Metropolitan Water Reclamation District of Greater Chicago

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OPERATION LAKE WATCH - 1985

BACTERIA, ALGAE, AND BENTHOS IN THE WILMETTE, CHICAGO, AND CALUMET HARBOR AREAS OF SOUTHWESTERN LAKE MICHIGAN

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August 1991

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Disclaimer

Mention of proprietary equipment and chemicals in this report does not constitute endorsement by the Metropolitan Water Reclamation District of Greater Chicago.

SUMMARY AND CONCLUSIONS

Bacteria

In 1985, of the seven open water Lake Michigan sampling stations only one, station 7-A, located about 300 yards (275 meters) offshore, from the Indiana Harbor Lighthouse, had fecal coliform (FC) levels greater than four per 100 mL. Station 7-A had counts of 128 per 100 mL as a geometric mean. In 1985 this was the only station which had FC counts higher than the Illinois Pollution Control Board Lake Michigan open water quality standard of 20 per 100 mL.

In 1985, all locations met the Illinois Department of Public Health Lake Michigan beach standard of 500 FC per 100 mL.

Algae

Comparing summer algal composition with studies conducted during the 1970's by the District and the Great Lakes Environmental Research Laboratory at Ann Arbor, Michigan, a clearly discernible improvement could be seen in Lake Michigan during 1985. The dominance of the green and blue-green algae in Lake Michigan's summer algal populations which were found during the 1970's did not occur in 1985. In the 1970's the diatom contribution had been as low as 5% of the total algal population. The diatom contribution in 1985 was never less than 69% of the total algal population. The appearance and increased dominance of the oligotrophic indicator species Cyclotella kützingiana and C. ocellata combined with the loss of dominance and reduced ap-

pearance of the eutrophic indicator species Fragilaria capucina, Melosira granulata, Stephanodiscus tenuis, and the recently introduced eutrophic species Diatoma tenue var. elongatum, Nitzschia dissipata, Stephanodiscus binderanus, S. subtilis, and Cyclotella stelligera confirmed the improvement in water quality. The loss of Stephanodiscus hantzschii and S. minutus (mesotrophic to eutrophic indicators) from a position of dominance in the population also supports the conclusion of water quality improvement; even though Fragilaria crotonensis and Asterionella formosa, both mesotrophic to eutrophic indicators, remained as dominants through most of the year. The increased dominance of Tabellaria fenestrata (a mesotrophic indicator) throughout 1985 added weight to the conclusion of improved Lake Michigan water quality as compared to the 1970's.

Benthic Invertebrates

Bottom samples were collected from the inshore area of southwestern Lake Michigan at depths ranging from 13 to 35 feet during April, July through August, and November 1985. Based on the results from this study, the following conclusions can be made concerning the Lake Michigan benthic invertebrate communities:

1. Seventy-nine benthic taxa, most of which were identified to species, were collected from the study area, with an overall estimated mean density of 2,380 organisms/m^2.
2. Of the total number of invertebrates, tubificids, chironomids, naidids, orthocladines, and amphipods accounted for 41.2, 32.2, 10.3, 4.6, and 1.6 percent, respectively.
3 The overall estimated mean abundance of the benthic invertebrates during the spring, summer, and fall was 1,921, 3,891, and 2,372 organisms/m^2, respectively.
4. The most common invertebrate taxa included the chironomid midges Chironomus fluviatilis-gr., Cyphomella sp., and Polypedilium scalaenum, the naidid worm Piguetiella michiganensis, and the tubificid worm Potamothrix vejdovskyi.
5. Using several numerical indices for oligochaete worms (total number and percent composition) and the indicator species approach, the benthic invertebrate community in Lake Michigan typified an area which has sustained a moderate degree of organic pollution or was characteristic of a mesotrophic habitat.

Sediment Quality

Bottom sediments were collected from the same three stations as the benthic invertebrates in October and November 1985, and analyzed for 15 constituents. The following conclusions can be made regarding the quality of the Lake Michigan sediment in the study area:

1. The mean percent volatile solids and the mean concentration of chemical oxygen demand (COD), fats, oils, and greases (FOG), arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, and zinc in the sediments was 1.02 percent, 639, 19.0, 0, 0, 7.0, 12.6, 11,860, 6.6, 364, 0, 0, 0, and 40.0 mg/kg, respectively.
2. Using the USEPA's Region V guidelines for evaluating Great Lakes harbor sediments, the Lake Michigan bottom sediments in the study area can be classified as nonpolluted.

INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN

INTRODUCTION

Lake Michigan is one of the Laurentian Great Lakes that form a natural boundary between Canada and the United States of America. The physical characteristics of these lakes were established 10,000 years ago with the retreat of the Wisconsinian glacier, and are stable and slow to change. Because these lakes contain 20 percent of the world's supply of surface fresh water the drainage basin is heavily populated. Eighty percent of the Canadian and 20 percent of the United States populations reside around these lakes.

Lake Michigan is the only Great Lake completely within the boundaries of the United States. It is 350 miles (560 kilometers) long, divided into basins by an underwater ridge, and in the southern basin has a maximum east-west width of 84 miles (134 kilometers). The average depth of Lake Michigan is 279 feet (85 meters) with maximum depths in the northern basin of 923 feet (282 meters) and in the southern basin of 548 feet (167 meters). Lake Michigan has a surface area of 22,300 square miles (5,775,674 hectares) and drainage basin (including the lake) of 67,900 square miles (17,586,012 hectares). Lake Michigan contains 1,180 cubic miles (4,920 cubic kilometers) of water with an average discharge rate (including the Chicago diversion) of 51,000 cubic feet per second (1,444 cubic

meters/sec). By combining this information an emptying or turnover time of 108 years can be calculated for Lake Michigan (1).

The Metropolitan Water Reclamation District of Greater Chicago (District) was created in 1889 to protect Lake Michigan, the source of the City of Chicago's drinking water supply (2, 3). The District has continued to safeguard this valuable water resource not only through capital improvements such as the Tunnel and Reservoir Plan (TARP) (4), but also through continuing and extensive water quality monitoring programs for this Great Lake.

OBJECTIVES

A two year survey of the inshore waters of southwestern Lake Michigan was begun in January 1984. This report describes the results of the second year (1985) of this survey. A study of fish was not conducted in Lake Michigan during 1985 (as in 1984) because a fish survey of the Chicago man-made waterways was conducted instead. The primary objective of this survey was to determine the present water quality of this region through the biota collected; e.g., algae as the primary producers, benthos as organisms that are primary and secondary consumers, and bacteria as indicators of human activities. Chemical constituents in the water or sediments, as appropriate, were sampled at the same time as the biota. Thus, a composite water quality determination was made.

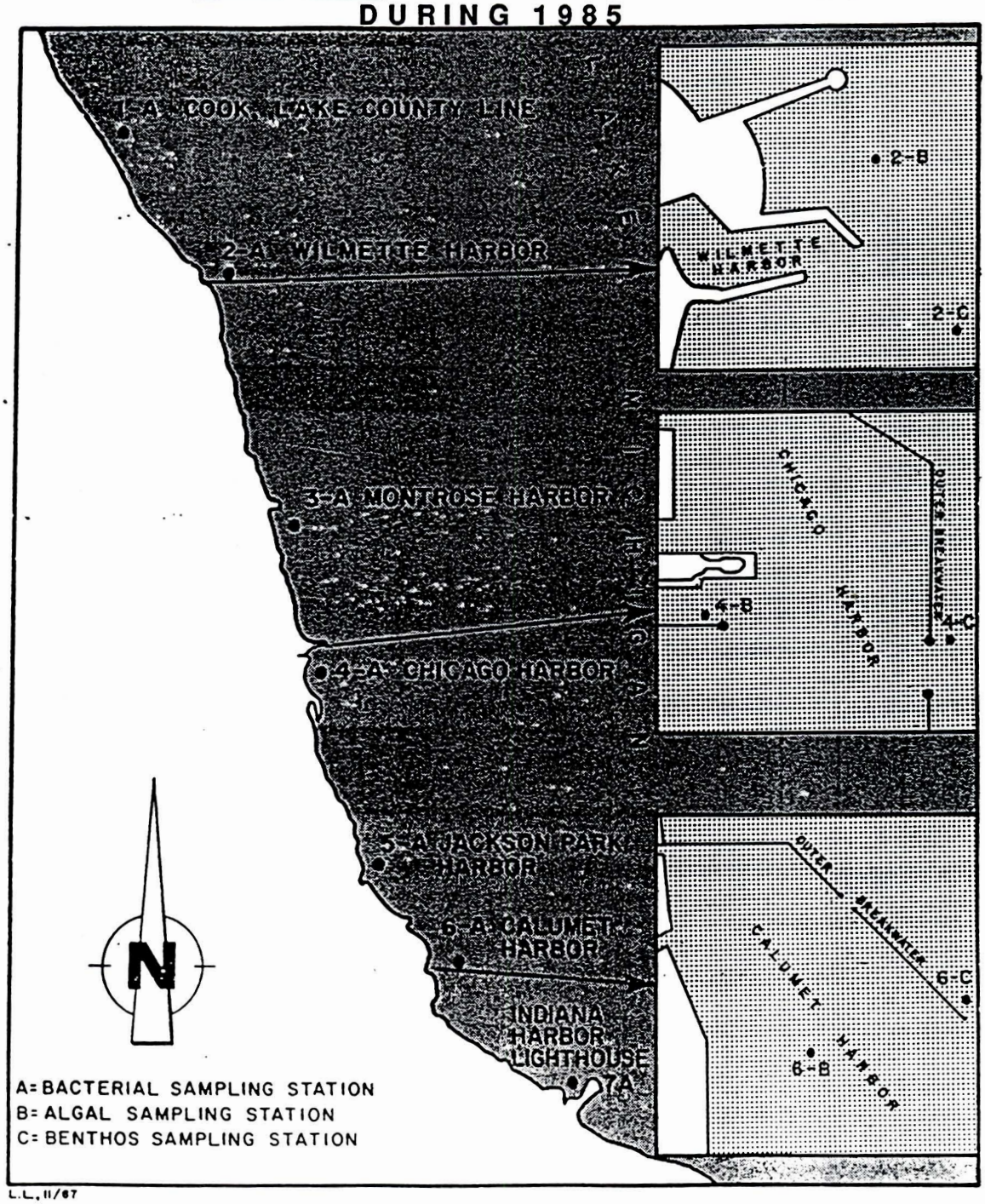
Samples were collected at, near, or in three harbor areas. These harbor areas were Wilmette Harbor, Chicago Harbor, and Calumet Harbor. The location of each sampling point or area is shown in Figure 1.

Comparisons of the data collected were to be made with the Lake Michigan Water Quality Standards (5) (published by the Illinois Environmental Protection Agency), previous studies conducted by the District (6) and by Argonne National Laboratories (7).

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE 1

INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN SHOWING BACTERIAL, ALGAL, AND BENTHOS SAMPLING LOCATIONS DURING 1985



Bacteria

Because there are large numbers of different kinds of bacteria to be found in natural waters the indicators of sanitary quality, total coliform (TC), fecal coliform (FC), and fecal streptococcus (FS) were the first choices for the determination of water quality in the inshore waters of southwestern Lake Michigan. The estimate of total heterotrophs or standard plate count (SPC), was added to provide an evaluation of bacterial biomass. To satisfy the public health aspect of a bacterial survey the Salmonella (enteric pathogens) group were identified and enumerated, as was Pseudomonas aeruginosa, an organism identified with water body contact infections, such as eye, ear, nose, and wound infections. Enterococci and Escherichia coli, indicative of human wastes, were also enumerated during 1985.

Algae

The algae are the primary producers in aquatic systems, analogous to the grasses of land systems. They convert inorganic substances to organic substances such as proteins, carbohydrates, and fats and are responsible for providing sustenance to the other organisms inhabiting the water. The kinds of algae present can indicate whether or not the system (in this case southwestern Lake Michigan) represents a disturbed or stable environment. To make this determination both planktonic and periphytic algae were collected. These algae

planktonic and periphytic algae were collected. These algae were identified to species and enumerated.

More than 2,000 species of algae have been previously identified from Lake Michigan (7). Sixty-five percent of these species were classified as diatoms (Bacillariophyceae). The remainder were divided among the green algae (Chlorophyta), blue-green algae (Cyanophyta), golden-brown algae (Chrysophyceae), euglenoids (Euglenophyta), and dinoflagellates and cryptomonads (Pyrrhophyta).

