	22.0
2	6	70.0	80.0	33	0.011	14.0	19.0
2	6	96.0	100.0	31	0.008	11.0	17.0
2	6	108.0	112.0	32	0.012	11.0	20.0
2	6	136.0	140.0	20	0.0	6.1	10.0
2	6	146.0	151.0	14	0.005	7.6	14.0
2	GS7	0.0	10.0	51	1.400	110.0	74.0
2	7	0.0	2.0	59	2.800	140.0	140.0
2	7	2.0	4.0	61	2.500	140.0	160.0
2	7	4.0	6.0	61	2.100	140.0	150.0
2	7	6.0	8.0	60	2.100	99.0	110.0
2	7	8.0	10.0	56	1.600	110.0	130.0
2	7	10.0	12.0	57	1.600	120.0	140.0
2	7	12.0	14.0	51	0.950	71.0	120.0
2	7	14.0	16.0	49	0.360	33.0	84.0
2	7	16.0	20.0	50	0.260	28.0	82.0
2	7	20.0	24.0	45	0.220	28.0	83.0
2	7	24.0	27.0	43	0.089	25.0	79.0
2	7	27.0	31.0	46	0.098	23.0	72.0
2	7	31.0	36.0	42	0.070	20.0	59.0
2	7	36.0	40.0	41	0.065	25.0	72.0
2	7	40.0	50.0	40	0.051	18.0	67.0
2	7	50.0	55.0	39	0.090	20.0	67.0
2	7	55.0	65.0	37	0.140	17.0	71.0
2	7	65.0	74.0	35	0.056	14.0	62.0
2	7	74.0	78.0	27	0.037	14.0	57.0
2	7	78.0	91.0	40	0.072	15.0	77.0
2	7	91.0	98.0	37	0.088	15.0	62.0
2	7	98.0	100.0	34	0.081	14.0	63.0
2	7	100.0	103.0	41	0.120	18.0	67.0
2	7	103.0	105.0	25	0.047	9.5	42.0
2	7	105.0	115.0	17	0.028	11.0	72.0
2	7	115.0	119.0	14	0.020	8.8	70.0
2	7	119.0	123.0	16	0.038	11.0	75.0
2	7	123.0	127.0	18	0.031	0.0	76.0
2	7	127.0	131.0	19	0.030	10.0	73.0
2	7	131.0	135.0	15	0.037	12.0	77.0
2	GS9	0.0	10.0	37	1.200	69.0	70.0
2	9	0.0	2.0	60	1.400	80.0	140.0
2	9	2.0	4.0	57	1.400	90.0	160.0
2	9	4.0	6.0	57	1.300	91.0	160.0
2	9	6.0	8.0	55	0.990	57.0	120.0
2	9	8.0	10.0	52	0.650	52.0	110.0
2	9	10.0	12.0	49	0.460	36.0	100.0
2	9	12.0	14.0	47	0.430	29.0	100.0
2	9	14.0	16.0	48	0.450	23.0	98.0
2	9	16.0	20.0	51	0.087	19.0	82.0
2	9	20.0	24.0	52	0.079	19.0	82.0
2	9	24.0	28.0	49	0.047	23.0	78.0
2	9	28.0	32.0	45	0.056	19.0	71.0
2	9	32.0	36.0	46	0.100	19.0	66.0
2	9	36.0	40.0	48	0.065	22.0	77.0
2	9	40.0	50.0	45	0.066	20.0	76.0
2	9	70.0	80.0	42	0.097	19.0	98.0
2	9	80.0	84.0	38	0.074	19.0	83.0
2	9	84.0	86.0	37	0.049	16.0	88.0
2	9	86.0	88.0	36	0.073	15.0	72.0
2	9	88.0	90.0	37	0.074	17.0	85.0

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
2	9	90.0	94.0	42	0.055	19.0	76.0
2	9	94.0	98.0	43	0.066	19.0	93.0
2	9	118.0	120.0	44	0.056	21.0	77.0
2	9	120.0	124.0	50	0.066	23.0	82.0
2	9	124.0	128.0	44	0.073	19.0	84.0
2	9	129.0	132.0	53	0.100	18.0	64.0
2	9	132.0	136.0	49	0.056	11.0	65.0
2	9	136.0	140.0	33	0.033	15.0	96.0
2	9	140.0	144.0	27	0.045	9.9	80.0
2	9	144.0	147.0	27	0.024	8.3	84.0
2	9	147.0	148.0	47	0.036	10.0	89.0
2	9	148.0	152.0	65	0.110	12.0	94.0
2	9	152.0	156.0	54	0.045	15.0	59.0
2	9	156.0	161.0	27	0.023	18.0	72.0
2	9	161.0	167.0	24	0.029	19.0	71.0
2	GS10	0.0	10.0	55	0.840	61.0	63.0
2	10	0.0	2.0	55	0.710	75.0	84.0
2	10	2.0	4.0	54	0.870	72.0	84.0
2	10	4.0	6.0	48	0.730	63.0	80.0
2	10	6.0	8.0	43	0.450	49.0	63.0
2	10	8.0	10.0	41	0.330	43.0	58.0
2	10	10.0	12.0	36	0.170	34.0	51.0
2	10	12.0	14.0	31	0.140	27.0	46.0
2	10	14.0	16.0	35	0.052	21.0	37.0
2	10	16.0	20.0	40	0.030	18.0	37.0
2	10	20.0	24.0	41	0.026	21.0	42.0
2	10	24.0	28.0	37	0.042	19.0	39.0
2	10	28.0	30.5	48	0.032	21.0	44.0
2	10	30.5	36.0	41	0.028	20.0	41.0
2	10	36.0	40.0	38	0.029	16.0	40.0
2	10	40.0	50.0	39	0.025	0.0	47.0
2	10	60.0	70.0	42	0.045	21.0	49.0
2	10	80.0	87.0	40	0.034	21.0	50.0
2	10	87.0	91.0	38	0.019	15.0	36.0
2	10	91.0	95.0	31	0.013	9.8	30.0
2	10	95.0	99.0	63	0.033	11.0	40.0
2	10	99.0	105.0	54	0.032	16.0	44.0
2	10	105.0	109.0	46	0.050	15.0	41.0
2	10	109.0	110.5	43	0.060	19.0	46.0
2	10	110.5	114.5	54	0.045	12.0	45.0
2	10	114.5	122.5	38	0.026	9.8	31.0
2	10	122.5	129.5	43	0.025	19.0	44.0
2	GS11	0.0	10.0	48	0.300	0.0	0.0
2	11	0.0	2.0	49	0.820	48.0	67.0
2	11	2.0	4.0	40	0.570	38.0	54.0
2	11	4.0	6.0	36	0.170	29.0	41.0
2	11	6.0	8.0	34	0.110	24.0	40.0
2	11	8.0	10.0	32	0.076	21.0	42.0
2	11	10.0	12.0	37	0.050	22.0	49.0
2	11	12.0	14.0	34	0.043	21.0	52.0
2	11	14.0	16.0	36	0.048	22.0	48.0
2	11	16.0	20.0	47	0.032	21.0	49.0
2	11	20.0	24.0	51	0.038	25.0	55.0
2	11	24.0	28.0	44	0.036	24.0	51.0
2	11	28.0	31.0	47	0.024	18.0	44.0
2	11	31.0	36.0	38	0.023	13.0	41.0
2	11	36.0	37.0	37	0.021	14.0	51.0
2	11	37.0	41.0	42	0.023	15.0	51.0
2	11	41.0	45.0	44	0.015	21.0	59.0
2	11	60.0	70.0	47	0.024	14.0	49.0
2	11	80.0	90.0	48	0.027	18.0	53.0
2	11	100.0	110.0	51	0.026	16.0	52.0
2	11	110.0	118.0	51	0.039	13.0	39.0
2	11	118.0	120.0	62	0.053	11.0	26.0
2	11	120.0	122.0	41	0.032	12.0	21.0
2	11	122.0	124.0	26	0.022	11.0	27.0
2	11	124.0	127.0	26	0.023	9.3	23.0
2	11	127.0	128.5	21	0.014	9.5	27.0
2	11	128.5	135.0	20	0.016	12.0	32.0
2	11	135.0	140.0	18	0.014	12.0	31.0
2	11	140.0	145.0	18	0.017	13.0	31.0
2	11	155.0	158.5	23	0.019	12.0	35.0
2	11	158.5	161.0	45	0.032	12.0	44.0
2	11	161.0	163.0	44	0.033	13.0	51.0
2	GS12	0.0	10.0	34	0.570	46.0	54.0
2	12	0.0	2.0	55	0.490	47.0	63.0
2	12	2.0	4.0	52	0.620	53.0	63.0
2	12	4.0	6.0	48	0.530	57.0	64.0
2	12	6.0	8.0	39	0.220	33.0	45.0
2	12	8.0	10.0	38	0.120	31.0	38.0
2	12	10.0	12.0	32	0.087	22.0	30.0
2	12	12.0	14.0	24	0.021	14.0	33.0
2	12	14.0	16.0	21	0.021	17.0	35.0
2	12	16.0	20.0	21	0.020	14.0	31.0
2	12	16.0	20.0	20	0.009	14.0	29.0
2	12	20.0	22.0	18	0.0	8.1	24.0
2	12	22.0	24.0	30	0.012	21.0	33.0
2	12	24.0	26.0	41	0.033	26.0	36.0
2	12	26.0	29.0	40	0.012	25.0	35.0
2	GS13	0.0	10.0	56	0.200	29.0	39.0
2	13	0.0	2.0	54	0.440	37.0	65.0
2	13	2.0	4.0	45	0.130	23.0	49.0
2	13	4.0	6.0	44	0.052	19.0	43.0
2	13	6.0	8.0	43	0.110	18.0	39.0
2	13	8.0	10.0	43	0.096	15.0	36.0
2	13	10.0	12.0	38	0.054	13.0	34.0

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
2	13	12.0	14.0	34	0.054	13.0	31.0
2	13	14.0	16.0	33	0.040	14.0	34.0
2	13	16.0	20.0	36	0.018	15.0	39.0
2	13	20.0	24.0	38	0.038	11.0	36.0
2	13	24.0	28.0	32	0.055	12.0	33.0
2	13	28.0	30.0	28	0.027	13.0	35.0
2	13	30.0	32.0	26	0.027	14.0	38.0
2	13	32.0	36.0	28	0.028	13.0	40.0
2	13	36.0	40.0	29	0.027	13.0	38.0
2	13	40.0	50.0	33	0.032	15.0	41.0
2	13	50.0	54.0	30	0.036	16.0	41.0
2	13	54.0	56.0	31	0.029	12.0	41.0
2	13	56.0	60.0	32	0.040	15.0	44.0
2	13	60.0	66.0	35	0.036	15.0	53.0
2	13	66.0	76.5	38	0.041	15.0	50.0
2	13	76.5	80.0	37	0.033	19.0	49.0
2	13	80.0	90.0	39	0.032	17.0	51.0
2	13	110.0	120.0	41	0.024	19.0	63.0
2	13	140.0	150.0	39	0.024	20.0	65.0
2	13	170.0	180.0	40	0.028	22.0	68.0
2	13	200.0	203.5	35	0.030	21.0	67.0
2	13	203.5	208.0	45	0.170	0.0	37.0
2	GS14	0.0	10.0	78	0.180	35.0	47.0
2	14	0.0	2.0	63	0.120	18.0	39.0
2	14	2.0	4.0	57	0.064	22.0	42.0
2	14	4.0	6.0	55	0.029	35.0	53.0
2	14	6.0	8.0	53	0.034	16.0	56.0
2	14	8.0	10.0	51	0.030	21.0	51.0
2	14	10.0	12.0	53	0.025	18.0	53.0
2	14	12.0	14.0	47	0.024	24.0	55.0
2	14	14.0	16.0	52	0.028	26.0	52.0
2	14	16.0	20.0	50	0.062	34.0	42.0
2	14	20.0	24.0	47	0.022	24.0	43.0
2	14	24.0	28.0	44	0.030	21.0	49.0
2	14	28.0	32.0	50	0.031	21.0	47.0
2	14	32.0	36.0	47	0.021	25.0	51.0
2	14	36.0	40.0	46	0.025	23.0	42.0
2	14	40.0	50.0	47	0.037	30.0	54.0
2	14	50.0	60.0	48	0.031	29.0	51.0
2	14	60.0	70.0	41	0.039	27.0	51.0
2	14	70.0	80.0	46	0.025	28.0	44.0
2	14	100.0	110.0	48	0.034	24.0	47.0
2	14	110.0	114.0	49	0.029	24.0	49.0
2	14	114.0	120.0	38	0.022	25.0	46.0
2	14	140.0	150.0	45	0.030	30.0	50.0
2	14	170.0	180.0	45	0.017	18.0	45.0
2	14	200.0	210.0	45	0.012	21.0	52.0
2	14	230.0	240.0	40	0.016	22.0	49.0
2	14	260.0	270.0	44	0.017	23.0	45.0
2	14	270.0	278.0	39	0.024	18.0	46.0
2	14	278.0	286.0	36	0.030	26.0	75.0
2	14A	0.0	2.0	59	0.560	60.0	65.0
2	14A	2.0	4.0	52	0.440	53.0	57.0
2	14A	4.0	6.0	47	0.270	35.0	52.0
2	14A	6.0	8.0	45	0.170	26.0	41.0
2	14A	8.0	10.0	38	0.120	21.0	40.0
2	14A	10.0	12.0	30	0.071	17.0	31.0
2	14A	12.0	14.0	32	0.057	19.0	32.0
2	14A	14.0	16.0	31	0.052	17.0	28.0
2	14A	16.0	20.0	41	0.039	18.0	29.0
2	14A	24.0	28.0	39	0.120	16.0	25.0
2	14A	32.0	36.0	36	0.041	16.0	24.0
2	14A	45.0	49.0	33	0.007	15.0	23.0
2	GS15	0.0	10.0	69	0.190	41.0	48.0
2	15	0.0	2.0	51	0.089	0.0	0.0
2	15	2.0	4.0	36	0.052	21.0	36.0
2	15	4.0	6.0	39	0.034	22.0	39.0
2	15	6.0	8.0	37	0.035	19.0	36.0
2	15	8.0	10.0	38	0.034	19.0	39.0
2	15	10.0	12.0	33	0.035	18.0	36.0
2	15	12.0	14.0	30	0.028	20.0	40.0
2	15	14.0	16.0	31	0.035	21.0	38.0
2	15	16.0	20.0	31	0.036	20.0	35.0
2	15	20.0	24.0	31	0.010	18.0	32.0
2	15	24.0	28.0	30	0.013	18.0	31.0
2	15	28.0	32.0	29	0.010	18.0	31.0
2	15	32.0	36.0	33	0.009	16.0	31.0
2	15	36.0	40.0	30	0.016	16.0	30.0
2	15	40.0	48.0	30	0.080	17.0	33.0
2	15	70.0	80.0	38	0.027	18.0	34.0
2	15	100.0	110.0	41	0.017	16.0	33.0
2	GS16	0.0	10.0	74	0.270	50.0	57.0
2	16	0.0	2.0	56	0.330	60.0	56.0
2	16	2.0	4.0	54	0.280	57.0	33.0
2	16	4.0	6.0	50	0.200	32.0	17.0
2	16	6.0	8.0	50	0.190	35.0	33.0
2	16	8.0	10.0	47	0.053	37.0	43.0
2	16	10.0	12.0	41	0.190	39.0	17.0
2	16	12.0	14.0	40	0.150	33.0	31.0
2	16	14.0	16.0	45	0.160	35.0	20.0
2	16	16.0	21.0	39	0.093	34.0	32.0
2	16	21.0	31.5	44	0.130	27.0	29.0
2	16	31.5	35.5	53	0.063	34.0	0.0
2	16	35.5	39.5	44	0.058	30.0	28.0
2	16	39.5	43.5	39	0.047	14.0	18.0
2	16	43.5	47.0	42	0.054	20.0	22.0
2	16	47.0	50.0	40	0.050	21.0	10.0
2	16	50.0	52.5	37	0.041	17.0	9.6
2	16	52.5	54.5	44	0.039	20.0	19.0
2	16	54.5	56.5	40	0.039	19.0	24.0
2	16	56.5	60.0	38	0.027	18.0	27.0
2	16	70.0	80.0	32	0.028	21.0	30.0
2	16	90.0	100.0	28	0.021	18.0	32.0
2	16	110.0	120.0	32	0.032	17.0	28.0
2	16	130.0	140.0	31	0.027	21.0	34.0
2	16	150.0	160.0	32	0.020	22.0	33.0
2	16	170.0	180.0	32	0.025	25.0	24.0
2	16	180.0	185.5	28	0.024	25.0	30.0
2	16	185.5	187.5	20	0.025	16.0	22.0
2	16	187.5	189.5	19	0.031	16.0	16.0
2	16	189.5	191.5	20	0.026	18.0	22.0
2	16	191.5	193.5	21	0.020	15.0	26.0
2	16	193.5	195.5	22	0.033	13.0	24.0
2	16	195.5	197.5	19	0.026	18.0	26.0
2	16	197.5	202.0	23	0.032	19.0	28.0
2	GS17	0.0	10.0	64	0.130	36.0	46.0
2	17	0.0	2.0	79	0.100	34.0	50.0
2	17	2.0	4.0	85	0.033	33.0	51.0
2	17	4.0	6.0	77	0.038	28.0	48.0
2	17	6.0	8.0	71	0.031	29.0	50.0
2	17	8.0	10.0	68	0.027	28.0	47.0
2	17	10.0	12.0	68	0.022	27.0	46.0
2	17	12.0	14.0	78	0.041	32.0	53.0
2	17	14.0	16.0	73	0.059	31.0	52.0
2	GS18	0.0	10.0	62	0.160	37.0	48.0
2	18	0.0	2.0	56	0.180	47.0	35.0
2	18	2.0	4.0	57	0.110	34.0	20.0
2	18	4.0	6.0	54	0.160	35.0	18.0
2	18	6.0	8.0	60	0.073	31.0	5.7
2	18	8.0	10.0	56	0.047	27.0	17.0
2	18	10.0	12.0	55	0.042	36.0	11.0
2	18	12.0	14.0	52	0.013	37.0	28.0
2	18	14.0	16.0	47	0.034	29.0	23.0
2	18	16.0	20.0	48	0.037	32.0	32.0
2	18	20.0	24.0	55	0.028	31.0	32.0
2	18	24.0	28.0	47	0.029	30.0	47.0
2	18	28.0	32.0	50	0.033	29.0	50.0
2	18	32.0	36.0	55	0.018	30.0	40.0
2	18	36.0	40.0	50	0.023	32.0	51.0
2	18	40.0	50.0	44	0.014	28.0	53.0
2	18	50.0	60.0	46	0.029	22.0	38.0
2	18	80.0	90.0	41	0.023	27.0	47.0
2	18	110.0	120.0	45	0.042	26.0	38.0
2	18	140.0	150.0	45	0.027	32.0	49.0
2	18	170.0	180.0	47	0.024	31.0	56.0
2	18	180.0	190.0	41	0.018	31.0	52.0
2	18	210.0	220.0	44	0.015	28.0	52.0
2	18	240.0	250.0	44	0.011	26.0	57.0
2	18	270.0	280.0	42	0.021	27.0	50.0
2	18	300.0	310.0	42	0.024	24.0	50.0
2	18	320.0	327.5	38	0.014	0.0	0.0
2	18	327.5	332.0	42	0.017	30.0	51.0
2	GS19	0.0	10.0	68	0.350	59.0	60.0
2	19	0.0	2.0	63	0.460	53.0	95.0
2	19	2.0	4.0	60	0.440	58.0	80.0
2	19	4.0	6.0	57	0.360	47.0	70.0
2	19	6.0	8.0	56	0.360	48.0	71.0
2	19	8.0	10.0	52	0.260	34.0	72.0
2	19	10.0	12.0	52	0.210	24.0	60.0
2	19	12.0	14.0	49	0.110	16.0	47.0
2	19	14.0	16.0	55	0.120	19.0	58.0
2	19	16.0	20.0	51	0.053	16.0	35.0
2	19	20.0	24.0	46	0.047	15.0	41.0
2	19	24.0	28.0	50	0.050	16.0	44.0
2	19	28.0	32.0	49	0.047	16.0	38.0
2	19	32.0	36.0	45	0.056	16.0	40.0
2	19	36.0	40.0	41	0.028	13.0	43.0
2	19	40.0	43.5	40	0.041	13.0	41.0
2	19	43.5	47.0	44	0.032	16.0	52.0
2	19	47.0	51.0	39	0.045	12.0	30.0
2	19	51.0	53.0	39	0.049	11.0	31.0
2	19	53.0	58.0	35	0.049	10.0	39.0
2	19	58.0	60.0	30	0.022	9.3	38.0
2	19	60.0	70.0	26	0.025	12.0	51.0
2	19	70.0	73.0	25	0.036	14.0	47.0
2	19	73.0	75.5	23	0.034	16.0	51.0
2	19	75.5	78.0	21	0.031	14.0	53.0
2	GS20	0.0	10.0	45	0.670	140.0	75.0
2	20	0.0	1.0	45	0.930	150.0	90.0
2	20	1.0	3.0	43	0.770	150.0	0.0
2	20	3.0	5.0	47	0.550	150.0	110.0
2	20	5.0	7.0	50	0.500	170.0	99.0
2	20	7.0	9.0	51	1.400	190.0	110.0
2	20	9.0	11.0	53	0.610	190.0	130.0
2	20	11.0	13.0	55	0.800	210.0	130.0
2	20	13.0	15.0	54	0.910	210.0	120.0
2	20	15.0	17.0	50	0.830	150.0	98.0
2	20	17.0	21.0	52	0.830	150.0	100.0
2	20	21.0	25.0	50	0.820	160.0	120.0
2	20	25.0	29.0	55	1.000	210.0	140.0
2	20	29.0	33.0	55	0.660	210.0	130.0

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
2	20	33.0	37.0	49	0.630	190.0	140.0
2	20	37.0	41.0	52	0.780	200.0	120.0
2	20	41.0	45.0	54	0.650	170.0	110.0
2	20	45.0	49.0	56	0.740	200.0	110.0
2	20	49.0	59.0	54	0.700	170.0	120.0
2	20	59.0	69.0	54	0.720	170.0	98.0
2	20	69.0	79.0	53	0.960	83.0	77.0
2	20	79.0	89.0	48	0.900	67.0	73.0
2	20	89.0	99.0	50	0.870	34.0	61.0
2	20	99.0	103.0	49	0.930	33.0	63.0
2	20	103.0	108.0	44	0.880	30.0	57.0
2	20	108.0	113.0	45	1.100	31.0	70.0
2	20	113.0	121.0	37	0.960	28.0	51.0
2	20	121.0	125.0	40	0.180	18.0	58.0
2	GS21	0.0	10.0	61	0.240	34.0	43.0
2	21	0.0	2.0	56	0.680	0.0	0.0
2	21	2.0	4.0	53	0.650	0.0	0.0
2	21	4.0	6.0	51	0.095	27.0	37.0
2	21	6.0	8.0	48	0.055	24.0	38.0
2	21	8.0	10.0	46	0.061	19.0	31.0
2	21	10.0	12.0	42	0.037	22.0	33.0
2	21	12.0	14.0	41	0.017	23.0	35.0
2	21	14.0	16.0	37	0.011	18.0	29.0
2	GS22	0.0	10.0	62	0.250	45.0	48.0
2	22	0.0	2.0	25	0.370	0.0	0.0
2	22	2.0	4.0	48	0.530	0.0	0.0
2	22	4.0	6.0	41	0.013	24.0	29.0
2	22	6.0	8.0	42	0.023	19.0	41.0
2	22	8.0	10.0	27	0.012	20.0	20.0
2	22	10.0	12.0	38	0.021	22.0	36.0
2	22	12.0	14.0	38	0.013	24.0	40.0
2	22	14.0	16.0	43	0.022	20.0	43.0
2	GS24	0.0	10.0	33	0.050	16.0	20.0
2	24	0.0	2.0	35	0.190	0.0	0.0
2	24	2.0	4.0	30	0.240	0.0	0.0
2	24	4.0	6.0	31	0.018	14.0	21.0
2	24	6.0	8.0	30	0.022	14.0	25.0
2	24	8.0	10.0	31	0.015	15.0	26.0
2	24	10.0	12.0	30	0.019	15.0	26.0
2	24	12.0	14.0	27	0.020	13.0	22.0
2	24	14.0	16.0	25	0.022	11.0	21.0
2	GS25	0.0	10.0	51	0.250	40.0	41.0
2	25	0.0	2.0	36	0.230	24.0	0.0
2	25	2.0	4.0	29	0.120	15.0	0.0
2	25	4.0	6.0	36	0.180	19.0	0.0
2	25	6.0	12.0	29	0.069	14.0	0.0
2	GS26	0.0	10.0	41	0.046	13.0	17.0
2	26	0.0	2.0	15	0.014	5.0	0.0
2	26	2.0	4.0	5	0.015	4.5	0.0
2	26	4.0	6.0	14	0.012	4.7	0.0
2	26	6.0	8.0	14	0.010	14.0	0.0
2	26	8.0	10.0	17	0.026	13.0	0.0
2	26	10.0	12.0	27	0.037	22.0	0.0
2	26	12.0	14.0	25	0.020	23.0	0.0
2	26	14.0	16.0	28	0.017	18.0	0.0
2	26	16.0	18.0	25	0.013	20.0	0.0
2	26	18.0	21.0	26	0.017	24.0	0.0
2	26	21.0	23.0	25	0.014	22.0	0.0
2	26	23.0	25.0	23	0.018	18.0	0.0
2	26	25.0	28.0	25	0.024	22.0	0.0
2	26	28.0	30.0	26	0.011	24.0	0.0
2	26	30.0	32.0	28	0.012	22.0	0.0
2	26	32.0	34.0	28	0.027	22.0	0.0
2	26	34.0	39.0	31	0.032	23.0	0.0
2	26	39.0	42.0	30	0.023	19.0	0.0
2	26	42.0	45.0	29	0.022	24.0	0.0
2	26	45.0	50.0	30	0.030	20.0	0.0
2	26	50.0	54.0	28	0.016	18.0	0.0
2	GS27	0.0	10.0	16	0.011	2.9	7.8
2	GS28	0.0	10.0	37	0.094	20.0	25.0
2	28B	0.0	10.0	50	0.810	56.0	52.0
2	GS29	0.0	10.0	61	0.190	46.0	48.0
2	29	0.0	2.0	56	0.190	44.0	63.0
2	29	2.0	4.0	53	0.110	38.0	69.0
2	29	4.0	6.0	52	0.059	35.0	65.0
2	29	6.0	8.0	51	0.120	33.0	64.0
2	29	8.0	10.0	47	0.140	30.0	60.0
2	29	10.0	12.0	51	0.076	25.0	58.0
2	29	12.0	14.0	49	0.065	24.0	54.0
2	29	14.0	16.0	51	0.100	25.0	51.0
2	29	16.0	20.0	46	0.069	23.0	51.0
2	29	20.0	24.0	50	0.065	20.0	48.0
2	29	24.0	28.0	51	0.030	24.0	51.0
2	29	28.0	32.0	51	0.048	25.0	50.0
2	29	32.0	36.0	51	0.048	25.0	50.0
2	29	36.0	41.0	53	0.036	24.0	55.0
2	29	41.0	50.0	44	0.044	23.0	52.0
2	29	50.0	60.0	45	0.039	21.0	50.0
2	29	60.0	70.0	44	0.023	23.0	49.0
2	29	70.0	80.0	45	0.032	22.0	51.0
2	29	80.0	90.0	43	0.049	24.0	52.0

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
2	29	110.0	120.0	46	0.037	22.0	52.0
2	29	140.0	150.0	48	0.022	25.0	56.0
2	29	170.0	180.0	45	0.043	19.0	54.0
2	29	200.0	210.0	44	0.032	22.0	54.0
2	29	230.0	240.0	41	0.019	24.0	56.0
2	29	260.0	270.0	46	0.018	20.0	51.0
2	29	290.0	300.0	49	0.027	23.0	58.0
2	29	320.0	330.0	46	0.022	23.0	54.0
2	29	350.0	360.0	45	0.014	26.0	56.0
2	29	380.0	391.0	44	0.017	23.0	52.0
2	29	391.0	397.0	38	0.014	22.0	53.0
2	GS30	0.0	10.0	54	0.0	30.0	45.0
2	30	0.0	2.0	47	0.120	31.0	47.0
2	30	2.0	4.0	43	0.075	26.0	37.0
2	30	4.0	6.0	42	0.077	26.0	31.0
2	30	6.0	8.0	42	0.069	26.0	32.0
2	30	8.0	10.0	43	0.024	23.0	28.0
2	30	10.0	12.0	41	0.042	23.0	28.0
2	30	12.0	14.0	43	0.041	22.0	29.0
2	30	14.0	16.0	40	0.028	22.0	28.0
2	30	16.0	20.0	48	0.024	21.0	33.0
2	30	20.0	24.0	49	0.024	19.0	28.0
2	30	24.0	28.0	44	0.021	22.0	33.0
2	30	28.0	32.0	44	0.008	20.0	22.0
2	30	32.0	36.0	49	0.054	22.0	28.0
2	30	36.0	40.0	49	0.018	20.0	25.0
2	30	40.0	50.0	49	0.027	21.0	30.0
2	30	50.0	60.0	42	0.019	22.0	0.0
2	30	80.0	91.0	44	0.029	21.0	20.0
2	30	91.0	100.0	45	0.011	21.0	16.0
2	30	120.0	130.0	40	0.031	18.0	17.0
2	30	150.0	160.0	45	0.025	19.0	23.0
2	30	180.0	190.0	42	0.013	23.0	21.0
2	30	210.0	220.0	40	0.022	18.0	21.0
2	30	240.0	250.0	36	0.019	19.0	14.0
2	30	250.0	260.0	35	0.022	20.0	21.0
2	30	260.0	265.0	37	0.013	16.0	23.0
2	30	265.0	270.0	33	0.019	17.0	27.0
2	GS31	0.0	10.0	53	0.120	34.0	46.0
2	31	0.0	2.0	47	0.093	29.0	38.0
2	31	2.0	4.0	48	0.029	23.0	32.0
2	31	4.0	6.0	49	0.068	23.0	34.0
2	31	6.0	8.0	50	0.061	23.0	34.0
2	31	8.0	10.0	49	0.047	22.0	33.0
2	31	10.0	12.0	49	0.050	21.0	31.0
2	31	12.0	14.0	50	0.028	21.0	34.0
2	31	14.0	16.0	50	0.036	23.0	36.0
2	GS32	0.0	10.0	35	2.100	88.0	34.0
2	32	0.0	2.0	26	2.300	100.0	58.0
2	32	2.0	4.0	28	4.800	130.0	59.0
2	32	4.0	6.0	27	4.900	140.0	52.0
2	32	6.0	8.0	29	5.000	150.0	61.0
2	32	8.0	10.0	30	4.800	160.0	48.0
2	32	10.0	12.0	30	5.400	210.0	58.0
2	32	12.0	14.0	31	6.900	250.0	48.0
2	32	14.0	17.0	30	3.100	93.0	57.0
2	32	17.0	20.0	29	0.970	67.0	47.0
2	32	20.0	23.0	27	0.520	41.0	59.0
2	32	23.0	27.0	15	0.026	16.0	46.0
2	32	27.0	31.0	16	0.025	18.0	52.0
2	32	31.0	33.0	15	0.064	15.0	54.0
2	32	33.0	38.0	20	0.120	21.0	63.0
2	32	38.0	41.0	17	0.058	17.0	61.0
2	32	41.0	44.0	21	0.051	23.0	63.0
2	32	44.0	46.0	11	0.015	0.0	0.0
2	32	46.0	48.0	15	0.032	0.0	0.0
2	32	48.0	55.0	19	0.031	0.0	0.0
2	GS33	0.0	10.0	27	0.093	31.0	29.0
2	GS34	0.0	10.0	39	0.065	18.0	27.0
2	34	0.0	2.0	37	0.070	12.0	32.0
2	34	2.0	4.0	30	0.025	9.0	31.0
2	34	4.0	6.0	26	0.025	11.0	37.0
2	34	6.0	8.0	26	0.022	9.0	30.0
2	34	8.0	10.0	25	0.023	11.0	32.0
2	34	10.0	12.0	26	0.050	8.4	28.0
2	34	12.0	14.0	24	0.015	9.6	35.0
2	34	14.0	16.0	28	0.028	9.1	31.0
2	34	16.0	20.0	25	0.023	10.0	35.0
2	34	20.0	24.0	25	0.019	7.5	35.0
2	34	24.0	28.0	26	0.037	8.1	39.0
2	34	28.0	32.0	25	0.035	10.0	32.0
2	34	32.0	36.0	25	0.035	8.5	29.0
2	34	36.0	40.0	25	0.026	8.8	43.0
2	34	40.0	50.0	26	0.049	5.4	0.0
2	34	70.0	75.0	21	0.017	8.2	52.0
2	34	75.0	80.0	19	0.022	9.6	56.0
2	34	100.0	110.0	21	0.018	8.6	54.0
2	34	130.0	140.0	22	0.018	11.0	66.0
2	34	160.0	170.0	23	0.037	0.0	63.0
2	34	190.0	200.0	25	0.020	11.0	69.0
2	34	220.0	230.0	29	0.025	15.0	65.0
2	34	245.0	254.0	29	0.028	11.0	68.0
2	34	254.0	260.0	24	0.019	13.0	76.0
2	GS35	0.0	10.0	52	0.230	48.0	54.0