The previous investigations of indicator algal species in Lake Michigan were primarily on diatoms since they had been dominant in both species and number (7). The underlying assumption for determining indicator species was that different taxa were either adapted to or tolerate water of dissimilar nutrient content.

The Shannon-Weaver species diversity index was used to describe the richness of species and the distribution of individuals among the species (8). The persistence of species through the year showed tolerance to changing climatic conditions and dominance of a species in the population (greater than one percent of the total population) showed that conditions were favorable for that species at that time.

Benthic Invertebrates

The benthic invertebrate community frequently has been used to assess the environmental quality of lakes and rivers. These organisms are sensitive to both physical and chemical changes in the environment. They also have sufficiently long life cycles and low motility, and thus reflect past and present environmental conditions. The community characteristics analyzed included the abundance, percent composition, and seasonal trends of invertebrates.

Sediment Quality

Much of the suspended material that has been discharged from point and nonpoint sources of pollution eventually settles to the bottom of lakes. Some of these wastes can be toxic to aquatic organisms when present in high concentrations. Even though these materials are usually discharged to lakes at sub-lethal levels, many are capable of being concentrated in aquatic food chains. In this study, sediment samples were collected and analyzed for 15 chemical constituents.

METHODS AND MATERIALS

Bacteria

Water samples for bacterial analyses were collected at a depth of one meter using a Kemmerer bottle. These samples were placed in sterile four liter containers, with enough sodium thiosulfate to neutralize 15 mg/L chlorine, and transported on ice to the R & D Laboratory in Stickney, Illinois. Analyses were begun approximately six to twenty-four hours after sample collection began, and from two to twenty hours after the last sample was collected. Total coliform (TC), fecal coliform (FC), fecal streptococcus (FS), and standard plate count (SPC) were performed according to Standard Methods for the Examination of Water and Wastewater, 14th Edition (Standard Methods), (9). Salmonella were estimated using a modification of the MPN technique described by Kenner and Clark (10). Presumptive Salmonella were identified biochemically utilizing the API 20® system for identification of Enterobacteriaceae. Confirmation of Salmonella isolates was performed with polyvalent "O" antisera. Pseudomonas aeruginosa (PA) analyses were performed according to the tentative method in Standard Methods, 15th Edition, (11). Escherichia coli (EC) was enumerated by the membrane filter procedure of Dufour et al. (12) and enterococci (ME) were enumerated using the procedure of Dufour (13). Results were expressed as the geometric mean of samples collected four times during the year.

Colony confirmations for TC, FC, FS, PA, Escherichia coli, and Enterococci are presented in Table 1. The confirmation rates for typical TC, FC, FS, ME, EC, and PA colonies were 54%, 93%, 43%, 100%, 91% and 82%, respectively.

Algae

PLANKTON

"Plankton refers to microscopic aquatic forms having little or no resistance to currents and living free-floating and suspended in open or pelagic waters." (11)

Two types of plankton samples were collected. One type of sample was collected with a Kemmerer water sampler which collected discrete water samples at depths of one meter and the bottom meter. The other type of sample was collected with a plankton net (80 micrometer mesh) by lowering the net to the bottom of the water column and then raising it straight up. This is called a column or vertical plankton net tow and samples the entire water column. Both types of samples were kept in the dark and iced.

Upon return to the laboratory the discrete water samples were divided into four aliquots; one for diatom analysis, one for nondiatom or soft-bodied algae analysis, one for chlorophyll a analysis, and one for organic matter analysis. The vertical plankton net tow sample was divided into two aliquots; one for diatom analysis and one for nondiatom analysis.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 1

TOTAL COLIFORM (TC), FECAL STREPTOCOCCUS (FS), FECAL COLIFORM (FC), ENTEROCOCCUS (ME), *ESCHERICHIA COLI*, AND *PSEUDOMONAS AERUGINOSA* (PA) COLONY CONFIRMATIONS FROM SAMPLES COLLECTED IN LAKE MICHIGAN IN 1985

	TC		FC		FS		ME		EC		PA	
	Typ[1]	Atyp[2]	Typ[1]	Atyp[2]	Typ[1]	Atyp[2]	Typ[1]	Atyp[2]	Typ[1]	Atyp[2]	Typ[1]	Atyp[2]
Number of Colonies Tested	101	27	81	4	28	6	8	0[3]	35	2	22	2
Number Confirmed	54	2	35	2	26	4	8	0	32	1	18	0
Percent Confirmed	54	7	43	50	93	50	100	0	91	50	82	0

[1]Typical Colonies.
[2]Atypical Colonies.
[3]No atypical colonies seen during the year.

Diatoms. The samples for diatom analysis were digested with 30 percent hydrogen peroxide and dichromate as a catalyst as described in Standard Methods (11). Serial concentrations were by sedimentation (11). After mounting in Hyrax® the counting protocol used was to identify and count 500 organisms or 300 fields, whichever came first.

Nondiatoms. The samples for nondiatom analysis were preserved with 0.5 percent glutaraldehyde, and three drops of concentrated detergent. Serial sedimentation as described in Standard Methods (11) was used to concentrate the organisms 200 times. Five hundred organisms or 300 fields were identified and counted. To determine the percentage of live diatoms the total number of diatoms was noted as well as those containing chloroplasts. Because the digestion process for diatom preparation destroys those diatoms which are only slightly silicified, such as Rhizosolenia, these organisms were counted in the nondiatom preparation and added to the diatom count.

Chlorophyll a. Samples were filtered through glass fiber (Reeve Angel®) filters (nominal pore size 0.45 µm), extracted with 90 percent acetone, and ground in a tissue grinder as described in Standard Methods (11). Samples were clarified by centrifugation and absorbances determined in a spectrophotometer. Chlorophyll a concentrations were calculated using the UNESCO equations (11).

Organic Matter. The sample for organic matter analysis was dried at 103°C, weighed, fired in the muffle oven at 600°C, and reweighed. The difference in weight is the organic matter (11).

PERIPHYTON

Periphyton are, "A community of microscopic plants and animals associated with the surfaces of submerged objects. Some are attached, some move about." (11)

The periphytic algae were sampled by providing artificial substrates (microscope slides) for them to colonize. They were collected at two week intervals, protected from auto-oxidation by wrapping in aluminum foil, kept viable at 4°C, and transported to the laboratory. The slides were equally divided among the four analyses: diatoms, nondiatoms, chlorophyll a, and organic matter. Because of the variation among slides the distribution to each analysis was made on a rotating basis to minimize sampling bias. Once the samples had been scraped off the slides, the samples were handled as for plankton analyses.

WATER CHEMISTRY

Water samples for chemical analysis were collected at the same time as the algae samples. Temperature, Secchi disk, dissolved oxygen, and pH were determined on site. A total of 49 water quality constituents were measured at each site according to Standard Methods (11) and the results of these analyses are presented in the Appendix, Tables AII-10 through AII-12.

Benthic Invertebrates

Three replicate bottom samples of 0.05 m^2 were collected with a Ponar grab sampler during April, July through August, and November 1985 from stations near Wilmette (2-C), Chicago (4-C), and Calumet (6-C) harbors (Figure 1). The sediment samples were placed in one gallon plastic containers and returned to the laboratory for analysis. All samples collected were stored at 4°C until processed.

Upon return to the laboratory, the samples were washed and screened through a number 60 U.S. Standard Sieve. The sieved material was examined under a stereomicroscope at 7 to 30 magnifications. All invertebrates were removed from the finer residual material, sorted into major taxonomic groups, and counted within three to four days of the time of sampling. Except for the worms and midges, each organism was examined and identified to the lowest possible taxon with the stereomicroscope. Oligochaete worms and chironomid midge larvae were mounted on slides using a temporary mounting medium (100 mL lactic acid, 100 mL glycerol, and 200 mL tap water), and identified under a compound microscope at 100 to 1,000 magnifications. At least 200 worms were identified from each of the replicate samples.

Identifications were made to the species level whenever possible using the following taxonomic references: Curry (14), Hiltunen and Klemen (15), Hosinger (16), Jackson (17), Klemm

(18), Mackie, et al. (19), Maschwitz (20), Pennak (21), Saether (22, 23, 24) and Stimson et al. (25) Hamilton and Saether were personally contacted by Irwin Polls.

Sediment Quality

Sediment samples were collected with a Ponar grab sampler during November from the same three stations as benthic invertebrates. The samples were transferred to quart glass jars and analyzed for percent total and volatile solids, chemical oxygen demand (COD), fat, oils and greases (FOG), arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, and zinc. All 15 constituents were analyzed according to Methods for Chemical Analysis of Water and Wastes (26).

RESULTS

Bacteria

Geometric means of the bacterial indicators monitored during 1985 in Lake Michigan are shown in Table 2. The complete data from which Table 2 was derived are contained in Appendix AI. Sampling locations are shown in Figure 1. Samples were analyzed for total coliform, fecal coliform, fecal streptococci, enterococci, standard plate count, *Escherichia coli*, *Pseudomonas aeruginosa* and *Salmonella* species. The sampling stations included six within Cook County (Stations 1-A through 6-A) and one south of Cook County (Station 7-A).

Algae

A summary of the algae analyses is presented in Table 3. The column or vertical plankton net tow plankton densities ranged from 107 to 157 organisms per mL with 40 to 48 species. The periphyton population densities ranged from 203 to 249,584 organisms per cm^2 with 13 to 112 species. By combining stations an average periphyton density of 215,275 organisms/cm^2 with 129 species was calculated. Results from Wilmette Harbor were not included since only one sample was collected. Kemmerer plankton (discrete water samples collected with a Kemmerer bottle) ranged at one meter depth from 4,099 to 11,378 organisms per mL with 121 to 136 species, and at the bottom meter from 4,851 to 7,082 organisms per mL with 127 to 129 species. Summarizing the

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 2

BACTERIAL COUNTS FOR LAKE MICHIGAN SHORELINE STATIONS[1]

Station Location[2]	TC[3]	FC	EC	FS	Ent.	SPC	PA	Salmonella
1-A Lake-Cook Road	36	2	1	5	<1	402	<1	<0.15
2-A Wilmette Harbor	9	1	1	7	<1	190	<1	<0.15
3-A Montrose Harbor	9	1	1	5	<1	203	<1	<0.15
4-A Chicago Harbor	14	2	3	7	1	330	1	<0.15
5-A Jackson Park Harbor	15	2	2	3	<1	270	<1	<0.15
6-A Calumet Harbor	78	4	4	12	<1	750	<1	<0.15
7-A Indiana Harbor Lighthouse	1,800	128	122	5	1	78,000	10	<0.15

[1]All counts per 100 mL except SPC which is in counts per mL.

[2]Figure 1.

[3]TC = total coliform, FC = fecal coliform, EC = Escherichia coli, FS = fecal streptococcus, Ent. = Enterococci, SPC = standard plate count, PA = Pseudomonas aeruginosa.

[4]Values shown are the geometric mean of results of analyses of four samples taken April, June, August, and October 1985. FS are the result of one sampling run in October 1985.

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TABLE 3

SUMMARY OF ALGAL DATA COLLECTED FROM THE INSHORE AREAS OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Constituent	Wilmette Harbor Station 2-B*	Chicago Harbor Station 4-B*	Calumet Harbor Station 6-B*
Column Plankton-Net Tow			
Population Density (organisms/mL)	157	107	129
Numbers of Species	40	48	41
Periphyton (Average)			
Population Density (organisms/cm^2)	203	180,966	249,584
Species Diversity	0.86	1.05	0.84
Numbers of Species	13	112	80
Organic Matter ($\mu g/cm^2$)	14.2	55.1	48.0
Chlorophyll a ($\mu g/cm^2$)	0.07	0.13	0.32
Kemmerer Plankton - 1 Meter			
Population Density (organisms/mL)	4,318	3,973	11,378
Species Diversity	1.22	1.19	0.77
Numbers of Species	133	136	121
Organic Matter ($\mu g/mL$)	46.5	46.0	44.9
Chlorophyll a ($\mu g/mL$)	3.02	2.83	2.56

Table continued on following page.

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TABLE 3 (Continued)

SUMMARY OF ALGAL DATA COLLECTED FROM THE INSHORE AREAS OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Constituent	Wilmette Harbor Station 2-B	Chicago Harbor Station 4-B	Calumet Harbor Station 6-B
Kemmerer Plankton - Bottom			
Population Density (organisms/mL)	5,036	4,850	7,082
Species Diversity	1.20	1.18	1.21
Numbers of Species	127	129	129
Organic Matter (µg/mL)	46.7	46.9	47.2
Chlorophyll a (µg/mL)	4.08	3.50	4.43
Site Average Kemmerer Plankton			
Population Density (organimsm/mL)	4,648	4,223	9,056
Species Diversity	1.22	1.19	1.01
Numbers of Species	167	167	161
Organic Matter (µg/mL)	45.6	46.4	46.1
Chlorophyll a (µg/mL)	3.55	3.15	3.50
	Southwestern Lake Michigan 1985 Average		
Kemmerer Plankton - Overall			
Population Density (organisms/mL)		5,976	
Species Diversity		1.17	
Numbers of Species		278	
Organic Matter (µg/mL)		42.1	
Chlorophyll a (µg/mL)		3.93	

Table continued on following page.

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TABLE 3 (Continued)

SUMMARY OF ALGAL DATA COLLECTED FROM THE INSHORE AREAS OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Constituent	Wilmette Harbor Station 2-B	Chicago Harbor Station 4-B	Calumet Harbor Station 6-B
		Southwestern Lake Michigan 1985 Average	
Periphyton - Overall			
Population Density (organisms/cm^2)		215,275	
Species Diversity		1.06	
Numbers of Species		129	
Organic Matter ($\mu g/cm^2$)		50.3	
Chlorophyll a ($\mu g/cm^2$)		0.21	

*Figure 1 shows location of sampling stations.
**Only those sample where both diatoms and nondiatoms were represented were included.

Kemmerer plankton through all depths at each site, the population densities ranged from 4,223 to 9,056 organisms per mL with 161 to 167 species. By combining stations an average Kemmerer plankton population density of 5,976 organisms per mL with 278 species was calculated.

Table 4 shows that seven periphytic organisms were present in more than 90 percent of the samples collected. Two of the seven persistent periphytic organisms (Fragilaria crotonensis and Nitzschia fonticola) were listed by Palmer (27, 28) as pollutant-tolerant species. Table 5 shows that among the 14 persistent plankton species which were found in the southwestern Lake Michigan harbor areas, four (Fragilaria crotonensis, Nitzschia fonticola, Synedra acus, and Synedra ulna) were listed by Palmer as pollutant-tolerant species. Table 6 shows 48 periphyton organisms considered to be dominant species in Lake Michigan harbor areas in 1985. Eleven of these organisms were listed by Palmer as pollutant-tolerant. Table 7 lists 50 plankton species considered to be dominant in Lake Michigan harbor areas during 1985. Nine of these organisms were listed by Palmer as being pollutant-tolerant.

A summary of the results of the water chemistry analyses is presented in Table 8. The number of observations, mean, and sample deviation are given for each of the constituents determined.

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TABLE 4

PERSISTENT PERIPHYTON ORGANISMS (PRESENT IN ≥90 PERCENT OF SAMPLES) COLLECTED FROM THE INSHORE AREAS OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Persistent Organisms*	Wilmette Harbor Station 2-B	Chicago Harbor Station 4-B	Calumet Harbor Station 6-B
Diatoms			
Achnanthes affinis		X	
Cyclotella kuetzingiana		X	
Diatoma elongatum		X	
Fragilaria crotonensis**		X	X
Fragilaria intermedia		X	X
Nitzschia fonticola**		X	
Tabellaria fenestrata		X	

*Organisms present in ≥90 percent of the samples collected. The one sample collected from Wilmette was not included, but there were 14 samples at Chicago, and 11 samples at Calumet, (Stations 4-B, and 6-B, respectively).

**Pollutant-tolerant (28).

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TABLE 5

PERSISTENT PLANKTONIC ORGANISMS (PRESENT IN ≥90 PERCENT OF SAMPLES) COLLECTED FROM THE INSHORE AREAS OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Persistent Organisms	Wilmette Harbor Station 2-B*	Chicago Harbor Station 4-B*	Calumet Harbor Station 6-B*
Diatoms			
Achnanthes affinis		X	
Asterionella formosa	X		
Cyclotella kuetzingiana	X	X	X
Fragilaria bicapitata		X	X
Fragilaria crotonensis**	X	X	X
Fragilaria pinnata			X
Melosira islandica	X	X	X
Nitzschia fonticola**			X
Stephanodiscus astraea	X	X	X
Synedra acus**	X		
Synedra ulna var. chaseana**		X	X
Tabellaria fenestrata	X	X	X
Tabellaria flocculosa	X	X	
Blue-Green Algae			
Oscillatoria limnetica			X

*Station locations shown in Figure 1.
**Pollutant-tolerant (28).

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TABLE 6

DOMINANT PERIPHYTIC ORGANISMS (≥1 PERCENT OF THE TOTAL PERIPHYTON POPULATION) FROM SAMPLES COLLECTED FROM THE INSHORE AREAS OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Dominant Organisms	Wilmette Harbor Station 2-B*	Chicago Harbor Station 4-B*	Calumet Harbor Station 6-B*
Diatoms			
Achnanthes affinis		X	X
Achnanthes conspicua		X	
Amphipleura pellucida			X
Amphora delicatissima		X	
Asterionella formosa	X	X	X
Cyclotella glomerata	X	X	X
Cyclotella kuetzingiana	X	X	X
Cyclotella ocellata		X	
Cymbella microcephala			X
Cymbella prostrata		X	
Cymbella protracta		X	
Diatoma elongatum		X	X
Diatoma elongatum var. minor	X	X	X
Diatoma vulgare**		X	X
Fragilaria bicapitata			X
Fragilaria construens var. subsalina		X	
Fragilaria intermedia	X	X	X
Fragilaria pinnata		X	X
Gomphonema abbreviatum		X	
Gomphonema olivaceum	X	X	X
Gomphonema olivaceum var. calcarea		X	
Melosira granulata**		X	X
Melosira islandica	X	X	
Navicula cryptocephala**		X	
Navicula lanceolata		X	
Nitzschia acicularis**	X		
Nitzschia dissipata**		X	
Nitzschia fonticola**		X	X

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 6 (Continued)

DOMINANT PERIPHYTIC ORGANISMS (≥1 PERCENT OF THE TOTAL PERIPHYTON POPULATION) FROM SAMPLES COLLECTED FROM THE INSHORE AREAS OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Dominant Organisms	Wilmette Harbor Station 2-B*	Chicago Harbor Station 4-B*	Calumet Harbor Station 6-B*
Nitzschia frustulum		X	
Nitzschia gracilis**		X	X
Nitzschia linearis**	X	X	X
Nitzschia recta		X	
Stephanodiscus astraea			X
Stephanodiscus minutus		X	
Synedra acus**	X	X	X
Synedra gaillonii		X	
Synedra ulna*		X	X
Synedra ulna var. chaseana**	X	X	X
Tabellaria fenestrata	X	X	X
Green Algae			
Ankistrodesmus convolutus	X		
Cladophora sp.		X	X
Mougeotia sp.		X	X
Rhizoclonium hieroglyphium		X	
Stichococcus bacillaris		X	
Stigeoclonium polymorphum		X	
Ulothrix sp.		X	
Blue-Green Algae			
Oscillatoria agardhii		X	
Oscillatoria subbrevis		X	

*Station locations shown in Figure 1.
**Pollutant-tolerant (28)

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 7

DOMINANT PLANKTONIC ORGANISMS (≥1 PERCENT OF THE TOTAL PLANKTON POPULATION) COLLECTED FROM THE INSHORE AREAS OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Dominant Organisms	Wilmette Harbor Station 2-B*	Chicago Harbor Station 4-B*	Calumet Harbor Station 6-B*
Diatoms			
Achnanthes affinis	X	X	
Amphoira veneta			X
Asterionella formosa	X	X	X
Cyclotella glomerata	X		X
Cyclotella iris		X	X
Cyclotella kuetzingiana	X	X	X
Cyclotella pseudostelligera		X	
Cymbella ventricosa			X
Diatoma elongatum	X	X	X
Diatoma tenue			X
Fragilaria bicapitata	X	X	X
Fragilaria construens var. subsalina	X	X	X
Fragilaria crotonensis**	X	X	X
Fragilaria intermedia		X	
Fragilaria pinnata	X	X	X
Melosira granulata**	X	X	X
Melosira islandica	X	X	X
Nitzschia acicularis**	X		
Nitzschia fonticola**	X	X	X
Nitzschia gracilis**	X		X
Nitzschia linearis**	X		X
Rhizosolenia longiseta			X
Stephanodiscus astraea	X	X	X
Stephanodiscus minutus	X	X	X
Synedra acus*	X	X	X
Synedra ulna var. chaseana**	X	X	X
Tabellaria fenestrata	X	X	X
Tabellaria flocculosa	X		X

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 7 (Continued)

DOMINANT PLANKTONIC ORGANISMS (≥1 PERCENT OF THE TOTAL PLANKTON POPULATION) COLLECTED FROM THE INSHORE AREAS OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Dominant Organisms	Wilmette Harbor Station 2-B*	Chicago Harbor Station 4-B*	Calumet Harbor Station 6-B*
Green Algae			
Ankistrodesmus convolutus		X	
Chlamydomonas globosa		X	
Cladophora sp.		X	X
Mougeotia sp.	X		
Oocystis parva		X	
Selenastrum contorta			X
Stichococcus bacillaris	X	X	X
Chrysophyte Algae			
Dinobryon divergens	X	X	X
Dinobryon sertularia	X	X	X
Blue-Green Algae			
Anabaena circinalis	X	X	
Anabaena scheremetievi	X		X
Anabaena spiroides		X	
Anabaena wisconsinense		X	
Aphanocapsa delicatissima		X	
Aphanothece nidulans		X	
Chroococcus limneticus			X
Oscillatoria agardhii	X	X	X
Oscillatoria limnetica	X	X	X
Oscillatoria lutea	X	X	
Oscillatoria subbrevis		X	X
Oscillatoria tenuis**	X	X	X
Phormidium corium			X

*Station locations shown in Figure 1.
**Pollutant-tolerant (43).

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 8

SUMMARY OF WATER QUALITY CONSTITUENTS DETERMINED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Constituents	Units	Wilmette Harbor Station 2-B			Chicago Harbor Station 4-B			Calumet Harbor Station 6-B		
		n*	Mean	SD**	n*	Mean	SD**	n*	Mean	SD**
Temperature	°C	17	12.8	5.8	22	10.5	6.9	18	12.8	6.1
Turbidity	NTU	17	6.2	8.5	21	6.5	14.3	18	1.9	1.3
Secchi Disk	meters	16	1.7	1.2	21	1.7	0.9	18	2.3	0.9
Alkalinity, Total	mg/L	17	118	9.3	22	116	6.7	18	115	7.6
Sulfate	mg/L	17	22.4	3.6	22	21.7	4.5	18	26.5	22.4
Fluoride	mg/L	17	0.16	0.04	22	0.17	0.04	18	0.16	0.02
Chloride	mg/L	17	12.8	3.9	22	12.1	4.5	18	12.4	3.9
Phosphorus, Total	mg/L	14	0.012	0.008	18	0.019	0.030	15	0.011	0.010
Phosphorus, Dissolved	mg/L	12	0.016	0.022	18	0.018	0.031	15	0.007	0.006
Silica, Total	mg/L	17	1.32	1.35	21	0.99	0.55	18	0.79	0.44
Calcium	mg/L	17	29.9	3.0	21	30.0	3.7	18	29.3	3.3
Magnesium	mg/L	17	11.5	1.2	21	11.1	0.6	18	11.1	0.9
Potassium	mg/L	17	1.0	0	21	1.1	0.3	18	1.0	0
Sodium	mg/L	17	5.1	1.0	21	5.6	1.2	18	5.4	0.9
Solids, Total	mg/L	17	190	25.9	22	185	16.0	18	193	19.1
Solids, Total Volatile	mg/L	17	51.3	15.8	22	52.2	20.7	18	63.2	29.9
Solids, Suspended	mg/L	17	13.6	15.6	22	7.2	6.8	18	4.2	2.7
Solids, Volatile Suspended	mg/L	6	3.0	1.3	5	2.8	3.0	3	1.3	0.6

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 8 (Continued)