CRUISE	STATION	INTERVAL TOP CM	BOTTOM CM	WATER %	HG PPM	CP PPM	NI PPM
2	35	0.0	2.0	55	0.170	41.0	46.0
2	35	2.0	4.0	61	0.088	0.0	0.0
2	35	4.0	6.0	63	0.060	24.0	38.0
2	35	6.0	8.0	62	0.057	24.0	37.0
2	35	8.0	10.0	61	0.041	24.0	37.0
2	35	10.0	12.0	61	0.046	23.0	35.0
2	35	12.0	14.0	61	0.041	24.0	35.0
2	35	14.0	16.0	61	0.019	22.0	34.0
2	GS36	0.0	10.0	50	0.160	43.0	54.0
2	36	0.0	2.0	56	0.120	35.0	48.0
2	36	2.0	4.0	50	0.084	26.0	38.0
2	36	4.0	6.0	53	0.064	20.0	27.0
2	36	6.0	8.0	49	0.060	25.0	36.0
2	36	8.0	10.0	45	0.037	23.0	37.0
2	36	10.0	12.0	46	0.033	24.0	38.0
2	36	12.0	13.0	47	0.029	26.0	36.0
2	36	18.0	21.0	46	0.018	21.0	30.0
2	GS37	0.0	10.0	47	0.560	39.0	43.0
2	37	0.0	2.0	48	0.980	47.0	76.0
2	37	2.0	4.0	49	0.780	40.0	70.0
2	37	4.0	6.0	37	0.210	21.0	40.0
2	37	6.0	8.0	39	0.120	16.0	39.0
2	37	8.0	10.0	39	0.084	15.0	39.0
2	37	10.0	12.0	37	0.080	12.0	34.0
2	37	12.0	14.0	39	0.072	16.0	36.0
2	37	14.0	16.0	36	0.082	16.0	34.0
2	37	16.0	18.0	39	0.046	18.0	37.0
2	37	18.0	20.0	31	0.048	13.0	34.0
2	37	20.0	22.0	32	0.031	12.0	33.0
2	37	22.0	24.0	33	0.030	13.0	28.0
2	37	24.0	26.0	34	0.040	12.0	37.0
2	37	26.0	28.0	32	0.047	12.0	37.0
2	37	28.0	30.0	33	0.052	13.0	37.0
2	37	30.0	32.0	34	0.049	13.0	33.0
2	37	32.0	34.0	30	0.040	13.0	32.0
2	37	34.0	36.0	27	0.038	14.0	35.0
2	37	36.0	38.0	25	0.040	15.0	35.0
2	37	38.0	40.0	29	0.037	14.0	35.0
2	37	40.0	42.0	21	0.042	15.0	33.0
2	37	42.0	44.0	14	0.019	12.0	25.0
2	37	44.0	46.0	14	0.030	11.0	29.0
2	37	46.0	48.0	19	0.015	14.0	36.0
2	37	48.0	51.0	21	0.046	13.0	32.0
2	37	51.0	54.0	17	0.040	13.0	31.0
2	37	54.0	57.0	21	0.019	12.0	30.0
2	37	57.0	59.0	20	0.043	14.0	35.0
2	37	59.0	63.0	17	0.030	10.0	29.0
2	37	63.0	66.0	18	0.025	8.6	27.0
2	37	66.0	68.0	22	0.044	12.0	29.0
2	37	68.0	70.0	26	0.024	11.0	27.0
2	37	70.0	73.0	21	0.041	10.0	27.0
2	37	73.0	76.0	23	0.020	14.0	41.0
2	37	76.0	78.0	30	0.046	17.0	33.0
2	37	78.0	80.0	30	0.059	18.0	36.0
2	37	80.0	82.0	30	0.057	18.0	37.0
2	37	82.0	84.0	32	0.044	21.0	40.0
2	37	84.0	86.0	29	0.046	20.0	34.0
2	37	86.0	88.0	30	0.250	22.0	37.0
2	37	88.0	90.0	28	0.061	20.0	48.0
2	37	90.0	92.0	23	0.032	17.0	31.0
2	37	92.0	94.0	26	0.045	0.0	36.0
2	37	94.0	96.0	27	0.051	27.0	40.0
2	37	96.0	98.0	35	0.029	17.0	38.0
2	37	98.0	100.0	38	0.090	23.0	42.0
2	37	100.0	102.0	44	0.052	22.0	34.0
2	37	102.0	104.0	45	0.056	23.0	44.0
2	37	104.0	106.0	45	0.054	11.0	34.0
2	37	106.0	108.0	43	0.045	25.0	40.0
2	37	108.0	110.0	45	0.066	32.0	39.0
3	11	0.0	2.0	64	0.280	28.0	40.0
3	11	4.0	6.0	66	0.310	28.0	44.0
3	11	8.0	10.0	62	0.310	26.0	43.0
3	11	10.0	12.0	58	0.220	26.0	38.0
3	11	12.0	14.0	49	0.140	22.0	37.0
3	11	16.0	20.0	49	0.076	23.0	40.0
3	11	20.0	24.0	54	0.032	24.0	37.0
3	11	24.0	28.0	50	0.043	22.0	40.0
3	11	28.0	32.0	50	0.038	19.0	35.0
3	13	0.0	2.0	50	0.230	25.0	41.0
3	13	4.0	6.0	51	0.250	24.0	39.0
3	13	8.0	10.0	48	0.230	25.0	38.0
3	13	10.0	12.0	50	0.130	23.0	39.0
3	13	12.0	14.0	51	0.160	27.0	39.0
3	13	16.0	20.0	51	0.110	25.0	41.0
3	13	20.0	24.0	52	0.075	24.0	38.0
3	13	24.0	28.0	53	0.078	26.0	40.0
3	13	32.0	36.0	55	0.067	23.0	42.0
3	13	40.0	50.0	52	0.055	27.0	46.0
3	13	50.0	60.0	45	0.048	20.0	35.0
3	13	66.0	72.0	39	0.043	17.0	31.0
3	14	0.0	2.0	43	0.180	19.0	32.0
3	14	4.0	6.0	43	0.200	20.0	34.0
3	14	8.0	10.0	45	0.260	23.0	39.0
3	14	12.0	14.0	46	0.200	28.0	46.0
3	14	16.0	20.0	50	0.140	27.0	43.0

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	BOTTOM CM	WATER %	HG PPM	CP PPM	NI PPM
3	14	20.0	24.0	52	0.110	28.0	47.0
3	14	28.0	32.0	53	0.058	25.0	41.0
3	14	32.0	36.0	55	0.069	22.0	38.0
3	14	40.0	50.0	56	0.048	24.0	39.0
3	14	50.0	60.0	45	0.046	19.0	38.0
3	14	68.0	75.0	36	0.039	13.0	26.0
3	15	0.0	2.0	67	0.360	28.0	47.0
3	15	4.0	6.0	78	0.390	28.0	45.0
3	15	8.0	10.0	65	0.450	27.0	44.0
3	15	12.0	14.0	63	0.390	26.0	46.0
3	15	16.0	20.0	74	0.520	28.0	47.0
3	15	20.0	24.0	60	0.170	25.0	41.0
3	15	24.0	28.0	61	0.170	24.0	41.0
3	15	32.0	36.0	45	0.084	22.0	39.0
3	15	36.0	40.0	62	0.054	24.0	40.0
3	15	40.0	50.0	53	0.059	20.0	43.0
3	15	58.0	66.0	42	0.058	21.0	42.0
3	27	0.0	2.0	69	0.310	27.0	47.0
3	27	4.0	6.0	67	0.300	27.0	43.0
3	27	8.0	10.0	62	0.290	25.0	43.0
3	27	12.0	14.0	53	0.220	21.0	37.0
3	27	16.0	20.0	51	0.084	19.0	32.0
3	27	20.0	24.0	50	0.041	21.0	36.0
3	27	24.0	28.0	45	0.035	14.0	29.0
3	27	35.0	38.0	41	0.043	28.0	43.0
3	29	0.0	2.0	57	0.340	25.0	42.0
3	29	4.0	6.0	56	0.350	28.0	42.0
3	29	8.0	10.0	57	0.400	26.0	46.0
3	29	12.0	14.0	57	0.390	25.0	44.0
3	29	16.0	20.0	59	0.260	26.0	45.0
3	29	24.0	28.0	54	0.094	23.0	42.0
3	29	32.0	36.0	51	0.067	23.0	45.0
3	29	36.0	40.0	62	0.047	26.0	41.0
3	29	40.0	50.0	52	0.054	21.0	40.0
3	29	50.0	60.0	54	0.039	24.0	40.0
3	29	70.0	77.0	38	0.040	15.0	29.0
3	31	0.0	2.0	53	0.360	25.0	40.0
3	31	4.0	6.0	53	0.390	23.0	38.0
3	31	8.0	10.0	54	0.370	24.0	43.0
3	31	12.0	14.0	52	0.420	26.0	50.0
3	31	16.0	20.0	57	0.290	25.0	44.0
3	31	24.0	28.0	55	0.200	22.0	44.0
3	31	32.0	36.0	56	0.140	24.0	49.0
3	31	40.0	50.0	53	0.071	22.0	45.0
3	31	50.0	60.0	57	0.056	27.0	45.0
3	31	66.0	71.0	44	0.052	19.0	42.0
3	43	0.0	2.0	60	0.360	26.0	47.0
3	43	4.0	6.0	68	0.350	28.0	48.0
3	43	8.0	10.0	61	0.370	24.0	43.0
3	43	12.0	14.0	55	0.240	26.0	44.0
3	43	16.0	20.0	56	0.170	24.0	44.0
3	43	20.0	24.0	40	0.037	26.0	39.0
3	43	24.0	28.0	35	0.036	26.0	40.0
3	43	28.0	32.0	39	0.032	0.0	0.0
3	43	32.0	35.0	37	0.046	32.0	47.0
3	45	0.0	2.0	59	0.410	28.0	44.0
3	45	4.0	6.0	57	0.400	24.0	45.0
3	45	8.0	10.0	57	0.420	25.0	44.0
3	45	12.0	14.0	54	0.320	28.0	43.0
3	45	16.0	20.0	59	0.250	27.0	45.0
3	45	24.0	28.0	58	0.150	27.0	45.0
3	45	32.0	36.0	60	0.094	27.0	43.0
3	45	40.0	50.0	50	0.060	25.0	45.0
3	45	50.0	60.0	61	0.048	0.8	37.0
3	45	60.0	68.0	40	0.054	16.0	29.0
3	47	0.0	2.0	69	0.380	27.0	41.0
3	47	4.0	6.0	48	0.340	25.0	38.0
3	47	8.0	10.0	44	0.340	25.0	39.0
3	47	12.0	14.0	41	0.210	24.0	39.0
3	47	16.0	20.0	51	0.120	25.0	43.0
3	47	24.0	28.0	53	0.097	26.0	43.0
3	47	32.0	36.0	52	0.072	23.0	42.0
3	47	40.0	46.0	45	0.063	21.0	39.0
3	59	0.0	2.0	46	0.270	25.0	44.0
3	59	4.0	6.0	52	0.220	25.0	44.0
3	59	8.0	10.0	41	0.070	26.0	44.0
3	59	10.0	12.0	34	0.069	25.0	42.0
3	59	12.0	14.0	32	0.032	24.0	42.0
3	61	0.0	2.0	52	0.140	29.0	46.0
3	61	4.0	6.0	43	0.100	29.0	46.0
3	61	6.0	8.0	38	0.310	28.0	45.0
3	61	8.0	10.0	32	0.230	26.0	44.0
3	61	10.0	12.0	38	0.140	23.0	43.0
3	61	12.0	14.0	44	0.045	24.0	42.0
3	61	14.0	16.0	49	0.093	22.0	43.0
3	61	16.0	20.0	45	0.090	24.0	45.0
3	61	24.0	28.0	46	0.079	26.0	46.0
3	61	36.0	40.0	51	0.068	25.0	46.0
3	61	46.0	52.0	58	0.061	26.0	44.0
3	63	0.0	2.0	59	0.390	26.0	43.0

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
3	63	4.0	6.0	60	0.350	25.0	43.0
3	63	8.0	10.0	57	0.360	25.0	41.0
3	63	12.0	14.0	55	0.340	19.0	42.0
3	63	16.0	20.0	61	0.270	25.0	41.0
3	63	24.0	28.0	61	0.210	25.0	42.0
3	63	28.0	32.0	59	0.110	22.0	41.0
3	63	32.0	36.0	58	0.078	24.0	45.0
3	63	36.0	40.0	65	0.079	22.0	40.0
3	63	40.0	50.0	59	0.064	25.0	44.0
3	63	58.0	66.0	57	0.071	25.0	43.0
3	65	0.0	2.0	83	0.310	27.0	41.0
3	65	4.0	6.0	68	0.340	26.0	41.0
3	65	8.0	10.0	61	0.380	27.0	41.0
3	65	12.0	14.0	59	0.310	25.0	40.0
3	65	16.0	20.0	59	0.210	26.0	41.0
3	65	24.0	26.5	52	0.110	27.0	42.0
3	78	0.0	2.0	66	0.330	24.0	41.0
3	78	2.0	4.0	64	0.390	25.0	41.0
3	78	4.0	6.0	63	0.350	24.0	37.0
3	78	6.0	8.0	63	0.420	24.0	39.0
3	78	8.0	10.0	59	0.320	22.0	39.0
3	78	10.0	12.0	55	0.290	20.0	36.0
3	78	12.0	14.0	52	0.190	20.0	40.0
3	78	14.0	16.0	53	0.130	22.0	37.0
3	78	16.0	20.0	56	0.160	23.0	41.0
3	78	20.0	24.0	55	0.092	25.0	41.0
3	78	24.0	28.0	56	0.079	22.0	44.0
3	78	28.0	32.0	48	0.070	20.0	41.0
3	78	32.0	37.0	52	0.066	21.0	43.0
3	83	0.0	2.0	57	0.370	26.0	41.0
3	83	4.0	6.0	53	0.390	25.0	41.0
3	83	8.0	10.0	55	0.390	27.0	41.0
3	83	12.0	14.0	51	0.370	26.0	42.0
3	83	16.0	20.0	63	0.370	25.0	40.0
3	83	20.0	24.0	58	0.240	24.0	41.0
3	83	24.0	28.0	60	0.140	24.0	41.0
3	83	32.0	36.0	57	0.093	24.0	41.0
3	83	36.0	40.0	56	0.067	23.0	44.0
3	83	40.0	50.0	61	0.065	26.0	43.0
3	83	57.0	64.0	47	0.060	21.0	35.0
3	85	0.0	2.0	49	0.460	25.0	41.0
3	85	2.0	4.0	48	0.460	23.0	39.0
3	85	4.0	6.0	45	0.370	22.0	38.0
3	85	6.0	8.0	41	0.440	23.0	41.0
3	85	8.0	10.0	48	0.430	20.0	38.0
3	85	10.0	12.0	49	0.310	20.0	41.0
3	85	12.0	14.0	51	0.320	24.0	35.0
3	85	14.0	16.0	53	0.230	21.0	38.0
3	85	16.0	20.0	57	0.210	21.0	38.0
3	85	20.0	24.0	56	0.130	19.0	35.0
3	85	24.0	28.0	57	0.120	20.0	37.0
3	85	28.0	32.0	63	0.150	21.0	37.0
3	85	32.0	36.0	55	0.073	0.0	37.0
3	85	36.0	40.0	57	0.057	22.0	41.0
3	85	40.0	44.0	51	0.100	0.0	38.0
3	100	0.0	2.0	49	0.380	23.0	42.0
3	100	2.0	4.0	48	0.380	24.0	41.0
3	100	4.0	6.0	48	0.400	22.0	36.0
3	100	6.0	8.0	43	0.400	23.0	37.0
3	100	8.0	10.0	41	0.270	16.0	27.0
3	100	10.0	12.0	45	0.210	23.0	37.0
3	100	12.0	14.0	43	0.220	22.0	35.0
3	100	14.0	16.0	44	0.190	22.0	38.0
3	100	16.0	20.0	45	0.110	26.0	42.0
3	100	20.0	24.0	46	0.130	24.0	40.0
3	100	24.0	28.0	46	0.150	27.0	44.0
3	100	28.0	32.0	43	0.043	22.0	33.0
3	100	32.0	35.0	46	0.130	20.0	40.0
3	103	0.0	2.0	56	0.460	21.0	28.0
3	103	2.0	4.0	56	0.390	21.0	39.0
3	103	4.0	6.0	58	0.450	22.0	31.0
3	103	6.0	8.0	57	0.520	24.0	37.0
3	103	8.0	10.0	57	0.400	23.0	35.0
3	103	10.0	12.0	51	0.380	19.0	31.0
3	103	12.0	14.0	52	0.400	17.0	30.0
3	103	14.0	16.0	51	0.390	22.0	38.0
3	103	16.0	20.0	49	0.290	15.0	28.0
3	103	20.0	24.0	48	0.240	18.0	31.0
3	103	24.0	28.0	48	0.160	17.0	33.0
3	103	28.0	32.0	46	0.081	18.0	32.0
3	103	32.0	36.0	45	0.039	16.0	31.0
3	103	36.0	40.0	39	0.038	13.0	24.0
3	103	40.0	50.0	49	0.011	9.2	27.0
3	103	50.0	60.0	57	0.160	9.3	31.0
3	105	0.0	2.0	59	0.340	25.0	36.0
3	105	4.0	6.0	58	0.330	24.0	37.0
3	105	8.0	10.0	51	0.330	20.0	31.0
3	105	12.0	14.0	42	0.360	19.0	31.0
3	105	16.0	20.0	39	0.180	23.0	37.0
3	122	0.0	2.0	38	0.220	11.0	19.0
3	122	2.0	4.0	34	0.240	10.0	18.0

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
3	122	4.0	6.0	30	0.230	9.3	15.0
3	122	6.0	8.0	29	0.160	8.2	16.0
3	122	8.0	10.0	26	0.110	7.3	13.0
3	122	10.0	12.0	27	0.049	7.2	14.0
3	122	12.0	14.0	27	0.047	7.9	15.0
3	122	14.0	16.0	27	0.064	7.6	16.0
3	122	16.0	20.0	33	0.052	7.0	15.0
3	122	20.0	24.0	31	0.065	7.8	18.0
3	122	24.0	28.0	29	0.068	8.8	18.0
3	122	28.0	30.5	25	0.075	9.9	19.0
3	125	0.0	2.0	62	0.300	22.0	32.0
3	125	4.0	6.0	45	0.290	15.0	22.0
3	125	8.0	10.0	39	0.240	14.0	21.0
3	125	12.0	14.0	29	0.180	11.0	19.0
3	125	14.0	16.0	28	0.100	10.0	19.0
3	125	16.0	20.0	27	0.035	8.3	14.0
3	125	20.0	24.0	26	0.019	7.7	12.0
3	125	28.0	31.0	33	0.037	23.0	33.0
3	138	0.0	2.0	45	0.190	24.0	44.0
3	138	4.0	6.0	48	0.110	25.0	44.0
3	138	8.0	10.0	58	0.085	28.0	45.0
3	138	12.0	14.0	48	0.082	28.0	42.0
3	138	16.0	20.0	53	0.080	28.0	45.0
3	138	24.0	28.0	43	0.055	20.0	36.0
3	138	32.0	36.0	42	0.069	20.0	36.0
3	138	40.0	50.0	50	0.046	21.0	35.0
3	138	60.0	70.0	42	0.035	27.0	33.0
3	138	80.0	88.0	36	0.032	25.0	32.0
3	140	0.0	2.0	56	0.260	25.0	40.0
3	140	4.0	6.0	55	0.280	23.0	39.0
3	140	8.0	10.0	56	0.260	27.0	39.0
3	140	12.0	14.0	56	0.240	26.0	39.0
3	140	14.0	16.0	60	0.180	21.0	40.0
3	140	16.0	20.0	58	0.120	22.0	39.0
3	140	24.0	28.0	60	0.067	24.0	42.0
3	140	32.0	36.0	59	0.064	23.0	39.0
3	140	36.0	40.0	55	0.048	19.0	36.0
3	140	40.0	50.0	54	0.054	20.0	35.0
3	140	70.0	77.0	39	0.049	15.0	28.0
3	141	0.0	2.0	54	0.260	23.0	39.0
3	141	4.0	6.0	52	0.290	26.0	40.0
3	141	8.0	10.0	52	0.250	40.0	47.0
3	141	12.0	14.0	55	0.250	26.0	47.0
3	141	16.0	20.0	61	0.160	24.0	41.0
3	141	20.0	24.0	59	0.100	21.0	38.0
3	141	24.0	28.0	49	0.068	21.0	37.0
3	141	32.0	36.0	47	0.065	16.0	36.0
3	141	40.0	50.0	49	0.037	17.0	36.0
3	141	50.0	60.0	41	0.036	16.0	29.0
3	141	66.0	72.0	31	0.024	8.2	17.0
3	142	0.0	2.0	55	0.210	22.0	40.0
3	142	4.0	6.0	50	0.210	23.0	39.0
3	142	8.0	10.0	50	0.220	22.0	38.0
3	142	12.0	14.0	48	0.140	18.0	34.0
3	142	16.0	20.0	48	0.062	19.0	38.0
3	142	24.0	28.0	55	0.049	21.0	38.0
3	142	28.0	32.0	56	0.049	17.0	36.0
3	142	32.0	36.0	50	0.041	19.0	36.0
3	142	40.0	50.0	42	0.024	15.0	29.0
3	142	50.0	59.0	47	0.042	20.0	34.0
3	142	59.0	67.0	51	0.041	18.0	40.0
3	143	0.0	2.0	63	0.200	27.0	46.0
3	143	2.0	4.0	61	0.210	23.0	45.0
3	143	4.0	6.0	59	0.210	21.0	38.0
3	143	6.0	8.0	58	0.210	25.0	45.0
3	143	8.0	10.0	56	0.190	23.0	43.0
3	144	0.0	2.0	56	0.210	24.0	44.0
3	144	4.0	6.0	56	0.290	24.0	41.0
3	144	12.0	14.0	53	0.280	22.0	37.0
3	144	16.0	20.0	46	0.180	18.0	34.0
3	144	20.0	24.0	41	0.110	16.0	30.0
3	144	24.0	28.0	42	0.071	16.0	31.0
3	144	28.0	32.0	37	0.043	14.0	26.0
3	144	32.0	36.0	37	0.045	14.0	28.0
3	144	40.0	50.0	38	0.037	15.0	32.0
3	144	60.0	71.0	44	0.035	15.0	33.0
3	145	0.0	2.0	51	0.220	22.0	41.0
3	145	4.0	6.0	46	0.190	21.0	41.0
3	145	8.0	10.0	46	0.110	18.0	36.0
3	145	12.0	14.0	48	0.064	18.0	36.0
3	145	16.0	20.0	49	0.055	17.0	36.0
3	145	28.0	32.0	53	0.050	16.0	35.0
3	145	32.0	36.0	49	0.044	16.0	35.0
3	145	40.0	50.0	44	0.038	15.0	34.0
3	145	66.0	72.0	45	0.046	16.0	38.0
3	146	0.0	2.0	56	0.074	19.0	39.0
3	146	4.0	6.0	34	0.069	18.0	40.0
3	146	8.0	10.0	31	0.062	21.0	42.0
3	146	12.0	14.0	36	0.054	19.0	40.0
3	146	16.0	20.0	45	0.052	20.0	40.0

CRUISE	STATION	INTERVAL TOP CM	BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
3	146	24.0	28.0	41	0.047	16.0	33.0
3	146	32.0	36.0	48	0.048	19.0	38.0
3	146	40.0	46.0	47	0.049	19.0	40.0
3	147	0.0	2.0	32	0.110	10.0	19.0
3	147	4.0	6.0	27	0.110	8.2	15.0
3	147	8.0	10.0	27	0.094	8.5	15.0
3	147	12.0	14.0	32	0.140	12.0	22.0
3	147	16.0	20.0	34	0.150	13.0	21.0
3	147	24.0	28.0	29	0.110	11.0	18.0
3	147	28.0	32.0	27	0.075	11.0	17.0
3	147	32.0	36.0	30	0.071	12.0	20.0
3	147	36.0	39.0	26	0.066	9.9	17.0
3	147	39.0	42.0	25	0.052	7.7	14.0
3	148	0.0	2.0	47	0.220	23.0	38.0
3	148	4.0	6.0	44	0.190	24.0	38.0
3	148	8.0	10.0	45	0.170	23.0	40.0
3	148	12.0	14.0	47	0.170	21.0	37.0
3	148	16.0	20.0	47	0.220	20.0	35.0
3	148	20.0	24.0	49	0.071	21.0	36.0
3	148	24.0	28.0	43	0.058	18.0	31.0
3	148	32.0	36.0	38	0.046	12.0	22.0
3	148	36.0	40.0	34	0.043	11.0	22.0
3	148	40.0	50.0	38	0.044	14.0	26.0
3	148	50.0	60.0	31	0.027	11.0	21.0
3	148	70.0	79.0	40	0.033	15.0	31.0
3	149	0.0	2.0	50	0.320	30.0	47.0
3	149	4.0	6.0	48	0.320	30.0	45.0
3	149	8.0	10.0	47	0.250	27.0	42.0
3	149	10.0	12.0	43	0.120	17.0	31.0
3	149	12.0	14.0	42	0.045	14.0	30.0
3	149	16.0	20.0	40	0.038	12.0	27.0
3	149	20.0	24.0	33	0.021	14.0	23.0
3	149	24.0	27.0	25	0.026	16.0	34.0
3	150	0.0	2.0	37	0.130	19.0	26.0
3	150	2.0	4.0	36	0.130	18.0	28.0
3	150	6.0	8.0	29	0.067	10.0	18.0
3	150	4.0	6.0	33	0.100	12.0	19.0
3	150	8.0	10.0	29	0.084	7.9	15.0
3	150	10.0	12.5	26	0.035	8.9	13.0
4	1	0.0	2.0	30	0.710	20.0	37.0
4	1	2.0	4.0	39	0.570	24.0	34.0
4	1	4.0	6.0	51	1.400	22.0	63.0
4	1	6.0	8.0	57	0.440	20.0	36.0
4	1	8.0	10.0	40	0.810	21.0	59.0
4	1	10.0	12.0	37	0.410	25.0	35.0
4	1	12.0	14.0	34	0.370	22.0	31.0
4	1	14.0	16.0	36	0.550	30.0	37.0
4	1	16.0	20.0	38	2.600	31.0	52.0
4	1	20.0	24.0	40	0.410	19.0	37.0
4	1	24.0	28.0	43	0.360	20.0	35.0
4	1	28.0	32.0	47	0.610	27.0	59.0
4	1	32.0	37.0	47	0.260	19.0	32.0
4	1	37.0	42.0	48	0.280	28.0	36.0
4	2	0.0	2.0	15	0.330	10.0	17.0
4	2	2.0	4.0	13	0.140	12.0	16.0
4	2	4.0	6.0	10	0.180	14.0	16.0
4	2	6.0	8.0	9	0.034	11.0	18.0
4	2	8.0	10.0	10	0.150	9.9	8.8
4	2	10.0	12.0	12	0.030	11.0	9.8
4	2	12.0	14.0	17	0.078	5.5	17.0
4	2	14.0	16.0	17	0.100	4.7	11.0
4	3	0.0	2.0	21	0.400	20.0	24.0
4	3	2.0	4.0	18	0.110	12.0	14.0
4	3	4.0	6.0	21	0.680	17.0	24.0
4	3	6.0	8.0	27	0.270	26.0	21.0
4	3	8.0	10.0	30	0.660	35.0	39.0
4	3	10.0	12.0	35	0.410	40.0	36.0
4	3	12.0	14.0	40	1.500	44.0	52.0
4	3	14.0	16.0	25	1.100	37.0	27.0
4	4	0.0	2.0	30	0.950	44.0	0.0
4	4	2.0	4.0	21	0.120	15.0	21.0
4	4	4.0	6.0	17	0.090	7.0	7.1
4	4	6.0	8.0	14	0.270	15.0	12.0
4	4	8.0	10.0	16	0.093	13.0	14.0
4	5	0.0	2.0	28	2.200	140.0	120.0
4	5	2.0	4.0	24	1.300	120.0	95.0
4	5	4.0	6.0	18	0.550	31.0	22.0
4	5	6.0	8.0	7	0.220	0.0	14.0
4	5	8.0	10.0	9	0.130	12.0	16.0
4	5	10.0	12.0	16	0.061	12.0	15.0
4	5	12.0	14.0	18	0.079	13.0	24.0
4	5	14.0	16.0	18	0.042	12.0	17.0
4	5	16.0	20.0	20	0.046	13.0	25.0
4	5	20.0	24.0	18	0.071	12.0	19.0
4	5	24.0	28.0	21	0.064	11.0	19.0
4	5	28.0	32.0	21	0.060	17.0	26.0
4	5	36.0	40.0	24	0.087	14.0	20.0
4	5	40.0	52.0	17	0.087	10.0	17.0
4	6	0.0	2.0	16	0.670	28.0	20.0
4	6	2.0	4.0	12	0.570	28.0	30.0

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
4	6	4.0	6.0	15	0.510	26.0	32.0
4	7	0.0	1.5	22	0.630	30.0	47.0
4	8	0.0	2.0	31	0.890	55.0	95.0
4	8	2.0	4.0	26	0.850	53.0	82.0
4	11	0.0	2.0	7	2.300	90.0	98.0
4	11	2.0	4.0	5	1.500	45.0	55.0
4	11	4.0	6.0	6	2.100	48.0	66.0
4	11	6.0	8.0	5	2.200	41.0	50.0
4	11	8.0	10.0	11	2.100	56.0	58.0
4	11	10.0	12.0	10	2.700	49.0	51.0
4	11	12.0	14.0	13	1.400	51.0	47.0
4	11	14.0	16.0	17	0.950	44.0	44.0
4	11	16.0	20.0	18	0.220	65.0	64.0
4	11	20.0	24.0	13	0.062	5.8	12.0
4	11	28.0	32.0	18	0.096	10.0	25.0
4	11	32.0	36.0	18	0.038	7.0	10.0
4	11	40.0	50.0	22	0.040	9.4	12.0
4	11	50.0	60.0	21	0.046	11.0	14.0
4	11	60.0	70.0	21	0.048	11.0	15.0
4	11	70.0	75.0	20	0.042	11.0	16.0
4	12	0.0	2.0	18	0.400	97.0	83.0
4	12	2.0	4.0	12	0.310	54.0	49.0
4	12	4.0	6.0	13	0.360	50.0	47.0
4	12	6.0	8.0	15	0.049	9.6	12.0
4	12	8.0	10.0	17	0.083	13.0	18.0
4	12	10.0	12.0	22	0.059	11.0	12.0
4	12	12.0	14.0	23	0.110	16.0	22.0
4	12	14.0	16.0	24	0.060	13.0	18.0
4	12	16.0	20.0	27	0.110	22.0	32.0
4	12	20.0	24.0	31	0.066	15.0	21.0
4	12	24.0	28.0	24	0.046	8.4	17.0
4	12	32.0	36.0	26	0.066	12.0	21.0
4	12	40.0	50.0	29	0.048	13.0	20.0
4	12	50.0	60.0	33	0.0	15.0	22.0
4	12	60.0	73.0	32	0.060	17.0	26.0
4	13	0.0	2.0	51	0.730	150.0	140.0
4	13	2.0	4.0	41	0.770	150.0	120.0
4	13	4.0	6.0	38	0.970	110.0	120.0
4	13	6.0	8.0	37	0.630	110.0	110.0
4	13	8.0	10.0	41	0.360	120.0	110.0
4	13	10.0	12.0	47	1.200	150.0	130.0
4	13	12.0	14.0	43	0.940	18.0	42.0
4	13	14.0	16.0	38	0.660	100.0	110.0
4	13	16.0	20.0	33	0.500	84.0	71.0
4	13	20.0	24.0	27	0.180	27.0	30.0
4	13	24.0	28.0	26	0.070	16.0	34.0
4	13	28.0	32.0	27	0.069	15.0	33.0
4	13	32.0	36.0	26	0.045	16.0	43.0
4	13	36.0	40.0	25	0.110	15.0	35.0
4	13	40.0	46.0	22	0.041	13.0	18.0
4	14	0.0	2.0	21	0.290	39.0	43.0
4	14	2.0	4.0	31	0.052	21.0	34.0
4	14	4.0	6.0	35	0.110	20.0	39.0
4	14	6.0	8.0	35	0.056	20.0	44.0
4	14	8.0	10.0	30	0.180	16.0	28.0
4	14	10.0	12.0	25	0.040	15.0	23.0
4	14	12.0	14.0	25	0.058	120.0	83.0
4	14	14.0	16.0	19	0.430	12.0	17.0
4	14	16.0	20.0	27	0.170	15.0	33.0
4	14	20.0	24.0	27	0.037	15.0	30.0
4	14	24.0	28.0	24	0.048	12.0	30.0
4	14	28.0	32.0	25	0.0	12.0	25.0
4	14	36.0	40.0	30	0.053	16.0	23.0
4	14	40.0	45.5	34	0.083	17.0	24.0
4	14	32.0	36.0	33	0.0	20.0	29.0
4	14	28.0	32.0	24	0.076	0.0	0.0
4	15	0.0	2.0	15	1.600	5.7	19.0
4	15	2.0	4.0	17	0.150	6.5	9.7
4	15	4.0	6.0	20	0.160	12.0	24.0
4	15	6.0	8.0	21	0.055	9.5	17.0
4	15	8.0	10.0	21	0.074	8.6	21.0
4	15	10.0	12.0	25	0.052	6.2	11.0
4	15	12.0	14.0	34	0.043	5.8	11.0
4	15	14.0	16.0	18	0.068	4.3	0.0
4	15	16.0	20.0	20	0.029	5.0	8.7
4	15	20.0	24.0	26	0.040	9.0	18.0
4	15	24.0	28.0	28	0.043	8.9	15.0
4	15	28.0	32.0	25	0.140	10.0	30.0
4	15	32.0	35.5	24	0.046	11.0	17.0
4	16	0.0	2.0	38	2.000	48.0	57.0
4	16	2.0	4.0	39	1.500	51.0	45.0
4	16	4.0	6.0	40	2.100	46.0	45.0
4	16	6.0	8.0	41	1.900	49.0	58.0
4	16	8.0	10.0	39	2.200	47.0	53.0
4	16	10.0	12.0	41	1.800	44.0	42.0
4	16	12.0	14.0	42	2.900	39.0	56.0
4	16	14.0	16.0	42	2.400	38.0	70.0
4	16	16.0	20.0	50	2.800	41.0	57.0
4	16	20.0	24.0	53	2.200	44.0	53.0
4	16	24.0	28.0	50	1.600	41.0	51.0
4	16	28.0	32.0	47	1.700	37.0	55.0
4	16	32.0	36.0	45	2.400	41.0	71.0