SUMMARY OF WATER QUALITY CONSTITUENTS DETERMINED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Constituents	Units	Wilmette Harbor Station 2-B			Chicago Harbor Station 4-B			Calumet Harbor Station 6-B		
		n*	Mean	SD**	n*	Mean	SD**	n*	Mean	SD**
Oxygen, Dissolved	mg/L	16	10.5	1.7	20	10.6	1.9	18	10.5	1.6
Oxygen Demand, Chemical	mg/L	17	11.2	8.3	22	9.4	5.4	18	8.4	5.6
Oxygen Demand, 5-Day Biochemical	mg/L	17	2.0	0	22	2.1	0.4	18	2.2	0.7
Total Organic Carbon	mg/L									
Nitrogen, Total Kjeldahl	mg/L	14	0.25	0.07	18	0.32	0.17	15	0.26	0.06
Nitrogen, Dissolved Total Kjeldahl	mg/L	12	0.21	0.09	18	0.27	0.12	15	0.24	0.08
Nitrogen, Ammonia	mg/L									
Nitrogen, Nitrate	mg/L	15	0.19	0.09	19	0.20	0.11	16	0.20	0.09
Nitrogen, Nitrite	mg/L	15	0.01	0	19	0.01	0	16	0.01	0
Fats, Oils, and Greases	mg/L	17	1.47	0.87	22	1.41	0.96	18	1.22	0.43
Foaming Agents MBAS	mg/L	14	0.019	0.015	18	0.016	0.011	16	0.020	0.021
Hardness, Titration as $CaCO_3$	mg/L	17	149	19.4	21	145	14.7	17	145	11.4
Hardness, Atomic Absorption as $CaCO_3$	mg/L	17	122	10.4	21	121	10.0	18	119	9.8
Aluminum	mg/L	17	1.0	0	21	1.0	0	18	1.0	0
Arsenic	mg/L	17	1.0	0	21	1.0	0	18	1.0	0
Barium	mg/L	17	0.2	0	21	0.2	0	18	0.2	0

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 8 (Continued)

SUMMARY OF WATER QUALITY CONSTITUENTS DETERMINED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Constituents	Units	Wilmette Harbor Station 2-B			Chicago Harbor Station 4-B			Calumet Harbor Station 6-B		
		n*	Mean	SD**	n*	Mean	SD**	n*	Mean	SD**
Cadmium	mg/L	17	1.12	0.33	21	1.10	0.44	18	1.22	0.55
Chromium	mg/L	17	1.71	0.85	21	1.95	1.28	18	2.16	1.10
Copper	mg/L	17	10.7	6.2	21	26.4	65.7	18	11.8	10.1
Iron, Total	mg/L	17	220	256	20	155	144	18	100	92
Lead	mg/L	17	2.00	2.26	21	4.14	3.82	18	2.44	2.73
Manganese	mg/L	17	8.24	8.14	21	7.24	5.33	18	5.61	2.81
Mercury	µg/L	17	0.07	0.05	21	0.34	1.30	18	0.06	0.04
Nickel	mg/L	17	3.82	3.11	21	4.61	3.94	18	4.50	3.28
Selenium	mg/L	14	1.00	0	21	1.00	0	15	1.00	0
Zinc	mg/L	17	16.8	12.6	19	25.0	38.2	18	17.2	11.4
Phenol-Like Substances as Phenol	µg/L	17	1.06	0.24	22	1.18	0.50	18	1.44	1.04
Silver	mg/L	17	1.0	0	21	1.1	0.3	18	1.0	0
Cyanides, Total	µg/L	17	0.002	0.001	19	0.009	0.027	15	0.002	0.001
Conductivity	µmhos/cm	17	271	11.5	22	271	15.7	18	274	11.3
Plankton (surface)										
Population Density	org/mL	17	4,118	2,423	22	4,099	1,792	18	11,378	27,512
Chlorophyll a	µg/mL	16	3.02	1.82	22	2.83	1.27	17	2.56	1.67
Organic Matter	µg/mL	17	46.5	5.0	21	46	8.0	16	44.9	7.1

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 8 (Continued)

SUMMARY OF WATER QUALITY CONSTITUENTS DETERMINED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Constituents	Units	Wilmette Harbor Station 2-B			Chicago Harbor Station 4-B			Calumet Harbor Station 6-B		
		n*	Mean	SD**	n*	Mean	SD**	n*	Mean	SD**
Number of Species		17	34.8	7.6	22	33.0	6.5	18	30.2	8.8
Species Diversity		17	0.94	0.23	22	0.90	0.23	18	0.83	0.28
Plankton (bottom)										
Population Density	org/mL	17	5,036	2,718	21	4,851	2,531	18	7,082	3,822
Chlorophyll a	µg/mL	16	4.08	1.55	20	3.540	1.22	17	4.43	2.58
Organic Matter	µg/mL	17	46.7	6.3	21	46.9	7.2	18	47.2	7.7
Number of Species		17	33.8	10.3	21	35.1	6.9	18	35.2	6.1
Species Diversity		17	0.93	0.27	21	0.96	0.20	18	0.96	
Periphyton										
Population Density	org/cm^2	1	203	0	13	$1.8x10^5$	$1.7x10^5$	12	$2.5x10^5$	$1.5x10^5$
Chlorophyll a	µg/cm^2	1	0.07	0	14	0.13	0.17	11	0.32	0.86
Organic Matter	µg/cm^2	1	14.2	0	14	55.1	42.6	13	48.0	31.1
Number of Species		1	13	0	15	30.1	12.2	12	22.8	6.8
Species Diversity Index		1	0.86	0	15	0.93	0.22	12	0.71	0.26

*n = Number of Observations.
**SD = Standard Deviation.

Benthic Invertebrates

Seventy-nine benthic invertebrate taxa were identified from the inshore area of southwestern Lake Michigan (Table 9) with an overall estimated mean faunal density of 2,728 organisms/m^2 (Table 10). There were 21 species of chironomids, 12 naidids and 10 tubificids. The estimated mean abundance of the benthic invertebrates collected at Stations 2-C, 4-C, and 6-C (Figure 1) during the spring, summer, and fall are presented in Appendix AIII. Overall, tubificids, chironomids, naidids, orthocladines, and amphipods accounted for 41.2, 32.2, 10.3, 4.6 and 3.2%, respectively, of the total from all stations (Figure 2). Seventy-nine percent of the tubificids were unidentifiable immature worms. The dominant taxa shifted throughout the year, and seasonally dominant organisms included the chironomids (C. fluviatilis-gr., Cyphomella sp., and P. scalaenum), the naidid (P. michiganensis), and the tubificid (P. vejdovskyi).

STATION 2-C NEAR WILMETTE HARBOR

A total of 37 benthic taxa, most of which were identified to species, were collected from Station 2-C near Wilmette Harbor (Table AIII-1). There were 14 species of chironomids, 5 pelecypods, and 3 tubificids, naidids, orthocladines, and amphipods. The highest number of taxa (22) was collected during the fall (Figure 3). The estimated mean number of organisms/m^2 for the spring, summer, and fall sampling periods were 1,987, 2,254, and

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 9

DISTRIBUTION OF BENTHIC INVERTEBRATES FROM
THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN, 1985

Taxon	April	August	October
Coelenterata			
Hydra sp.	-	+	-
Annelida			
Enchytraeidae	+	+	+
Lumbriculidae			
Stylodrilus heringianus	-	+	-
Naididae			
Amphicaeta leydigi	-	+	+
Chaetogaster diaphanus	-	-	+
Nais communis	-	+	+
Nais simplex	-	+	-
Nais variablis	-	+	+
Piguetiella michiganensis	+	+	+
Pristina foreli	-	-	+
Pristina osborni	-	-	+
Slanina appendiculata	-	+	-
Stylaria lacustris	-	-	+
Uncinais uncinata	+	-	+
Vejdovskyella intermedia	+	+	+
Tubificidae			
Aulodrilus americanus	-	+	-
Aulodrilus pluriseta	-	+	+
Ilyodrilus tempretoni	-	+	-
Limnodrilus cervix	-	+	-
Limnodrilus hoffmesteri	+	+	+
Limnodrilus maumeensis	-	+	-
Limnodrilus udekemianus	+	-	-
Potamothrix moldaviensis	+	+	+
Potamothrix vejdovskyi	-	+	+
Tubifex superiorensis	-	+	-
Undetermined immatures			
with capilliforms	+	+	+
without capilliforms	+	+	+

Table continued on following page.

TABLE 9 (Continued)

DISTRIBUTION OF BENTHIC INVERTEBRATES FROM
THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN, 1985

Taxon	April	August	October
Hirudinea			
Helobdella stagnalis	+	+	-
Arthropoda			
Crustacea			
Isopoda			
Asellus sp.	-	+	-
Amphipoda			
Gammarus pseudolimnaeus	+	+	+
Hyalella azteca	+	-	-
Pontoporeia hoyi	+	+	+
Insecta			
Tricoptera			
Hydroptila sp.	+	-	-
Diptera			
Tanypodinae			
Conchapelopia sp.	+	-	-
Procladius sp.	-	+	+
Diamesinae			
Potthastia cf. *longimanus*	-	+	+
Prodiamesinae			
Monodiamesa depectinata	-	+	+
Monodiamesa cf. *tuberculata*	+	+	+
Orthocladinae			
Heterotrissocladius cf. *changi*	+	+	+
Nanocladius sp.	+	-	-
Parakiefferiella sp.	+	+	+
Chironominae			
Chironomini			
Chironomus anthracinus-gr.	+	+	+

Table continued on following page.

TABLE 9 (Continued)

DISTRIBUTION OF BENTHIC INVERTEBRATES FROM
THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN, 1985

Taxon	April	August	October
Chironomus fluviatilis gr.	+	+	+
Chironomus plumosus-gr.	-	+	+
Chironomus sp.	+	+	+
Cladopelma sp.	-	+	-
Cryptochironomus digitatus	+	+	+
Cryptochironomus cf. fulvus	+	+	+
g. nr. Cyphomella	+	+	+
Demicryptochironomus sp.	-	+	+
Dicrotendipes sp.	-	+	-
Glyptotendipes sp.	+	-	-
Microtendipes cf. pedellus	+	-	-
Parqacladopelma camptolabis-gr.	+	+	+
Paracladopelma nereis	+	-	-
Paracladopelma undine	+	-	+
Paracladopelma cf. winnelli	-	+	-
Polypedilium cf. scalaenum	+	+	+
Polypedilium cf. tuberculum	-	+	+
Pseudochironomus sp.	+	+	+
Tanytarsini			
Microspecta sp.	-	-	+
Tanytarsus sp.	+	-	+
Mollusca			
Gastropoda			

Table continued on following page.

TABLE 9 (Continued)

DISTRIBUTION OF BENTHIC INVERTEBRATES FROM
THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN, 1985

Taxon	April	August	October
Amnicola limosa	+	+	+
Bithynia tentaculata	-	+	-
Physella gyrinasayi	-	+	-
Physella vinosa	-	+	-
Physella sp.	-	+	-
Valvata perdepressa	-	+	-
Valvata sincera	-	+	-
Valvata tricarinata	-	+	-
Pelecypoda			
Musculium transversum	-	+	-
Pisidium casertanum	+	+	+
Pisidium compressum	-	+	-
Pisidium fallax	+	+	+
Pisidium henslowanum	-	+	-
Pisidium nitidium cf. *pauperculatum*	-	+	-
Pisidium subtruncatum	-	+	-
Pisidium variabile	-	+	-
Sphaerium corneum	+	-	-
Sphaerium rhomboideum	+	-	-
Sphaerium striatinum	+	+	-
Total Number of Taxa	37	61	42

+ = present.
- = absent.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 10

SUMMARY OF THE ESTIMATED MEAN ABUNDANCE OF BENTHIC INVERTEBRATES IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN, 1985