CRUISE	STATION	INTERVAL TOP CM	BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
4	16	36.0	40.0	49	2.200	37.0	51.0
4	16	40.0	50.0	47	2.400	38.0	66.0
4	16	50.0	60.0	44	2.400	46.0	59.0
4	16	60.0	70.0	40	0.890	29.0	46.0
4	16	70.0	80.0	40	0.830	29.0	51.0
4	16	80.0	87.0	41	0.940	30.0	54.0
4	17	0.0	2.0	42	2.600	110.0	110.0
4	17	2.0	4.0	38	2.100	83.0	89.0
4	17	4.0	6.0	36	2.800	79.0	80.0
4	17	6.0	8.0	33	2.000	69.0	66.0
4	17	8.0	10.0	37	7.800	85.0	99.0
4	17	10.0	12.0	53	4.000	120.0	140.0
4	17	12.0	14.0	38	1.900	61.0	64.0
4	17	14.0	16.0	23	0.630	27.0	28.0
4	17	16.0	20.0	20	0.560	23.0	27.0
4	17	20.0	24.0	23	0.330	26.0	23.0
4	17	24.0	28.0	24	0.110	6.5	18.0
4	17	28.0	31.0	20	0.150	7.9	24.0
4	18	0.0	2.0	11	0.450	26.0	36.0
4	18	2.0	4.0	12	0.500	33.0	38.0
4	18	4.0	6.0	29	0.750	85.0	58.0
4	18	6.0	8.0	32	0.560	86.0	54.0
4	18	8.0	10.0	31	0.720	73.0	56.0
4	18	10.0	12.0	32	0.490	56.0	47.0
4	18	12.0	14.0	31	0.530	75.0	47.0
4	18	14.0	16.0	30	0.600	75.0	53.0
4	18	16.0	20.0	34	0.490	96.0	58.0
4	18	24.0	28.0	34	0.390	76.0	48.0
4	18	28.0	32.0	33	0.580	71.0	52.0
4	18	32.0	36.0	34	0.490	60.0	43.0
4	18	40.0	50.0	30	0.280	23.0	31.0
4	18	50.0	56.5	30	0.120	17.0	29.0
4	19	0.0	2.0	36	2.000	60.0	62.0
4	19	2.0	4.0	34	0.750	42.0	51.0
4	19	4.0	6.0	36	0.820	45.0	64.0
4	19	6.0	8.0	36	1.200	49.0	52.0
4	19	8.0	10.0	35	0.990	48.0	57.0
4	19	10.0	12.0	35	0.730	37.0	44.0
4	19	12.0	14.0	35	0.650	38.0	51.0
4	19	14.0	16.0	37	0.710	43.0	55.0
4	19	16.0	20.0	37	0.550	43.0	50.0
4	19	20.0	24.0	35	0.780	40.0	42.0
4	19	28.0	32.0	40	1.700	47.0	61.0
4	19	32.0	36.0	39	1.400	30.0	39.0
4	19	36.0	40.0	42	1.600	36.0	48.0
4	19	40.0	50.0	37	0.300	32.0	40.0
4	20	0.0	2.0	9	0.130	11.0	11.0
4	20	2.0	4.5	12	0.048	20.0	26.0
4	21	0.0	2.0	11	0.075	8.3	13.0
4	21	2.0	4.0	13	0.083	8.6	14.0
4	21	4.0	6.0	19	0.083	9.4	16.0
4	21	8.0	10.0	15	0.100	11.0	14.0
4	21	10.0	12.0	15	0.150	9.8	13.0
4	22	0.0	2.0	13	0.027	15.0	38.0
4	23	0.0	2.0	49	3.000	110.0	91.0
4	23	2.0	4.0	44	2.100	82.0	73.0
4	23	4.0	6.0	43	0.950	99.0	66.0
4	23	6.0	8.0	45	0.590	44.0	48.0
4	23	8.0	10.0	45	0.590	41.0	50.0
4	23	12.0	14.0	35	0.380	15.0	28.0
4	23	10.0	12.0	39	0.510	32.0	40.0
4	23	14.0	16.0	34	0.380	20.0	29.0
4	23	16.0	20.0	27	0.100	12.0	21.0
4	23	20.0	24.0	28	0.054	11.0	20.0
4	23	24.0	28.0	26	0.044	9.6	18.0
4	23	28.0	33.0	23	0.068	14.0	27.0
4	24	0.0	2.0	65	1.500	72.0	76.0
4	24	2.0	4.0	61	4.500	92.0	87.0
4	24	4.0	6.0	54	1.200	110.0	96.0
4	24	6.0	8.0	59	2.100	80.0	80.0
4	24	8.0	10.0	58	1.500	88.0	90.0
4	24	10.0	12.0	59	1.400	95.0	68.0
4	24	12.0	14.0	58	1.100	77.0	70.0
4	24	14.0	16.0	56	0.690	69.0	56.0
4	24	16.0	20.0	53	0.490	51.0	46.0
4	24	20.0	24.0	35	0.190	15.0	22.0
4	24	24.0	27.0	26	0.110	10.0	17.0
4	24	27.0	30.5	18	0.073	11.0	20.0
4	25	0.0	2.0	53	3.200	86.0	83.0
4	25	2.0	4.0	54	3.500	110.0	91.0
4	25	4.0	6.0	53	1.900	110.0	84.0
4	25	6.0	8.0	55	1.200	80.0	70.0
4	25	8.0	10.0	57	1.200	80.0	78.0
4	25	10.0	12.0	56	0.750	64.0	59.0
4	25	12.0	14.0	56	0.660	73.0	55.0
4	25	14.0	16.0	50	0.560	58.0	51.0
4	25	16.0	20.0	39	0.290	21.0	29.0
4	25	20.0	24.0	21	0.065	9.3	15.0
4	25	24.0	28.0	48	0.400	50.0	45.0
4	25	28.0	32.0	51	0.630	72.0	59.0

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
4	25	32.0	36.0	43	0.360	41.0	44.0
4	25	36.0	40.0	27	0.150	13.0	20.0
4	25	40.0	44.0	17	0.046	7.5	12.0
4	26	0.0	2.0	43	1.900	69.0	63.0
4	26	2.0	4.0	50	1.200	96.0	81.0
4	26	4.0	6.0	46	1.000	82.0	68.0
4	26	6.0	8.0	45	0.820	77.0	52.0
4	26	8.0	10.0	41	1.000	97.0	64.0
4	26	10.0	12.0	43	2.000	110.0	70.0
4	26	12.0	14.0	47	1.700	100.0	72.0
4	26	14.0	16.0	41	1.500	81.0	57.0
4	26	16.0	20.0	49	1.400	80.0	63.0
4	26	24.0	28.0	50	1.600	110.0	77.0
4	26	28.0	32.0	51	1.300	87.0	69.0
4	26	32.0	36.0	50	0.480	70.0	56.0
4	26	40.0	50.0	38	0.260	30.0	40.0
4	26	50.0	55.0	16	0.013	6.8	11.0
4	27	0.0	2.0	37	2.400	170.0	120.0
4	27	2.0	4.0	40	2.300	140.0	97.0
4	27	4.0	6.0	42	2.300	190.0	120.0
4	27	6.0	8.0	46	2.300	200.0	110.0
4	27	8.0	10.0	47	2.100	210.0	97.0
4	27	10.0	12.0	46	2.200	160.0	83.0
4	27	12.0	14.0	44	2.000	140.0	79.0
4	27	14.0	16.0	45	0.980	130.0	77.0
4	27	16.0	20.0	44	1.100	100.0	56.0
4	27	20.0	24.0	43	0.850	70.0	52.0
4	27	24.0	28.0	45	0.590	37.0	41.0
4	27	28.0	32.0	40	0.460	17.0	35.0
4	27	32.0	36.0	22	0.099	6.3	12.0
4	27	36.0	40.0	15	0.016	5.0	7.1
4	27	40.0	42.5	16	0.024	5.2	9.4
4	28	0.0	2.0	20	0.110	12.0	16.0
4	28	2.0	4.5	18	0.180	14.0	21.0
4	29	0.0	1.5	18	0.027	16.0	55.0
4	29	1.5	3.0	17	0.007	19.0	46.0
4	30	0.0	2.0	22	0.170	16.0	17.0
4	30	2.0	4.0	15	0.075	8.6	20.0
4	31	0.0	2.0	46	2.500	160.0	130.0
4	31	2.0	4.0	43	1.600	130.0	97.0
4	31	4.0	6.0	47	2.600	140.0	93.0
4	31	6.0	8.0	49	1.400	110.0	65.0
4	31	8.0	10.0	46	1.100	59.0	52.0
4	31	10.0	12.0	41	1.100	16.0	30.0
4	31	12.0	14.0	27	0.310	15.0	18.0
4	31	14.0	16.0	22	0.130	11.0	20.0
4	31	16.0	20.0	22	0.017	8.1	15.0
4	31	20.0	24.0	20	0.012	12.0	24.0
4	31	24.0	28.0	19	0.017	18.0	16.0
4	31	28.0	32.0	19	0.032	0.0	100.0
4	33	0.0	2.0	58	2.500	180.0	110.0
4	33	2.0	4.0	61	2.000	180.0	110.0
4	33	4.0	6.0	59	2.400	160.0	94.0
4	33	6.0	8.0	58	1.100	130.0	78.0
4	33	8.0	10.0	39	0.410	50.0	44.0
4	33	10.0	12.0	32	0.190	22.0	25.0
4	33	12.0	14.0	52	0.590	46.0	49.0
4	33	14.0	16.0	30	0.230	14.0	18.0
4	33	16.0	19.0	31	0.170	9.2	16.0
4	33	19.0	21.0	23	0.130	8.9	15.0
4	34	0.0	2.0	36	2.400	170.0	110.0
4	34	2.0	4.0	30	1.400	110.0	78.0
4	34	4.0	6.0	33	2.100	150.0	97.0
4	34	6.0	8.0	26	1.000	87.0	63.0
4	34	8.0	10.0	28	1.700	93.0	72.0
4	34	10.0	12.0	27	0.960	61.0	53.0
4	34	12.0	14.0	25	0.990	51.0	47.0
4	34	14.0	16.0	28	1.900	99.0	77.0
4	34	16.0	20.0	30	1.700	97.0	76.0
4	34	20.0	24.0	30	1.600	91.0	74.0
4	34	24.0	28.0	37	1.500	130.0	86.0
4	34	28.0	32.0	36	1.600	110.0	75.0
4	34	32.0	36.0	34	0.680	39.0	53.0
4	34	36.0	40.0	33	0.840	160.0	100.0
4	34	40.0	50.0	20	0.054	8.1	14.0
4	34	50.0	56.0	14	0.009	7.7	13.0
4	35	0.0	2.0	37	3.300	140.0	100.0
4	35	2.0	4.0	38	3.200	25.0	36.0
4	35	4.0	6.0	37	2.200	150.0	100.0
4	35	6.0	8.0	36	1.500	12.0	20.0
4	35	8.0	10.0	37	1.800	21.0	95.0
4	35	10.0	12.0	37	1.200	19.0	37.0
4	35	12.0	14.0	34	1.100	12.0	29.0
4	35	14.0	16.0	34	1.400	780.0	78.0
4	35	16.0	20.0	36	1.900	140.0	84.0
4	35	20.0	24.0	35	1.300	8.9	13.0
4	35	28.0	32.0	27	0.520	38.0	31.0
4	35	36.0	40.0	40	1.900	26.0	38.0
4	35	40.0	50.0	39	1.800	120.0	85.0
4	35	50.0	60.0	35	1.100	70.0	52.0
4	35	60.0	70.0	31	0.200	15.0	27.0

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
4	35	76.0	83.0	20	0.048	8.8	18.0
4	36	0.0	2.0	46	2.300	110.0	84.0
4	36	2.0	4.0	36	0.320	140.0	100.0
4	36	4.0	6.0	31	0.110	13.0	25.0
4	36	6.0	8.0	28	0.069	120.0	79.0
4	36	8.0	10.0	34	0.067	11.0	19.0
4	36	10.0	12.0	24	0.037	34.0	37.0
4	36	12.0	14.0	25	0.048	13.0	22.0
4	36	14.0	16.0	27	0.051	11.0	33.0
4	36	28.0	31.0	21	0.046	10.0	18.0
4	37	0.0	2.0	49	2.600	140.0	100.0
4	37	2.0	4.0	48	1.800	120.0	96.0
4	37	4.0	6.0	48	2.000	120.0	80.0
4	37	6.0	8.0	48	0.950	84.0	64.0
4	37	8.0	10.0	50	0.780	73.0	66.0
4	37	10.0	12.0	48	0.450	75.0	59.0
4	37	12.0	14.0	44	0.400	130.0	110.0
4	37	14.0	16.0	44	0.590	23.0	43.0
4	37	16.0	20.0	44	0.500	22.0	42.0
4	37	20.0	24.0	41	0.570	220.0	150.0
4	37	24.0	28.0	28	0.053	12.0	24.0
4	37	28.0	32.0	25	0.077	12.0	24.0
4	37	36.0	40.0	21	0.037	11.0	22.0
4	37	40.0	43.5	18	0.031	10.0	22.0
4	38	0.0	2.0	54	2.300	99.0	99.0
4	38	2.0	4.0	50	1.600	99.0	83.0
4	38	4.0	6.0	51	2.200	100.0	88.0
4	38	6.0	8.0	52	1.900	110.0	80.0
4	38	8.0	10.0	52	1.900	120.0	89.0
4	38	10.0	12.0	51	1.300	91.0	70.0
4	38	12.0	14.0	52	1.700	130.0	88.0
4	38	14.0	16.0	53	1.900	130.0	100.0
4	38	16.0	20.0	55	1.200	110.0	78.0
4	38	20.0	24.0	54	1.200	100.0	75.0
4	38	24.0	28.0	51	0.370	50.0	51.0
4	38	28.0	32.0	27	0.140	13.0	39.0
4	38	32.0	36.0	24	0.024	11.0	27.0
4	38	36.0	40.0	22	0.023	9.5	24.0
4	38	40.0	46.5	19	0.019	8.3	20.0
4	39	0.0	2.0	59	3.200	140.0	120.0
4	39	2.0	4.0	59	3.300	140.0	120.0
4	39	4.0	6.0	55	2.500	110.0	110.0
4	39	6.0	8.0	36	0.260	24.0	44.0
4	39	8.0	10.0	36	0.120	16.0	30.0
4	39	10.0	12.0	32	0.039	20.0	32.0
4	39	12.0	14.0	34	0.056	12.0	30.0
4	39	14.0	16.0	34	0.080	14.0	33.0
4	39	16.0	20.0	31	0.036	11.0	25.0
4	39	20.0	24.0	42	0.230	20.0	39.0
4	39	28.0	32.0	32	0.089	13.0	26.0
4	39	36.0	40.0	26	0.032	10.0	26.0
4	39	40.0	50.0	29	0.031	12.0	27.0
4	39	50.0	61.0	24	0.025	2.5	13.0
4	40	0.0	2.0	57	2.600	160.0	130.0
4	40	2.0	4.0	60	2.400	150.0	130.0
4	40	4.0	6.0	63	4.100	160.0	130.0
4	40	6.0	8.0	59	2.600	130.0	110.0
4	40	8.0	10.0	64	5.500	170.0	140.0
4	40	10.0	12.0	63	4.200	170.0	140.0
4	40	12.0	14.0	63	3.800	160.0	140.0
4	40	14.0	16.0	61	3.500	160.0	140.0
4	40	16.0	20.0	60	1.800	150.0	130.0
4	40	24.0	28.0	42	0.460	35.0	46.0
4	40	28.0	32.0	51	2.200	94.0	95.0
4	40	36.0	40.0	55	1.800	140.0	120.0
4	40	50.0	60.0	47	0.049	18.0	46.0
4	40	70.0	80.0	52	0.073	18.0	50.0
4	41	0.0	2.0	25	0.043	6.9	22.0
4	41	2.0	4.0	27	0.032	7.0	18.0
4	41	4.0	6.0	25	0.075	6.7	19.0
4	41	6.0	8.0	24	0.044	7.4	20.0
4	41	8.0	10.0	24	0.042	7.5	25.0
4	41	10.0	12.5	30	0.035	8.5	25.0
4	42	0.0	2.0	47	3.000	160.0	140.0
4	42	2.0	4.0	43	2.100	140.0	110.0
4	42	4.0	6.0	28	0.330	29.0	48.0
4	42	6.0	8.0	35	0.490	54.0	61.0
4	42	8.0	10.0	28	0.190	24.0	45.0
4	42	10.0	12.0	27	0.190	23.0	37.0
4	42	12.0	14.0	27	0.200	23.0	36.0
4	42	14.0	16.0	27	0.240	25.0	35.0
4	42	16.0	20.0	27	0.220	23.0	41.0
4	42	20.0	24.0	27	0.190	23.0	38.0
4	42	24.0	28.0	40	1.400	96.0	77.0
4	42	28.0	32.0	24	0.064	15.0	28.0
4	42	32.0	36.0	23	0.034	12.0	26.0
4	42	36.0	40.0	22	0.031	9.4	23.0
4	42	40.0	48.0	19	0.018	6.7	11.0
4	43	0.0	2.0	29	0.098	10.0	16.0
4	43	2.0	4.0	18	0.024	3.8	11.0
4	43	4.0	6.0	17	0.031	6.6	14.0

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
4	43	6.0	8.0	19	0.029	5.9	13.0
4	43	8.0	10.0	19	0.054	6.9	13.0
4	43	10.0	12.0	29	0.260	26.0	32.0
4	43	12.0	14.0	41	0.690	61.0	55.0
4	43	14.0	16.0	41	0.880	61.0	64.0
4	43	16.0	20.0	26	0.110	16.0	21.0
4	43	20.0	24.0	18	0.065	9.2	14.0
4	43	24.0	28.0	35	0.440	39.0	39.0
4	43	28.0	31.0	45	1.100	78.0	76.0
4	44	0.0	2.0	38	0.140	17.0	53.0
4	44	2.0	4.0	27	0.072	12.0	30.0
4	44	4.0	6.0	37	0.130	13.0	46.0
4	44	6.0	8.0	31	0.110	12.0	36.0
4	44	8.0	10.0	28	0.089	15.0	34.0
4	44	10.0	12.0	36	0.110	14.0	37.0
4	44	12.0	14.0	29	0.096	12.0	31.0
4	44	14.0	16.0	33	0.100	16.0	39.0
4	44	16.0	20.0	29	0.110	12.0	32.0
4	44	20.0	24.0	31	0.110	12.0	32.0
4	44	24.0	28.0	28	0.067	14.0	31.0
4	44	28.0	32.0	25	0.077	9.4	31.0
4	44	32.0	36.0	26	0.054	8.9	27.0
4	44	40.0	47.0	28	0.021	10.0	28.0
4	45	0.0	2.0	38	0.140	19.0	42.0
4	45	2.0	4.0	21	0.042	7.0	12.0
4	45	4.0	6.0	26	0.077	13.0	28.0
4	45	6.0	8.0	25	0.084	12.0	23.0
4	45	8.0	10.0	28	0.082	17.0	30.0
4	45	10.0	12.0	20	0.062	9.9	23.0
4	45	12.0	14.0	13	0.024	7.0	17.0
4	45	14.0	16.0	18	0.030	12.0	36.0
4	45	16.0	20.0	21	0.029	14.0	52.0
4	45	24.0	26.0	20	0.034	20.0	54.0
4	45	26.0	29.0	20	0.035	16.0	43.0
4	46	0.0	2.0	17	0.066	10.0	29.0
4	46	2.0	4.0	15	0.053	8.9	32.0
4	46	4.0	6.0	17	0.066	7.8	29.0
4	46	6.0	8.0	17	0.047	7.8	26.0
4	46	8.0	10.0	21	0.055	9.9	30.0
4	46	10.0	12.0	62	0.061	12.0	33.0
4	46	12.0	14.0	49	0.031	13.0	34.0
4	46	14.0	16.0	30	0.042	12.0	36.0
4	46	16.0	20.0	28	0.049	22.0	52.0
4	46	20.0	24.0	29	0.051	25.0	69.0
4	47	0.0	2.0	34	0.160	28.0	54.0
4	47	2.0	4.0	34	0.160	30.0	48.0
4	47	4.0	6.0	34	0.180	32.0	48.0
4	47	6.0	8.0	35	0.210	35.0	46.0
4	47	8.0	10.0	35	0.190	31.0	58.0
4	47	10.0	12.0	31	0.160	24.0	45.0
4	47	12.0	14.0	30	0.200	22.0	50.0
4	47	14.0	16.0	30	0.180	21.0	57.0
4	47	16.0	20.0	29	0.150	17.0	36.0
4	47	20.0	24.0	37	0.260	17.0	41.0
4	47	24.0	28.0	38	0.240	18.0	44.0
4	47	28.0	32.0	39	0.200	20.0	56.0
4	47	32.0	37.0	31	0.071	13.0	31.0
4	48	0.0	2.0	31	0.088	12.0	27.0
4	48	4.0	6.0	28	0.100	14.0	30.0
4	48	6.0	8.0	27	0.093	14.0	31.0
4	48	8.0	10.0	30	0.091	14.0	35.0
4	48	10.0	12.0	24	0.042	22.0	60.0
4	48	12.0	14.0	18	0.033	20.0	57.0
4	49	0.0	2.0	49	0.250	33.0	50.0
4	49	2.0	4.0	5[illegible]	0.390	36.0	59.0
4	49	4.0	6.0	44	0.270	41.0	53.0
4	49	6.0	8.0	41	0.260	41.0	29.0
4	49	8.0	10.0	39	0.250	42.0	39.0
4	49	10.0	12.0	41	0.260	41.0	38.0
4	49	12.0	14.0	36	0.210	30.0	47.0
4	49	14.0	16.0	39	0.200	39.0	50.0
4	49	16.0	20.0	40	0.240	37.0	38.0
4	49	20.0	24.0	38	0.160	38.0	50.0
4	49	24.0	28.0	37	0.250	45.0	0.0
4	49	28.0	32.0	38	0.260	43.0	53.0
4	49	32.0	36.0	38	0.270	40.0	42.0
4	49	36.0	40.0	38	0.270	39.0	45.0
4	49	40.0	50.0	38	0.280	42.0	51.0
4	49	50.0	60.0	37	0.270	37.0	48.0
4	50	0.0	2.0	18	0.050	8.3	30.0
4	50	2.0	4.0	14	0.034	13.0	24.0
4	50	4.0	6.0	15	0.029	9.1	26.0
4	51	0.0	2.0	30	0.140	31.0	35.0
4	51	2.0	4.0	28	0.130	24.0	30.0
4	51	4.0	6.0	27	0.140	23.0	28.0
4	51	6.0	8.0	26	0.130	24.0	33.0
4	51	8.0	10.0	14	0.037	200.0	34.0
4	51	10.0	12.0	12	0.041	120.0	27.0
4	51	12.0	14.0	21	0.056	12.0	24.0
4	51	14.0	16.0	22	0.048	84.0	26.0
4	51	16.0	21.0	21	0.037	220.0	19.0

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
4	52	0.0	2.0	29	0.100	21.0	32.0
4	52	2.0	4.0	23	0.069	14.0	20.0
4	52	4.0	6.0	22	0.047	93.0	21.0
4	53	0.0	2.0	35	0.220	46.0	45.0
4	53	2.0	4.0	40	0.200	44.0	48.0
4	53	4.0	6.0	38	0.190	43.0	43.0
4	53	6.0	8.0	42	0.210	36.0	47.0
4	53	8.0	10.0	40	0.200	38.0	50.0
4	53	10.0	12.0	38	0.200	38.0	45.0
4	53	12.0	14.0	40	0.240	34.0	35.0
4	53	14.0	16.0	45	0.230	33.0	41.0
4	53	16.0	20.0	38	0.170	18.0	26.0
4	53	20.0	24.0	30	0.094	15.0	6.4
4	53	24.0	28.0	26	0.028	7.4	19.0
4	53	28.0	31.5	27	0.041	10.0	20.0
4	54	0.0	2.0	39	0.510	320.0	60.0
4	54	2.0	4.0	36	0.410	180.0	54.0
4	54	4.0	6.0	32	0.390	160.0	58.0
4	54	6.0	8.0	30	0.340	130.0	66.0
4	54	8.0	10.0	36	0.370	200.0	61.0
4	54	10.0	12.0	39	0.320	170.0	57.0
4	54	12.0	14.0	37	0.220	92.0	58.0
4	54	14.0	16.0	38	0.200	99.0	59.0
4	54	16.0	20.0	38	0.370	190.0	61.0
4	54	20.0	24.0	42	0.380	100.0	60.0
4	54	24.0	28.0	48	0.370	110.0	58.0
4	54	28.0	32.0	49	0.410	130.0	64.0
4	54	32.0	36.0	48	0.430	120.0	55.0
4	54	36.0	40.0	48	0.410	130.0	61.0
4	54	40.0	50.0	52	0.490	200.0	63.0
4	54	50.0	61.0	49	0.510	150.0	65.0
4	55	0.0	2.0	23	0.140	26.0	34.0
4	55	2.0	4.0	22	0.170	28.0	30.0
4	55	4.0	6.0	18	0.097	14.0	29.0
4	55	6.0	8.0	16	0.150	16.0	19.0
4	55	8.0	10.0	18	0.110	18.0	28.0
4	55	10.0	12.0	19	0.180	33.0	29.0
4	55	12.0	14.0	19	0.220	31.0	24.0
4	55	14.0	16.0	15	0.160	21.0	33.0
4	55	16.0	20.0	23	0.310	33.0	40.0
4	55	20.0	24.0	19	0.120	14.0	9.6
4	55	24.0	29.0	20	0.220	17.0	27.0
4	55	32.0	38.0	22	0.160	18.0	37.0
4	56	0.0	2.0	51	0.200	58.0	63.0
4	56	2.0	4.0	48	0.160	51.0	57.0
4	56	4.0	6.0	44	0.140	50.0	58.0
4	56	6.0	8.0	41	0.110	47.0	27.0
4	56	8.0	10.0	44	0.150	51.0	64.0
4	56	10.0	12.0	33	0.096	33.0	47.0
4	56	12.0	14.0	41	0.190	46.0	50.0
4	56	14.0	16.0	42	0.190	49.0	54.0
4	56	16.0	20.0	23	0.130	14.0	43.0
4	56	20.0	24.0	28	0.088	10.0	32.0
4	56	24.0	28.0	34	0.150	25.0	25.0
4	56	28.0	32.0	31	0.084	31.0	32.0
4	57	0.0	2.0	44	0.750	84.0	74.0
4	57	2.0	4.0	45	0.850	78.0	66.0
4	57	4.0	6.0	44	0.810	81.0	58.0
4	57	6.0	8.0	46	0.770	80.0	67.0
4	57	8.0	10.0	43	0.590	65.0	53.0
4	57	10.0	12.0	45	0.640	81.0	69.0
4	57	12.0	14.0	47	0.790	78.0	60.0
4	57	14.0	16.0	49	0.740	91.0	77.0
4	57	16.0	20.0	49	0.570	85.0	62.0
4	57	20.0	24.0	52	0.690	85.0	84.0
4	57	24.0	28.0	52	0.580	71.0	53.0
4	57	32.0	36.0	53	0.660	76.0	69.0
4	57	40.0	50.0	55	0.700	75.0	68.0
4	57	50.0	58.0	55	0.410	42.0	38.0
4	58	0.0	2.0	76	1.100	110.0	82.0
4	58	2.0	4.0	71	1.000	130.0	82.0
4	58	4.0	6.0	70	0.990	120.0	83.0
4	58	6.0	8.0	64	0.790	98.0	72.0
4	58	8.0	10.0	63	0.810	87.0	65.0
4	58	10.0	12.0	54	0.550	71.0	47.0
4	58	12.0	14.0	38	0.210	27.0	21.0
4	58	14.0	16.0	32	0.120	17.0	16.0
4	58	16.0	20.0	51	0.400	43.0	41.0
4	58	20.0	24.0	63	0.720	85.0	62.0
4	58	24.0	28.0	47	0.350	38.0	37.0
4	58	32.0	36.0	40	0.260	30.0	27.0
4	58	40.0	51.0	16	0.020	5.4	13.0
4	59	0.0	2.0	75	0.0	110.0	85.0
4	59	2.0	4.0	71	1.100	110.0	83.0
4	59	4.0	6.0	70	1.100	110.0	78.0
4	59	6.0	8.0	68	1.400	110.0	97.0
4	59	8.0	10.0	64	0.810	95.0	87.0
4	59	10.0	12.0	65	0.970	100.0	78.0
4	59	12.0	14.0	62	0.660	75.0	71.0
4	59	14.0	16.0	61	0.780	77.0	72.0
4	59	16.0	20.0	62	0.810	120.0	64.0
4	59	20.0	24.0	62	0.860	130.0	79.0
4	59	24.0	28.0	63	1.000	130.0	72.0
4	59	32.0	36.0	54	0.760	100.0	72.0
4	59	40.0	50.0	40	0.062	19.0	44.0
4	59	50.0	60.0	40	0.077	14.0	34.0
4	60	0.0	4.0	79	2.400	170.0	120.0
4	60	4.0	6.0	70	1.600	190.0	140.0
4	60	6.0	8.0	65	0.960	130.0	86.0
4	60	8.0	10.0	54	0.370	50.0	53.0
4	60	10.0	12.0	40	0.190	24.0	28.0
4	60	12.0	14.0	28	0.058	14.0	18.0
4	60	14.0	16.0	26	0.073	14.0	20.0
4	60	16.0	20.0	69	0.800	170.0	110.0
4	60	20.0	24.0	67	1.100	160.0	120.0
4	60	24.0	28.0	47	0.250	36.0	33.0
4	60	28.0	32.0	32	0.100	19.0	22.0
4	61	0.0	2.0	24	0.100	15.0	15.0
4	61	2.0	4.0	29	0.190	26.0	20.0
4	61	4.0	6.0	27	0.190	20.0	14.0
4	61	6.0	8.0	18	0.100	13.0	11.0
4	61	8.0	10.0	18	0.067	12.0	16.0
4	61	10.0	12.0	16	0.042	11.0	15.0
4	61	12.0	14.0	16	0.038	12.0	18.0
4	61	14.0	17.0	18	0.018	14.0	19.0
4	63	0.0	2.0	39	0.560	56.0	35.0
4	63	2.0	4.0	37	0.430	38.0	26.0
4	63	4.0	6.0	32	0.330	35.0	23.0
4	63	6.0	8.0	29	0.300	33.0	23.0
4	63	8.0	9.5	27	0.095	33.0	20.0
4	63	9.5	12.0	27	0.270	29.0	20.0
4	64	0.0	2.0	54	2.200	170.0	120.0
4	64	2.0	4.0	58	1.800	160.0	80.0
4	64	4.0	6.0	54	1.300	120.0	63.0
4	64	6.0	8.0	29	0.160	26.0	21.0
4	64	8.0	10.0	21	0.040	10.0	11.0
4	64	10.0	12.0	20	0.056	9.8	11.0
4	64	12.0	14.0	36	0.400	50.0	27.0
4	64	14.0	16.0	49	0.680	100.0	53.0
4	65	0.0	2.0	64	3.100	270.0	130.0
4	65	2.0	4.0	68	2.900	270.0	110.0
4	65	4.0	6.0	69	3.600	250.0	110.0
4	65	6.0	8.0	70	3.500	250.0	98.0
4	65	8.0	10.0	70	3.500	260.0	96.0
4	65	10.0	12.0	70	2.700	210.0	82.0
4	65	12.0	14.0	65	1.300	160.0	59.0
4	65	14.0	16.0	61	1.100	110.0	55.0
4	65	16.0	20.0	45	0.720	40.0	28.0
4	65	20.0	24.0	49	0.750	33.0	30.0
4	65	24.0	28.0	35	0.210	17.0	18.0
4	65	28.0	32.0	27	0.071	13.0	14.0
4	65	32.0	36.0	22	0.051	13.0	17.0
4	65	36.0	41.0	20	0.079	15.0	30.0
4	66	0.0	2.0	36	0.390	27.0	19.0
4	66	2.0	4.0	26	0.064	12.0	11.0
4	66	4.0	6.0	33	0.280	25.0	21.0
4	66	6.0	8.0	58	2.000	14.0	61.0
4	66	8.0	10.0	40	0.340	26.0	19.0
4	66	10.0	12.0	34	0.110	13.0	15.0
4	66	12.0	14.0	28	0.110	14.0	13.0
4	66	14.0	16.0	62	3.200	160.0	83.0
4	66	16.0	20.0	64	2.900	210.0	140.0
4	66	20.0	24.0	61	1.900	120.0	87.0
4	66	24.0	28.0	57	1.100	57.0	39.0
4	66	28.0	32.0	43	0.610	22.0	21.0
4	66	32.0	36.5	30	0.140	13.0	13.0
4	67	0.0	2.0	72	0.0	150.0	91.0
4	67	2.0	4.0	63	2.000	130.0	97.0
4	67	4.0	6.0	60	2.200	130.0	80.0
4	67	6.0	8.0	62	2.200	130.0	97.0
4	67	8.0	10.0	61	2.100	130.0	87.0
4	67	10.0	12.0	59	3.000	130.0	83.0
4	67	12.0	14.0	56	1.500	80.0	73.0
4	67	14.0	16.0	52	0.670	27.0	29.0
4	67	16.0	20.0	46	0.460	0.0	0.0
4	67	20.0	24.0	36	0.250	17.0	17.0
4	67	24.0	27.0	24	0.080	10.0	11.0
4	67	27.0	30.0	22	0.077	10.0	10.0
4	68	0.0	3.0	16	0.120	11.0	16.0
4	68	3.0	7.5	16	0.092	14.0	17.0
4	69	0.0	2.0	17	0.079	10.0	10.0
4	69	2.0	4.0	15	0.071	8.7	7.7
4	69	4.0	6.0	15	0.069	8.1	9.2
4	69	6.0	8.0	15	0.071	11.0	13.0
4	69	8.0	10.0	16	0.068	11.0	13.0
4	69	10.0	12.0	15	0.072	9.4	8.7
4	69	12.0	14.0	16	0.061	8.9	9.1
4	69	14.0	16.0	15	0.044	9.3	9.0
4	69	16.0	21.0	21	0.029	16.0	33.0
4	70	0.0	2.0	79	0.110	11.0	30.0
4	70	2.0	4.0	80	0.130	11.0	43.0
4	70	4.0	6.0	84	0.160	20.0	12.0