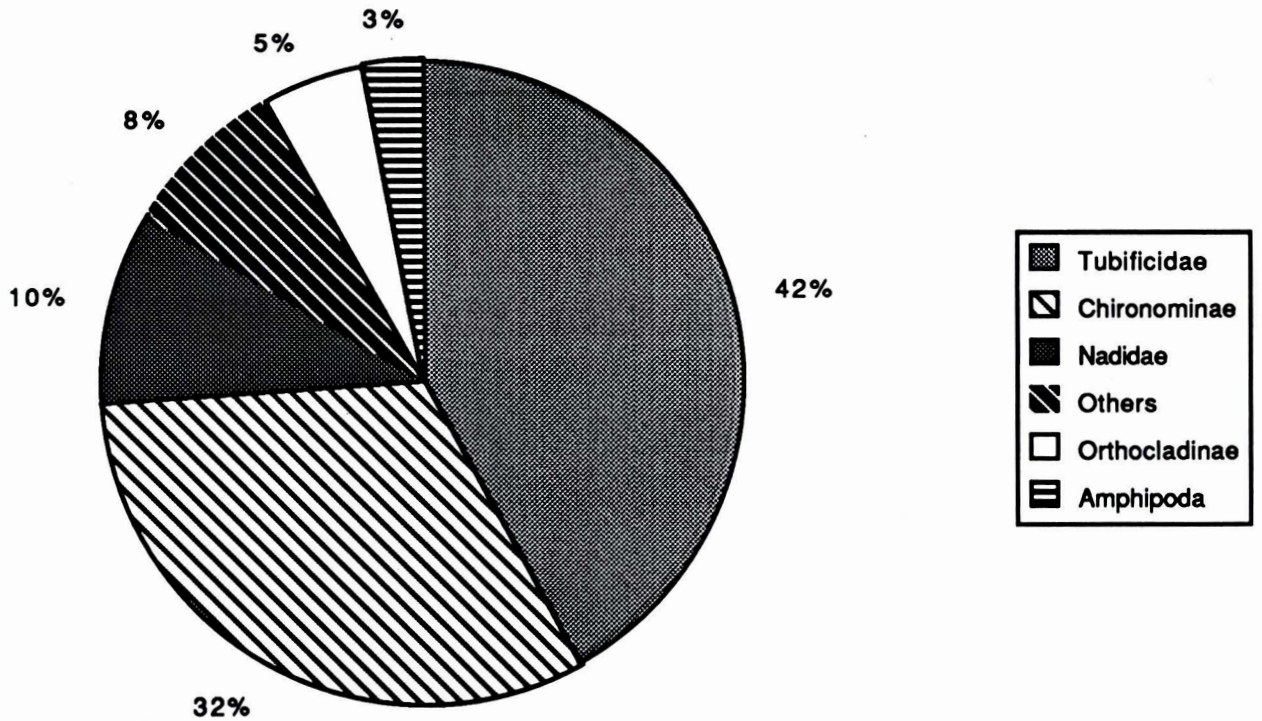
Station Number	Mean Abundance* (numbers/m^2)		
	Spring	Summer	Fall
2-C	1,987	2,254	2,779
4-C	2,669	7,637	3,793
6-C	1,107	1,782	544

*Three replicate bottom samples were collected at each station during the spring, summer, and fall.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE 2

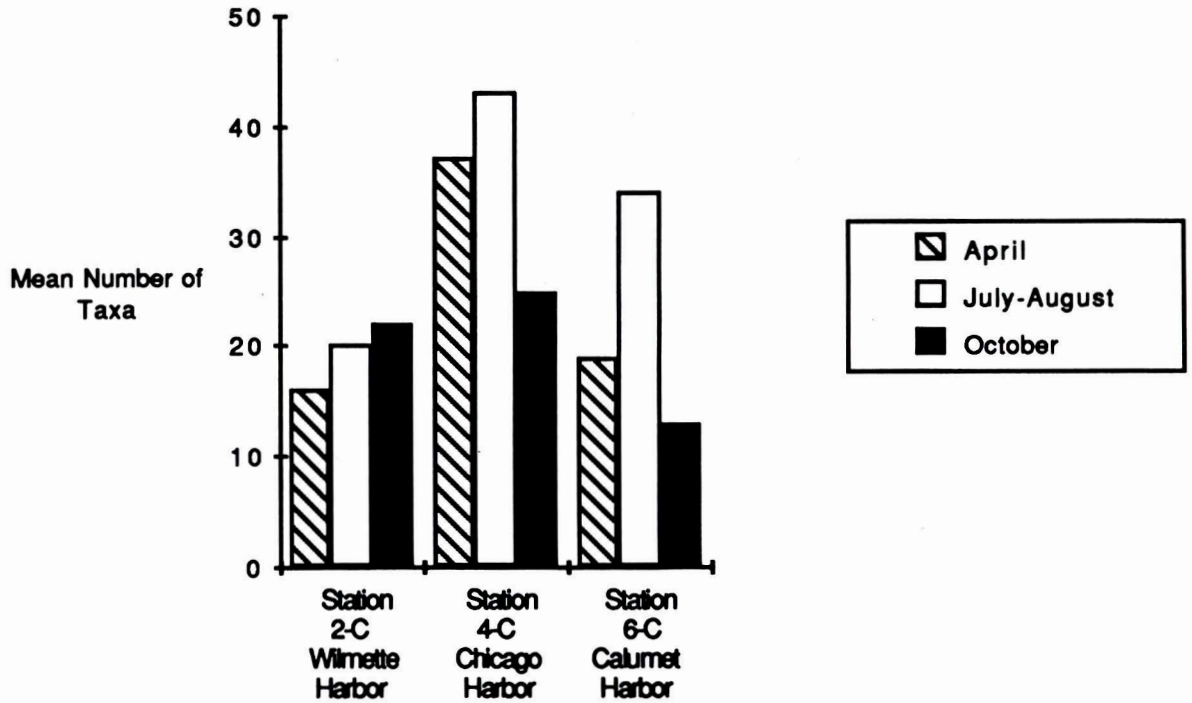
PERCENT COMPOSITION OF BENTHIC INVERTEBRATES FROM THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN, 1985



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE 3

MEAN NUMBER OF BENTHIC INVERTEBRATE TAXA FROM THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN, 1985



2,779, organisms/m^2, respectively, (Figure 4). Overall, chironomids, naidids, tubificids, orthocladines, and amphipods accounted for 60, 20, 9, 3, and 3%, respectively, of the total number of invertebrates (Figure 5). Numerically, the chironomids were the predominant benthic group during the spring and fall (Figure 6). Especially noteworthy was the large number of naidids (1,324/m^2) collected during the summer which accounted for 58.7% of the total benthic fauna (Figure 6). The most common invertebrates (total number collected during 1985) at station 2-C included the chironomid Cyphomella sp. (1,894/m^2), the naidid worm P. michiganensis (1,115/m^2), and the midges P. scalaenum (629/m^2) and C. fluviatilis-gr. (437/m^2).

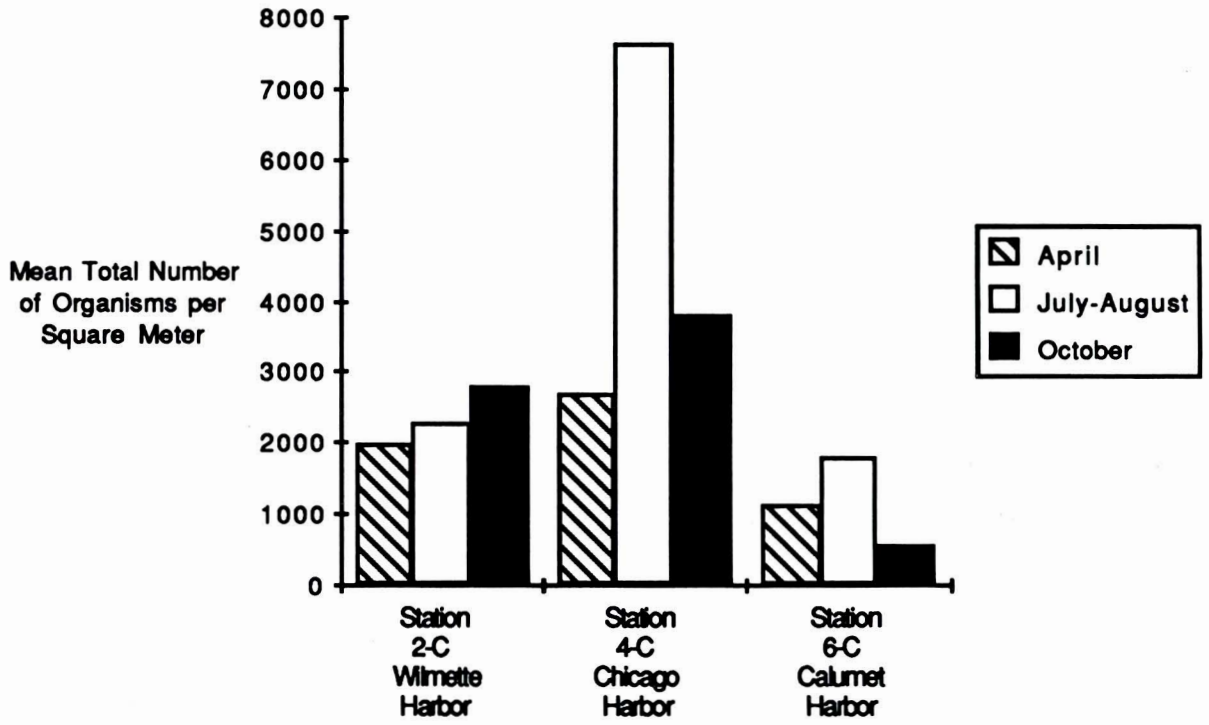
STATION 4-C NEAR CHICAGO HARBOR

Sixty-one taxa, most of which were identified to species, were collected from station 4-C near Chicago Harbor (Table AIII-2). This included 25 species of chironomids, 7 naidids, and 9 tubificids. The greatest number of taxa (43) were found during the summer (Figure 3). Estimated mean densities for the spring, summer, and fall were 2,669, 7,637, and 3,793 organisms/m^2, respectively, (Figure 4). The high number of undetermined immature tubificids (4,661/m^2) collected during July and August accounted for the increased abundance of invertebrates during the summer. Overall, the benthos was dominated numerically by the tubificids (65%), and the chironomids (15%) (Figure 5). Tubificids predominated at all times during the year (Figure 6).

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE 4

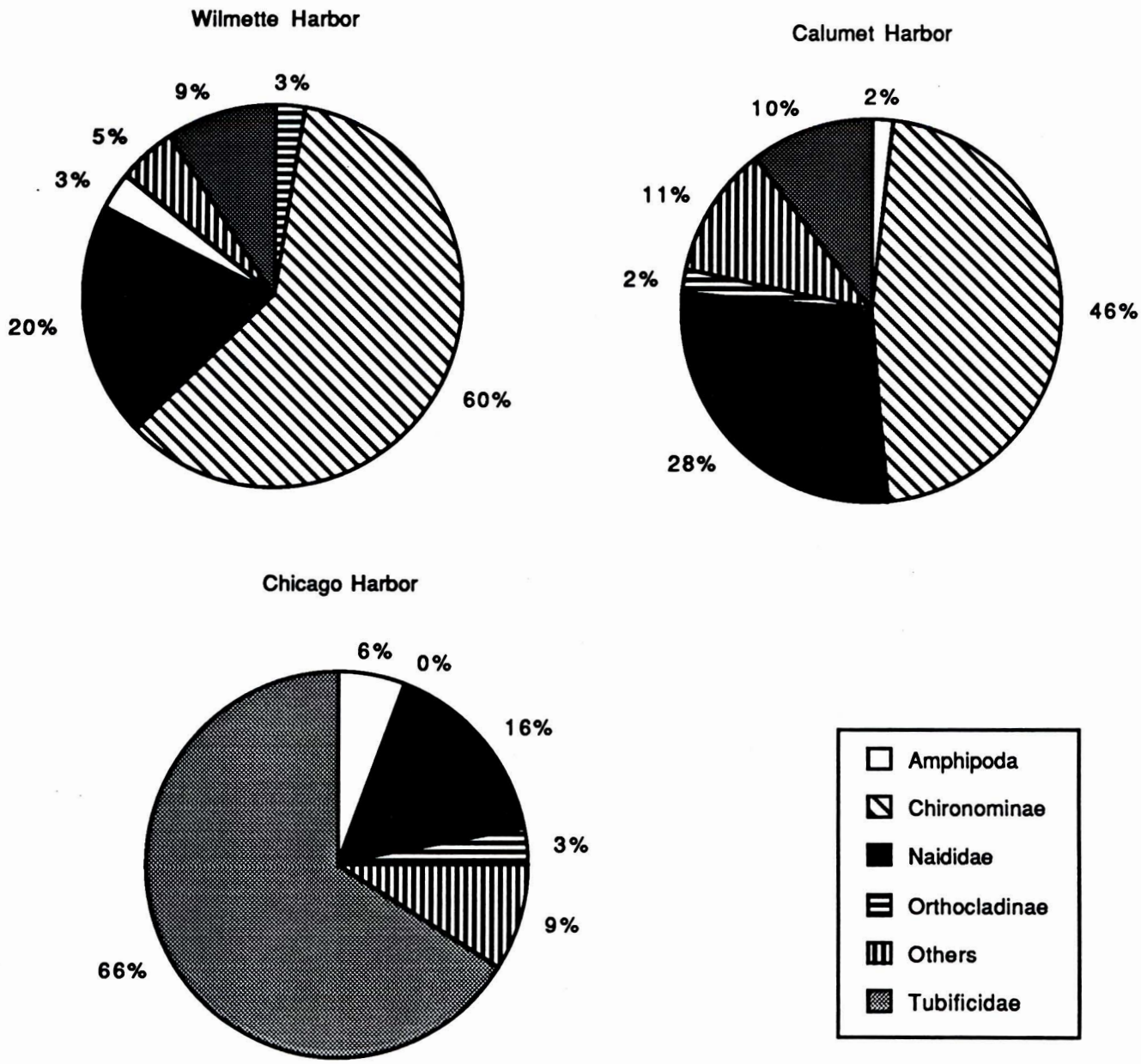
MEAN NUMBER OF BENTHIC INVERTEBRATES FROM THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN, 1985



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE 5

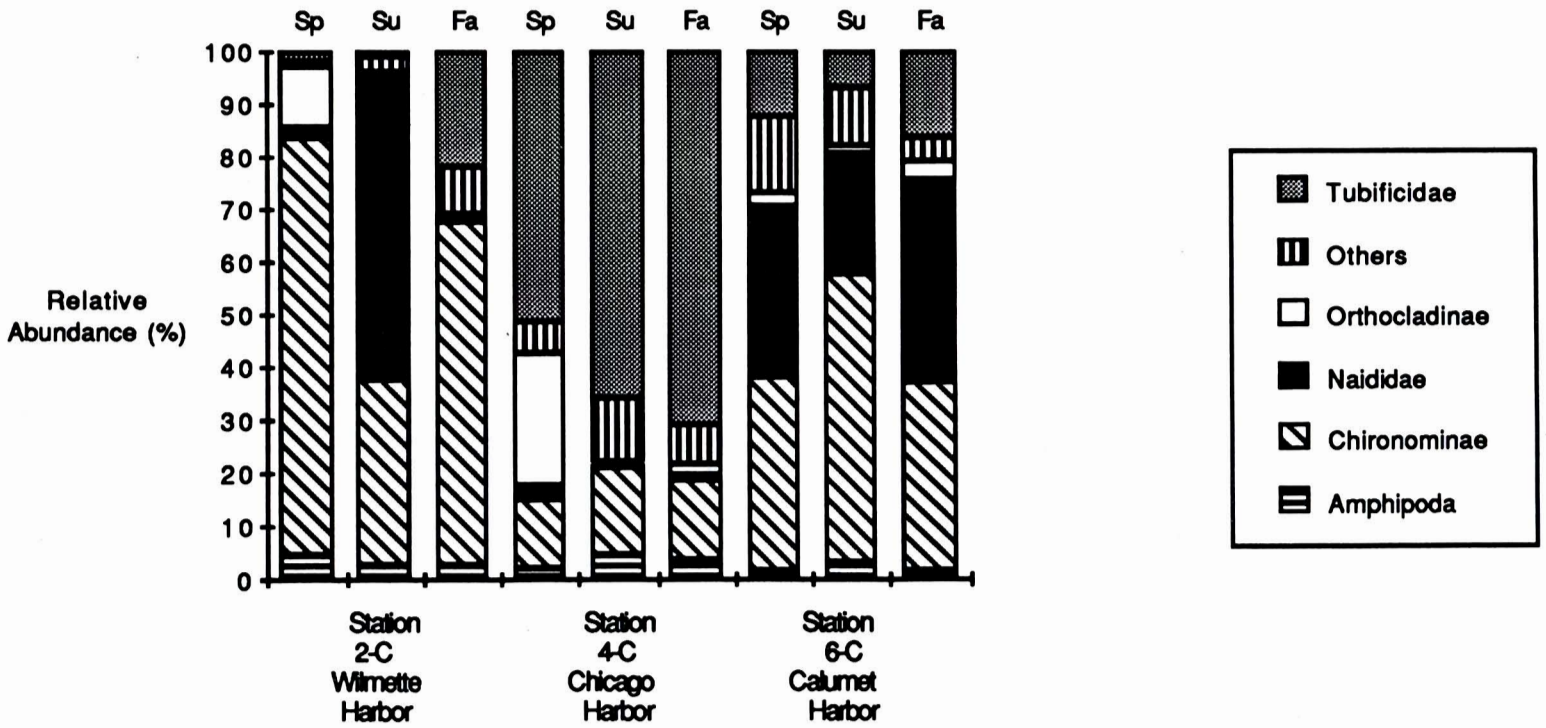
RANKED, RELATIVE ABUNDANCE (PERCENT COMPOSITION) OF BENTHIC INVERTEBRATES FROM THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN, 1985



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE 6

SEASONAL RELATIVE ABUNDANCE OF BENTHIC INVERTEBRATES FROM THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN, 1985 (Sp = SPRING, Su = SUMMER, Fa = FALL)



The most abundant invertebrate taxa (total number collected during 1985) at Station 4-C were the undetermined immature tubificids (7,131/m^2), followed by the tubificid P. vejdovskyi (1,314/m^2), the orthoclandine Parakiefferiella sp., and the chironomids P. scalaenum (666/m2) and C. fluviatilis-gr (602/m2).

A total of 42 taxa, most of which were identified to species, were collected from Station 6-C near Calumet Harbor (Table AIII-3). There were 15 species of chironomids, 10 naidids, and 4 tubificids. The number of taxa ranged from a low of 13 during the fall to a maximum of 34 in the summer (Figure 3). The estimated mean abundance of invertebrates collected during the spring, summer, and fall were 1,107, 1,782, and 544 organisms/m^2, respectively, (Figure 4). Overall, the most abundant major invertebrate groups which contributed over 85% of the fauna during 1985 were the chironomids (46%), naidids (29%), and tubificids (10%) (Figure 5). The predominant benthic organisms (total number collected during 1985 at Station 6-C) were the midge C. fluviatilis (786/m^2), and the naidid worm P. michiganensis (418/m^2).

Sediment Quality

The chemical characteristics and 11 trace metal concentrations in the sediments for Stations 2-C, 4-C, and 6-C are summarized in Tables 11 and 12, respectively.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 11

CHEMICAL CHARACTERISTICS OF BOTTOM SEDIMENTS
IN THE INSHORE AREA OF SOUTHWESTERN
LAKE MICHIGAN OCTOBER 1985

Station	Constituent			
	Total Solids (%)	Volatile Solids (%)	Chemical Oxygen Demand (mg/kg)	Fats, Oils, and Greases (mg/kg)
Wilmette Harbor				
2-C	82.1	0.57	740	6
Chicago Harbor				
4-C	90.7	1.44	776	16
Calumet Harbor				
6-C	83.7	1.05	401	36

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 12

TRACE METALS IN BOTTOM SEDIMENTS IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN, OCTOBER 1985

Station	Metal*										
	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
Wilmette Harbor 2-C	<1.0	<0.02	6.0	12.0	6,680	6.0	212	<0.01	<0.2	<0.02	40
Chicago Harbor 4-C	<1.0	<0.02	10.0	12.0	18,000	7.0	590	<0.01	<0.2	<0.02	40
Calumet Harbor 6-C	<1.0	<0.02	5.0	14.0	10,900	7.0	290	<0.01	<0.2	<0.02	40

*Expressed in mg/kg of dry sediment.

STATION 2-C NEAR WILMETTE HARBOR

The percent total and volatile solids measured in the sediment at Station 2-C near Wilmette Harbor were 82.1 and 0.57%, respectively, the concentration of COD was 740 mg/kg, and the FOG measured 6 mg/kg (Table 11). Arsenic, cadmium, mercury, nickel, and silver were all below the detection limit (Table 12). The concentration of chromium, copper, iron, lead, manganese, and zinc in sediments at Station 2-C was 6.0, 12.0, 6,680, 6.0, 212, and 40.0 mg/kg, respectively.

STATION 4-C NEAR CHICAGO HARBOR

At Station 4-C near Chicago Harbor, the percent total and volatile solids in the sediments were 90.7 and 1.44%, respectively, the COD was 776 mg/kg and the concentration of FOG was 16 mg/kg (Table 11). Arsenic, cadmium, mercury, nickel, and silver were all below the detection limit (Table 12). The concentration of chromium, copper, iron, lead, manganese, and zinc in sediment at Station 4-C was 10.0, 12.0, 18,000, 7.0, 590, and 40.0 mg/kg, respectively.

STATION 6-C NEAR CALUMET HARBOR

The percent total and volatile solids in sediment of Station 6-C near Calumet Harbor were 83.7 and 1.05%, respectively, the COD concentration was 401 mg/kg.and the FOG measured was 36 mg/kg (Table 11). Arsenic, cadmium, mercury, nickel, and silver were all below the detection limit of 1.0, 0.02, 0.01, 0.2, and 0.02

mg/kg, respectively (Table 12). The concentration of chromium, copper, iron, lead, manganese, and zinc in the sediment was 5.0, 14.0, 10,900, 7.0, 290, and 40 mg/kg, respectively.

DISCUSSION

Bacteria

The southernmost station sampled in Lake Michigan, Station 7-A (Figure 1) is located within 275 meters of the mouth of Indiana Harbor. This station had the highest concentration of total coliform, fecal coliform, standard plate count, Escherichia coli, and Pseudomonas aeruginosa. As in 1984, this was the only station which did not meet the Illinois Pollution Control Board Lake Michigan open water quality standard of 20 fecal coliform per 100 mL. All stations (Table 2) met the Illinois beach standard of 500 fecal coliform per 100 mL. Salmonella was not recovered from any station. The bacterial results do not indicate any serious bacterial contamination of this area of Lake Michigan during the April through November sampling period.

Algae

POPULATIONS

Algal population densities determined for a body of water describe how many primary producers (algae) are supported by that water. Oligotrophic conditions are characterized by low population densities, eutrophic conditions are characterized by large populations, and mesotrophic conditions are characterized by populations intermediate to these extremes.

Three methods were used in 1985 to collect and estimate the total population densities of algae: (a) the column plankton-

net tow, (b) periphyton sampling, and (c) Kemmerer water bottle sampling.

The column plankton-net tow included all those organisms retained by the plankton-net mesh when hauled from the bottom to the surface at each station in Lake Michigan. Column plankton-net tow population densities (Table 3) ranged from 107 to 157 organisms per mL.

Periphyton are those algae growing or captured on microscope slides immersed for two weeks at the surface of the water column at each station in Lake Michigan. The total periphyton populations ranged from 203 organisms/cm^2 to 249,584 organisms/cm^2 (Table 3).

Kemmerer plankton were those planktonic algae captured in a Kemmerer water bottle at discrete depths. Two depths (one meter below the surface, and one meter above the bottom) were sampled in each area (Wilmette, Chicago, and Calumet harbors - Figure 1) of Lake Michigan. The average total Kemmerer plankton population at the three harbors ranged from 4,223 organisms/mL to 9,056 organisms/mL (Table 3).

Each of the methods used to estimate population densities produced different results, but the results were consistent within each method. For each method the conclusion was that the three areas sampled could be considered as one large sampling area.

Comparing the plankton-net tow population densities in this study (Table 3) with those determined for the vicinity of Zion during 1970 through 1975 (6) we find that the populations were higher in this study than they were in 1975 at Zion. For the Zion study (6) plankton-net tow densities of 25 to 61 organisms/mL were found during 1975 compared to the plankton-net tow densities of 107 to 157 organisms/mL for this study at Chicago, Wilmette, and Calumet harbors during 1985. Kemmerer water bottle samples were collected at Zion at the one meter depth from 1972 through 1975 (6), and the range of plankton organisms found was 519 to 4,079 organisms/mL. The range of plankton organisms found at the one meter depth in 1985 (3,973 to 11,378/mL) in the three harbor areas (Table 3) showed that the populations were higher in the harbor areas in 1985 than in the Zion area in 1975.

The conclusion based on these data regarding population densities is that the water quality of the area of Lake Michigan from Wilmette Harbor to Calumet Harbor has declined when compared with the Zion area during 1970 through 1975 (6).