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
4	70	6.0	8.0	85	0.200	12.0	7.4
4	70	8.0	10.0	84	0.130	9.9	6.3
4	70	10.0	12.0	79	0.082	10.0	5.4
4	70	12.0	14.0	78	0.170	16.0	16.0
4	70	14.0	16.0	79	0.160	15.0	20.0
4	70	16.0	22.0	83	0.160	13.0	6.4
4	71	0.0	2.0	65	2.200	190.0	100.0
4	71	2.0	4.0	67	2.300	170.0	94.0
4	71	4.0	6.0	68	2.200	170.0	79.0
4	71	6.0	8.0	69	2.100	190.0	91.0
4	71	8.0	10.0	63	1.600	120.0	58.0
4	71	10.0	12.0	46	0.370	40.0	24.0
4	71	12.0	14.0	32	0.120	15.0	13.0
4	71	14.0	16.0	29	0.097	12.0	11.0
4	71	16.0	20.0	50	0.650	57.0	29.0
4	71	20.0	24.0	71	2.300	0.0	120.0
4	71	24.0	28.0	69	2.100	160.0	74.0
4	71	28.0	32.0	59	0.930	95.0	47.0
4	71	32.0	36.0	45	0.450	45.0	32.0
4	71	36.0	41.5	30	0.074	9.1	11.0
4	72	0.0	2.0	70	2.100	190.0	110.0
4	72	2.0	4.0	34	0.370	48.0	27.0
4	72	4.0	6.0	21	0.180	17.0	12.0
4	72	6.0	8.0	18	0.061	7.2	5.8
4	73	0.0	2.0	26	0.180	15.0	12.0
4	73	2.0	4.0	19	0.140	13.0	11.0
4	73	4.0	6.0	25	0.230	20.0	14.0
4	74	0.0	2.0	40	0.430	36.0	21.0
4	74	2.0	4.0	31	0.320	32.0	25.0
4	74	4.0	6.0	29	0.250	25.0	16.0
4	74	6.0	8.0	30	0.380	29.0	19.0
4	74	8.0	10.0	41	0.630	52.0	31.0
4	74	10.0	12.0	40	0.680	58.0	33.0
4	74	12.0	14.0	21	0.190	15.0	11.0
4	74	14.0	16.0	19	0.055	9.1	6.1
4	74	16.0	18.0	17	0.029	6.3	4.8
4	75	0.0	2.0	31	0.520	39.0	28.0
4	75	2.0	4.0	22	0.410	23.0	19.0
4	75	4.0	6.0	39	1.100	66.0	38.0
4	75	8.0	10.0	37	1.200	67.0	33.0
4	75	6.0	8.0	38	0.940	71.0	47.0
4	75	10.0	12.0	40	1.300	70.0	52.0
4	75	12.0	14.0	39	1.100	66.0	46.0
4	75	14.0	16.0	36	0.650	54.0	47.0
4	75	16.0	20.0	39	0.730	61.0	51.0
4	75	20.0	24.0	40	0.830	62.0	53.0
4	75	24.0	28.0	40	0.970	70.0	51.0
4	75	28.0	32.0	38	1.000	63.0	48.0
4	75	36.0	40.0	40	1.200	66.0	67.0
4	75	40.0	51.0	38	1.300	69.0	48.0
4	76	0.0	2.0	21	0.140	14.0	12.0
4	76	2.0	4.0	18	0.096	15.0	12.0
4	76	4.0	6.0	17	0.120	13.0	9.0
4	77	0.0	2.0	34	0.320	35.0	24.0
4	77	2.0	4.0	24	0.210	20.0	16.0
4	77	4.0	6.0	29	0.260	26.0	20.0
4	77	6.0	8.0	26	0.280	23.0	23.0
4	77	8.0	10.0	26	0.300	25.0	24.0
4	77	10.0	12.0	36	0.380	33.0	27.0
4	77	12.0	14.0	34	0.350	33.0	25.0
4	77	14.0	16.0	37	0.380	38.0	27.0
4	77	16.0	21.0	19	0.055	15.0	32.0
4	78	0.0	2.0	33	0.290	34.0	25.0
4	78	2.0	4.0	32	0.270	26.0	27.0
4	78	4.0	6.0	22	0.110	13.0	14.0
4	78	6.0	8.0	21	0.049	10.0	12.0
4	78	8.0	10.0	20	0.041	9.0	11.0
4	78	10.0	12.0	21	0.060	9.7	12.0
4	78	12.0	14.0	21	0.029	9.9	13.0
4	78	14.0	16.0	21	0.0	8.8	13.0
4	78	16.0	20.0	23	0.062	9.5	14.0
4	78	20.0	24.0	25	0.063	11.0	14.0
4	78	24.0	27.0	26	0.056	10.0	16.0
4	79	0.0	2.0	37	0.150	21.0	32.0
4	79	2.0	4.0	39	0.140	19.0	27.0
4	79	4.0	6.0	46	0.130	29.0	32.0
4	79	6.0	8.0	34	0.070	16.0	31.0
4	79	8.0	10.0	14	0.032	9.6	28.0
4	79	10.0	12.0	15	0.034	8.8	31.0
4	79	12.0	14.0	9	0.030	7.2	28.0
4	79	14.0	16.0	15	0.035	13.0	29.0
4	79	16.0	20.0	23	0.054	16.0	26.0
4	79	20.0	24.0	18	0.042	16.0	26.0
4	79	24.0	28.0	24	0.033	13.0	26.0
4	79	28.0	31.0	22	0.048	6.7	8.3
4	79	31.0	34.0	26	0.023	16.0	18.0
4	80	0.0	2.0	43	0.210	26.0	30.0
4	80	2.0	4.0	43	0.170	21.0	24.0
4	80	4.0	6.0	62	0.420	50.0	40.0
4	80	6.0	8.0	61	0.400	54.0	46.0
4	80	8.0	10.0	56	0.190	41.0	36.0
4	80	10.0	12.0	52	0.200	31.0	31.0
4	80	12.0	14.0	47	0.110	26.0	32.0
4	80	14.0	16.0	42	0.130	22.0	24.0
4	80	16.0	20.0	35	0.140	16.0	19.0
4	80	20.0	24.0	27	0.064	9.9	13.0
4	80	28.0	32.0	54	0.340	46.0	41.0
4	80	32.0	36.0	49	0.160	30.0	33.0
4	80	40.0	48.0	26	0.029	9.4	13.0
4	80	48.0	56.0	84	0.170	12.0	3.9
4	81	0.0	2.0	13	0.018	10.0	25.0
4	81	2.0	4.0	13	0.015	11.0	24.0
4	81	4.0	6.0	13	0.020	12.0	30.0
4	81	6.0	8.0	13	0.019	13.0	29.0
4	81	8.0	11.0	14	0.015	11.0	30.0
4	82	0.0	2.0	67	0.640	61.0	70.0
4	82	2.0	4.0	23	0.073	13.0	11.0
4	82	4.0	6.0	18	0.052	8.3	7.9
4	82	6.0	8.0	27	0.130	22.0	16.0
4	83	0.0	2.0	28	0.220	29.0	22.0
4	83	2.0	4.0	34	0.330	34.0	24.0
4	83	4.0	6.0	31	0.240	28.0	21.0
4	83	6.0	8.0	38	0.440	46.0	29.0
4	83	8.0	10.0	28	0.290	26.0	21.0
4	83	10.0	12.0	30	0.220	26.0	20.0
4	83	12.0	14.0	37	0.400	38.0	29.0
4	83	14.0	16.0	39	0.330	36.0	28.0
4	83	16.0	20.0	24	0.095	15.0	13.0
4	83	20.0	24.0	19	0.034	14.0	19.0
4	83	24.0	28.0	24	0.052	24.0	40.0
4	83	28.0	31.0	23	0.055	18.0	36.0
4	84	0.0	2.0	62	1.100	90.0	53.0
4	84	2.0	4.0	66	1.100	90.0	65.0
4	84	4.0	6.0	63	0.970	85.0	57.0
4	84	6.0	8.0	44	0.470	49.0	35.0
4	84	8.0	10.0	30	0.220	30.0	22.0
4	84	10.0	12.0	53	0.590	62.0	41.0
4	84	12.0	14.0	51	0.510	62.0	38.0
4	84	14.0	16.0	40	0.470	42.0	28.0
4	84	16.0	20.0	24	0.140	17.0	14.0
4	84	20.0	24.0	22	0.034	10.0	13.0
4	84	24.0	28.0	24	0.042	17.0	32.0
4	84	28.0	31.5	26	0.056	20.0	26.0
4	85	0.0	2.0	68	1.100	82.0	53.0
4	85	2.0	4.0	69	0.800	77.0	55.0
4	85	4.0	6.0	66	0.820	73.0	59.0
4	85	6.0	8.0	63	0.740	70.0	61.0
4	85	8.0	10.0	59	0.480	53.0	47.0
4	85	10.0	12.0	52	0.240	38.0	36.0
4	85	12.0	14.0	39	0.190	24.0	25.0
4	85	14.0	16.0	42	0.230	24.0	24.0
4	85	16.0	20.0	52	0.300	29.0	32.0
4	85	20.0	24.0	47	0.220	25.0	29.0
4	85	24.0	28.0	37	0.120	16.0	19.0
4	86	0.0	0.2	28	0.160	23.0	24.0
4	86	2.0	4.0	26	0.150	16.0	15.0
4	86	4.0	6.0	27	0.130	21.0	19.0
4	86	6.0	8.0	29	0.200	16.0	21.0
4	86	8.0	10.0	30	0.160	15.0	18.0
4	86	10.0	12.0	38	0.260	20.0	20.0
4	86	12.0	14.0	35	0.330	12.0	17.0
4	86	14.0	16.0	35	0.240	15.0	18.0
4	86	16.0	20.0	36	0.130	20.0	25.0
4	86	20.0	24.0	38	0.180	20.0	27.0
4	86	28.0	32.0	28	0.074	15.0	17.0
4	86	24.0	28.0	33	0.100	17.0	23.0
4	86	32.0	36.0	28	0.100	16.0	20.0
7	23GS	0.0	10.0	20	0.013	6.6	10.0
7	24GS	0.0	10.0	32	0.049	13.0	19.0
7	24	0.0	2.0	22	0.016	10.0	4.8
7	24	2.0	4.0	22	0.016	12.0	5.2
7	24	4.0	6.0	23	0.015	12.0	5.0
7	24	6.0	8.0	27	0.017	14.0	5.9
7	24	8.0	10.0	25	0.017	12.0	5.1
7	24	10.0	12.0	24	0.013	9.5	5.1
7	24	12.0	14.0	29	0.021	11.0	5.4
7	24	14.0	16.0	34	0.019	14.0	6.4
7	24	20.0	24.0	36	0.020	15.0	7.3
7	24	28.0	32.0	38	0.021	16.0	7.0
7	24	36.0	40.0	28	0.019	12.0	5.7
7	24	50.0	60.0	32	0.019	13.0	6.3
7	25	0.0	2.0	92	0.098	25.0	33.0
7	25	2.0	4.0	40	0.019	18.0	25.0
7	25	4.0	6.0	460	-0.003	0.0	0.0
7	25	6.0	8.0	32	0.019	4.5	9.9
7	25	8.0	10.0	27	0.019	3.4	7.9
7	25	10.0	12.0	27	0.017	3.1	7.8
7	25	12.0	14.0	28	0.021	0.5	10.0
7	25	14.0	16.0	23	0.016	3.0	7.4
7	25	20.0	24.0	29	0.020	15.0	22.0
7	25	28.0	32.0	27	0.017	6.4	13.0

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
7	25	36.0	40.0	28	0.018	7.2	13.0
7	25	50.0	60.0	27	0.018	14.0	21.0
7	27GS	0.0	10.0	24	0.013	15.0	12.0
7	30GS	0.0	10.0	34	0.033	20.0	28.0
7	30	0.0	2.0	74	0.022	16.0	30.0
7	30	2.0	4.0	66	0.022	14.0	29.0
7	30	4.0	6.0	68	0.016	14.0	33.0
7	30	6.0	8.0	61	0.016	16.0	34.0
7	30	8.0	10.0	58	0.024	15.0	32.0
7	30	10.0	12.0	61	0.028	14.0	29.0
7	30	12.0	14.0	53	0.016	17.0	32.0
7	30	14.0	16.0	54	0.019	17.0	34.0
7	30	20.0	24.0	41	0.010	4.2	16.0
7	30	28.0	32.0	46	0.015	14.0	32.0
7	30	37.0	40.0	35	0.017	5.3	21.0
7	30	50.0	60.0	43	0.016	1.3	14.0
7	31GS	0.0	10.0	34	0.033	16.0	25.0
7	31	0.0	2.0	48	0.051	12.0	23.0
7	31	2.0	4.0	35	0.012	11.0	25.0
7	31	4.0	6.0	38	0.015	11.0	24.0
7	31	6.0	8.0	40	0.010	14.0	28.0
7	31	8.0	10.0	40	0.016	13.0	30.0
7	31	10.0	12.0	36	0.013	14.0	31.0
7	31	12.0	14.0	41	0.014	14.0	29.0
7	31	14.0	16.0	39	0.013	14.0	28.0
7	31	20.0	24.0	39	0.013	14.0	30.0
7	31	28.0	32.0	39	0.011	12.0	26.0
7	31	36.0	40.0	35	0.011	11.0	24.0
7	31	50.0	60.0	35	0.013	12.0	28.0
7	32GS	0.0	10.0	39	0.049	16.0	22.0
7	32	0.0	2.0	34	0.020	15.0	6.7
7	32	2.0	4.0	36	0.018	13.0	6.7
7	32	4.0	6.0	35	0.017	14.0	6.9
7	32	6.0	8.0	36	0.022	15.0	6.6
7	32	8.0	10.0	42	0.024	16.0	7.6
7	32	10.0	12.0	37	0.012	13.0	6.9
7	32	12.0	14.0	34	0.017	9.0	8.2
7	32	14.0	16.0	30	0.014	10.0	6.8
7	32	20.0	24.0	31	0.015	5.6	5.4
7	32	28.0	32.0	52	0.023	12.0	9.5
7	32	36.0	40.0	8	0.011	9.1	5.5
7	32	50.0	60.0	30	0.013	10.0	6.5
7	33GS	0.0	10.0	59	0.300	49.0	45.0
7	33	0.0	2.0	57	0.410	78.0	47.0
7	33	2.0	4.0	50	0.180	40.0	34.0
7	33	4.0	6.0	46	0.089	16.0	23.0
7	33	6.0	8.0	31	0.034	9.6	15.0
7	33	8.0	10.0	32	0.032	10.0	17.0
7	33	10.0	12.0	30	0.030	11.0	17.0
7	33	12.0	14.0	28	0.027	10.0	16.0
7	33	14.0	16.0	30	0.023	13.0	19.0
7	33	20.0	24.0	29	0.023	8.5	15.0
7	33	28.0	32.0	32	0.024	11.0	20.0
7	33	36.0	40.0	32	0.140	8.8	17.0
7	33	50.0	60.0	34	0.071	3.7	13.0
7	34GS	0.0	10.0	41	0.360	62.0	43.0
7	35GS	0.0	10.0	21	0.042	13.0	37.0
7	36GS	0.0	10.0	66	0.320	60.0	60.0
7	36	0.0	2.0	82	0.260	40.0	22.0
7	36	2.0	4.0	32	0.110	32.0	13.0
7	36	4.0	6.0	62	0.100	24.0	14.0
7	36	6.0	8.0	61	0.065	26.0	14.0
7	36	8.0	10.0	63	0.057	22.0	12.0
7	36	10.0	12.0	62	0.032	24.0	15.0
7	36	12.0	14.0	59	0.039	27.0	17.0
7	36	14.0	16.0	58	0.032	23.0	13.0
7	36	20.0	24.0	62	0.032	27.0	15.0
7	36	28.0	32.0	59	0.039	24.0	15.0
7	36	36.0	40.0	61	0.036	23.0	13.0
7	36	50.0	60.0	63	0.019	26.0	14.0
7	37	0.0	2.0	66	0.110	24.0	30.0
7	37	2.0	4.0	64	0.090	22.0	31.0
7	37	4.0	6.0	69	0.061	23.0	33.0
7	37	6.0	8.0	68	0.046	24.0	33.0
7	37	8.0	10.0	67	0.035	22.0	32.0
7	37	10.0	12.0	68	0.032	21.0	33.0
7	37	12.0	14.0	64	0.028	23.0	34.0
7	37	14.0	16.0	64	0.025	20.0	33.0
7	37	20.0	24.0	67	0.024	23.0	35.0
7	37	28.0	32.0	67	0.022	22.0	34.0
7	37	36.0	40.0	68	0.025	21.0	33.0
7	37	50.0	60.0	68	0.022	18.0	29.0
7	37	326.5	331.5	48	0.013	25.0	35.0
7	38GS	0.0	10.0	47	0.035	22.0	36.0
7	38	0.0	2.0	65	0.046	27.0	51.0
7	38	2.0	4.0	60	0.018	22.0	45.0
7	38	4.0	6.0	57	0.030	20.0	43.0
7	38	6.0	8.0	74	0.0	19.0	45.0
7	38	8.0	10.0	76	0.042	21.0	44.0
7	38	10.0	12.0	64	0.027	20.0	45.0

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
7	38	12.0	14.0	83	0.083	15.0	35.0
7	38	14.0	16.0	45	0.046	23.0	49.0
7	38	20.0	24.0	84	0.045	21.0	50.0
7	38	28.0	32.0	54	0.019	21.0	44.0
7	38	36.0	40.0	82	0.041	20.0	40.0
7	38	50.0	60.0	62	0.180	19.0	40.0
7	39GS	0.0	10.0	50	0.044	23.0	39.0
7	39	0.0	2.0	62	0.066	29.0	14.0
7	39	2.0	4.0	57	0.024	23.0	13.0
7	39	4.0	6.0	54	0.025	20.0	12.0
7	39	6.0	8.0	57	0.023	21.0	12.0
7	39	8.0	10.0	54	0.024	22.0	12.0
7	39	10.0	12.0	59	0.015	21.0	13.0
7	39	12.0	14.0	72	0.041	30.0	20.0
7	39	14.0	16.0	43	0.008	14.0	8.4
7	39	20.0	24.0	55	0.024	20.0	11.0
7	39	28.0	32.0	56	0.020	23.0	11.0
7	39	36.0	40.0	57	0.027	20.0	11.0
7	39	50.0	60.0	53	0.013	20.0	10.0
7	41GS	0.0	10.0	44	0.028	0.0	0.0
7	41	0.0	2.0	91	0.072	8.6	49.0
7	41	2.0	4.0	79	0.060	7.6	43.0
7	41	4.0	6.0	77	0.034	19.0	36.0
7	41	6.0	8.0	72	0.031	14.0	34.0
7	41	8.0	10.0	63	0.025	17.0	36.0
7	41	10.0	12.0	62	0.023	15.0	34.0
7	41	12.0	14.0	61	0.030	14.0	34.0
7	41	14.0	16.0	66	0.029	20.0	38.0
7	41	20.0	24.0	64	0.029	14.0	36.0
7	41	28.0	32.0	68	0.027	17.0	37.0
7	41	36.0	40.0	63	0.026	13.0	34.0
7	41	50.0	60.0	66	0.024	15.0	36.0
7	41	81.0	86.0	34	0.015	0.1	9.8
7	42	0.0	2.0	89	0.064	23.0	41.0
7	42	2.0	4.0	83	0.041	18.0	38.0
7	42	4.0	6.0	84	0.040	17.0	41.0
7	42	6.0	8.0	82	0.041	18.0	38.0
7	42	8.0	10.0	79	0.046	22.0	41.0
7	42	10.0	12.0	82	0.041	17.0	35.0
7	42	12.0	14.0	79	0.028	22.0	45.0
7	42	14.0	16.0	77	0.031	20.0	44.0
7	42	20.0	24.0	70	0.019	18.0	35.0
7	42	28.0	32.0	68	0.019	22.0	41.0
7	42	36.0	40.0	69	0.023	18.0	40.0
7	42	50.0	60.0	68	0.021	25.0	41.0
7	43GS	0.0	10.0	52	0.044	25.0	45.0
7	43	0.0	2.0	75	0.210	48.0	22.0
7	43	2.0	4.0	74	0.140	38.0	19.0
7	43	4.0	6.0	73	0.029	25.0	16.0
7	43	6.0	8.0	75	0.067	25.0	15.0
7	43	8.0	10.0	85	0.062	21.0	16.0
7	43	10.0	12.0	80	0.040	23.0	15.0
7	43	12.0	14.0	74	0.040	23.0	15.0
7	43	14.0	16.0	74	0.037	24.0	16.0
7	43	20.0	24.0	76	0.032	23.0	15.0
7	43	28.0	32.0	76	0.030	24.0	17.0
7	43	36.0	40.0	68	0.021	22.0	14.0
7	43	50.0	60.0	67	0.021	24.0	15.0
7	45GS	0.0	10.0	46	0.076	23.0	37.0
7	45	0.0	2.0	68	0.110	23.0	32.0
7	45	2.0	4.0	64	0.056	18.0	31.0
7	45	4.0	6.0	57	0.044	13.0	24.0
7	45	6.0	8.0	52	0.035	12.0	23.0
7	45	8.0	10.0	51	0.039	12.0	22.0
7	45	10.0	12.0	50	0.043	11.0	22.0
7	45	12.0	14.0	49	0.039	13.0	23.0
7	45	14.0	16.0	50	0.031	13.0	25.0
7	45	20.0	24.0	49	0.027	13.0	25.0
7	45	28.0	32.0	45	0.026	15.0	25.0
7	45	36.0	40.0	41	0.026	13.0	23.0
7	45	50.0	60.0	41	0.024	12.0	23.0
7	46GS	0.0	10.0	63	0.120	27.0	39.0
7	46	0.0	2.0	70	0.200	41.0	60.0
7	46	2.0	4.0	67	0.120	31.0	50.0
7	46	4.0	6.0	69	0.063	27.0	47.0
7	46	6.0	8.0	64	0.042	29.0	48.0
7	46	8.0	10.0	57	0.0	27.0	43.0
7	46	10.0	12.0	58	0.032	23.0	47.0
7	46	12.0	14.0	59	0.031	22.0	44.0
7	46	14.0	16.0	58	0.038	24.0	46.0
7	46	20.0	24.0	60	0.036	21.0	51.0
7	46	28.0	32.0	58	0.044	19.0	38.0
7	46	36.0	40.0	56	0.028	26.0	48.0
7	46	50.0	60.0	52	0.023	16.0	30.0
7	48GS	0.0	10.0	13	0.022	5.3	30.0
7	49GS	0.0	10.0	44	0.110	23.0	31.0
7	49	0.0	2.0	62	0.110	24.0	47.0
7	49	2.0	4.0	59	0.089	20.0	39.0
7	49	4.0	6.0	53	0.050	18.0	32.0
7	49	6.0	8.0	53	0.040	18.0	36.0
7	49	8.0	10.0	55	0.036	19.0	35.0
7	49	10.0	12.0	48	0.031	16.0	27.0

CRUISE	STATION	INTERVAL TOP CM	BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
7	49	12.0	14.0	44	0.027	14.0	28.0
7	49	14.0	16.0	50	0.029	16.0	32.0
7	49	20.0	24.5	17	0.012	3.4	12.0
7	49	28.0	32.0	23	0.022	5.4	18.0
7	49	36.0	40.0	20	0.026	1.8	11.0
7	51	0.0	2.0	74	0.120	26.0	41.0
7	51	2.0	4.0	65	0.100	21.0	33.0
7	51	4.0	6.0	59	0.077	18.0	31.0
7	51	6.0	8.0	54	0.065	18.0	31.0
7	51	8.0	10.0	47	0.058	15.0	29.0
7	51	10.0	12.0	43	0.047	14.0	25.0
7	51	12.0	14.0	40	0.034	14.0	25.0
7	51	14.0	16.0	43	0.038	13.0	28.0
7	51	20.0	24.0	29	0.019	10.0	19.0
7	51	28.0	32.0	30	0.018	11.0	22.0
7	51	36.0	40.0	37	0.018	14.0	25.0
7	51	50.0	60.0	43	0.023	17.0	34.0
7	51	60.0	70.0	30	0.015	11.0	21.0
7	52GS	0.0	10.0	53	0.180	32.0	40.0
7	52	0.0	2.0	72	0.410	52.0	66.0
7	52	2.0	4.0	65	0.290	42.0	53.0
7	52	4.0	6.0	63	0.220	36.0	53.0
7	52	6.0	8.0	59	0.170	25.0	37.0
7	52	8.0	10.0	61	0.150	28.0	45.0
7	52	10.0	12.0	49	0.079	20.0	36.0
7	52	12.0	14.0	43	0.033	16.0	29.0
7	52	14.0	16.0	41	0.037	14.0	29.0
7	52	20.0	24.0	41	0.036	11.0	26.0
7	52	28.0	32.0	40	0.046	16.0	30.0
7	52	36.0	40.0	41	0.036	14.0	30.0
7	52	50.0	59.0	41	0.0	9.2	16.0
7	53	0.0	2.0	71	0.240	39.0	56.0
7	53	2.0	4.0	71	0.240	43.0	62.0
7	53	4.0	6.0	67	0.200	35.0	58.0
7	53	6.0	8.0	62	0.140	31.0	49.0
7	53	8.0	10.0	58	0.150	28.0	45.0
7	53	10.0	12.0	56	0.110	26.0	43.0
7	53	12.0	14.0	51	0.091	19.0	35.0
7	53	14.0	16.0	50	0.078	18.0	33.0
7	53	20.0	24.0	40	0.012	13.0	22.0
7	53	28.0	32.0	36	0.029	11.0	21.0
7	53	36.0	40.0	36	0.041	14.0	24.0
7	53	50.0	60.0	32	0.027	10.0	19.0
7	54GS	0.0	10.0	59	0.420	57.0	60.0
7	54	0.0	2.0	65	0.063	58.0	16.0
7	54	2.0	4.0	66	0.044	50.0	13.0
7	54	4.0	6.0	65	0.058	50.0	13.0
7	54	6.0	8.0	62	0.034	40.0	10.0
7	54	8.0	10.0	60	0.043	32.0	8.8
7	54	10.0	12.0	57	0.065	32.0	7.8
7	54	12.0	14.0	56	0.056	28.0	10.0
7	54	14.0	16.0	51	0.092	22.0	8.1
7	54	20.0	24.0	42	0.048	16.0	6.0
7	54	28.0	32.0	36	0.030	14.0	5.5
7	54	36.0	40.0	27	0.019	11.0	5.1
7	54	50.0	60.0	26	0.025	11.0	6.4
7	55GS	0.0	10.0	32	0.170	21.0	22.0
7	56GS	0.0	10.0	47	0.400	38.0	33.0
7	56	0.0	2.0	89	1.900	83.0	98.0
7	56	2.0	4.0	76	2.400	88.0	87.0
7	56	4.0	6.0	72	2.500	88.0	88.0
7	56	6.0	8.0	70	0.850	84.0	81.0
7	56	8.0	10.0	71	1.000	70.0	76.0
7	56	10.0	12.0	64	1.150	57.0	60.0
7	56	12.0	14.0	53	0.590	46.0	51.0
7	56	14.0	16.0	46	0.320	30.0	36.0
7	56	20.0	24.0	39	0.290	14.0	25.0
7	56	28.0	32.0	40	0.042	17.0	29.0
7	56	36.0	40.0	35	0.120	19.0	27.0
7	57GS	0.0	10.0	45	0.730	0.0	0.0
7	57	0.0	2.0	77	0.950	99.0	84.0
7	57	2.0	4.0	71	0.720	82.0	82.0
7	57	4.0	6.0	62	0.720	51.0	58.0
7	57	6.0	8.0	64	0.480	36.0	48.0
7	57	8.0	10.0	61	0.380	27.0	42.0
7	57	10.0	12.0	58	0.410	26.0	42.0
7	57	12.0	14.0	56	0.400	26.0	39.0
7	57	14.0	16.0	50	0.270	22.0	38.0
7	57	20.0	24.0	48	0.170	18.0	31.0
7	57	28.0	32.0	47	0.037	20.0	35.0
7	57	36.0	40.0	42	0.050	18.0	33.0
7	57	40.0	50.0	46	0.043	16.0	30.0
7	57	50.0	60.0	36	0.062	16.0	28.0
7	58	0.0	2.0	81	0.810	88.0	110.0
7	58	2.0	4.0	80	0.890	93.0	100.0
7	58	4.0	6.0	80	1.100	90.0	100.0
7	58	6.0	8.0	63	0.550	85.0	95.0
7	58	8.0	10.0	71	0.670	73.0	90.0
7	58	10.0	12.0	68	0.420	30.0	58.0
7	58	12.0	14.0	51	0.240	45.0	59.0
7	58	14.0	16.0	56	0.130	23.0	42.0
7	58	20.0	24.0	49	0.074	18.0	32.0

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
7	58	28.0	32.0	49	0.041	20.0	38.0
7	58	35.0	40.0	41	0.055	21.0	39.0
7	58	50.0	60.0	42	0.050	9.2	23.0
7	59GS	0.0	10.0	49	0.980	95.0	75.0
7	59	0.0	2.0	94	0.710	91.0	88.0
7	59	2.0	4.0	82	0.870	94.0	95.0
7	59	4.0	6.0	74	0.680	77.0	86.0
7	59	6.0	8.0	68	0.500	66.0	79.0
7	59	8.0	10.0	66	0.490	59.0	70.0
7	59	10.0	12.0	65	0.280	46.0	62.0
7	59	12.0	14.0	62	0.330	39.0	57.0
7	59	14.0	16.0	56	0.200	30.0	48.0
7	59	20.0	24.0	61	0.190	21.0	35.0
7	60GS	0.0	10.0	57	1.800	180.0	100.0
7	60	0.0	2.0	74	1.800	180.0	120.0
7	60	2.0	4.0	54	0.720	73.0	53.0
7	60	4.0	6.0	230	-0.193	0.0	0.0
7	60	6.0	8.0	36	0.320	36.0	37.0
7	60	8.0	10.5	44	0.330	29.0	32.0
7	60	10.5	15.5	17	0.010	6.1	11.0
7	61GS	0.0	10.0	57	3.500	190.0	100.0
7	61	0.0	2.0	90	3.500	140.0	69.0
7	61	2.0	4.0	73	9.100	140.0	93.0
7	61	4.0	6.0	79	3.000	130.0	94.0
7	61	6.0	8.0	23	0.170	19.0	27.0
7	61	8.0	10.0	23	0.017	8.0	10.0
7	61	10.0	12.0	22	0.018	6.7	15.0
7	61	12.0	14.0	24	0.017	7.1	16.0
7	61	14.0	16.0	27	0.013	7.7	16.0
7	61	20.0	24.0	20	0.015	4.4	11.0
7	61	28.0	32.0	20	0.011	5.1	14.0
7	65GS	0.0	10.0	54	0.530	53.0	58.0
7	65	0.0	2.0	42	0.260	27.0	38.0
7	65	2.0	4.0	35	0.092	22.0	29.0
7	65	4.0	6.0	34	0.083	17.0	29.0
7	65	6.0	8.0	30	0.0	15.0	25.0
7	65	8.0	10.0	32	0.480	15.0	30.0
7	65	10.0	12.0	41	0.620	15.0	30.0
7	65	12.0	14.0	49	1.000	18.0	36.0
7	65	14.0	16.0	43	0.540	16.0	33.0
7	65	20.0	24.0	48	0.570	19.0	41.0
7	65	28.0	32.0	39	0.630	9.3	26.0
7	65	36.0	40.0	34	0.300	4.3	22.0
7	65	50.0	60.0	39	0.280	9.9	33.0
7	66GS	0.0	10.0	39	0.250	29.0	38.0
7	66	0.0	2.0	68	0.410	37.0	11.0
7	66	2.0	4.0	51	0.110	22.0	6.8
7	66	4.0	6.0	50	0.100	24.0	7.5
7	66	6.0	8.0	49	0.067	22.0	7.8
7	66	8.0	10.0	42	0.065	19.0	6.4
7	66	10.0	12.0	43	0.036	21.0	7.6
7	66	12.0	14.0	42	0.039	22.0	7.5
7	66	14.0	16.0	40	0.035	20.0	6.9
7	66	16.0	20.0	41	0.035	19.0	6.9
7	66	20.0	24.0	36	0.035	21.0	7.0
7	66	24.0	28.0	34	0.040	20.0	7.9
7	66	28.0	32.0	36	0.033	20.0	7.0
7	66	32.0	36.0	33	0.026	18.0	7.3
7	66	36.0	40.0	30	0.026	19.0	7.3
7	66	40.0	49.5	28	0.024	20.0	6.5
7	66	49.5	53.5	27	0.019	11.0	5.5
7	67	0.0	2.0	90	0.570	69.0	74.0
7	67	2.0	4.0	88	0.590	69.0	72.0
7	67	4.0	6.0	96	0.390	60.0	76.0
7	67	6.0	8.0	92	0.250	48.0	63.0
7	67	8.0	10.0	85	0.250	50.0	68.0
7	67	10.0	12.0	75	0.300	48.0	62.0
7	67	12.0	14.0	62	0.240	35.0	51.0
7	67	14.0	16.0	61	0.190	22.0	32.0
7	67	16.0	20.0	56	0.120	20.0	32.0
7	67	20.0	24.0	47	0.057	18.0	30.0
7	67	24.0	28.0	46	0.043	19.0	30.0
7	67	28.0	32.0	45	0.032	15.0	27.0
7	67	32.0	36.0	46	0.032	13.0	28.0
7	67	36.0	40.0	62	0.035	0.0	0.0
7	67	40.0	50.0	46	0.030	13.0	26.0
7	67	50.0	60.0	41	0.026	7.0	20.0
7	68GS	0.0	10.0	56	0.750	71.0	76.0
7	68	0.0	2.0	56	0.095	40.0	12.0
7	68	2.0	4.0	50	0.025	29.0	9.6
7	68	4.0	6.0	56	0.061	29.0	10.0
7	68	6.0	8.0	48	0.052	27.0	9.9
7	68	8.0	10.0	49	0.022	26.0	9.4
7	68	10.0	12.0	50	0.052	29.0	10.0
7	68	12.0	14.0	56	0.073	27.0	12.0
7	68	14.0	16.0	48	0.044	30.0	11.0
7	68	16.0	20.0	49	0.050	27.0	9.5
7	68	20.0	24.0	47	0.051	28.0	10.0
7	68	24.0	28.0	46	0.061	25.0	11.0
7	68	28.0	32.0	45	0.028	27.0	9.7
7	68	32.0	36.0	46	0.055	27.0	10.0
7	68	36.0	40.0	44	0.049	26.0	9.2
7	68	40.0	50.0	43	0.046	23.0	8.6

STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
68	50.0	60.0	42	0.042	20.0	8.1
70GS	0.0	10.0	52	0.540	58.0	54.0
70	0.0	2.0	49	0.550	64.0	69.0
70	2.0	4.0	47	0.580	58.0	65.0
70	4.0	6.0	48	0.370	61.0	76.0
70	6.0	8.0	47	0.028	56.0	68.0
70	8.0	10.0	49	0.380	57.0	63.0
70	10.0	12.0	51	0.110	59.0	58.0
70	12.0	14.0	50	0.130	53.0	48.0
70	14.0	16.0	51	0.400	55.0	47.0
70	16.0	20.0	51	0.460	62.0	44.0
70	24.0	28.0	50	0.240	40.0	43.0
70	36.0	40.0	48	0.220	33.0	39.0
70	50.0	60.0	47	0.290	29.0	32.0
70	115.0	120.0	19	0.039	14.0	22.0
71GS	0.0	10.0	53	0.074	26.0	49.0
71	0.0	2.0	66	0.059	32.0	35.0
71	2.0	4.0	58	0.022	30.0	33.0
71	4.0	6.0	59	0.032	29.0	33.0
71	6.0	8.0	61	0.018	27.0	31.0
71	8.0	10.0	60	0.020	28.0	36.0
71	10.0	12.0	59	0.016	26.0	34.0
71	12.0	14.0	62	0.014	32.0	30.0
71	14.0	16.0	61	0.016	30.0	29.0
71	16.0	20.0	59	0.055	28.0	38.0
71	20.0	24.0	62	0.110	30.0	33.0
71	24.0	28.0	61	0.050	29.0	33.0
71	28.0	32.0	59	0.033	28.0	35.0
71	32.0	36.0	59	0.056	30.0	51.0
71	36.0	40.0	60	0.005	26.0	30.0
71	40.0	50.0	60	0.057	26.0	30.0
71	50.0	60.0	58	0.056	26.0	29.0
72GS	0.0	10.0	46	0.130	26.0	41.0
72	0.0	2.0	49	0.320	69.0	31.0
72	2.0	4.0	44	0.310	76.0	32.0
72	4.0	6.0	44	0.300	74.0	27.0
72	6.0	8.0	46	0.300	65.0	27.0
72	8.0	10.0	42	0.260	60.0	22.0
72	10.0	12.0	57	0.410	90.0	33.0
72	12.0	14.0	60	0.340	96.0	33.0
72	14.0	16.0	54	0.270	80.0	27.0
72	16.0	20.0	48	0.280	26.0	17.0
72	20.0	24.0	49	0.260	20.0	12.0
72	24.0	28.0	50	0.240	23.0	17.0
72	28.0	32.0	51	0.310	23.0	14.0
72	36.0	40.0	43	0.100	20.0	14.0
72	50.0	60.0	35	0.023	13.0	8.4
72	0.0	2.0	63	0.180	35.0	44.0
72	2.0	4.0	60	0.099	28.0	42.0
72	4.0	6.0	47	0.049	22.0	40.0
72	6.0	8.0	55	0.058	22.0	34.0
72	8.0	10.0	53	0.060	22.0	34.0
72	10.0	12.0	51	0.052	23.0	32.0
72	12.0	14.0	52	0.047	21.0	40.0
72	14.0	16.0	54	0.046	22.0	36.0
72	20.0	24.0	55	0.023	25.0	39.0
72	28.0	32.0	53	0.044	23.0	40.0
72	36.0	40.0	54	0.038	23.0	40.0
72	50.0	60.0	49	0.028	21.0	54.0
74GS	0.0	10.0	50	0.290	29.0	37.0
74	0.0	2.0	64	0.200	23.0	31.0
74	2.0	4.0	36	0.053	13.0	21.0
74	4.0	6.0	31	0.036	0.0	19.0
74	6.0	8.0	32	0.017	12.0	20.0
74	8.0	10.0	31	0.031	9.6	17.0
74	10.0	12.0	23	0.018	9.0	14.0
74	12.0	14.0	23	0.020	8.6	14.0
74	14.0	16.0	27	0.029	13.0	21.0
74	20.0	24.0	27	0.024	9.1	17.0
74	28.0	32.0	25	0.022	9.7	17.0
74	36.0	40.0	24	0.024	11.0	21.0
75GS	0.0	10.0	43	0.710	56.0	43.0
75	0.0	2.0	49	1.400	110.0	110.0
75	2.0	4.0	32	0.250	36.0	39.0
75	4.0	6.0	21	0.120	13.0	17.0
75	6.0	8.0	18	0.056	11.0	11.0
75	8.0	10.0	18	0.064	12.0	15.0
75	10.0	12.0	22	0.036	11.0	18.0
75	12.0	14.0	25	0.064	18.0	29.0
75	14.0	16.0	21	0.052	14.0	22.0
75	16.0	22.0	21	0.055	15.0	25.0
75	22.0	27.0	17	0.036	10.0	25.0
78	0.0	2.0	27	0.034	13.0	17.0
78	2.0	4.0	25	0.021	12.0	17.0
78	4.0	6.0	27	0.025	11.0	16.0
78	6.0	8.0	30	0.017	13.0	16.0
78	8.0	10.0	31	0.022	15.0	24.0
78	10.0	12.0	36	0.032	16.0	23.0
78	12.0	14.0	37	0.028	17.0	25.0
78	14.0	16.0	38	0.030	18.0	28.0
78	20.0	24.0	38	0.030	19.0	29.0
78	28.0	33.0	23	0.017	7.2	16.0

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
7	80	0.0	2.0	35	0.100	14.0	20.0
7	80	2.0	4.0	33	0.071	11.0	19.0
7	80	4.0	6.0	31	0.052	10.0	19.0
7	80	6.0	8.0	29	0.036	9.7	18.0
7	80	8.0	10.0	29	0.030	10.0	17.0
7	80	10.0	12.0	30	0.033	11.0	19.0
7	80	12.0	14.0	33	0.037	11.0	21.0
7	80	14.0	16.0	34	0.029	12.0	20.0
7	80	16.0	20.0	28	0.027	11.0	19.0
7	80	20.0	24.0	30	0.031	11.0	19.0
7	80	28.0	32.0	26	0.021	7.5	14.0
7	80	36.0	40.0	25	0.020	8.7	18.0
7	80	50.0	60.0	25	0.007	8.9	18.0
7	81	0.0	2.0	71	0.200	28.0	41.0
7	81	2.0	4.0	49	0.130	19.0	30.0
7	81	4.0	6.0	44	0.087	15.0	26.0
7	81	6.0	8.0	38	0.059	14.0	22.0
7	81	8.0	10.0	31	0.037	13.0	20.0
7	81	10.0	12.0	30	0.038	12.0	21.0
7	81	12.0	14.0	28	0.030	13.0	20.0
7	81	14.0	16.0	31	0.034	12.0	19.0
7	81	20.0	24.0	36	0.028	15.0	25.0
7	81	28.0	32.0	31	0.028	11.0	21.0
7	81	36.0	40.0	33	0.033	15.0	24.0
7	81	50.0	60.0	31	0.027	9.1	20.0
7	82GS	0.0	10.0	54	0.450	42.0	54.0
7	82	0.0	2.0	51	0.190	23.0	38.0
7	82	2.0	4.0	44	0.120	20.0	32.0
7	82	4.0	6.0	39	0.072	15.0	26.0
7	82	6.0	8.0	38	0.055	15.0	0.0
7	82	8.0	10.0	40	0.047	14.0	27.0
7	82	10.0	12.0	39	0.053	15.0	26.0
7	82	12.0	14.0	40	0.050	14.0	26.0
7	82	14.0	16.0	39	0.047	14.0	24.0
7	82	20.0	24.0	36	0.047	13.0	22.0
7	82	28.0	32.0	29	0.037	13.0	23.0
7	82	36.0	40.0	33	0.032	14.0	23.0
7	82	50.0	60.0	29	0.030	12.0	20.0
7	82	60.0	70.0	30	0.034	15.0	25.0
7	83	0.0	2.0	96	0.320	52.0	71.0
7	83	2.0	4.0	80	0.340	41.0	68.0
7	83	4.0	6.0	68	0.260	31.0	57.0
7	83	6.0	8.0	61	0.220	25.0	46.0
7	83	8.0	10.0	53	0.150	19.0	37.0
7	83	10.0	12.0	56	0.110	17.0	35.0
7	83	12.0	14.0	51	0.097	17.0	30.0
7	83	14.0	16.0	48	0.077	14.0	28.0
7	83	20.0	24.0	42	0.043	19.0	21.0
7	83	28.0	32.0	43	0.047	17.0	0.0
7	83	36.0	40.0	38	0.049	15.0	27.0
7	83	50.0	60.0	46	0.040	16.0	35.0
7	84GS	0.0	10.0	30	0.064	9.5	17.0
7	84	0.0	2.0	30	0.035	10.0	16.0
7	84	2.0	4.0	27	0.015	11.0	15.0
7	84	4.0	6.0	28	0.010	10.0	17.0
7	84	6.0	8.0	21	0.009	6.4	15.0
7	84	8.0	10.0	22	0.010	8.3	17.0
7	84	10.0	12.0	20	0.009	2.7	12.0
7	84	12.0	14.0	23	0.012	1.8	9.9
7	84	14.0	16.0	29	0.010	8.6	21.0
7	84	20.0	27.5	18	0.015	1.1	8.5
7	84	27.5	33.5	15	0.018	9.8	27.0
7	85GS	0.0	10.0	32	0.054	9.8	19.0
7	86GS	0.0	10.0	66	0.320	47.0	72.0
7	86	2.0	4.0	64	0.200	32.0	52.0
7	86	4.0	6.0	62	0.180	30.0	44.0
7	86	6.0	8.0	63	0.160	21.0	43.0
7	86	8.0	10.0	60	0.110	25.0	48.0
7	86	10.0	12.0	61	0.130	22.0	43.0
7	86	12.0	14.0	57	0.094	21.0	35.0
7	86	14.0	16.0	58	0.110	22.0	39.0
7	86	20.0	24.0	47	0.057	16.0	30.0
7	86	28.0	32.0	50	0.048	17.0	34.0
7	86	36.0	40.0	42	0.037	15.0	26.0
7	86	50.0	60.0	45	0.035	19.0	37.0
7	93GS	0.0	10.0	24	0.067	12.0	41.0
7	94GS	0.0	10.0	61	0.210	37.0	61.0
7	94	0.0	2.0	99	0.260	19.0	48.0
7	94	2.0	4.0	88	0.098	0.0	0.0
7	94	4.0	6.0	79	0.071	18.0	36.0
7	94	6.0	8.0	67	0.054	15.0	32.0
7	94	8.0	10.0	66	0.041	16.0	37.0
7	94	10.0	12.0	59	0.033	16.0	35.0
7	94	12.0	14.0	64	0.030	17.0	34.0
7	94	14.0	16.0	63	0.031	16.0	35.0
7	94	20.0	24.0	60	0.024	19.0	38.0
7	94	28.0	32.0	65	0.028	21.0	40.0
	94	36.0	40.0	60	0.025	18.0	37.0
7	94	50.0	60.0	59	0.024	22.0	38.0
7	95GS	0.0	10.0	18	0.076	19.0	31.0

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
7	96GS	0.0	10.0	44	0.200	34.0	42.0
7	97GS	0.0	10.0	10	0.025	5.7	13.0
7	98GS	0.0	10.0	11	0.019	6.5	43.0
7	98	0.0	2.0	17	0.016	11.0	8.1
7	98	2.0	4.0	15	0.017	11.0	8.3
7	98	4.0	6.0	16	0.018	12.0	7.8
7	98	6.0	8.0	16	0.018	14.0	8.5
7	98	8.0	10.0	16	0.018	13.0	8.7
7	98	10.0	12.0	18	0.019	14.0	8.8
7	98	12.0	15.0	18	0.015	13.0	9.2
7	98	15.0	20.0	16	0.018	12.0	6.8
7	99GS	0.0	10.0	18	0.018	8.6	14.0
7	100G	0.0	10.0	58	0.230	38.0	55.0
7	100	0.0	2.0	67	0.360	38.0	46.0
7	100	2.0	4.0	65	0.320	39.0	46.0
7	100	4.0	6.0	65	0.220	31.0	42.0
7	100	6.0	8.0	64	0.160	22.0	36.0
7	100	8.0	10.0	61	0.110	14.0	30.0
7	100	10.0	12.0	56	0.055	14.0	29.0
7	100	12.0	14.0	56	0.052	13.0	29.0
7	100	14.0	16.0	56	0.045	12.0	24.0
7	100	20.0	24.0	52	0.038	12.0	26.0
7	100	28.0	32.0	44	0.033	9.2	21.0
7	100	36.0	40.0	40	0.025	7.9	19.0
7	100	50.0	60.0	24	0.012	2.9	14.0
7	100	60.0	68.0	26	0.008	0.3	9.5
7	101G	0.0	10.0	16	0.019	12.0	35.0
7	102G	0.0	10.0	20	0.018	12.0	32.0
7	102	0.0	2.0	18	0.019	15.0	12.0
7	102	2.0	4.0	18	0.019	16.0	12.0
7	102	4.0	6.0	18	0.019	14.0	10.0
7	102	6.0	8.0	17	0.017	13.0	9.4
7	102	8.0	10.0	18	0.018	15.0	12.0
7	102	10.0	12.0	20	0.017	14.0	9.4
7	102	12.0	14.0	19	0.017	16.0	10.0
7	102	14.0	16.0	19	0.018	14.0	9.7
7	102	16.0	18.0	20	0.017	13.0	7.7
7	103G	0.0	10.0	49	0.120	27.0	46.0
7	103	0.0	2.0	80	0.063	29.0	19.0
7	103	2.0	4.0	76	0.052	25.0	16.0
7	103	4.0	6.0	84	0.044	25.0	16.0
7	103	6.0	8.0	74	0.040	21.0	15.0
7	103	8.0	10.0	89	0.120	72.0	42.0
7	103	10.0	12.0	68	0.026	23.0	13.0
7	103	12.0	14.0	62	0.041	20.0	13.0
7	103	14.0	16.0	57	0.039	22.0	13.0
7	103	20.0	24.0	67	0.023	22.0	12.0
7	103	28.0	32.0	63	0.018	24.0	14.0
7	103	36.0	40.0	65	0.017	24.0	13.0
7	103	50.0	60.0	61	0.019	26.0	13.0
7	104G	0.0	10.0	39	0.280	58.0	50.0
7	104	0.0	2.0	46	0.390	44.0	40.0
7	104	2.0	4.0	51	0.510	75.0	54.0
7	104	4.0	6.0	47	0.490	46.0	40.0
7	104	6.0	8.0	45	0.250	37.0	35.0
7	104	8.0	10.0	39	0.200	27.0	24.0
7	104	10.0	12.0	24	0.012	11.0	22.0
7	104	12.0	14.0	26	0.017	12.0	30.0
7	104	14.0	16.0	11	0.010	15.0	35.0
7	104	20.0	24.0	39	0.019	19.0	48.0
7	104	28.0	32.0	26	0.009	11.0	30.0
7	104	36.0	41.0	25	0.017	8.5	25.0
7	105G	0.0	10.0	21	0.030	11.0	32.0
7	106G	0.0	10.0	60	0.280	49.0	59.0
7	106	0.0	2.0	57	0.280	34.0	37.0
7	106	2.0	4.0	48	0.340	37.0	37.0
7	106	4.0	6.0	73	0.570	89.0	82.0
7	106	6.0	8.0	55	0.350	59.0	54.0
7	106	8.0	10.0	60	0.350	57.0	51.0
7	106	10.0	12.0	53	0.310	49.0	47.0
7	106	12.0	14.0	61	0.560	130.0	80.0
7	106	14.0	16.0	60	0.690	70.0	57.0
7	106	20.0	24.0	68	0.290	35.0	42.0
7	106	28.0	32.0	41	0.070	7.6	18.0
7	106	36.0	40.0	39	0.060	9.6	22.0
7	106	50.0	60.0	30	0.011	10.0	21.0
7	107G	0.0	10.0	46	0.081	19.0	34.0
7	107	0.0	2.0	67	0.082	22.0	34.0
7	107	2.0	4.0	56	0.065	17.0	28.0
7	107	4.0	6.0	46	0.052	14.0	24.0
7	107	6.0	8.0	36	0.035	14.0	22.0
7	107	8.0	10.0	20	0.024	11.0	23.0
7	107	10.0	12.0	25	0.020	12.0	18.0
7	107	12.0	14.0	29	0.018	13.0	22.0
7	107	14.0	17.0	33	0.016	14.0	25.0
A	2	0.0	2.0	43	0.490	140.0	130.0
A	2	2.0	4.0	23	0.410	63.0	59.0

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
A	2	4.0	6.0	19	0.320	53.0	45.0
A	2	6.0	8.4	28	0.300	89.0	87.0
A	3	0.0	2.0	70	1.000	67.0	44.0
A	3	4.0	6.0	43	0.670	82.0	49.0
A	3	2.0	4.0	45	0.920	63.0	42.0
A	3	6.0	8.0	42	1.300	92.0	49.0
A	3	8.0	10.0	42	0.830	110.0	57.0
A	3	10.0	12.0	40	1.000	160.0	62.0
A	3	12.0	14.0	40	0.870	130.0	51.0
A	3	14.0	16.0	36	0.390	75.0	33.0
A	3	16.0	20.0	39	0.460	73.0	33.0
A	3	24.0	28.0	38	0.280	35.0	25.0
A	3	20.0	24.0	39	0.220	54.0	26.0
A	3	28.0	32.0	42	0.450	26.0	25.0
A	3	32.0	36.0	42	0.330	21.0	21.0
A	3	36.0	40.0	42	0.310	20.0	20.0
A	3	40.0	44.5	38	0.150	22.0	21.0
A	6	2.0	4.0	20	0.290	31.0	47.0
A	6	0.0	2.0	37	0.450	36.0	48.0
A	6	4.0	6.0	15	0.190	18.0	36.0
A	6	6.0	8.0	21	0.540	58.0	82.0
A	6	8.0	10.0	10	0.400	20.0	20.0
A	6	10.0	12.0	26	0.870	24.0	41.0
A	6	12.0	13.3	32	0.029	19.0	39.0
A	31	0.0	2.0	18	0.110	1.2	4.1
A	31	2.0	4.0	18	0.110	3.2	3.7
A	31	4.0	6.0	21	0.110	1.3	3.4
A	31	6.0	8.0	18	0.160	2.1	2.5
A	31	8.0	10.0	19	0.071	3.6	1.4
A	31	10.0	12.0	19	0.077	2.8	2.1
A	31	12.0	14.0	18	0.025	0.7	2.8
A	31	14.0	16.0	17	0.016	4.7	2.1
A	31	16.0	20.0	16	0.025	3.6	1.5
A	31	24.0	28.0	18	0.021	5.2	2.4
A	31	20.0	24.0	17	0.030	3.2	4.5
A	32	0.0	2.0	24	0.110	4.1	4.1
A	32	2.0	4.7	16	0.085	3.5	4.3
A	36	0.0	2.0	26	0.130	9.0	12.0
A	36	4.0	6.0	21	0.043	11.0	11.0
A	36	6.0	8.0	22	0.020	17.0	28.0
A	36	8.0	9.6	33	0.024	14.0	27.0
A	37	0.0	2.0	38	0.180	15.0	16.0
A	37	2.0	4.0	32	0.059	22.0	27.0
A	37	4.0	6.0	30	0.034	25.0	34.0
A	37	6.0	8.0	29	0.026	20.0	31.0
A	37	8.0	10.0	30	0.030	22.0	32.0
A	37	10.0	12.0	30	0.035	19.0	33.0
A	37	12.0	14.4	33	0.035	31.0	35.0
A	38	0.0	5.0	29	0.028	22.0	36.0
A	40	0.0	2.0	25	0.023	4.8	4.3
A	40	2.0	4.0	18	0.023	4.6	4.0
A	40	4.0	6.0	19	0.018	6.6	9.9
A	40	6.0	8.0	21	0.044	6.6	9.1
A	40	8.0	10.0	21	0.045	5.3	8.2
A	41	0.0	2.0	22	0.074	5.5	6.6
A	41	2.0	4.0	14	0.076	6.4	7.6
A	41	4.0	5.5	13	0.044	3.9	8.6
A	42	0.0	1.0	21	0.016	3.8	6.8
A	44	0.0	2.0	24	0.077	11.0	17.0
A	44	2.0	4.0	35	0.038	20.0	33.0
A	44	4.0	6.0	35	0.030	18.0	40.0
A	44	6.0	8.0	31	0.043	18.0	35.0
A	44	8.0	10.0	27	0.027	19.0	38.0
A	44	10.0	12.0	27	0.030	18.0	32.0
A	44	12.0	14.0	32	0.036	17.0	37.0
A	44	14.0	16.0	34	0.028	20.0	44.0
A	44	16.0	20.0	34	0.031	17.0	34.0
A	44	20.0	24.0	31	0.072	18.0	41.0
A	44	24.0	27.0	37	0.046	22.0	38.0
A	45	0.0	2.0	22	0.009	2.0	3.0
A	45	2.0	4.0	16	0.008	2.4	3.6
A	45	4.0	6.0	16	0.020	2.7	3.8
A	45	6.0	8.0	15	0.011	2.4	3.6
A	45	8.0	10.0	15	0.013	2.0	6.6
A	45	10.0	12.0	17	0.012	3.0	3.8
A	45	12.0	14.0	17	0.014	3.1	4.8
A	45	14.0	16.0	17	0.016	3.3	5.6
A	45	16.0	20.0	16	0.010	2.4	3.5
A	45	20.0	23.7	19	0.015	2.4	5.3
A	46	0.0	2.0	46	81.000	8.8	21.0
A	46	2.0	4.0	38	13.000	11.0	23.0
A	46	4.0	6.0	32	16.000	13.0	19.0
A	46	6.0	8.0	32	43.000	6.8	25.0
A	46	8.0	10.0	33	23.000	12.0	22.0
A	46	10.0	12.0	29	8.000	17.0	43.0
A	46	12.0	14.0	28	0.540	18.0	43.0
A	46	14.0	16.0	31	0.220	20.0	42.0

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
A	46	16.0	20.0	28	2.100	13.0	29.0
A	46	20.0	24.0	25	0.150	18.0	39.0
A	46	24.0	27.0	24	0.480	16.0	42.0
A	47	0.0	2.0	55	0.058	6.7	26.0
A	47	2.0	4.0	27	0.041	4.3	9.0
A	47	4.0	6.0	47	0.059	14.0	25.0
A	47	6.0	8.0	46	0.072	13.0	22.0
A	47	8.0	10.0	41	0.075	12.0	21.0
A	47	10.0	12.0	38	0.078	9.6	21.0
A	47	12.0	14.0	15	0.029	4.8	11.0
A	48	0.0	2.0	26	0.020	3.1	2.9
A	48	2.0	4.0	20	0.016	3.0	4.4
A	48	4.0	6.0	17	0.019	2.5	5.0
A	48	6.0	7.5	16	0.041	3.8	4.7
A	49	0.0	2.0	36	0.310	15.0	34.0
A	49	2.0	4.0	30	0.055	14.0	34.0
A	49	4.0	6.0	30	0.034	18.0	38.0
A	49	6.0	8.0	30	0.037	19.0	39.0
A	49	8.0	10.0	28	0.068	14.0	37.0
A	49	10.0	12.0	27	0.032	18.0	41.0
A	49	12.0	14.0	27	0.037	17.0	36.0
A	49	14.0	16.0	27	0.067	19.0	38.0
A	50	0.0	2.0	44	0.120	3.9	9.6
A	50	2.0	4.0	19	0.063	4.8	7.8
B	5	0.0	4.0	42	0.024	15.0	28.0
B	5	4.0	6.0	36	0.021	14.0	28.0
B	5	6.0	8.0	33	0.016	15.0	29.0
B	5	8.0	10.0	32	0.018	16.0	29.0
B	5	10.0	12.0	33	0.024	16.0	28.0
B	5	12.0	14.0	30	0.027	16.0	29.0
B	5	14.0	16.0	32	0.028	17.0	30.0
B	5	16.0	20.0	32	0.031	13.0	37.0
B	5	20.0	24.0	28	0.036	11.0	18.0
B	5	24.0	28.0	39	0.046	11.0	20.0
B	5	28.0	32.0	41	0.076	19.0	27.0
B	6	0.0	2.0	64	0.030	59.0	63.0
B	6	2.0	4.0	58	0.290	62.0	64.0
B	6	4.0	6.0	55	0.330	74.0	64.0
B	6	6.0	8.0	55	0.420	76.0	65.0
B	6	8.0	10.0	51	0.260	55.0	59.0
B	6	10.0	12.0	49	0.190	48.0	60.0
B	6	12.0	14.0	48	0.160	42.0	58.0
B	6	14.0	16.0	55	0.230	33.0	44.0
B	6	16.0	20.0	54	0.330	21.0	28.0
B	6	20.0	24.0	55	0.097	18.0	28.0
B	6	24.0	28.0	56	0.160	18.0	28.0
B	6	28.0	32.0	54	0.068	16.0	32.0
B	6	32.0	36.0	56	0.140	18.0	31.0
B	6	36.0	40.0	56	0.067	17.0	31.0
B	7	0.0	4.0	51	0.290	53.0	63.0
B	7	4.0	6.0	49	0.200	49.0	63.0
B	7	6.0	8.0	47	0.190	45.0	58.0
B	7	8.0	10.0	42	0.160	35.0	51.0
B	7	10.0	12.0	44	0.140	28.0	45.0
B	7	12.0	14.0	45	0.170	30.0	45.0
B	7	14.0	16.0	45	0.140	30.0	46.0
B	7	16.0	20.0	61	0.092	23.0	36.0
B	7	20.0	24.0	58	0.042	20.0	30.0
B	7	24.0	28.0	55	0.031	19.0	31.0
B	7	28.0	32.0	55	0.015	19.0	30.0
B	7	32.0	36.0	53	0.085	27.0	44.0
B	7	36.0	38.0	49	0.049	19.0	30.0
B	9	2.0	4.0	61	0.280	63.0	78.0
B	9	0.0	2.0	71	0.190	60.0	72.0
B	9	4.0	6.0	57	0.190	53.0	72.0
B	9	6.0	8.0	54	0.140	48.0	70.0
B	9	8.0	10.0	52	0.110	41.0	60.0
B	9	10.0	12.0	53	0.150	38.0	56.0
B	9	12.0	14.0	49	0.120	33.0	53.0
B	9	14.0	16.0	64	0.038	34.0	53.0
B	9	16.0	20.0	57	0.074	22.0	40.0
B	9	20.0	24.0	59	0.070	25.0	42.0
B	9	24.0	28.0	58	0.032	23.0	42.0
B	9	28.0	32.0	54	0.026	23.0	41.0
B	9	32.0	36.0	50	0.040	23.0	36.0
B	9	36.0	40.0	51	-0.061	25.0	42.0
B	10	0.0	2.0	83	0.0	44.0	67.0
B	10	2.0	4.0	91	0.017	43.0	66.0
B	10	4.0	6.0	83	0.020	44.0	70.0
B	10	6.0	8.0	79	0.021	40.0	64.0
B	10	8.0	10.0	63	0.004	40.0	64.0
B	10	10.0	12.0	59	0.001	29.0	52.0
B	10	12.0	14.0	56	0.005	27.0	46.0
B	10	14.0	16.0	54	0.530	30.0	44.0
B	10	16.0	20.0	60	1.000	30.0	48.0
B	10	20.0	24.0	64	0.004	25.0	44.0
B	10	24.0	28.0	67	0.003	28.0	46.0
B	10	28.0	32.0	58	0.020	28.0	49.0
B	10	32.0	36.0	51	0.023	27.0	46.0
B	10	36.0	40.0	48	0.016	26.0	46.0
B	10	40.0	43.0	48	0.043	27.0	47.0

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
B	11	0.0	2.0	18	0.100	19.0	30.0
B	11	2.0	4.0	31	0.052	21.0	42.0
B	11	4.0	6.0	33	0.046	20.0	43.0
B	12	0.0	2.0	33	0.024	14.0	21.0
B	12	2.0	4.0	32	0.024	15.0	22.0
B	12	4.0	6.0	31	0.036	17.0	26.0
B	12	6.0	8.0	38	0.051	17.0	28.0
B	12	8.0	10.0	29	0.038	14.0	25.0
B	12	10.0	12.0	30	0.061	16.0	23.0
B	12	12.0	14.0	29	0.029	16.0	25.0
B	12	14.0	16.0	29	0.013	13.0	20.0
B	12	16.0	20.0	27	0.028	15.0	24.0
B	12	20.0	25.0	29	0.028	19.0	33.0
B	13	0.0	2.0	30	0.012	14.0	22.0
B	13	2.0	4.0	26	0.027	11.0	23.0
B	13	4.0	6.0	30	0.015	12.0	21.0
B	13	6.0	8.0	25	0.016	14.0	23.0
B	13	8.0	10.0	25	0.015	14.0	26.0
B	13	10.0	12.0	24	0.014	13.0	22.0
B	13	12.0	14.0	25	0.014	14.0	25.0
B	13	14.0	16.0	24	0.008	13.0	21.0
B	13	16.0	20.0	26	0.009	17.0	26.0
B	13	20.0	24.0	25	0.022	16.0	24.0
B	14	0.0	2.0	72	0.220	39.0	69.0
B	14	2.0	4.0	73	0.180	37.0	62.0
B	14	4.0	6.0	67	1.400	39.0	60.0
B	14	6.0	8.0	65	0.380	40.0	61.0
B	14	8.0	10.0	54	0.097	36.0	58.0
B	14	10.0	12.0	58	0.110	34.0	56.0
B	14	12.0	14.0	60	0.490	31.0	52.0
B	14	14.0	16.0	58	0.140	28.0	48.0
B	14	16.0	20.0	62	0.110	24.0	39.0
B	14	20.0	24.0	58	0.150	24.0	40.0
B	14	24.0	28.0	55	0.110	24.0	43.0
B	14	28.0	32.0	51	0.055	15.0	28.0
B	14	32.0	36.0	60	0.076	22.0	40.0
B	14	36.0	40.0	56	0.040	26.0	48.0
B	14	40.0	48.0	55	0.041	20.0	36.0
B	15	0.0	2.0	60	0.013	37.0	59.0
B	15	2.0	4.0	60	0.010	43.0	61.0
B	15	4.0	6.0	61	0.020	47.0	63.0
B	15	6.0	8.0	60	0.082	46.0	60.0
B	15	8.0	10.0	57	0.010	46.0	61.0
B	15	10.0	12.0	59	0.018	43.0	61.0
B	15	12.0	14.0	57	0.005	47.0	64.0
B	15	14.0	16.0	71	0.004	41.0	63.0
B	15	16.0	20.0	61	0.120	29.0	39.0
B	15	20.0	24.0	61	0.067	22.0	33.0
B	15	24.0	28.0	59	0.044	26.0	41.0
B	15	28.0	32.0	58	0.140	25.0	35.0
B	15	32.0	36.0	59	0.260	21.0	33.0
B	15	36.0	40.0	55	0.100	22.0	34.0
B	15	40.0	47.5	62	0.350	23.0	35.0
B	16	0.0	2.0	55	0.270	46.0	62.0
B	16	2.0	4.0	49	0.086	41.0	58.0
B	16	4.0	6.0	47	0.062	29.0	50.0
B	16	6.0	8.0	48	0.070	26.0	46.0
B	16	8.0	10.0	46	0.051	23.0	47.0
B	16	10.0	12.0	48	0.050	26.0	48.0
B	16	12.0	14.0	49	0.045	25.0	50.0
B	16	14.0	16.0	59	0.008	24.0	45.0
B	16	16.0	20.0	46	0.026	16.0	25.0
B	16	20.0	24.0	43	0.046	12.0	21.0
B	16	24.0	28.0	45	0.036	17.0	29.0
B	16	28.0	32.0	36	0.022	12.0	21.0
B	16	32.0	36.0	36	0.013	22.0	37.0
B	16	36.0	40.0	35	0.017	15.0	26.0
B	16	40.0	43.5	38	0.037	15.0	23.0
B	17	0.0	2.0	26	0.009	17.0	33.0
B	17	2.0	4.0	29	0.015	20.0	39.0
B	17	4.0	6.0	34	0.021	24.0	47.0
B	17	6.0	8.0	33	0.004	24.0	45.0
B	17	8.0	10.0	32	0.008	26.0	45.0
B	17	10.0	12.0	30	0.003	21.0	44.0
B	17	12.0	14.0	31	0.028	22.0	45.0
B	17	14.0	16.0	36	0.024	22.0	48.0
B	18	0.0	2.0	60	0.043	27.0	48.0
B	18	2.0	4.0	41	0.033	25.0	47.0
B	18	4.0	6.0	40	0.045	25.0	47.0
B	18	6.0	8.0	42	0.034	25.0	47.0
B	18	8.0	10.0	40	0.021	24.0	47.0
B	18	10.0	12.0	64	0.053	69.0	130.0
B	18	12.0	14.0	41	0.017	25.0	45.0
B	18	14.0	16.0	44	0.043	26.0	48.0
B	18	16.0	20.0	54	0.068	21.0	35.0
B	18	20.0	24.0	41	0.026	13.0	20.0
B	18	24.0	28.0	54	0.014	20.0	32.0
B	18	28.0	32.0	56	0.069	21.0	31.0
B	18	32.0	36.0	56	0.061	22.0	32.0
B	18	36.0	40.0	53	0.008	21.0	30.0
B	18	40.0	49.0	67	0.013	24.0	32.0