COMMUNITY STRUCTURE

Community structure refers to the organisms making up the community and the number of species found. The numbers of plankton species found in the column plankton-net tow was 40, 48, and 41 for the Wilmette, Chicago, and Calumet harbor areas, respectively (Table 3). These data indicated similarity among

the stations. Among the total species identified 13 species were unique to Wilmette Harbor, Chicago Harbor had 20 unique species, and Calumet Harbor had 16 unique species, (Tables AII-1 to AII-3). Of the 75 species found in the column plankton-net tow samples only 23 species or 31 percent were common to all three harbor areas sampled (Tables AII-1 to AII-3).

The numbers of periphyton species (Table 3) were 13, 112, and 80 for the Wilmette (Station 2-B), Chicago (Station 4-B), and Calumet (Station 6-B) harbor areas, respectively. The total number of periphyton species found was 129.

The numbers of plankton species collected at each of the three harbor areas with the Kemmerer bottle water sampler (Table 3) were 167, 167, and 161, respectively, at Station 2-B, Station 4-B, and Station 6-B (Figure 1). The close correspondence of the number of plankton species suggested a similarity of environment for the Wilmette, Chicago, and Calumet harbor areas. The total number of plankton species found in all three harbor areas in southwestern Lake Michigan was 278, using the Kemmerer sampler. Ninety-eight of these plankton species (42 percent) were common to all stations, 37 species (16 percent) were unique to the Wilmette Harbor area (Station 2-B), 27 species (11 percent) were unique to the Chicago Harbor area (Station 4-B), and 29 species (12 percent) were unique to the Calumet Harbor area (Station 6-B), Tables AII-7 to AII-9. These data indicated the individuality of each area sampled.

Species diversities; i.e., the Shannon-Weaver Index, were reported by Tarapchak and Stoermer (7) to indicate trophic status as follows: >3.5 = oligotrophic (water deficient in nutrients), 3.5 to 2.5 = mesotrophic (water contains some nutrients), <2.5 = eutrophic (water is enriched with nutrients).

The mean species diversity (d) (7, 11) at Wilmette Harbor (Station 2-B), Chicago Harbor (Station 4-B), and Calumet Harbor (Station 6-B) (Figure 1) for the average Kemmerer plankton ranged from 1.01 to 1.22. Tarapchak and Stoermer (7) reported that Schelske found in the inshore waters of Lake Michigan at Grand Haven, Michigan, in 1971, species diversities of 1.79 to 2.93. Tarapchak and Stoermer also reported on the work by Piala and Lamble for 1971. Piala and Lamble found for the inshore waters of Lake Michigan at Zion that species diversities varied from 1.75 in late July to 3.0 in mid-January. It is clear that the species diversities found in this study (1985) were less than those found in 1971 in inshore areas not as heavily populated as the shoreline from the Wilmette Harbor to the Calumet Harbor areas (Stations 2-B to 6-B, Figure 1). The results of the Grand Haven and Zion studies established the range for species diversities for the southeastern and southwestern inshore waters of Lake Michigan during 1971. The species diversity results of this study were somewhat less in value (d = 0.77 to 1.22) and would indicate water of poorer quality than that found at Grand Haven and Zion in 1971.

Examination of Tables 4 and 5, which lists those organisms found in ≥90% of the samples collected and analyzed, shows that two of the seven periphyton and four of the 14 planktonic organisms were considered pollutant indicators by Palmer (27, 28). Tarapchak and Stoermer (7) called these same organisms eutrophic and mesotrophic to eutrophic indicators, (organisms that tolerated moderate enrichment), but added three oligotrophic organisms Cyclotella compacta, Cyclotella kuetzingiana and Cyclotella ocellata. One of these species, Cyclotella kuetzingiana, was found among the plankton at all three sampling sites (Tables 5 and 7), and was also found among the periphyton at Station 4-B at Chicago Harbor (Tables 4 and 6). Tarapchak and Stoermer (7) also listed three mesotrophic indicators (organisms found in oligotrophic waters that decreased in abundance with enrichment), Cyclotella michiganiana, Melosira islandica, and Tabellaria fenestrata. Tabellaria fenestrata was found persistent at all stations sampled in this study (Table 4 and Table 5). Of the four mesotrophic to eutrophic indicator organisms listed by Tarapchak and Stoermer (7), Asterionella formosa, Fragilaria crotonensis, Stephanodiscus hantzschii, and Stephanodiscus minutus, only one, Fragilaria crotonensis, was found to be persistent in this study (1985) among the periphyton at Chicago and Calumet harbors (Table 4). Two plankton, Asterionella formosa and Fragilaria crotonensis were found (Table 5) at Station 2-B at Wilmette

Harbor and at all three sampling stations, respectively. One category of indicator organisms listed by Tarapchak and Stoermer (7) was referred to as introduced eutrophic forms. This category was defined as those organisms either previously present in small percentages, and which have now become dominant in nutrient enriched water, or species that did not exist in Lake Michigan prior to cultural eutrophication. These organisms were: Diatoma tenue var. elongatum, Nitzschia dissipata (an indicator of advanced eutrophication), Stephanodiscus binderanus, and Stephanodiscus subtilis. None of these organisms was persistent during 1985.

Among the dominant organisms listed in Tables 6 and 7, 11 of 47 periphytic organisms (23 percent) and 9 of 50 plankton organisms (18 percent) were listed by Palmer (27, 28) as being pollutant-tolerant. According to the classification by Tarapchak and Stoermer (7) the oligotrophic indicator Cyclotella kuetzingiana was dominant (≥1% of the total population) at all stations among both plankton and periphyton. Cyclotella ocellata, an oligotrophic indicator, was found dominant among the plankton in Chicago Harbor (Station 4-B). Among the mesotrophic indicators, Tabellaria fenestrata was dominant at all stations among both periphyton and plankton. Melosira islandica, another mesotrophic indicator, was found dominant at all stations among the plankton, and at Wilmette and Chicago harbors among the periphyton. Of the four organisms

characterized as mesotrophic to eutrophic by Tarapchak and Stoermer (7), Asterionella formosa, Fragilaria crotonensis, Stephanodiscus minutus were found as dominants among the plankton and Asterionella formosa and Stephanodiscus minutus among the periphyton. Melosira granulata, a eutrophic indicator, was found dominant at every station among the plankton (Table 7) and at Chicago and Calumet harbors among the periphyton (Tables 6). Of the five organisms listed by Tarapcak and Stoermer (7) as being introduced eutrophic forms none were dominants among the plankton, but Nitzschia dissipata, an indicator of advanced eutrophication, was found among the periphyton at Chicago Harbor, (Station 2-B).

As with the persistent organisms, those organisms characterized as dominants were indicators of oligotrophy, mesotrophy, and eutrophy; i.e., the organisms found were indicative of a wide range of conditions, perhaps a reflection of a period of instability or transition.

Besides the organisms that are present it is sometimes helpful to examine those organisms that no longer inhabit an area. Historically Lake Michigan phytoplankton were still numerically dominated by diatoms (>70% diatoms) in 1962 through 1963 (29). By 1969 shifts in phytoplankton composition were noted by Schelske and Stoermer (30), to dominance by greens, blue-greens, and golden brown algae. By August 1969, Schelske and Stoermer found that up to 80% of the population density was

reported to be blue-green algae. The blue-greens remained dominant through October after the fall overturn resupplied the euphotic zone with nutrients.

During the monitoring conducted in this study (1985) diatoms maintained a numerical dominance of the population in the three harbors for all dates sampled. The diatom contribution to the population was 77 to 97 percent at Wilmette Harbor, 69 to 99.9 percent at Chicago Harbor, and 80 to 99.9 percent at Calumet Harbor.

The blue-green algal blooms reported in 1969 (30) and in 1970 to 1975 (6) no longer occur. Apparently a change in water quality, has restored Lake Michigan to a state in which diatoms dominate the algae population. This indicates improved water quality.

Comparing summer algal composition with studies conducted during the 1970's by the District (6) and Argonne National Laboratories (7), a clearly discernible improvement was found in Lake Michigan during 1985. The dominance of the green and blue-green algae in Lake Michgan summer algal populations found during the 1970's did not occur in 1985. Whereas the diatom contribution in the 1970's had been as low as 5% of the algal population, the lowest diatom contribution in 1985 was 69% of the algal population. The increased dominance and appearance of the oligotrophic indicator species Cyclotella kützingiana and C. ocellata along with the loss of dominance and reduced appearance

of the eutrophic indicator species Fragilaria capucina, Melosira granulata, and Stephanodiscus tenuis and the recently introduced eutrophic species Diatoma tenue var. elongatum, Nitzschia dissipata, Stephanodiscus binderanus, S. subtilis, and Cyclotella stelligera also confirms an improvement in water quality. The loss of Stephanodiscus hantzschii and S. minutus (mesotrophic to eutrophic indicators) from a position of dominance in the population also supports the hypothesis of water quality improvement, even though Fragilaria crotonensis and Asterionella formosa remained as dominants through most of the year. The increased dominance of Tabellaria fenestrata (mesotrophic indicator) throughout 1985 added weight to the conclusion of improved Lake Michigan water quality as compared to the 1970's.

Thus, the conclusion from population numbers alone was that the present water quality of Lake Michigan from Wilmette Harbor to Calumet Harbor had declined when compared with the area of the Zion Nuclear Power Plant during 1970 to 1975, as shown by increases in the population. The species diversity index, also showed that water quality in 1985 was less than during 1970 through 1975. Examination of the kinds of organisms now present indicated that the water quality was undergoing change; all trophic status indicators were represented. The shifts in populations of organisms from pollution-tolerant to more pollution-sensitive organisms, however, demonstrated an

improvement in water quality. Overall, the conclusion is that the waters of southwestern Lake Michigan have improved because the increase in algal populations has been to more pollution-sensitive organisms with a concomitant elimination or decrease in the pollution-tolerant organisms.

Benthic Invertebrates

RELATIVE ABUNDANCE AND SPECIES COMPOSITION

Benthic surveys similar to the present study have been conducted in the inshore area of Lake Michigan. These studies were done by Mozley and Garcia (31), and by the Great Lakes Research Division (32, 33, 34). The published data from these studies were used to recalculate mean abundances, and percentage composition results for total benthos at depths in the approximate range of 15 to 35 feet, to provide for easier comparisons with the results of the present study.

The present study (1985) showed that the invertebrate fauna of the inshore area of southwestern Lake Michigan at depths of 15 to 31 feet was dominated, numerically, by oligochaetes (58%) and chironomids (36%). In 1972, Mozley and Garcia (31) found that the most abundant major invertebrate groups in the coastal zone of southwestern Lake Michigan at depths ranging from 12 to 35 feet were the oligochaetes (50%) and chironomids (26%). However, the relative abundance of amphipods (17%) and sphaeriids (8%) was much greater in the 1972 survey than was found in the present study (2 and <1%, respectively).

Findings similar to that of the present study have also been reported by Ladronka (32), and Winnell (33, 34) in the near shore area of southwestern Lake Michigan at depths from 24 to 36 feet. In these three studies the benthos was dominated, numerically, by the oligochaetes (53%) and chironomids (21%). As was shown by Mozley and Garcia (31), amphipods accounted for a greater percentage of the benthic invertebrates (13%) compared to the present (1985) study (2%).

Even though the percent composition of the predominant benthic groups was similar in the above mentioned studies, the species composition differed. The 1972 survey by Mozley and Garcia (31) was composed primarily of Pontoporeia affinis, L. hoffmeisteri, P. nereis, Cryptochironomus sp., C. fluviatilis-gr., and S. striatinum. In the present study, the dominant invertebrates were P. vejdovskyi, A. pluriseta, P. hoyi, C. fluviatilis-gr., P. michiganensis, P. moldaviensis, Cladotanytarsus sp., Cryptochironomus sp. and S. lacustris. The most common benthic taxa in the present study included Cyphomella sp., C. fluviatilis-gr., P. scalaenum, P. michiganensis, V. intermedia, P. vejdovskyi, and G. pseudolimnaeus (Appendix AIII).

TROPHIC INDICES

Oligochaetes, because they comprise a major faunal group consisting of various species assemblages in habitats with all ranges of organic enrichment, have provided the basis for several indices of pollution which have been applied to the

Great Lakes. Two of these indices, total and percent composition, were applied to the present (1985) data.

The total number of oligochaetes was first proposed by Wright and Tidd (35) as a pollution index. They classified those benthic habitats possessing oligochaetes at less than 1,000/m^2 as having "negligible pollution." The presence of 1,000-5,000 oligochaetes/m^2 indicated "mild pollution," and more than 5,000/m^2 as evidence of "severe pollution." Based upon this classification, Station 2-C at Wilmette Harbor (mean = 686/m^2) and Station 6-C at Calumet Harbor (mean = 441/m^2) would be considered nonpolluted, and Station 4-C at Chicago Harbor (mean = 3,088/m^2) would be considered moderately polluted.