CRUISE	STATION	INTERVAL TOP CM	BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
B	19	0.0	2.0	75	0.062	25.0	40.0
B	19	2.0	4.0	58	0.045	21.0	31.0
B	19	4.0	6.0	54	0.041	19.0	31.0
B	19	6.0	8.0	51	0.057	17.0	26.0
B	19	8.0	10.0	49	0.019	19.0	31.0
B	19	10.0	12.0	59	0.038	22.0	34.0
B	19	12.0	14.0	46	0.027	18.0	27.0
B	19	14.0	16.0	46	0.048	16.0	26.0
B	19	16.0	20.0	52	0.042	21.0	32.0
B	19	20.0	24.0	57	0.025	26.0	40.0
B	19	24.0	28.0	54	0.022	30.0	52.0
B	19	28.0	32.0	47	0.014	19.0	24.0
B	19	32.0	36.0	51	0.027	25.0	37.0
B	19	36.0	40.0	51	0.030	23.0	34.0
B	20	0.0	2.0	36	0.015	13.0	24.0
B	20	2.0	4.0	26	0.019	13.0	22.0
B	20	4.0	6.0	30	0.022	17.0	29.0
B	20	6.0	8.0	34	0.020	18.0	31.0
B	20	8.0	10.0	34	0.026	19.0	38.0
B	20	10.0	12.0	29	0.024	16.0	33.0
B	20	12.0	14.0	23	0.014	11.0	24.0
B	20	14.0	16.0	25	0.012	12.0	25.0
B	21	0.0	2.0	23	0.003	9.2	11.0
B	21	2.0	4.0	25	0.039	11.0	16.0
B	21	4.0	6.0	24	0.003	10.0	18.0
B	21	6.0	8.0	22	0.002	9.5	14.0
B	21	8.0	10.0	23	0.006	13.0	28.0
B	21	10.0	12.0	32	0.008	14.0	23.0
B	21	12.0	13.8	27	0.025	15.0	33.0
B	22	4.0	6.0	37	0.057	28.0	38.0
B	22	2.0	4.0	38	0.100	34.0	42.0
B	22	6.0	8.0	39	0.120	34.0	42.0
B	22	8.0	10.0	39	0.057	29.0	41.0
B	22	10.0	12.0	43	0.110	36.0	46.0
B	22	12.0	14.0	46	0.085	38.0	46.0
B	22	14.0	16.0	38	0.068	22.0	36.0
B	22	16.0	20.0	36	0.096	18.0	32.0
B	22	20.0	24.0	35	0.110	17.0	34.0
B	63	0.0	2.0	68	0.540	51.0	71.0
B	63	2.0	4.0	77	0.260	48.0	75.0
B	63	4.0	6.0	69	0.098	46.0	70.0
B	63	6.0	8.0	64	0.0	39.0	66.0
B	63	8.0	10.0	60	0.130	39.0	64.0
B	63	10.0	12.0	60	0.0	32.0	59.0
B	63	12.0	14.0	61	0.120	29.0	56.0
B	63	14.0	16.0	58	0.065	29.0	53.0
B	63	16.0	20.0	67	0.075	25.0	39.0
B	63	20.0	24.0	70	0.063	24.0	38.0
B	63	24.0	28.0	69	0.025	24.0	36.0
B	63	28.0	32.0	64	0.036	25.0	38.0
B	63	32.0	36.0	70	0.057	24.0	40.0
B	63	36.0	40.0	64	0.048	24.0	35.0
B	63	40.0	48.5	53	0.092	22.0	33.0
B	64	0.0	2.0	47	0.024	23.0	31.0
B	64	2.0	4.0	50	0.025	25.0	31.0
B	64	4.0	6.0	50	0.050	30.0	30.0
B	64	6.0	8.0	43	0.077	29.0	28.0
B	64	8.0	10.0	46	0.058	26.0	29.0
B	64	10.0	12.0	34	0.063	24.0	25.0
B	64	12.0	14.0	34	0.094	23.0	26.0
B	64	14.0	16.0	35	0.072	25.0	29.0
B	64	16.0	20.0	40	0.067	31.0	29.0
B	64	20.0	24.0	39	0.072	28.0	28.0
B	64	24.0	28.0	45	0.098	0.0	0.0
B	64	28.0	31.0	45	0.053	28.0	27.0
B	80	0.0	2.0	33	0.005	11.0	18.0
B	80	2.0	4.0	29	0.017	12.0	16.0
B	80	4.0	6.0	31	0.006	13.0	19.0
B	80	6.0	8.0	31	0.013	11.0	18.0
B	80	8.0	10.0	30	0.010	13.0	22.0
B	80	10.0	12.0	33	0.003	14.0	22.0
B	80	12.0	14.0	31	0.008	13.0	20.0
B	80	14.0	16.0	32	0.009	14.0	20.0
B	80	16.0	20.0	30	0.006	12.0	20.0
B	80	20.0	24.0	29	0.008	12.0	19.0
B	80	24.0	28.0	29	0.009	13.0	19.0
B	80	26.0	32.1	26	0.012	11.0	20.0
C	24	0.0	4.0	70	0.085	43.0	61.0
C	24	4.0	6.0	26	0.016	13.0	29.0
C	24	6.0	8.0	30	0.010	15.0	37.0
C	24	8.0	10.0	31	0.015	17.0	41.0
C	24	10.0	12.0	29	0.008	12.0	32.0
C	24	12.0	14.0	29	0.012	18.0	42.0
C	24	14.0	16.0	31	0.012	10.0	30.0
C	24	20.0	24.0	31	0.017	17.0	42.0
C	24	28.0	32.0	31	0.017	15.0	39.0
C	24	36.0	38.0	29	0.019	9.6	30.0
C	30	0.0	2.0	60	0.003	20.0	40.0
C	30	2.0	4.0	51	0.007	18.0	35.0
C	30	4.0	6.0	51	0.006	16.0	33.0
C	30	6.0	8.0	50	0.003	18.0	40.0
C	30	8.0	10.0	46	0.008	17.0	37.0

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
C	30	10.0	12.0	44	0.010	18.0	35.0
C	30	12.0	14.0	44	0.015	16.0	37.0
C	30	14.0	16.0	43	0.010	15.0	30.0
C	30	20.0	24.0	43	0.015	16.0	41.0
C	30	28.0	32.0	36	0.009	12.0	33.0
C	30	36.0	40.0	35	0.008	2.5	18.0
C	30	50.0	60.0	38	0.012	3.3	20.0
C	30	70.0	80.0	36	0.009	14.0	36.0
C	30	90.0	99.0	36	0.009	10.0	31.0
C	31	0.0	2.0	53	0.030	17.0	33.0
C	31	2.0	4.0	51	0.022	17.0	36.0
C	31	4.0	6.0	47	0.017	18.0	41.0
C	31	6.0	8.0	44	0.017	18.0	46.0
C	31	8.0	10.0	45	0.021	17.0	41.0
C	31	10.0	12.0	47	0.018	19.0	45.0
C	31	12.0	14.0	42	0.015	17.0	41.0
C	31	14.0	16.0	48	0.019	19.0	48.0
C	31	16.0	20.0	43	0.013	14.0	35.0
C	31	20.0	24.0	43	0.025	18.0	40.0
C	31	24.0	28.0	41	0.011	15.0	38.0
C	31	28.0	32.0	40	0.009	16.0	37.0
C	31	32.0	36.0	41	0.014	14.0	36.0
C	31	36.0	40.0	42	0.017	18.0	41.0
C	31	40.0	50.0	41	0.011	16.0	38.0
C	31	50.0	60.0	39	0.017	15.0	33.0
C	31	60.0	68.0	34	0.015	5.5	17.0
C	32	0.0	2.0	63	0.051	27.0	34.0
C	32	2.0	4.0	56	0.035	16.0	26.0
C	32	4.0	6.0	47	0.019	16.0	26.0
C	32	6.0	8.0	41	0.013	14.0	29.0
C	32	8.0	10.0	40	0.012	17.0	33.0
C	32	10.0	12.0	35	0.011	13.0	27.0
C	32	12.0	14.0	29	0.008	13.0	23.0
C	32	14.0	16.0	29	0.008	13.0	23.0
C	32	20.0	24.0	31	0.012	8.8	16.0
C	32	28.0	32.0	27	0.010	11.0	18.0
C	32	36.0	40.0	31	0.012	13.0	21.0
C	32	50.0	60.0	34	0.007	14.0	24.0
C	32	70.0	81.5	28	0.008	12.0	20.0
C	33	0.0	2.0	85	0.260	63.0	72.0
C	33	2.0	4.0	72	0.180	45.0	51.0
C	33	4.0	6.0	65	0.100	23.0	36.0
C	33	6.0	8.0	49	0.028	15.0	27.0
C	33	8.0	10.0	44	0.030	15.0	30.0
C	33	10.0	12.0	37	0.020	16.0	33.0
C	33	12.0	14.0	36	0.016	15.0	36.0
C	33	14.0	16.0	39	0.019	15.0	33.0
C	33	20.0	24.0	38	0.036	14.0	37.0
C	33	28.0	32.0	34	0.021	14.0	38.0
C	33	36.0	40.0	28	0.012	14.0	38.0
C	34	0.0	2.0	57	0.210	55.0	71.0
C	34	2.0	4.0	58	0.300	37.0	64.0
C	34	4.0	6.0	55	0.460	26.0	47.0
C	34	6.0	8.0	57	0.440	34.0	61.0
C	34	8.0	10.0	54	0.360	32.0	48.0
C	34	10.0	12.0	56	0.500	25.0	55.0
C	34	12.0	14.0	48	0.350	17.0	42.0
C	34	14.0	16.0	40	0.200	12.0	36.0
C	34	20.0	24.0	41	0.140	15.0	39.0
C	34	28.0	32.0	41	0.054	14.0	34.0
C	34	36.0	40.0	39	0.033	13.0	37.0
C	36	0.0	2.0	78	0.320	58.0	68.0
C	36	2.0	4.0	76	0.270	51.0	63.0
C	36	4.0	6.0	76	0.150	32.0	55.0
C	36	6.0	8.0	75	0.130	27.0	45.0
C	36	8.0	10.0	73	0.094	25.0	46.0
C	36	10.0	12.0	67	0.046	22.0	42.0
C	36	12.0	14.0	62	0.039	23.0	43.0
C	36	14.0	16.0	62	0.028	24.0	42.0
C	36	20.0	24.0	60	0.028	24.0	47.0
C	36	28.0	32.0	57	0.025	23.0	47.0
C	36	36.0	40.0	57	0.023	24.0	44.0
C	36	50.0	60.0	55	0.022	22.0	41.0
C	36	70.0	80.0	52	0.029	23.0	39.0
C	37	0.0	2.0	81	0.170	54.0	99.0
C	37	2.0	4.0	79	0.068	53.0	97.0
C	37	4.0	6.0	75	0.081	41.0	85.0
C	37	6.0	8.0	73	0.052	33.0	83.0
C	37	8.0	10.0	71	0.026	29.0	73.0
C	37	10.0	12.0	68	0.029	26.0	70.0
C	37	12.0	14.0	66	0.040	28.0	70.0
C	37	14.0	16.0	64	0.016	26.0	70.0
C	37	16.0	20.0	65	0.008	28.0	73.0
C	37	20.0	24.0	64	0.012	28.0	72.0
C	37	24.0	28.0	64	0.008	28.0	73.0
C	37	28.0	32.0	63	0.021	26.0	70.0
C	37	32.0	36.0	62	0.021	28.0	73.0
C	37	36.0	40.0	61	0.012	27.0	70.0
C	37	40.0	50.0	61	0.014	24.0	64.0
C	37	50.0	60.0	60	0.013	26.0	65.0
C	37	60.0	70.0	59	0.022	28.0	73.0
C	37	70.0	80.0	58	0.0	26.0	65.0
C	37	80.0	90.0	61	0.025	25.0	65.0

APPENDIX 2 (CONTINUED)

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
C	38	0.0	2.0	76	0.160	41.0	86.0
C	38	2.0	4.0	83	0.070	34.0	71.0
C	38	4.0	6.0	82	0.087	28.0	68.0
C	38	6.0	8.0	67	0.047	23.0	55.0
C	38	8.0	10.0	69	0.036	23.0	55.0
C	38	10.0	12.0	64	0.033	20.0	51.0
C	38	12.0	14.0	61	0.030	21.0	50.0
C	38	14.0	16.0	63	0.037	22.0	55.0
C	38	20.0	24.0	60	0.068	23.0	67.0
C	38	28.0	32.0	56	0.029	24.0	58.0
C	38	36.0	40.0	55	0.037	24.0	61.0
C	38	50.0	60.0	52	0.037	22.0	55.0
C	38	70.0	80.0	49	0.036	22.0	54.0
C	38	90.0	94.0	47	0.065	21.0	54.0
C	39	0.0	2.0	71	0.047	33.0	73.0
C	39	2.0	4.0	74	0.032	28.0	53.0
C	39	4.0	6.0	74	0.020	21.0	47.0
C	39	6.0	8.0	69	0.028	21.0	51.0
C	39	8.0	10.0	67	0.018	20.0	49.0
C	39	10.0	12.0	67	0.006	19.0	50.0
C	39	12.0	14.0	59	0.013	21.0	50.0
C	39	14.0	16.0	64	0.010	17.0	43.0
C	39	20.0	24.0	54	0.014	19.0	45.0
C	39	28.0	32.0	52	0.010	21.0	51.0
C	39	36.0	40.0	51	0.013	21.0	51.0
C	39	50.0	60.0	50	0.011	18.0	43.0
C	39	70.0	80.0	48	0.014	20.0	50.0
C	41	0.0	2.0	74	0.033	39.0	57.0
C	41	2.0	4.0	81	0.041	36.0	58.0
C	41	4.0	6.0	71	0.039	28.0	47.0
C	41	6.0	8.0	67	0.007	27.0	46.0
C	41	8.0	10.0	62	0.034	28.0	45.0
C	41	10.0	12.0	57	0.013	26.0	45.0
C	41	12.0	14.0	56	0.019	26.0	43.0
C	41	14.0	16.0	60	0.011	23.0	46.0
C	41	20.0	24.0	62	0.013	26.0	44.0
C	41	28.0	32.0	61	0.024	25.0	44.0
C	41	36.0	40.0	60	0.017	26.0	43.0
C	41	50.0	57.0	53	0.023	25.0	42.0
C	42	0.0	2.0	79	0.095	52.0	84.0
C	42	2.0	4.0	77	0.092	52.0	82.0
C	42	4.0	6.0	77	0.089	47.0	81.0
C	42	6.0	8.0	70	0.025	38.0	70.0
C	42	8.0	10.0	70	0.082	29.0	57.0
C	42	10.0	12.0	68	0.081	31.0	75.0
C	42	12.0	14.0	68	0.062	28.0	69.0
C	42	14.0	16.0	65	0.040	31.0	76.0
C	42	20.0	24.0	68	0.017	27.0	50.0
C	42	28.0	32.0	72	0.011	27.0	60.0
C	42	36.0	40.0	69	0.013	24.0	55.0
C	42	50.0	60.0	73	0.022	26.0	58.0
C	42	70.0	80.0	64	0.025	29.0	65.0
C	42	90.0	100.0	62	0.026	28.0	62.0
C	42	0.0	2.0	80	0.086	32.0	55.0
C	42	2.0	4.0	76	0.026	29.0	52.0
C	42	4.0	6.0	72	0.020	29.0	56.0
C	42	6.0	8.0	70	0.017	27.0	50.0
C	42	8.0	10.0	67	0.022	29.0	61.0
C	42	10.0	12.0	68	0.018	30.0	60.0
C	42	12.0	14.0	67	0.012	27.0	59.0
C	42	14.0	16.0	70	0.007	29.0	59.0
C	42	20.0	24.0	63	0.026	27.0	59.0
C	42	28.0	32.0	63	0.023	25.0	56.0
C	42	36.0	40.0	61	0.017	26.0	57.0
C	42	50.0	60.0	60	0.012	27.0	57.0
C	42	70.0	84.0	57	0.021	24.0	54.0
C	43	0.0	2.0	84	0.040	30.0	74.0
C	43	2.0	4.0	84	0.0	34.0	82.0
C	43	4.0	6.0	75	0.190	27.0	68.0
C	43	6.0	8.0	67	0.036	26.0	72.0
C	43	8.0	10.0	71	0.037	27.0	86.0
C	43	10.0	12.0	67	0.061	28.0	85.0
C	43	12.0	14.0	65	0.047	27.0	92.0
C	43	14.0	16.0	66	0.032	25.0	83.0
C	43	20.0	24.0	61	0.041	26.0	79.0
C	43	28.0	32.0	59	0.031	26.0	76.0
C	45	0.0	2.0	71	0.460	55.0	95.0
C	45	2.0	4.0	71	0.260	53.0	92.0
C	45	4.0	6.0	71	0.300	54.0	91.0
C	45	6.0	8.0	69	0.330	54.0	87.0
C	45	8.0	10.0	70	0.240	58.0	93.0
C	45	10.0	12.0	66	0.340	50.0	85.0
C	45	12.0	14.0	50	0.061	23.0	51.0
C	45	14.0	16.0	46	0.029	16.0	40.0
C	45	20.0	24.0	50	0.019	22.0	49.0
C	45	28.0	32.0	48	0.026	20.0	49.0
C	45	36.0	40.0	42	0.021	17.0	42.0
C	45	50.0	56.0	41	0.023	18.0	42.0
C	46	0.0	2.0	74	0.057	25.0	57.0
C	46	2.0	4.0	70	0.040	23.0	52.0
C	46	4.0	6.0	63	0.042	25.0	56.0
C	46	6.0	8.0	64	0.032	23.0	46.0
C	46	8.0	10.0	62	0.031	23.0	54.0
C	46	10.0	12.0	56	0.028	22.0	56.0
C	46	12.0	14.0	52	0.029	21.0	55.0
C	46	14.0	16.0	52	0.024	20.0	57.0
C	46	20.0	24.0	49	0.021	22.0	54.0
C	46	28.0	32.0	52	0.025	21.0	58.0
C	46	36.0	40.0	45	0.024	16.0	50.0
C	47	0.0	2.0	80	0.230	52.0	100.0
C	47	2.0	4.0	77	0.170	51.0	110.0
C	47	4.0	6.0	74	0.130	48.0	110.0
C	47	6.0	8.0	72	0.140	36.0	85.0
C	47	8.0	10.0	70	0.089	31.0	79.0
C	47	10.0	12.0	70	0.055	29.0	81.0
C	47	12.0	14.0	69	0.048	28.0	70.0
C	47	14.0	16.0	73	0.023	27.0	74.0
C	47	20.0	24.0	72	0.011	26.0	68.0
C	47	28.0	32.0	69	0.012	24.0	66.0
C	47	36.0	40.0	72	0.010	27.0	79.0
C	47	50.0	60.0	60	0.022	26.0	75.0
C	47	0.0	2.0	82	0.066	37.0	80.0
C	47	2.0	4.0	85	0.056	6.2	27.0
C	47	4.0	6.0	84	0.039	32.0	76.0
C	47	6.0	8.0	85	0.029	29.0	73.0
C	47	8.0	10.0	81	0.018	29.0	74.0
C	47	10.0	12.0	63	0.013	27.0	69.0
C	47	12.0	14.0	68	0.024	27.0	63.0
C	47	14.0	16.0	75	0.017	30.0	68.0
C	47	20.0	24.0	64	0.019	28.0	74.0
C	47	28.0	32.0	61	0.018	26.0	68.0
C	47	36.0	40.0	62	0.017	28.0	74.0
C	47	50.0	60.0	57	0.010	25.0	60.0
C	47	70.0	80.0	53	0.016	23.0	56.0
C	49	0.0	2.0	63	0.210	31.0	67.0
C	49	2.0	4.0	54	0.130	25.0	54.0
C	49	4.0	6.0	51	0.089	23.0	51.0
C	49	6.0	8.0	53	0.080	20.0	50.0
C	49	8.0	10.0	50	0.064	18.0	46.0
C	49	10.0	12.0	51	0.051	17.0	44.0
C	49	12.0	14.0	52	0.055	19.0	46.0
C	49	14.0	16.0	55	0.045	18.0	43.0
C	49	20.0	24.0	50	0.020	18.0	41.0
C	49	28.0	32.0	30	0.008	12.0	30.0
C	49	36.0	40.0	34	0.007	14.0	35.0
C	49	50.0	58.0	35	0.054	15.0	40.0
C	51	0.0	2.0	70	0.230	40.0	54.0
C	51	2.0	4.0	65	0.330	39.0	52.0
C	51	4.0	6.0	62	0.260	36.0	46.0
C	51	6.0	8.0	62	0.170	40.0	54.0
C	51	8.0	10.0	54	0.086	28.0	40.0
C	51	10.0	12.0	50	0.060	23.0	35.0
C	51	12.0	14.0	48	0.042	21.0	33.0
C	51	14.0	16.0	48	0.028	17.0	27.0
C	51	20.0	24.0	40	0.014	14.0	22.0
C	51	28.0	32.0	36	0.023	15.0	23.0
C	51	36.0	40.0	39	0.021	15.0	24.0
C	51	50.0	60.0	32	0.033	14.0	25.0
C	52	0.0	2.0	70	0.490	45.0	83.0
C	52	2.0	4.0	70	0.560	51.0	110.0
C	52	4.0	6.0	68	0.440	48.0	100.0
C	52	6.0	8.0	74	0.370	48.0	99.0
C	52	8.0	10.0	67	0.270	39.0	88.0
C	52	10.0	12.0	56	0.180	32.0	71.0
C	52	12.0	14.0	53	0.160	28.0	71.0
C	52	14.0	16.0	46	0.120	22.0	55.0
C	52	20.0	24.0	44	0.030	17.0	42.0
C	52	28.0	32.0	37	0.025	13.0	39.0
C	52	36.0	40.0	38	0.024	16.0	42.0
C	52	50.0	59.0	35	0.017	15.0	41.0
C	53	0.0	2.0	63	0.430	43.0	91.0
C	53	2.0	4.0	68	0.490	47.0	99.0
C	53	4.0	6.0	66	0.420	45.0	100.0
C	53	6.0	8.0	62	0.370	38.0	91.0
C	53	8.0	10.0	62	0.350	40.0	85.0
C	53	10.0	12.0	61	0.350	37.0	83.0
C	53	12.0	14.0	61	0.300	40.0	90.0
C	53	14.0	16.0	58	0.150	34.0	77.0
C	53	20.0	24.0	56	0.130	31.0	71.0
C	53	28.0	32.0	55	0.130	25.0	63.0
C	53	36.0	40.0	52	0.083	23.0	60.0
C	54	0.0	2.0	75	0.120	52.0	83.0
C	54	2.0	4.0	72	0.190	49.0	74.0
C	54	4.0	6.0	73	0.210	44.0	73.0
C	54	6.0	8.0	72	0.170	42.0	69.0
C	54	8.0	10.0	69	0.160	41.0	66.0
C	54	10.0	12.0	67	0.230	38.0	63.0
C	54	12.0	14.0	64	0.074	27.0	48.0
C	54	14.0	16.0	67	0.250	35.0	61.0
C	54	20.0	24.0	59	0.150	29.0	59.0
C	54	28.0	32.0	46	0.052	16.0	33.0
C	54	36.0	40.0	35	0.012	14.0	29.0
C	56	0.0	2.0	68	0.870	74.0	71.0
C	56	2.0	4.0	66	0.910	74.0	70.0
C	56	4.0	6.0	72	0.820	76.0	73.0

SE STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
56	6.0	8.0	62	0.720	77.0	74.0
56	8.0	10.0	61	0.520	76.0	74.0
56	10.0	12.0	56	0.720	53.0	54.0
56	12.0	14.0	44	0.078	20.0	28.0
56	14.0	16.0	44	0.032	19.0	28.0
56	20.0	24.0	44	0.026	17.0	26.0
56	28.0	32.0	39	0.016	17.0	24.0
56	36.0	40.0	36	0.021	15.0	22.0
57	0.0	2.0	65	1.800	91.0	72.0
57	2.0	4.0	66	1.200	93.0	70.0
57	4.0	6.0	66	1.300	98.0	75.0
57	6.0	8.0	67	1.200	98.0	78.0
57	8.0	10.0	66	1.500	98.0	79.0
57	10.0	12.0	66	1.700	95.0	67.0
57	12.0	14.0	62	2.000	95.0	63.0
57	14.0	16.0	66	1.900	110.0	79.0
57	20.0	24.0	65	1.200	110.0	69.0
57	28.0	32.0	58	0.0	80.0	57.0
58	0.0	2.0	65	0.610	82.0	100.0
58	2.0	4.0	69	0.830	84.0	110.0
58	4.0	6.0	73	0.420	81.0	100.0
58	6.0	8.0	86	0.760	87.0	120.0
58	8.0	10.0	85	1.700	89.0	130.0
58	10.0	12.0	76	0.760	68.0	96.0
58	12.0	14.0	66	0.310	38.0	73.0
58	14.0	16.0	61	0.250	37.0	79.0
58	20.0	24.0	51	0.045	24.0	37.0
58	28.0	32.0	51	0.042	22.0	52.0
58	36.0	40.0	45	0.032	21.0	50.0
58	50.0	60.0	42	0.027	17.0	40.0
60	0.0	2.0	79	1.600	180.0	150.0
60	2.0	4.0	72	2.200	190.0	140.0
60	4.0	6.0	64	1.900	180.0	130.0
60	6.0	8.0	66	1.500	180.0	120.0
60	8.0	10.0	56	0.730	90.0	76.0
60	10.0	12.0	50	0.570	78.0	75.0
60	12.0	14.0	50	0.340	75.0	75.0
60	14.0	16.0	51	0.300	69.0	56.0
60	20.0	24.0	48	0.310	44.0	50.0
60	28.0	33.0	25	0.021	9.6	22.0
65	0.0	2.0	59	0.250	30.0	37.0
65	2.0	4.0	55	0.280	31.0	39.0
65	4.0	6.0	52	0.240	29.0	37.0
65	6.0	8.0	52	0.310	29.0	37.0
65	8.0	10.0	47	0.140	21.0	29.0
65	10.0	12.0	38	0.048	17.0	26.0
65	12.0	14.0	41	0.040	19.0	29.0
65	14.0	16.0	47	0.035	19.0	30.0
65	20.0	24.0	36	0.026	15.0	24.0
65	28.0	32.0	37	0.035	18.0	27.0
65	36.0	40.0	39	0.037	19.0	29.0
66	0.0	2.0	60	0.580	44.0	43.0
66	2.0	4.0	62	0.610	37.0	46.0
66	4.0	6.0	61	0.620	33.0	43.0
66	6.0	8.0	59	0.550	32.0	37.0
66	8.0	10.0	46	0.190	14.0	18.0
66	10.0	12.0	45	0.085	12.0	16.0
66	12.0	14.0	45	0.085	13.0	18.0
66	14.0	16.0	44	0.093	18.0	21.0
66	20.0	24.0	41	0.072	17.0	27.0
66	28.0	32.0	38	0.054	14.0	22.0
66	36.0	40.0	41	0.051	15.0	25.0
68	0.0	2.0	65	0.520	62.0	77.0
68	2.0	4.0	66	0.590	63.0	83.0
68	4.0	6.0	64	0.690	62.0	79.0
68	6.0	8.0	62	0.540	62.0	69.0
68	8.0	10.0	61	0.730	68.0	75.0
68	10.0	12.0	60	0.510	61.0	70.0
68	12.0	14.0	58	0.320	56.0	64.0
68	14.0	16.0	58	0.500	46.0	55.0
68	20.0	24.0	51	0.074	22.0	36.0
68	28.0	32.0	46	0.043	20.0	34.0
68	36.0	42.0	45	0.041	23.0	37.0
73	0.0	2.0	81	0.140	43.0	53.0
73	2.0	4.0	75	0.079	26.0	41.0
73	4.0	6.0	75	0.056	29.0	44.0
73	6.0	8.0	80	0.048	27.0	43.0
73	8.0	10.0	72	0.038	26.0	45.0
73	10.0	12.0	73	0.024	27.0	47.0
73	12.0	14.0	72	0.018	27.0	46.0
73	14.0	16.0	68	0.020	25.0	43.0
73	20.0	24.0	72	0.022	26.0	44.0
73	28.0	32.0	66	0.013	26.0	46.0
73	36.0	40.0	68	0.015	26.0	46.0
73	50.0	60.0	71	0.013	25.0	43.0
73	70.0	80.0	68	0.023	28.0	44.0
74	0.0	2.0	80	0.560	39.0	44.0
74	2.0	4.0	71	0.380	37.0	44.0
74	4.0	6.0	62	0.330	33.0	41.0
74	6.0	8.0	57	0.220	31.0	37.0
74	8.0	10.0	44	0.069	20.0	27.0
74	10.0	12.0	39	0.073	16.0	22.0

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	INTERVAL BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
C	74	12.0	14.0	36	0.064	15.0	20.0
C	74	14.0	16.0	37	0.038	11.0	17.0
C	74	20.0	24.0	28	0.020	11.0	16.0
C	74	28.0	31.5	24	0.028	10.0	17.0
C	78	0.0	2.0	85	0.092	46.0	85.0
C	78	2.0	4.0	71	0.120	35.0	68.0
C	78	4.0	6.0	73	0.098	25.0	57.0
C	78	6.0	8.0	75	0.069	22.0	61.0
C	78	8.0	10.0	67	0.031	19.0	56.0
C	78	10.0	12.0	65	0.046	19.0	57.0
C	78	12.0	14.0	59	0.037	17.0	53.0
C	78	14.0	16.0	72	0.029	20.0	67.0
C	78	20.0	24.0	57	0.020	18.0	62.0
C	78	28.0	32.0	54	0.046	17.0	60.0
C	78	36.0	40.0	52	0.039	18.0	59.0
C	78	50.0	60.0	52	0.036	16.0	53.0
C	78	70.0	80.0	48	0.039	16.0	53.0
C	79	0.0	2.0	38	0.014	13.0	26.0
C	79	2.0	4.0	29	0.019	7.4	18.0
C	79	4.0	6.0	25	0.014	8.5	17.0
C	79	6.0	8.0	28	0.020	17.0	28.0
C	81	0.0	2.0	67	0.620	68.0	77.0
C	81	2.0	4.0	69	0.490	62.0	76.0
C	81	4.0	6.0	73	0.540	70.0	78.0
C	81	6.0	8.0	62	0.650	66.0	78.0
C	81	8.0	10.0	63	0.690	68.0	79.0
C	81	10.0	12.0	61	0.620	65.0	76.0
C	81	12.0	14.0	60	0.510	54.0	70.0
C	81	14.0	16.0	59	0.320	41.0	52.0
C	81	20.0	24.0	57	0.100	22.0	40.0
C	81	28.0	32.0	58	0.067	24.0	43.0
C	81	36.0	40.0	55	0.074	24.0	41.0
C	82	0.0	2.0	72	0.220	34.0	45.0
C	82	2.0	4.0	46	0.087	15.0	20.0
C	82	4.0	6.0	26	0.025	8.7	13.0
C	82	6.0	8.0	24	0.015	8.8	14.0
C	82	8.0	10.0	24	0.012	9.2	18.0
C	82	10.0	12.0	22	0.012	9.6	16.0
C	82	12.0	14.0	22	0.013	8.6	17.0
C	82	14.0	16.0	22	0.009	7.5	15.0
C	82	16.0	20.0	22	0.012	8.9	18.0
C	CLH	0.0	2.0	42	0.310	100.0	110.0
C	CLH	2.0	4.0	31	0.280	56.0	83.0
C	CLH	4.0	6.0	40	0.230	71.0	90.0
C	CLH	6.0	8.0	47	0.310	150.0	110.0
C	CLH	8.0	10.0	41	0.300	88.0	110.0
C	CLH	10.0	12.0	41	0.230	85.0	110.0
C	CLH	12.0	14.0	40	0.210	69.0	110.0
C	CLH	14.0	16.0	44	0.270	87.0	120.0
C	CLH	20.0	24.0	50	0.620	170.0	190.0
C	CLH	28.0	32.0	45	0.240	87.0	100.0
C	CLH	36.0	40.0	45	0.350	150.0	130.0
D	1	0.0	2.0	64	0.460	7.0	54.0
D	1	2.0	4.0	65	0.680	17.0	54.0
D	1	4.0	6.0	64	0.550	19.0	50.0
D	1	6.0	8.0	63	0.470	18.0	51.0
D	1	8.0	10.0	69	0.380	21.0	56.0
D	1	10.0	12.0	67	0.420	17.0	53.0
D	1	12.0	14.0	72	0.055	19.0	49.0
D	1	14.0	16.0	70	0.002	22.0	53.0
D	1	20.0	24.0	66	0.010	18.0	61.0
D	1	28.0	32.0	47	0.020	18.0	56.0
D	1	36.0	40.0	31	0.022	16.0	38.0
D	2	0.0	2.0	57	0.500	19.0	53.0
D	2	2.0	4.0	60	0.560	20.0	58.0
D	2	4.0	6.0	64	0.620	24.0	65.0
D	2	6.0	8.0	67	0.640	22.0	62.0
D	2	8.0	10.0	62	0.490	20.0	57.0
D	2	10.0	12.0	56	0.250	15.0	49.0
D	2	12.0	14.0	60	0.260	21.0	52.0
D	2	14.0	16.0	56	0.220	21.0	57.0
D	2	20.0	24.0	60	0.230	22.0	58.0
D	2	28.0	32.0	53	0.002	19.0	47.0
D	3	0.0	2.0	33	0.400	16.0	37.0
D	3	2.0	4.0	36	0.240	16.0	38.0
D	3	4.0	6.0	30	0.079	19.0	46.0
D	3	6.0	8.0	24	0.008	21.0	41.0
D	3	8.0	10.0	26	0.005	19.0	38.0
D	3	10.0	12.0	29	0.003	21.0	41.0
D	3	12.0	14.0	26	0.004	19.0	40.0
D	3	14.0	16.0	29	0.004	21.0	41.0
D	3	20.0	24.0	29	0.004	17.0	37.0
D	4	0.0	2.0	24	0.470	10.0	26.0
D	4	2.0	4.0	29	0.039	13.0	31.0
D	4	4.0	6.0	42	0.004	17.0	44.0
D	4	6.0	8.0	44	0.0	17.0	47.0
D	4	8.0	10.0	39	0.002	17.0	39.0
D	4	10.0	12.0	37	0.005	20.0	38.0
D	4	12.0	14.0	38	0.012	18.0	37.0
D	4	14.0	16.0	35	0.001	19.0	39.0
D	4	20.0	24.0	30	0.003	18.0	34.0

APPENDIX 2 (CONTINUED)

CRUISE	STATION	INTERVAL TOP CM	BOTTOM CM	WATER %	HG PPM	CR PPM	NI PPM
D	4	28.0	32.0	33	0.001	22.0	45.0
D	4	36.0	40.0	31	0.0	18.0	36.0

APPENDIX 3

COMPUTER PROGRAMS

```
C
C     PROGRAM ACOMP
C
C     WRITTEN BY DAVID DRAIN
C     DURING FALL 1977
C     AT BOWLING GREEN STATE UNIVERSITY
C     BOWLING GREEN,OHIO
C
C     ACOMP HANDLES I/O FOR SUBROUTINE AMODEL, WHICH IS A SEDIMENT
C     MOVEMENT MODEL FOR LAKE ERIE
C
C     ACOMP HAS THE FOLLOWING STEPS:
C     1. READ INPUT DATA
C     2. FOR EACH OF THE 6 WIND DIRECTIONS:
C       A. READ PROBABILITIES
C       B. RUN MODEL (AMODEL)
C       C. SAVE RESULTS, PROPERLY WEIGHTED
C     3. OUTPUT RESULTS
C
C     UNIT1 IS AN INPUT TAPE NAMED .SRN1107 WITH DCB=(RECFM=VSB)
C     ACOMP READS THE FOLLOWING INFORMATION FROM UNIT 1:
C     ILOC  MODEL COORDINATES OF ADJACENT MODEL REGIONS
C     ALFA FALLOUT RATIO
C     SED  SEDIMENT INPUT
C     TRANSFER PROBABILITIES (READ SIX TIMES)
C
C     UNIT3 IS AN OUTPUT TAPE WITH DCB=(RECFM=VSB)
C     ACOMP WRITES TWO RECORDS ON UNIT3:
C     1. FALLEN SEDIMENT
```

```
C     2. SUSPENDED SEDIMENT
C
C     ACOMP READS ONE CONTROL CARD, FORMAT 2F10.5,E10.4,3I4
C     IT READS
C     TIME      MODEL TIME UNIT (2.5 HOURS)
C     THRSH      THRESHOLD FOR CONVERGENCE TEST
C     A      SCALE
C     (SCALE=1.E+30 IS RECOMMENDED TO MINIMIZE ROUNDOFF ERROR)
C     I      MAX NUMBER OF MODEL ITERATIONS
C     J      IF 0, DO NOT CHECK FOR SUSPENDED SEDIMENT CONVERGENCE
C     K       HOW OFTEN TO CHECK FOR CONVERGENCE
C
C     ACOMP REQUIRES 38448 (HEX) BYTES,
C     AND 14 MINUTES CPU TIME (FOR T=100) ON AN IBM 360/70
C
      LOGICAL LFLAG
      DIMENSION OMALFA(2529),SED(2529)
      DIMENSION FRAC(6),TOTSED(2529)
      INTEGER*2 ILOC(2529,9)
      COMMON S(2529,6),WPROB(2529,9),LFLAG,THRSH,INDMAX,IFET,ILOC
C
C     NOTE THAT S(.,2) AND S(.,3) ARE READ IMPLICITLY
C
      EQUIVALENCE (SED(1),S(1,3))
      EQUIVALENCE (OMALFA(1),S(1,2))
      DATA FRAC/.1666667,.0833333,.4166667,.1666667,.0833333,.0833333/
      CALL ERRSET(208,500,0,1,0)
C
C     TIME UNIT=2.5 HOURS
C
      READ(5,701) TIME,THRSH,A,I,J,K
      WRITE(6,721) TIME,THRSH,A,I,J,K
C
C     TAB PAST ICON
C
      READ(1) X
```

```
C
C     TAB PAST IRS...IRS(N)=WES COORDS OF REGION N
C
      READ(1) X
C
C     READ ILOC...ILOC GIVES MODEL INDICES OF ADJACENT MODEL REGIONS
C
      READ(1) ILOC
C
C     READ FALLOUT RATIO
C
      READ(1) OMALFA
C
C     CALCULATE 1-FALLOUT RATIO
C
      DO 101 IA=1,2529
  101 OMALFA(IA)=1.-OMALFA(IA)
C
C     READ SEDIMENT INPUT
C
      READ(1) SED
      DO 901 IA=1,2529
  901 SED(IA)=SED(IA)*1.E-03
C
C     TAB PAST WATER DEPTHS
C
      READ(1) X
C
C     SCALE SEDIMENT INPUT
C
      DO 100 IA=1,2529
C
C     SET INITIAL SUSPENDED SEDIMENT TO 0
C
      S(IA,1)=0.
      TOTSED(IA)=0.
```

```
  100 SED(IA)=SED(IA)*A
      INDMAX=2529
      DO 999 IFIRST=1,6,1
C
C     READ TRANSFER PROBABILITIES
C
      READ(1) WPROB
C
C     CALL SEDIMENT MODEL
C     AMODEL(I,J,K) WHERE
C     I=MAXIMUM NUMBER OF RUNS
C     J=1 TO TEST FOR CONVERGENCE,0 OTHERWISE
C     K=FREQUENCY OF CONVERGENCE TEST
C
      CALL AMODEL(I,J,K)
C
      IF(J.EQ.0) GO TO 718
      IF(LFLAG) GO TO 717
      WRITE(6,705)
      GO TO 718
  717 WRITE(6,704) IRET
  718 CONTINUE
      DO 305 IT=1,2529
C
C     TOTSED MUST BE NORMALIZED FOR TIME
C     TOTSED IS YEAR AVERAGED SEDIMENT FALLING PER TIME UNIT
C
      TOTSED(IT)=TOTSED(IT)+S(IT,1)*FRAC(IFIRST)
C
C     REINITIALIZE SUSPENDED SEDIMENT
C
  305 S(IT,1)=0.
  999 CONTINUE
C
C     SAVETOTSED (FALLEN SEDIMENT)
C     AND COMPENSATE FOR SCALING
```

```
C
      DO 306 IA=1,2529
      SED(IA)=S(IA,2)*TOTSED(IA)/A
  306 TOTSED(IA)=TOTSED(IA)*(1.-S(IA,2))/A
      WRITE(3) TOTSED
C
C     SAVE YEAR AVERAGED SUSPENDED SEDIMENT
C
      WRITE(3) SED
      STOP
  705 FORMAT(' CONVERGENCE DID NOT OCCUR')
  721 FORMAT(' TIME= ',F8.2,' THRSH= ',E12.6,' SCALE= ',E12.6/
     1' MAXRUN= ',I6,' CONVTST= ',I6,' FREQ= ',I6)
  701 FORMAT(2F10.5,E10.4,3I4)
  704 FORMAT('1CONVERGENCE OCCURED IN',I4,' STEPS'//)
      END
```

```
      SUBROUTINE AMODEL(MAXRUN,ICONVS ,ITEST)
C
C
C     SUBROUTINE AMODEL
C
C     WRITTEN BY DAVID DRAIN
C     SPRING 1977
C     AT BOWLING GREEN STATE UNIVERSITY
C     BOWLING GREEN, OHIO
C
C     SURBOUTINE AMODEL DETERMINES SUSPENDED AND BOTTOM SEDIMENT
C     MOVEMENT
C
C     MAXRUN=MAXIMUM NUMBER OF TIME UNITS TO RUN AMODEL
C     ICONVS=0 DO NOT CHECK FOR CONVERGENCE OF SUSP. SEDIMENT
C     ICONVS=1 CHECK FOR CONVERGENCE
C     ITEST  HOW OFTEN TO TEST FOR CONVERGENCE
C     THRSH   THRESHOLD FOR CONVERGENCE TEST
C     INV  INVERSE FUNCTION FOR ADJACENT REGION INDICES
C     IRET=NUMBER OF ITERATIONS COMPLETED
C     INDMAX   NUMBER OF REGIONS
C
C     S(2529,6) SEDIMENT ARRAY
C     S(.,1)  SUSPENDED SEDIMENT
C     S(.,2)  FALLOUT RATIO
C     S(.,3)  SEDIMENT INPUT CONSTANT FROM OUTSIDE OF THE MODEL
C     S(.,4)  TEMPORARY STORAGE
C     S(.,5)  TEMPORARY STORAGE
C     S(.,6)  TEMPORARY STORAGE
C     P(I,J)  IS THE PROBABILITY OF WATER MOVEMENT FROM REGION I
C     TO REGION J DURING ONE MODEL STEP
C     TOREGION J DURING ONE MODEL STEP
C
C     ALL I/O IS DONE BY THE CALLING PROGRAM, ACOMP
C
C
```

```
C
      LOGICAL LFLAG
      INTEGER*2 ILOC(2529,9)
      COMMON S(2529,6),WPROB(2529,9),LFLAG,THRSH,INDMAX,IRET,ILOC
      DIMENSION INV(9)
      DATA INV/1,9,8,7,6,5,4,3,2/
      DO 200  IA=1,MAXRUN,1
      IF((ICONVS .EQ. 1).AND.(MOD(IA     ,ITEST).EQ.(ITEST-2)))
     1GO TO 300
      IF((ICONVS .EQ. 1).AND.(MOD(IA     ,ITEST).EQ.0)) GO TO 400
C
C     COMPUTE TRANSPORTABLE SEDIMENT IN S(.,6)
C
  110 DO 120  ID=1,INDMAX,1
      S(ID,4)=0.
  120 S(ID,6)=S(ID,1)*S(ID,2)
C
C     COMPUTE NEW SUSPENDED SEDIMENT
C
      DO 180  IE=1,INDMAX
      DO 160  IF=1,9,1
      IF(ILOC(IE,IF).EQ.0)  GO TO 160
      S(IE,4)=WPROB(ILOC(IE,IF),INV(IF))*S(ILOC(IE,IF),6)+S(IE,4)
  160 CONTINUE
  180 S(IE,1)=S(IE,4)+S(IE,3)
      GO TO 200
C
C     SAVE SUSPENDED SEDIMENT IN S(.,5)  FOR CONVERGENCE TEST
C
  300 DO 310  IC=1,INDMAX,1
  310 S(IC,5)=S(IC,1)
      GO TO 110
C
C     CHECK FOR CONVERGENCE
C
  400 DUM=0.
```

```
      DUM2=0.
      ITA=IA
      DO 410 IB=1,INDMAX,1
      DUM2=DUM2+S(IB,1)
  410 DUM=DUM+ABS(S(IB,1)-S(IB,5))
      IF(DUM.LE.THRSH) GO TO 500
      PERC=DUM/DUM2
      WRITE(6,705) ITA,DUM,PERC
  705 FORMAT(' AT STEP ',I6,' ERROR= ',E12.6,' PERCENT ERROR= ',E12.6)
      GO TO 110
  200 CONTINUE
      LFLAG = .FALSE.
      RETURN
C
C     CONVERGENCE OCCURED
C
  500 LFLAG=.TRUE.
      IRET = IA
      RETURN
      END
```

```
C
C     PROGRAM ZBMD
C
C     WRITTEN BY DAVID DRAIN
C     DURING SPRING 1977
C     AT BOWLING GREEN STATE UNIVERSITY
C     AT BOWLING GREEN,OHIO
C
C     ZBMD HANDLES I/O FOR SUBROUTINE PROB, WHICH COMPUTES
C     PROBABILITIES OF WATER TRANSFER FROM ONE MODEL REGION TO THOSE
C     ADJACENT TO IT
C
C     ZBMD DOES THE FOLLOWING THREE STEPS
C     1. READ ALL NECESSARY DATA
C     2. CALL PROB TO COMPUTE TRANSFER PROBABILITIES
C     3. SAVE THE RESULTS ON TAPE
C
C     INPUT TAPES:
C     UNIT1 NAMED MASTER WITH DCB=(RECFM=FB,LRECL=80,BLKSIZE=7280)
C     UNIT1 HAS WATER DEPTHS
C     UNIT2 NAMED .FINTAPE WITH DCB=(RECFM=VSB)
C     UNIT2 HAS WATER VELOCITIES AS FOLLOWS
C     6 WIND DIRECTIONS(6 DEPTHS(X DIRECTION,Y DIRECTION))
C     FOR A TOTAL OF 72 RECORDS
C     UNIT8 NAMED .BMDPREP WITH DCB=(RECFM=FB,LRECL=108,BLKSIZE=8100)
C     UNIT8 HAS COORDINATES OF MODEL REGIONS BY INDEX
C
C     ZBMD WRITES 6 RECORDS TO UNIT9, EACH 2529 BY 9
C     UNIT9 HAS DCB=(RECFM=VSB)
C
      DIMENSION ASUM(9),PA(9),A(122,40),IRS(2625,2)
      COMMON DEPTH(122,40),XVEL(122,40,6),YVEL(122,40,6)
      DIMENSION WPROB(2529,9)
      TIM=2.5
      BOUND=1
C
```

```
C      READ DEPTHS
C
       DO 20 IM=1,122,1
       DO 10 IN=1,5,1
       IA=(IN-1)*8+1
       IB=IN*8
    10 READ(1,730)  (DEPTH(IM,IC),IC=IA,IB)
    20 CONTINUE
C
C      READ COORDINATES IN ORDER BY INDEX
C
       DO 107 IA=1,175,1
       IC=(IA-1)*15+1
       ID=IA*15
   107 READ(8,711)  ((IRS(IB,IE),IE=1,2),IB=IC,ID)
       DO 300 IZ=1,6,1
C
C      READ HOROZONTAL VELCCITIES
C
       DO 131 IA=1,6,1
       READ(2) A
       DO 19 IAA=1,122,1
       DO 18 IAB=1,40,1
       IF(A(IAA,IAB).GT.BOUND) A(IAA,IAB)=BOUND
    18 XVEL(IAA,IAB,IA)=A(IAA,IAB)
    19 CONTINUE
       READ(2) A
       DO 17 IAA=1,122,1
       DO 16 IAB=1,40,1
       IF(A(IAA,IAB).GT.BOUND) A(IAA,IAB)=BOUND
    16 YVEL(IAA,IAB,IA)=A(IAA,IAB)
    17 CONTINUE
   131 CONTINUE
C
C      CALCULATE AND TAPE WATER TRANSFER PROBABILITIES
C
```

```
      DO 200  IB=1,2529                                           ZBMD 730
      IF(IRS(IB,1).LE.0)  GO TO 111                               ZBMD 740
      CALL PROB(IRS(IB,1),IRS(IB,2),ASUM,PA,TIM)                  ZBMD 750
      DO 122 IPRO=1,9                                             ZBMD 760
  122 WPROB(IB,IPRO)=PA(IPRO)                                     ZBMD 770
      GO TO 200                                                   ZBMD 780
  111 DO 121 IC=1,9,1                                             ZBMD 790
  121 WPROB(IB,IC)=0.                                             ZBMD 800
  200 CONTINUE                                                    ZBMD 810
      WRITE(9) WPROB                                              ZBMD 820
  300 CONTINUE                                                    ZBMD 830
      STOP                                                        ZBMD 840
  711 FORMAT(1X,30I3)                                             ZBMD 850
  730 FORMAT(8F10.5)                                              ZBMD 860
      END                                                         ZBMD 870
```

```
      SUBROUTINE PROB(M,N,ASUM,PA,TIME)
C
C     SUBROUTINE PROB
C
C     WRITTEN BY DAVID DRAIN, SPRING 1977
C     AT BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OHIO
C
C     PROB COMPUTES THE PROBABILITY OF WATER TRANSFER DURING A
C     GIVEN TIME UNIT FROM ONE SEDIMENT MODEL REGION TO THOSE
C     ADJACENT TO IT
C
C     PROB HAS THREE STEPS:
C     1.  INTERPOLATE HOROZONTAL VELOCITIES AND ARRIVE AT A
C     PIECEWISE LINEAR FUNCTION FOR HOROZONTAL WATER VELOCITY IN
C     TERMS OF WATER DEPTH.
C     2. INTEGRATE THESE HOROZONTAL VELOCITIES OVER DEPTH TO
C     TO DETERMINE THE VOLUME OF WATER MOVED FROM THIS REGION
C     TO THOSE ADJACENT TO IT.
C     3. DIVIDE THE VOLUME OF WATER MOVING FROM REGION I TO REGION  J
C     BY THE VOLUME OF WATER IN REGION I TO OBTAIN THE DESIRED
C     PROBABILITIES.
C
C     ALL I/O IS MANAGED BY THE CALLING PROGRAM,ZBMD.
C
C     M,N IS THE INDEX OF THE WES REGION
C     ASUM IS AN ARRAY OF WATER AMOUNTS TRANSFERRED
C     IN CUBIC FEET PER (TIME*HOUR)
C     PA IS AN ARRAY OF PROBABILITIES RETURNED
C     ADJACENT REGIONS ARE INDEXED AS FOLLOWS:
C        2 3 4
C        5 1 6
C        7 8 9
C
C     TIME IS IN HOURS AND SHOULD BE SUCH THAT TIME*MAX VELOCITY<2 MILES
C     SO TIME<2.9333336/MAX VELOCITY (IN FEET PER SECOND)
C
```

```
C
C     DEPTH IS AN ARRAY OF WATER DEPTHS
C     XVEL IS AN ARRAY OF (X-DIRECTION) HOROZONTAL WATER VELOCITIES
C     YVEL IS AN ARRAY OF (Y-DIRECTION) HOROZONTAL WATER VELOCITIES
C
      COMMON DEPTH(122,40),XVEL(122,40,6),YVEL(122,40,6)
      DIMENSION Z(7),X(6),Y(6),XM(6),YM(6),XB(6),YB(6),ASUM(9),PA(9)
      DATA WD/10560./
      DATA Z/0.,5.,10.,20.,40.,60.,0./
      F1(S1,S2,B1,B2,D1,D2)=S1*S2*(D2**3/3-D1**3/3)+
     C(S1*B2+S2*B1)*(D2**2/2-D1**2/2)+B1*B2*(D2-D1)
      F4(S1,S2,B1,B2,D1,D2)=S1*S2*(D2**3/3-D1**3/3)+
     C(WD*S2+S1*B2+S2*B1)*(D2**2/2-D1**2/2)+(WD*B2+B1*B2)*(D2-D1)
C
C     READ DEPTH,HOROZONTAL VELOCITIES
C
      DO  20  I=1,6,1
      X(I)=XVEL(M,N,I)
   20 Y(I)=YVEL(M,N,I)
      ZMAX=DEPTH(M,N)
      Z(7)=ZMAX
      DO 90 I=1,9,1
   90 ASUM(I)=0.0
      IF(ZMAX.GT..5)  GO TO 5
      DO 2 IA=1,9,1
    2 PA(IA)=0.
      RETURN
    5 CONTINUE
C
C     CHANGE THE FT/SEC INPUT TO FT/HOUR*TIME
C
      DO 100 I=1,6,1
      X(I)=X(I)*3600.*TIME
  100 Y(I)=Y(I)*3600.*TIME
C
C     LINEARLY INTERPOLATE THE HORIZONTAL VELOCITIES
```

```
C
      DO 110  I=1,6,1
      J=I+1
      IF((Z(J).LE.ZMAX).AND.(J.LT.7))  GO TO 108
      XB(I)=X(I)
      XM(I)=0.
      YB(I)=Y(I)
      YM(I)=0.
      IMAX=I
      GO TO 112
  108 XM(I)=(X(J)-X(I))/(Z(J)-Z(I))
      XB(I)=(Z(J)*X(I)-Z(I)*X(J))/(Z(J)-Z(I))
      YM(I)=(Y(J)-Y(I))/(Z(J)-Z(I))
      YB(I)=(Z(J)*Y(I)-Z(I)*Y(J))/(Z(J)-Z(I))
  110 CONTINUE
C
C     INTEGRATE VELOCITY OVER DEPTH
C
  112 IDEPTH=1
      JDEPTH=IDEPTH+1
  113 IF((JDEPTH.GT.IMAX).OR.(JDEPTH.GT.6))  GO TO 200
      IF(((X(IDEPTH).GT.0.).AND.(X(JDEPTH).LT.0.)).OR.
     C(X(JDEPTH).GT.0.).AND.(X(IDEPTH).LT.0.))  GO TO 116
      XT=Z(JDEPTH)
      GO TO 118
  116 XT=-XB(IDEPTH)/XM(IDEPTH)
  118 IF(((Y(IDEPTH).GT.0.).AND.(Y(JDEPTH).LT.0.)).OR.
     C(Y(JDEPTH).GT.0.).AND.(Y(IDEPTH).LT.0.))  GO TO 120
      YT = Z(JDEPTH)
      GO TO 122
  120 YT=-YB(IDEPTH)/YM(IDEPTH)
  122 IF(XT-YT) 124,124,126
  124 DT1=XT
      DT2=YT
      GO TO 130
  126 DT1=YT
```

```
      DT2=XT                                                            PROB1090
  130 DEPT1=(DT1+Z(IDEPTH))/2                                           PROB1100
      DEPT2=(DT2+DT1)/2                                                 PROB1110
      DEPT3=(Z(JDEPTH)+DT2)/2                                           PROB1120
      K=0                                                               PROB1130
      TXM=XM(IDEPTH)                                                    PROB1140
      TYM=YM(IDEPTH)                                                    PROB1150
      TXB=XB(IDEPTH)                                                    PROB1160
      TYB=YB(IDEPTH)                                                    PROB1170
      CM=-TXM                                                           PROB1180
      CB=-TXB                                                           PROB1190
      DM=-TYM                                                           PROB1200
      DB=-TYB                                                           PROB1210
      DEPTX=DEPT1                                                       PROB1220
      DEPI1=Z(IDEPTH)                                                   PROB1230
      DEPI2=DT1                                                         PROB1240
  131 CONTINUE                                                          PROB1250
      IF(((XM(IDEPTH)*DEPTX=XB(IDEPTH)).GE.0.).AND.                     PROB1260
     C((YM(IDEPTH)*DEPTX+YB(IDEPTH)).GE.0.))   GO TO 140                PROB1270
      IF(((XM(IDEPTH)*DEPTX+XB(IDEPTH)).GE.0.).AND.                     PROB1280
     C((YM(IDEPTH)*DEPTX+YB(IDEPTH)).LT.0.))   GO TO 150                PROB1290
      IF(((XM(IDEPTH)*DEPTX+XB(IDEPTH)).LT.0.).AND.                     PROB1300
     C((YM(IDEPTH)*DEPTX+YB(IDEPTH)).GE.0.))   GO TO 160                PROB1310
      IF(((XM(IDEPTH)*DEPTX+XB(IDEPTH)).LT.0.).AND.                     PROB1320
     C((YM(IDEPTH)*DEPTX+YB(IDEPTH)).LT.0.))   GO TO 170                PROB1330
  140 ASUM(3)=ASUM(3)+F4(CM,TYM,CB,TYB,DEPI1,DEPI2)                     PROB1340
      ASUM(4)=ASUM(4)+F1(TXM,TYM,TXB,TYB,DEPI1,DEPI2)                   PROB1350
      ASUM(6)=ASUM(6)+F4(DM,TXM,DB,TXB,DEPI1,DEPI2)                     PROB1360
      GO TO 180                                                         PROB1370
  150 ASUM(6)= ASUM(6)+F4(TYM,TXM,TYB,TXB,DEPI1,DEPI2)                  PROB1380
      ASUM(8)=ASUM(8)-F4(CM,TYM,CB,TYB,DEPI1,DEPI2)                     PROB1390
      ASUM(9)=ASUM(9)-F1(TXM,TYM,TXB,TYB,DEPI1,DEPI2)                   PROB1400
  160 ASUM(2)=ASUM(2)-F1(TXM,TYM,TXB,TYB,DEPI1,DEPI2)                   PROB1420
      GO TO 180                                                         PROB1410
      ASUM(3)=ASUM(3)+F4(TXM,TYM,TXB,TYB,DEPI1,DEPI2)                   PROB1430
      ASUM(5)=ASUM(5)-F4(DM,TXM,DB,TXB,DEPI1,DEPI2)                     PROB1440
```

```
      GO TO 180
  170 ASUM(5)=ASUM(5)-F4(TYM,TXM,TYB,TXB,DEPI1,DEPI2)
      ASUM(7)=ASUM(7)+F1(TXM,TYM,TXB,TYB,DEPI1,DEPI2)
      ASUM(8)=ASUM(8)-F4(TXM,TYM,TXB,TYB,DEPI1,DEPI2)
  180 K=K+1
      IF(ABS(DEPI2-Z(JDEPTH))-.001) 188,188,182
  182 IF(K.EQ.2) GO TC 184
      DEPTX=DEPT2
      DEPI1=DT1
      DEPI2=DT2
      GO TO 131
  184 DEPTX=DEPT3
      DEPI1=DT2
      DEPI2=Z(JDEPTH)
      GO TO 131
  188 IDEPTH=IDEPTH+1
      JDEPTH=IDEPTH+1
      GO TO 113
  200 CONTINUE
      AX=X(IMAX)
      AY=Y(IMAX)
      ZD=ZMAX-Z(IMAX)
      IF((AX.GE.0.).AND.(AY.GE.0.))  GO TO 210
      IF((AX.GE.0.).AND.(AY.LT.0.))  GO TO 220
      IF((AX.LT.0.).AND.(AY.GE.0.))  GO TO 230
      IF((AX.LT.0.).AND.(AY.LT.0.))  GO TO 240
  210 ASUM(3)=ASUM(3)+(WD-AX)*AY*ZD
      ASUM(4)=ASUM(4)+(AX*AY*ZD)
      ASUM(6)=ASUM(6)+(WD-AY)*AX*ZD
      GO TO 250
  220 ASUM(6)=ASUM(6)+(WD+AY)*AX*ZD
      ASUM(8)=ASUM(8)-(WD-AX)*AY*ZD
      ASUM(9)=ASUM(9) -AX*AY*ZD
      GO TO 250
  230 ASUM(2)=ASUM(2) -AX*AY*ZD
      ASUM(3)=ASUM(3)+(WD+AX)*AY*ZD
```

```
      ASUM(5)=ASUM(5)-(WD-AY)*AX*ZD
      GO TO 250
  240 ASUM(5)=ASUM(5)-(WD+AY)*AX*ZD
      ASUM(7)=ASUM(7)+AX*AY*ZD
      ASUM(8)=ASUM(8)-AY*(WD+AX)*ZD
  250 VOL=WD**2*ZMAX
C
C     CHECK FOR VERY SMALL AMOUNT OF TRANSFER--IT WILL CAUSE UNDERFLOW
C
      DO 310 IA=2,9,1
      IF(ASUM(IA).GT..1) GO TO 310
      ASUM(IA)=0.
  310 CONTINUE
C
C     COMPUTE PROBABIIITIES OF TRANSFER
C
      PA(2)=ASUM(2)/VOL
      PA(3)=ASUM(3)/VOL
      PA(4)=ASUM(4)/VOL
      PA(5)=ASUM(5)/VOL
      PA(6)=ASUM(6)/VOL
      PA(7)=ASUM(7)/VCL
      PA(8)=ASUM(8)/VOL
      PA(9)=ASUM(9)/VCL
      ASUM(1)=VOL-(ASUM(2)+ASUM(3)+ASUM(4)+ASUM(5)+
     1ASUM(6)+ASUM(7)+ASUM(8)+ASUM(9))
      PA(1)=ASUM(1)/VOL
      RETURN
      END
```

```
C                                                                      
C     PROGRAM ZCON
C
C     WRITTEN BY DAVID DRAIN
C     DURING SPRING 1978
C     AT BOWLING GREEN STATE UNIVERSITY
C     BOWLING GREEN, OHIO
C
C     ZCON ATTEMPTS TO FIND A BETTER ESTIMATION OF THE RATE OF SEDIMENT
C     FALLOUT (ALFA) BY MANIPULATING BOTH ALFA, AND THE SUSPENDED
C     SEDIMENT DISTRIBUTION
C
C     THE FLOW CHART BELOW EXPLAINS THE OPERATION OF ZCON
C
C                            /------------------------------
C                            | READ INPUT AND              |
C                            | INITIAL CONDITIONS          |
C                            -------------------------------
C                                           |
C                                           |
C        ---------------------------------->|
C        |                                  |
C        |                                  |/
C        |         -----------------------------------------
C        |         |  SUBROUTINE XAT                       |
C        |         | CHANGE ALFA TO CORRELATE HIGHLY       |
C        |         |  WITH OBSERVED RATES                  |
C        |         -----------------------------------------
C        |                                  |
C        |                                  |
C        |                                  |/
C        |         -----------------------------------------
C        |         |  SUBROUTINE TALFA                     |
C        |         | TEST ALFA COMPUTED IN XAT             |
C        |         |                                       |
C        |               UNREASONABLE           OK         |
```

```
C       |          --------------------------------------------
C       |                                |          |
C       |                                |          |/
C       |                                |     -----------
C       |                                |     |  STOP   |
C       |                                |     -----------
C       |                                |
C       |                                |/
C       |          --------------------------------------------
C       |          | SUBROUTINE CHANGE                        |
C       |          | CHANGE SUSPENDED SEDIMENT                |
C       |          | DISTRIBUTION                             |
C       |          --------------------------------------------
C       |                                     |
C       |                                     |
C       ---------------------------------------
C
C     UNIT1 IS NAMEI BGSU.C.SGEOL1.WALTERS.ALFTAP
C     WITH DCB=(RECFM=VSB)
C     ZCON READS FROM UNIT1:
C     WRATE    OBSERVED SED RATES FOR LJW REGIONS
C     ICON     MODEL AREA IA IS IN LJW AREA ICON(IA)
C     ALFA     PROPORTION OF SEDIMENT FALLING OUT IN MODEI STEP
C     DEEP     DEPTH OF LAKE
C     TOTSED   SUSPENDED SEDIMENT DISTRIBUTION
C
C     UNIT2 IS A TAPE WITH DCB=(RECFM=VSB)
C     ZCON STORES THE FOLLOWING ON UNIT2
C     TOTSED   NEW SUSPENDED SEDIMENT DISTRIBUITON
C     SED      NEW FAILEN SEDIMENT DISTRIBUITON
C     SUM      SED RATE PREDICTED BY NEW PARAMETERS
C     OALFA    NEW ALFA
C
      INTEGER*2 ICON(2529)
      COMMON WRATE(34),TOTSED(2529),SED(2529),ALFA(2529),SUM(34),
     1OALFA(2529),DEEP(2529),NUM(34),ICON
```

```
      LOGICAL LTALFA
      READ(1) WRATE
      READ(1) ICON
      READ(1) ALFA
      READ(1) DEEP
      READ(1) TOTSED
C
C     SCALE SUSPENDED SEDIMENT UP TO GIVE REASONABLE SED RATES
C
      DO 3 IA=1,2529
C
C     USE FINAL ALFA FROM RAT AS INITIAL CONDITION
C
      OALFA(IA)=ALFA(IA)
    3 TOTSED(IA)=TOTSED(IA)*1.E06
      DO 100 IA=1,30
      IX=IA
      WRITE(6,704) IA
C
C     ADJUST ALFA FOR HIGH CORRELATION WITH OBSERVED RATES
C
      CALL XAT
C
C     SEE IF THE NEW ALFA IS REASONABLE
C
      CALL TALFA(LTALFA)
      IF(LTALFA) GO TO 101
C
C     IF NOT, CHANGE SUSPENDED SEDIMENT CONDITIONS
C
      CALL CHANGE
  100 CONTINUE
  101 WRITE(6,701) IX
      WRITE(6,703)
      DO 110 IA=1,34
  110 WRITE(6,702) IA,WRATE(IA),SUM(IA)
```

```
      WRITE(2) TOTSED                                                   ZCON1090
      WRITE(2) SED                                                      ZCON1100
      WRITE(2) SUM                                                      ZCON1110
      WRITE(2) OALFA                                                    ZCON1120
      STOP                                                              ZCON1130
  701 FORMAT(//' CONVERGENCE OCCURED IN ',I3,' STEPS')                  ZCON1140
  702 FORMAT(2X,I2,2X,E12.6,2X,E12.6)                                   ZCON1150
  703 FORMAT(//5X,'REAL RATE',5X,'CALCULATED RATE'//)                   ZCON1160
  704 FORMAT(' **MAIN** STEP ',I4)                                      ZCON1170
      END                                                               ZCON1180
```

```
      SUBROUTINE XAT
C
C     SUBROUTINE XAT
C
C     WRITTEN BY DAVID DRAIN
C     DURING SPRING 1978
C     AT BOWLING GREEN STATE UNIVERSITY
C     BOWLING GREEN, OHIO
C
C     XAT PERFORMS THE FOLLOWING OPERATIONS
C     1. CALCULATE THE SED RATE WITH OALFA FOR EACH LJW REGION
C     2. COMPUTE CORRELATION COEFFICIENTS WITH OBSERVED RATES
C     3. SEE WHERE ERRORS(LOW CORRELATIONS) OCCUR AND COMPUTE
C     NEW ALFA
C
C     ALL I/O IS MANAGED BY THE CALLING PROGRAM ,ZCON
C
      INTEGER*2 ICON(2529)
      COMMON WRATE(34),TOTSED(2529),SED(2529),ALFA(2529),SUM(34),
     1OALFA(2529),DEEP(2529),NUM(34),ICON
      DIMENSION RAT(34),C(3,3)
      DIMENSION AOT(34),BOT(34)
      DATA IJK/1/
C
C     FALCON CONVERTS FROM KG (4 MILES)-2 (2.5 HOURS)-1 TO
C     GRAMS (CM)-2 (YEAR)-1
C
      FALCON = 3.38459E-03
C
C     AOT AND BOT ARE UPPER AND LOWER LIMITS RESPECTIVELY FOR RAT
C
      IF(IJK.GT.1) GO TO 2
      DO 1 IA=1,34
    1 READ(5,704) AOT(IA),BOT(IA)
    2 CONTINUE
      IJK=10
```

```
      DO 3 IA=1,2529
    3 SED(IA)=TOTSED(IA)*OALFA(IA)*FALCON
C
C     CHANGE ALFA UNTIL PREDICTED RATES CORRELATE HIGHLY WITH
C     OBSERVED RATES
C
      DO 100 I300=1,1500
      IX=I300
      I100=I300/3
      DO 5 IA=1,3
      DO 4 IB=1,3
    4 C(IA,IB)=0.
    5 CONTINUE
      DO 10 IA=1,34
      SUM(IA)=0.
      NUM(IA)=0.
   10 RAT(IA)=0.
C
C     CALCULATE SEDIMENTATION RATES FOR EACH LJW REGION
C
      DO 20 IA=1,2529
      IF(ICON(IA).EQ.0) GO TO 20
      IF(DEEP(IA).LT.5.) GO TO 20
      NUM(ICON(IA))=NUM(ICON(IA))+1
      SUM(ICON(IA))=SUM(ICON(IA))+SED(IA)
   20 CONTINUE
C
C     COMPUTE CORRELATION COEFFICIENT
C
      DO 30 IA=1,21
      SUM(IA)=SUM(IA)/NUM(IA)
      DO 29 IB=1,2
      C(IB,1)=C(IB,1)+WRATE(IA)*SUM(IA)
      C(IB,2)=C(IB,2)+SUM(IA)
   29 C(IB,3)=C(IB,3)+SUM(IA)*SUM(IA)
   30 CONTINUE
```

```
      DO 40 IA=22,33
      SUM(IA)=SUM(IA)/NUM(IA)
      DO 39 IB=1,3,2
      C(IB,1)=C(IB,1)+WRATE(IA)*SUM(IA)
      C(IB,2)=C(IB,2)+SUM(IA)
   39 C(IB,3)=C(IB,3)+SUM(IA)*SUM(IA)
   40 CONTINUE
      SUM(34)=SUM(34)/NUM(34)
      C(1,1)=C(1,1)+WRATE(34)*SUM(34)
      C(1,2)=C(1,2)+SUM(34)
      C(1,3)=C(1,3)+SUM(34)*SUM(34)
      RT=(C(1,1)-.39973*C(1,2))/
     1(1.46392*SQRT(C(1,3)-C(1,2)*C(1,2)/34.))
      RW=(C(2,1)-.51955*C(2,2))/
     1(.96803*SQRT(C(2,3)-C(2,2)*C(2,2)/21.))
      RC=(C(3,1)-.19927*C(3,2))/
     1(.64029*SQRT(C(3,3)-C(3,2)*C(3,2)/12.))
C
C     FIND ERRORS TO COMPUTE NEW ALFA
C
      DO 50 IA=1,34
   50 RAT(IA)=(WRATE(IA)-SUM(IA))/WRATE(IA)
      DO 60 IA=1,34
C
C     NOTE THAT AOT AND BOT ARE SUCCESIVELY REDUCED TO AVOID OSCILLATION
C
      A=AOT(IA)/12.
      B=BOT(IA)/12.
      IF(RAT(IA).LT.B) RAT(IA)=B
      IF(RAT(IA).GT.A) RAT(IA)=A
   60 CONTINUE
C
C     COMPUTE THE NEW ALFA
C
      DO 70 IA=1,2529
      B=OALFA(IA)+RAT(ICCN(IA))
```

```
      IF(B.LT.1.) GO TO 61
      OALFA(IA)=1.
      GO TO 70
   61 IF(B.GT.0.) GO TO 62
      OALFA(IA)=0.
      GO TO 70
   62 OALFA(IA)=B
   70 CONTINUE
      DO 80 IA=1,2529
   80 SED(IA)=TOTSED(IA)*OALFA(IA)*FALCON
      IF(RT.GT..75) GO TO 101
  100 CONTINUE
      WRITE(6,700)
      WRITE(6,703)
      WRITE(6,705)
      WRITE(6,701) RT,RW,RC,IX
      STOP
  101 WRITE(6,700)
      WRITE(6,702)
      WRITE(6,705)
      WRITE(6,701) RT,RW,RC,IX
      RETURN
  700 FORMAT(' *RAT*')
  701 FORMAT(' CORRELATIONS = ',3(2X,E12.6),' AT ',I4)
  702 FORMAT(' CONVERGENCE OCCURED')
  703 FORMAT(' CONVERGENCE DID NOT OCCUR')
  704 FORMAT(2E12.6)
  705 FORMAT(21X,'TOTAL',8X,'WESTERN',7X,'CENTRAL')
      END
```

```
      SUBROUTINE TALFA(LTALFA)
C
C     SUBROUTINE TALFA
C
C     WRITTEN BY DAVID CRAIN
C     DURING SPRING 1978
C     AT BOWLING GREEN STATE UNIVERSITY
C     BOWLING GREEN, OHIO
C
C     SUBROUTINE TALFA CHECKS TO SEE IF ALFA AS COMPUTED BY XAT IS
C     A REASONABLE ESTIMATE OF SEDIMENT FALLOUT RATE, AND OUTPUTS
C     THOSE REGIONS IN WHICH THE TEST FAILS
C
C     LTALFA IS A LOGICAL VARIABLE WHICH RETURNS
C     TRUE IF THE ALFA ARE REASONABLE
C     FALSE IF THE ALFA ARE NOT REASONABLE
C
C     ALL I/O IS MANAGED BY THE CALLING PROGRAM ,ZCON
C
      INTEGER*2 ICON(2529)
      COMMON WRATE(34),TOTSED(2529),SED(2529),ALFA(2529),SUM(34),
     1OALFA(2529),DEEP(2529),NUM(34),ICON
      DIMENSION ERR(34)
      LOGICAL LTALFA
      DIMENSION T(34),TR(34),ICT(34)
      DATA ITJK/1/
      IF(ITJK.GT.1) GO TO 2
C
C     T IS AN ARRAY OF REASONABLE ALFA
C     TR IS AN ARRAY OF ACCEPTABLE DEVIATIONS FROM THESE
C
      DO 1 IA=1,34
      READ(5,702) T(IA),TR(IA)
    1 TR(IA)=TR(IA)*10.
    2 CONTINUE
      ITJK=10
```

```
C
C     ICT IS AN ARRAY OF FLAGS:
C     0 MEANS ALFA IN REGION IS REASONABLE
C     1 OTHERWISE
C
      DO 3 IA=1,34
      ERR(IA)=0.
    3 ICT(IA)=0
      LTALFA=.TRUE.
      I=0
      DO 100 IA=1,2529
      IF((ICON(IA).LT.22).OR.(ICON(IA).GT.33)) GO TO 100
      IF(ABS(OALFA(IA)-T(ICON(IA))).LT.TR(ICON(IA))) GO TC 100
      ERR(ICON(IA))=ERR(ICON(IA))+OALFA(IA)-T(ICON(IA))
      ICT(ICON(IA))=ICT(ICON(IA))+1
  100 CONTINUE
      DO 200 IA=1,34
      ERR(IA)=ERR(IA)/NUM(IA)
C
C     REJECT ALFA IF MORE THAN 10 PERCENT ARE WRONG
C
      ITCON=NUM(IA)/10
      IF(ICT(IA).LE.ITCON) GO TO 200
      LTALFA=.FALSE.
      WRITE(6,701) IA,ERR(IA),ITCON
  200 CONTINUE
      RETURN
  701 FORMAT(' *TALFA* ALFA FAILED IN REGION ',I4,' ERROR = ',E12.6,
     12X,I6,' ALFA FAILED')
  702 FORMAT(2E12.6)
      END
```

```
      SUBROUTINE CHANGE
C
C     SUBROUTINE CHANGE
C
C
C     WRITTEN BY DAVIL CRAIN
C     DURING SPRING 1978
C     AT BOWLING GREEN STATE UNIVERSITY
C     BOWLING GREEN, CHIO
C
C     SUBROUTINE CHANGE CHANGES THE SUSPENDED SEDIMENT
C     DISTRIBUTION TO PRODUCE A MORE REASONABLE OVERALL DISTRIBUTION
C
C     ALL I/O IS MANAGED BY THE CALLING PROGRAM ,ZCON
C
      INTEGER*2 ICON(2529)
      COMMON WRATE(34),TOTSED(2529),SED(2529),ALFA(2529),SUM(34),
     1OALFA(2529),DEEP(2529),NUM(34),ICON
      GAMMA = .22
      I=0
C
C     UPSCLE CORRESPENDS TO ABOUT A '4' ON AN ISOPAC MAP
C     THE BASE VALE IS
C     UPSCLE=.77788E03
C     WHEN TOTSED IS SCALED UP, UPSCLE MUST BE SCALED ACCCRDINGLY
C
      UPSCLE=.77788E09
      DO 100 IA=1,2529
      IF((ICON(IA).LT.22).OR.(ICON(IA).GT.33)) GO TO 100
      IF(TOTSED(IA).GT.UPSCLE) GO TO 100
      IF(TOTSED(IA).LT.1.E-10) GO TO 100
      TOTSED(IA)=TOTSED(IA)*(UPSCLE/TOTSED(IA))**GAMMA
      I=I+1
  100 CONTINUE
      WRITE(6,700)
      WRITE(6,701) I
```

```
      RETURN                                                            CHNG 370
  700 FORMAT(' *CHANGE*')                                               CHNG 380
  701 FORMAT(2X,I6,' SUSPENDED SEDIMENT VALUES WERE CHANGED')           CHNG 390
      END                                                               CHNG 400
```

```
C
C     PROGRAM TRANX
C
C     WRITTEN BY DAVID DRAIN
C     SUMMER 1978
C     AT BOWLING GREEN STATE UNIVERSITY
C     BOWLING GREEN, OHIO
C
C     TRANX USES WATER TRANSPORT PROBABILITIES AND SUSPENDED SEDIMENT
C     DISTRIBUTION TO COMPUTE AMOUNT OF SEDIMENT TRANSFER FROM ONE
C     LJW REGION TO THOSE ADJACENT TO IT
C
C     TRANX DOES THE FOLLOWING OPERATIONS
C     1. READ DATA
C     2. SCALE SUSPENDED SEDIMENT AS IN ZCON
C     3. CALCULATE AMOUNT OF TRANSFER
C     4. OUTPUT RESULTS
C
C     TRANX READS THE FOLLOWING TAPES:
C     UNIT1  .AP9132    WITH DCB=(RECFM=VSB)
C     OLD SUSPENDED SEDIMENT DISTRIBUTION
C     UNIT2 .RUN029     WITH DCB=(RECFM=VSB)
C     ICON    MODEL REGION IA IS IN LJW REGION ICON(IA)
C     ILOC    MODEL REGIONS ADJACENT TO REGION IA ARE ILOC(IA,1),...
C     ILOC(IA,9)
C     P1,...P6    PROBABILITIES OF WATER TRANSFER
C     UNIT3 .TOSSOA     WITH DCB=(RECFM=VSB)
C     ALFA AS COMPUTED IN ZCON
C
C     UNIT4 IS AN OUTPUT TAPE WITH DCB=(RECFM=VSB)
C     SIX 34 BY 34 MATRICES OF SUSPENDED SEDIMENT TRANSFER
C     (ONE FOR EACH WIND DIRECTION) ARE WRITTEN
C
      INTEGER*2 ICON(2529),ILOC(2529,9)
      DIMENSION S(2529),ALFA(2529),P(2529,9),TR(34,34)
      GAMMA=.22
```

```
      UPSCLE=.77788E09
      READ(2) ICON
      READ(2) X
      READ(2) ILOC
      READ(2) X
      READ(2) X
      DO 1 IA=1,3
    1 READ(3) X
      READ(3) ALFA
      DO 100 IA=1,6
      READ(1) S
      READ(2) P
      DO 7 IB=1,34
      DO 6 IC=1,34
    6 TR(IB,IC)=0.
    7 CONTINUE
C
C     SCALE SUSPENDED SEDIMENT AS IN ZCON
C
      DO 20 IB=1,2529
      S(IB)=S(IB)*1.E06
      IF((ICON(IB).LT.22).OR.(ICON(IB).GT.33)) GO TO 20
      DO 10 IC=1,3
      IF(S(IB).GT.UPSCLE) GO TO 20
      IF(S(IB).LT.1.E-09) GO TO 20
   10 S(IB)=S(IB)*(UPSCLE/S(IB))**GAMMA
   20 S(IB)=S(IB)*(1.-ALFA(IB))
C
C     COMPUTE TRANSFER BETWEEN ADJACENT LJW REGIONS
C
      DO 80 IB=1,2529
      IY=ICON(IB)
      IF(IY.EQ.0) GO TO 80
      DO 60 IC=2,9
      IF(ILOC(IB,IC).LE.0) GO TO 60
      IX=ICON(ILOC(IB,IC))
```

```
      IF(IX.EQ.0) GO TO 60                                              TRNX 730
      IF(IX.EQ.IY)  GO TO 60                                            TRNX 740
      TR(IY,IX)=TR(IY,IX)+P(IB,IC)*S(IB)                                TRNX 750
   60 CONTINUE                                                          TRNX 760
   80 CONTINUE                                                          TRNX 770
  100 WRITE(4) TR                                                       TRNX 780
      STOP                                                              TRNX 790
      END                                                               TRNX 800
```

```
//HG1031 JOB ,'DAVID DRAIN'
/*RESPEC E=SGEOL1,T=225,L=4,M=11,K=190
// EXEC FORTHCLG,PARM.FORT='MAP,XREF,ID,OPT=2'
//SYSUT1 DD DSN=&UT1,UNIT=DISK,SPACE=(TRK,(40))
//SYSUT2 DD DSN=&UT2,UNIT=DISK,SPACE=(TRK,(40))
//FORT.SYSIN DD *
C     HGMODL
C
C     WRITTEN BY DAVID DRAIN
C     DURING 1977-1978
C     AT BOWLING GREEN STATE UNIVERSITY
C     BOWLING GREEN, OHIO
C
C     HGMODL MODELS THE MOVEMENT OF MERCURY THROUGH FIVE LEVELS
C     (FISH BENTHOS ACTIVE-SEDIMENT INACTIVE-SEDIMENT WATER)
C     OF LAKE ERIE
C
C     HGMODEL DOES THE FOLLOWING STEPS:
C     1.READ CONSTANTS TO BE USED IN THE MODEL
C     2.READ INITIAL CONDITIONS
C     3.RUN THE MODEL FROM 1938 TO 2019 (USING RKGS)
C     4.SAVE RESULTS FOR EACH MONTH
C
C     HGMODL REQUIRES ONE TAPE TO RUN (UNIT 1)
C     THAT TAPE IS NAMED BGSU.C.SGEOL1.WALTERS.HGRUN
C     WITH DCB=(RECFM=VSB)
C
C     HGMODL WRITES A TAPE RECORD (TO UNIT 2) FOR EACH MONTH
C
C     CONSTANTS IN THE MODEL
C     ZC        DEPTH OF ACTIVE SEDIMENT
C     RAEEF     RATIO BETWEEN ASSIM EFF OF ME-HG AND ENERGY FOR FISH
C     RAEEB     RATIO BETWEEN ASSIM EFF OF ME-HG AND ENERGY FOR BENTHOS
```

```
C      QESED     SPECIFIC ENERGY CONTENT OF SEDIMENT
C      RMBB      RATE CONST FOR METABOLIC BRKDWN OF ME-HG IN BENTHOS
C      DENS      DENSITY OF SEDIMENT
C      Q(L,K)    =1 FOR SED REGION K IN LAKE REGION L, 0 OTHERWISE
C      QRESF     ENERGY LOST BY FISH IN RESPIRATION
C      QRESB     ENERGY LOST BY BENTHOS IN RESPIRATION
C      QASSF     ENERGY ASSIMILATED BY FISH
C      QASSB     ENERGY ASSIMILATED BY BENTHOS
C      QB(L)     STANDING CROP OF BENTHOS IN LAKE REGION L
C      QF(L)     STANDING CROP OF FISH IN LAKE REGION L
C      F(K)      FRACTION OF SEDIMENT IN AREA L TREATED AS AREA K
C      SIGMA(K)  SEDIMENTATION RATE IN AREA K
C      A(K)      AREA OF SEDIMENT REGION K
C      DOSM      DISSOLVED OXYGEN CONCENTRATION IN SURFACE&MID WATERS
C      DOB       DISSOLVED OXYGEN CONCENTRATION IN BOTTOM WATERS
C      TRANSV    SEDIMENT TRANSFER CONSTANT(MONTH DEPENDENT)
C
C      MODEL PARAMETER
C      RATIO     RATIO OF SUSPENDED SEDIMENT RESULTING FROM RESUSPENSION
C
C      MODEL VARIABLES
C      Y(IA)     MERCURY CONTENT OF MODEL REGION IA
C      DERY(IA)  DERIVATIVE OF MERCURY CONTENT
C      AUX       ARRAY REQUIRED FOR RKGS
C      SVYR      ARRAY OF VALUES SAVED AT THE END OF EVERY MONTH
C      PRMT      INITIAL VALUE AND PARAMETER ARRAY FOR RKGS
C      C1(L)     MERCURY CONCENTRATION FOR FISH IN LAKE REGION L
C      C2(L)     MERCURY CONCENTRATION FOR BENTHOS IN REGION L
C      C3(K)     MERCURY CONCENTRATION IN SEDIMENT IN REGION K
C      CFIN(6)   CONSTANT HG INPUT TO FISH FROM WATER
C      CBIN(L)   CONSTANT HG INPUT TO BENTHOS FROM WATER
C
       COMMON ZC,RAEEF,RAEEB,RMBF,RMBB,DENS,QASSF(3),QASSB(3),QDF(3),
```

```
     1QB(3),QF(3),F(34),SIGMA(34),A(34),TRANSV(34,34,12),C1(3),C2(3),
     2C3(34),CFIN(3),CBIN(3),ZCDQSD,ORAEEF,ORAEEB,Q(3,34),QDB(3),IM
      EXTERNAL FCT,OUTP
      DIMENSION PRMT(5),Y(74),DERY(74),AUX(8,74),SVRY(42)
     1,DOB(12),DOSM(12),QRESF(3),QRESB(3)
      CALL ERRSET(208,600,-1,1,0)
C
C     READ CONSTANTS
C
C
C     RATIO=RATIO OF SUSPENDED SEDIMENT RESULTING FROM RESUSPENSION
C     RATIO IS A MODEL PARAMETER, NOT A CONSTANT
C
      ZC=          .04
      RAEEF=       .15
      RAEEB=       .6
      QESED=       100.
      RMBF=        .346
      RMBB=        1.15
      DENS=        1100.
      ZCDQSD=ZC*DENS*QESED
      ORAEEF=1.-RAEEF
      ORAEEB=1.-RAEEB
      DO 108 IA=1,3,1
  108 READ(5,7110) (Q(IA,IB),IB=1,34)
 7110 FORMAT(34F1.0)
      READ(5,7101) (QRESF(L),L=1,3)
      READ(5,7101)(QRESB(L),L=1,3)
      READ(5,7101) (QASSF(L),L=1,3)
      READ(5,7101) (QASSB(L),L=1,3)
      READ(5,7101) (QDF(L),L=1,3)
      READ(5,7101) (QDB(L),L=1,3)
      READ(5,7101) (QB(L),L=1,3)
```

```
      READ(5,7101)  (QF(L),L=1,3)
      READ(5,7102)  (F(K),K=1,34)
      READ(5,7103)  (SIGMA(K),K=1,34)
      READ(5,7103)  (A(K),K=1,34)
      DO 110 IM=1,12,1
  110 READ(5,7104) DOSM(IM),DOB(IM)
 7104 FORMAT(2E12.6)
 7103 FORMAT(4((8E9.4)/),2E9.4)
 7102 FORMAT(3((10F7.6)/),4F7.6)
 7101 FORMAT(3E12.6)
C
C     TAB PAST W (NO LONGER USED)
C
      READ(1) X
      READ(1) TRANSV
C
C     TEST RATIO TO MAKE SURE MASS WILL BE CONSERVED
C
      IRAT=0
      RATIO=1.
      DO 803 IRAT1=1,34
      SSOASD=A    (IRAT1)*.04*1100.
      DO 802 IRAT2=1,12
      DO 801 IRAT3=1,34
      IF(TRANSV(IRAT1,IRAT3,IRAT2).LE.1.E-05) GO TO 801
      IF(RATIO.LE.(SSOASD/TRANSV(IRAT1,IRAT3,IRAT2))) GO TO 801
      IRAT=1
      RATIO=SSOASD/TRANSV(IRAT1,IRAT3,IRAT2)
  801 CONTINUE
  802 CONTINUE
  803 CONTINUE
      IF(IRAT.EQ.1)  WRITE(6,804) RATIO
  804 FORMAT(' RATIO TOO LARGE, NEW RATIO= ',E12.6)
```

```
C
C     TRANSV MUST BE SCALED BY RATIO TO INSURE THAT THE MODEL
C     WILL  CONSERVE MASS
C
      DO 807 IR1=1,34
      DO 806 IR2=1,34
      DO 805 IR3=1,12
  805 TRANSV(IR1,IR2,IR3)=TRANSV(IR1,IR2,IR3)*RATIO
  806 CONTINUE
  807 CONTINUE
C
C     READ INITIAL CONDITIONS
C
      DO 205 IA=1,74
  205 Y(IA)=0.
      DO 210 IA=7,40
  210 READ(5,7201) Y(IA)
C     CHANGE TO INITIAL CONCENTRATION OF .03 PPM
      DO 211 IA=1,74
  211 Y(IA)=.4444444*Y(IA)
C
C     RUN THE MODEL, STEP SIZE = ONE MONTH
C
 9001 FORMAT(3(5X,E12.6))
 9002 FORMAT(6(6(2X,E10.5)/))
 9003 FORMAT(11(7(2X,E10.5)/))
      DO 498 IYR=1938,2019
      DO 499 IM=1,12,1
      WRITE(6,7105) IM,IYR
 7105 FORMAT(' COMMENCING MONTH ',I4,' OF ',I4)
C
C     ACCOUNT FOR HG SOURCES OUTSIDE THE LAKE
C
```

```
C     DETREX,ASHTABULA,REGION 32
C
      IF((IYR.GE.1963).AND.(IYR.LE.1970)) Y(38)=Y(38)+3.447E02
C
C     SANDUSKY BAY,REGION 21
C
      IF(IYR.GE.1941) Y(27)=Y(27)+1.0057E-02
C
C     WYANDOT MICHIGAN, REGION 9
C
      IF((IYR.LE.1958).AND.(IYR.GE.1940))Y(15)=Y(15)+1.021E02
      IF((IYR.GE.1941).AND.(IYR.LE.1970).AND.(IM.LE.4))
     1Y(15)=Y(15)+2.041E02
C
C     CALCULATE MONTH DEPENDENT CONSTANTS
C
      DO 106 IA=1,3
      CBIN(IA)=2.E-15*QRESB(IA)/DOB(IM)
  106 CFIN(IA)=2.E-15*QRESF(IA)/DOSM(IM)
C
C     NORMALIZE TIME FOR RKGS TO AVOID ROUNDOFF ERROR
C
      PRMT(1)=0.
      PRMT(2)=1.
      PRMT(3)=1.E-10
C
C     ERROR IS AT MOST 1 PERCENT OF ORIGINAL HG MASS
C
      PRMT(4)=6000.
C
C     CHOOSE ERROR WEIGHTS TO MINIMIZE ERROR
C
      DO 215 IA=1,3
```

```
  215 DERY(IA)=3.33333E-03
      DO 217 IA=4,6
  217 DERY(IA)=3.33333E-04
      DO 218 IA=7,40
  218 DERY(IA)=2.94118E-05
      DO 219 IA=41,74
  219 DERY(IA)=2.61471E-02
      NDIM=74
      CALL RKGS(PRMT,Y,DERY,NDIM,IHLF,FCT,OUTP,AUX)
      IF(IHLF.LE.10) GO TO 216
      WRITE(6,7202)
      STOP
  216 CONTINUE
C
C     SAVE RESULTS
C
      WRITE(2) Y
      DO 500 IA=1,3
  500 SVRY(IA)=C1(IA)
      DO 501 IA=1,3
  501 SVRY(IA+3)=C2(IA)
      DO 502 IA=1,34
  502 SVRY(IA+6)=C3(IA)
      SVRY(41)=IYR
      SVRY(42)=IM
      WRITE(2) SVRY
      WRITE(6,7106) IM,IYR
 7106 FORMAT(' ENDING MONTH ',I4,' OF ',I4)
  499 CONTINUE
  498 CONTINUE
      STOP
 7201 FORMAT(F10.5)
 7202 FORMAT(' *****PROGRAM TERMINATED *****')
```

```
      END
      SUBROUTINE FCT(X,Y,DERY)
C
C     SUBROUTINE FCT
C
C     SUBROUTINE FCT IS REQUIRED BY RKGS WHICH IS A FORTRAN
C     SCIENTIFIC SUBROUTINE PACKAGE ROUTINE FOR SOLVING SIMULTANEOUS
C     DIFFERENTIAL EQUATIONS BY THE RUNGE-KUTTA METHOD
C
C     FCT CALCULATES THE DERIVATIVE OF THE FUNCTION WE
C     ARE TRYING TO ESTIMATE
C
C     VARIABLES INTERNAL TO FCT
C     TR21      TRANSFER FROM BENTHOS TO FISH
C     TR31      TRANSFER FROM FISH TO SEDIMENT
C     TR23      TRANSFER FROM BENTHOS TO SEDIMENT
C     TR32      TRANSFER FROM SEDIMENT TO BENTHOS
C     TR3       TRANSFER BETWEEN SEDIMENT REGIONS
C     TR34      TRANSFER FROM ACTIVE TO INACTIVE SEDIMENT
C
      COMMON ZC,RAEEF,RAEEB,RMBF,RMBB,DENS,QASSF(3),QASSB(3),QDF(3),
     1QB(3),QF(3),F(34),SIGMA(34),A(34),TRANSV(34,34,12),C1(3),C2(3),
     2C3(34),CFIN(3),CBIN(3),ZCDQSD,ORAEEF,ORAEEB,Q(3,34),QDB(3),IM
      DIMENSION Y(74),DERY(74),
     1TR32(34),TR3(34,34),TR34(34)
      DATA IFCTNT/1/
      IF(MOD(IFCTNT,200).EQ.0) WRITE(6,7101) X,IFCTNT
      IF(MOD(IFCTNT,1000).EQ.1) CALL TRAC(Y,DERY)
      IFCTNT=IFCTNT+1
 7101 FORMAT(' BEGINNING FCT,TIME= ',E12.6,' FCT CALLS = ',I8)
C
C     RATES DEPENDING ON LAKE REGION ONLY
C
```

```
      DO 100 L=1,3
      C1(L)=Y(L)/QF(L)
      C2(L)=Y(L+3)/QB(L)
  100 TR21(L)=QASSB(L)*C2(L)*RAEEF
      DO 110 K=1,34
  110 C3(K)=Y(6+K)/(A(K)*ZCDQSD)
C
C     RATES DEPENDING ON SEDIMENT AND LAKE REGIONS
C
      DO 200 L=1,3
      CON13(L)=(QDF(L)+QASSF(L)*ORAEEF)*C1(L)
      CON23(L)=(QDB(L)+QASSB(L)*ORAEEB)*C2(L)
  200 CON32(L)=QASSB(L)*RAEEB
      DO 210 K=1,21
      TR13(K)=CON13(1)*F(K)
      TR23(K)=CON23(1)*F(K)
  210 TR32(K)=CON32(1)*C3(K)
      DO 220 K=22,33
      TR13(K)=CON13(2)*F(K)
      TR23(K)=CON23(2)*F(K)
  220 TR32(K)=CON32(2)*C3(K)
      TR13(34)=CON13(3)*F(34)
      TR23(34)=CON23(3)*F(34)
      TR32(34)=CON32(3)*C3(34)
      DO 300 K=1,34
      TR34(K)=Y(6+K)*SIGMA(K)/ZC
      DO 250 M=1,34
  250 TR3(K,M)=Y(6+K)*TRANSV(M,K,IM)/(A(M)*ZC*DENS)
  300 CONTINUE
C
C     COMPUTE DERIVATIVES
C
      DO 400 L=1,3
```

```
      DERY(L)=TR21(L)+CFIN(L)                                         HGMD2930
      DERY(L+3)=CBIN(L)-TR21(L)                                       HGMD2940
      DO 350 K=1,34                                                   HGMD2950
      DERY(L)=DERY(L)-TR13(K)*Q(L,K)                                  HGMD2960
  350 DERY(L+3)=DERY(L+3)+(TR32(K)-TR23(K))*Q(L,K)                    HGMD2970
  400 CONTINUE                                                        HGMD2980
      DO 500 K=1,34                                                   HGMD2990
      DERY(K+40)=TR34(K)                                              HGMD3000
      DERY(K+6)=TR23(K)-TR32(K)-TR34(K)+TR13(K)                       HGMD3010
      DO 450 M=1,34                                                   HGMD3020
  450 DERY(K+6)=DERY(K+6)+TP3(M,K)-TP3(K,M)                           HGMD3030
  500 CONTINUE                                                        HGMD3040
      RETURN                                                          HGMD3050
      END                                                             HGMD3060
      SUBROUTINE TRAC(Y,DERY)                                         HGMD3070
C                                                                     HGMD3080
C     SUBROUTINE DTRAC PROVIDES DEBUGGING ASSISTANCE                  HGMD3090
C     WHEN CALLED, IT WILL DUMP Y AND DERY                            HGMD3100
C                                                                     HGMD3110
      DIMENSION Y(74),DERY(74)                                        HGMD3120
      WRITE(6,701)  (Y(IA),IA=1,74)                                   HGMD3130
      WRITE(6,701)  (DERY(IA),IA=1,74)                                HGMD3140
      RETURN                                                          HGMD3150
  701 FORMAT(25(6(2X,E12.6)/))                                        HGMD3160
      END                                                             HGMD3170
      SUBROUTINE OUTP(X,Y,DERY,IHLF,NDIM,PRMT)                        HGMD3180
C     SUBROUTINE OUTP                                                 HGMD3190
C     SUBOUTINE OUTP OS REQUIRED BY RKGS                              HGMD3200
C     OUTP CHECKS INPUT PARAMETERS AND PREGRESS OF RKGS               HGMD3210
      DIMENSION Y(74),DERY(74)     ,PRMT(5)                           HGMD3220
      IF(IHLF.LE.10) RETURN                                           HGMD3230
      PRMT(5)=1.                                                      HGMD3240
      IF(IHLF.EQ.11) GO TO 10                                         HGMD3250
```

```
      IF(IHLF.EQ.12) GO TO 20
      WRITE(6,710)
      RETURN
   10 WRITE(6,720)
      RETURN
   20 WRITE(6,730)
  710 FORMAT(' *** INITIAL INCREMENT <0 ')
  720 FORMAT('1 *** MORE THAN TEN BISECTIONS OF THE ORIGINAL INCREMENT'
     1//' *** WERE NECESSARY TO GET SATISFACTORY ACCURACY')
  730 FORMAT(' *** INITIAL INCREMENT = 0 ')
      RETURN
      END
//GO.FT01F001 DD DSN=BGSU.C.SGEOL1.WALTERS.HGRUN,
// UNIT=TAPE,DISP=(OLD,KEEP),DCB=(RECFM=VSB)
//GO.FT02F001 DD DSN=BGSU.C.SGEOL1.WALTERS.HG1031,
// UNIT=TAPE,DISP=(NEW,CATLG),DCB=(RECFM=VSB)
//GO.FT05F001 DD *
1111111111111111111110000000000000                          Q1
0000000000000000000001111111111110                          Q2
0000000000000000000000000000000001                          Q3
1.28518 E+125.87988 E+111.87444 E+12                        QRESF
7.03745 E+123.21918 E+131.02642 E+13                        QRESB
1.55384 E+127.10784 E+132.26629 E+12                        QASSF
1.26425 E+135.78313 E+131.84392 E+13                        QASSB
1.94433 E+118.89406 E+112.83582 E+11                        QDF
4.09169 E+121.87168 E+135.96775 E+12                         QDB
1.2111  E+105.5398  E+101.7664  E+10                         QB
1.8030  E+138.2474  E+132.6296  E+13                        QF
.016057.020071.042819.037466.026762.026762.026762.029438.021409.0160571-10    86
.026762.026762.026762.037466.053523.100811.107046.123103.098215.096342 11-20   F
.039607.028082.023401.036857.095244.064354.059089.052653.065524.156789 21-30   F
.131340.122272.1643951.                                              30-34   F
8.591E-034.155E-035.205E-036.871E-031.364E-034.857E-033.676E-035.685E-03 1 SIGMA
```

```
8.386E-034.790E-037.028E-036.051E-033.545E-033.169E-034.991E-033.911E-03 2 SIGMA
3.571E-034.741E-033.704E-034.216E-036.818E-046.873E-032.227E-031.489E-03 3 SIGMA
6.709E-042.613E-031.262E-037.945E-044.655E-042.091E-041.623E-032.135E-03 4 SIGMA
1.376E-032.626E-03                                                       5 SIGM1
6.   E+077.5  E+071.6  E+081.4  E+081.   E+081.   E+081.   E+081.1  E+08 1  AREA
8.   E+076.   E+071.   E+081.   E+081.   E+081.4  E+082.   E+083.767E+08 2  AREA
4.   E+084.6  E+083.67 E+083.6  E+081.48 E+084.8  E+084.   E+086.3  E+08 3  AREA
1.628E+091.1  E+091.01 E+099.   E+081.12 E+092.680E+092.245E+092.09 E+09 4  AREA
2.81 E+095.45 E+09                                                       5  AREA
1.42984 E-051.32896 E-05                                     DOSM-DOB-1
1.48671 E-051.38583 E-05                                      DOSM-DOB-2
1.45760 E-051.35672 E-05                                     DOSM-DOB-3
1.34758 E-051.24670 E-05                                      DOSM-DOB-4
1.18542 E-051.08454 E-05                                     DOSM-DOB-5
1.01628 E-059.15398 E-06                                     DOSM-DOB-6
8.87129 E-067.86246 E-06                                     DOSM-DOB-7
8.33269 E-067.32386 E-06                                     DOSM-DOB-8
8.71189 E-067.70306 E-06                                     DOSM-DOB-9
9.89445 E-068.88562 E-06                                     DOSM-DOB-10
1.15469 E-051.05381 E-05                                      DOSM-DOB-11
1.31934 E-051.21846 E-05                                     DOSM-DOB-12
17.82              1          INITIAL HG
22.275             2          INITIAL HG
47.520             3          INITIAL HG
41.58              4          INITIAL HG
29.7               5          INITIAL HG
29.7               6          INITIAL HG
29.7               7          INITIAL HG
32.67              8          INITIAL HG
23.76              9          INITIAL HG
17.82              10         INITIAL HG
29.7               11         INITIAL HG
29.7               12         INITIAL HG
```

29.7	13	INITIAL HG
41.58	14	INITIAL HG
59.4	15	INITIAL HG
111.88	16	INITIAL HG
118.8	17	INITIAL HG
136.62	18	INITIAL HG
109.	19	INITIAL HG
106.92	20	INITIAL HG
43.956	21	INITIAL HG
142.56	22	INITIAL HG
118.8	23	INITIAL HG
187.11	24	INITIAL HG
483.52	25	INITIAL HG
327.60	26	INITIAL HG
299.97	27	INITIAL HG
267.3	28	INITIAL HG
332.64	29	INITIAL HG
795.96	30	INITIAL HG
666.77	31	INITIAL HG
620.73	32	INITIAL HG
834.57	33	INITIAL HG
1618.7	34	INITIAL HG

/*EOF