Goodnight and Whitley (36), working in a midwestern stream, used the relative abundance or percent composition of oligochaetes as a measure of the extent of organic enrichment. Fewer than 60% oligochaetes indicated "good conditions," between 60 and 80% "doubtful conditions," and more than 80% indicating "...a high degree of either organic enrichment or industrial pollution" (37). Using this index, Stations 2-C at Wilmette Harbor (29%) and 6-C at Calumet Harbor (39%) would be classified as good, and Station 4-C at Chicago Harbor (66%) as doubtful.

INDICATOR SPECIES

Another method frequently used to assess environmental quality is the indicator species approach. Benthic invertebrates are assigned to three classifications depending

upon the tolerance of each species to different concentrations of inorganic and/or organic wastes:

1. Intolerant - organisms which live in a narrow range of environmental conditions and are associated with "clean water."
2 Tolerant - organisms which can survive adverse environmental conditions.
3. Facultative - organisms capable of living under a wide range of environmental conditions, and which are associated with moderate amounts of pollution.

In other words, certain benthic invertebrate species have well-defined ecological requirements, and their presence or absence can be used as an indication of water quality.

In the present study, the benthic invertebrate community was dominated, numerically, by the naidid worm P. michiganensis, the tubificid worm, P. vejdovskyi, and the chironomids Cyphomella sp., P. scalaenum, and C. fluviatilis. Except for the midge Cyphomella sp., whose pollution tolerance is unknown, the other four benthic invertebrates are classified as facultative organisms (38, 39, 40, 34 and J. K. Hiltunen - personal communication with Irwin Polls, 1985), and are characteristic of mesotrophic or slightly enriched areas. Therefore, the high number of these facultative organisms at

each of the three sampling stations (2-C, 4-C, and 6-C) suggests that these areas are mesotrophic; i.e., moderately polluted.

Sediment Quality

Guidelines for the evaluation of Great Lakes harbor sediments, based on bulk sediment analysis, have been developed by the USEPA, Region V (41). Sediments are classified as heavily polluted, moderately polluted, or nonpolluted depending on the concentrations of 19 constituents. The overall classification of a sample is based on the most predominant classification of the individual constituents.

Using the USEPA's guidelines for volatile solids, COD, FOG, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, and zinc, the bottom sediments of the inshore area of southwestern Lake Michigan can be classified as nonpolluted. However, the concentration of iron (18,000 mg/kg), and manganese (590 mg/kg) at Station 4-C at Chicago Harbor, would classify these sediments as moderately and heavily polluted, respectively, for these two constituents.

Comparison of Bacteria, Algal, and Benthos Data

The four sets of bacterial data collected during 1985 from Lake Michigan showed no recovery of Salmonella and minimal counts for SPC, TC, FC, and PA. These indicated good water

quality in Lake Michigan at the Wilmette, Chicago and Calumet harbors.

The algal population densities found in 1985 were higher than those of ten years ago. The number of species have decreased resulting in lowered species diversity indices, but the dominant kinds of organisms present have changed back from blue-green algae to diatoms. The persistently dominant organisms were consistently indicative of mesotrophic to oligotrophic conditions, and so the algae generally indicated a good water quality for Lake Michigan.

The dominant benthic invertebrates were classified as facultative; i.e., organisms tolerating the wide range of conditions associated with moderate amounts of pollution. This is characteristic of the mesotrophic condition, and, thus, determined the water quality.

The sediments sampled were all classified as nonpolluted except for the sediments at Station 4-C at Chicago Harbor where the concentrations of iron and manganese, would classify the sediments as moderately, and heavily polluted, respectively.

In summary, it was the consensus of the data for the three ecological levels of biota that the water quality of southwestern Lake Michigan was mesotrophic to oligotrophic or moderately polluted to clean.

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APPENDIX AI

BACTERIAL RESULTS OF LAKE MICHIGAN SHORELINE SAMPLING - 1985

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-1

BACTERIAL RESULTS FROM SAMPLES COLLECTED 1,000 YARDS (915 METERS) OFFSHORE AT LAKE-COOK COUNTY LINE (STATION 1-A, FIGURE 1), 1985

Date	TC*	FC	FS	ME	SPC	E. Coli	PA	Salmonella
4-11-85	6	<1	150	<1	76	<1	<1	<0.15
6-17-85	59	<1	<1	<1	230	<1	<1	<0.15
8-26-85	12	<1	1	1	1,700	<1	<1	<0.15
10-22-85	390	6	6	<1	880	5	<1	<0.15
Geometric Mean	36	2	5	<1	402	1	<1	<0.15

*TC = Total Coliform, FC = Fecal Coliform, FS = Fecal Streptococcus, ME = Enterococci, SPC = Standard Plate Count, E. Coli = Escherichia coli, PA = Pseudomonas aeruginosa.

Note: All counts are expressed as colony forming units per 100 mL, except SPC which is colony forming units per mL.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-2

BACTERIAL RESULTS FROM SAMPLES COLLECTED 1,000 YARDS (915 METERS) OFFSHORE AT WILMETTE HARBOR (STATION 2-A, FIGURE 1), 1985

Date	TC*	FC	FS	ME	SPC	E. Coli	PA	Salmonella
4-23-85	1	<1	140	<1	45	<1	<1	<0.15
6-17-85	7	<1	<1	<1	400	2	<1	<0.15
8-26-85	24	<1	18	1	250	2	<1	<0.15
10-22-85	38	2	1	<1	290	<1	<1	<0.15
Geometric Mean	9	1	7	<1	190	1	<1	<0.15

*TC = Total Coliform, FC = Fecal Coliform, FS = Fecal Streptococcus, ME = Enterococci, SPC = Standard Plate Count, E. Coli = Escherichia coli, PA = Pseudomonas aeruginosa.

Note: All counts are expressed as colony forming units per 100 mL, except SPC which is colony forming units per mL.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-3

BACTERIAL RESULTS FROM SAMPLES COLLECTED 1,000 YARDS (915 METERS) OFFSHORE AT MONTROSE HARBOR (STATION 3-A, FIGURE 1), 1985

Date	TC*	FC	FS	ME	SPC	E. Coli	PA	Salmonella
4-11-85	1	<1	76	<1	27	<1	<1	<0.15
6-17-85	5	<1	<1	<1	270	<1	<1	<0.15
8-26-85	36	2	9	<1	250	4	<1	<0.15
10-22-85	30	<1	1	<1	940	<1	<1	<0.15
Geometric Mean	9	1	5	<1	203	1	<1	<0.15

*TC = Total Coliform, FC = Fecal Coliform, FS = Fecal Streptococcus, ME = Enterococci, SPC = Standard Plate Count, E. Coli = Escherichia coli, PA = Pseudomonas aeruginosa.

Note: All counts are expressed as colony forming units per 100 mL, except SPC which is colony forming units per mL.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-4

BACTERIAL RESULTS FROM SAMPLES COLLECTED 1,000 YARDS (915 METERS) OFFSHORE AT BREAKWATER GAP FOR CHICAGO HARBOR (STATION 4-A, FIGURE 1), 1985

Date	TC*	FC	FS	ME	SPC	E. Coli	PA	Salmonella
4-11-85	1	<1	130	<1	84	<1	<1	<0.15
6-17-85	10	<1	1	<1	260	<1	<1	<0.15
8-26-85	190	8	3	5	250	27	1	<0.15
10-22-85	22	4	5	<1	2,100	3	4	<0.15
Geometric Mean	14	2	7	1	327	3	1	<0.15

*TC = Total Coliform, FC = Fecal Coliform, FS = Fecal Streptococcus, ME = Enterococci, SPC = Standard Plate Count, E. Coli = Escherichia coli, PA = Pseudomonas aeruginosa.

Note: All counts are expressed as colony forming units per 100 mL, except SPC which is colony forming units per mL.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-5

BACTERIAL RESULTS FROM SAMPLES COLLECTED 1,000 YARDS (915 METERS) OFFSHORE AT JACKSON PARK HARBOR (STATION 5-A, FIGURE 1), 1985

Date	TC*	FC	FS	ME	SPC	E. Coli	PA	Salmonella
4-27-85	<1	<1	1	<1	60	<1	<1	<0.15
6-18-85	5	<1	7	<1	130	<1	<1	<0.15
8-27-85	170	2	<1	<1	1,200	<1	<1	<0.15
11-12-85	67	3	11	<1	530	10	2	<0.15
Geometric Mean	15	2	3	<1	270	2	1	<0.15

*TC = Total Coliform, FC = Fecal Coliform, FS = Fecal Streptococcus, ME = Enterococci, SPC = Standard Plate Count, E. Coli = Escherichia coli, PA = Pseudomonas aeruginosa.

Note: All counts are expressed as colony forming units per 100 mL, except SPC which is colony forming units per mL.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-6

BACTERIAL RESULTS FROM SAMPLES COLLECTED 1,000 YARDS (915 METERS) OFFSHORE AT BREAKWATER GAP FOR CALUMET HARBOR (STATION 6-A, FIGURE 1), 1985

Date	TC*	FC	FS	ME	SPC	E. Coli	PA	Salmonella
4-29-85	6	<1	70	<1	120	<1	<1	<0.15
6-18-85	8	1	1	<1	600	<1	<1	<0.15
8-27-85	1,600	3	8	1	2,500	5	<1	<0.15
10-30-84	490	110	36	<1	1,800	70	<1	<0.15
Geometric Mean	78	4	12	<1	754	4	<1	<0.15

*TC = Total Coliform, FC = Fecal Coliform, FS = Fecal Streptococcus, ME = Enterococci, SPC = Standard Plate Count, E. Coli = Escherichia coli, PA = Pseudomonas aeruginosa.

Note: All counts are expressed as colony forming units per 100 mL, except SPC which is colony forming units per mL.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-7

BACTERIAL RESULTS FROM SAMPLES COLLECTED 300 YARDS (275 METERS) OFFSHORE AT LIGHTHOUSE AT MOUTH OF INDIANA HARBOR (STATION 7-A, FIGURE 1), 1985

Date	TC*	FC	FS	ME	SPC	E. Coli	PA	Salmonella
4-29-85	500	19	<1	4	57,000	30	2	<0.15
6-18-85	600	33	1	4	48,000	19	4	<0.15
8-27-85	4,600	180	5	2	280,000	160	36	<0.15
11-12-85	>8,000	2,400	5	<1	48,000	1,100	34	<0.15
Geometric Mean	1,823	128	5	1	77,872	122	10	<0.15

*TC = Total Coliform, FC = Fecal Coliform, FS = Fecal Streptococcus, ME = Enterococci, SPC = Standard Plate Count, E. Coli = Escherichia coli, PA = Pseudomonas aeruginosa.

Note: All counts are expressed as colony forming units per 100 mL, except SPC which is colony forming units per mL.

APPENDIX AII

ALGAL AND CHEMICAL RESULTS FROM SAMPLES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-1

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, WILMETTE HARBOR (STATION 2-B, FIGURE 1), 1985

Organisms	Number of Organisms/Milliliter																
	3/18	4/3	4/17	4/30	5/13	5/30	6/13	6/24	7/9	7/24	8/6	8/19	9/18	10/2	10/18	11/13	12/10
Asterionella formosa	<1	22	60	59	8	63	27	44	12	<1	<1	2	5	14	13	38	11
A. gracillima	<1	8															
Coscinodiscus lacustris																	<1
Cyclotella bodanica		<1	<1														
C. striata			<1														
Diatoma elongatum		<1	<1				2										
Dictyosphaerium pulchellum										<1					<1		
Dinobryon sertularia				<1					<1								
Fragilaria construens	<1				4			23									
Fragilaria. construens var. subsalina	1	7	19	14													

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-1 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, WILMETTE HARBOR (STATION 2-B, FIGURE 1), 1985

Organisms	Number of Organisms/Milliliter																
	3/18	4/3	4/17	4/30	5/13	5/30	6/13	6/24	7/9	7/24	8/6	8/19	9/18	10/2	10/18	11/13	12/10
Fragilaria crotonensis	1	7	6	52	11	44	41	225	113	207	47	22	64	11	125	293	166
F. inflata													<1				
Fragilaria intermedia		2	2	16		16	18	20	4								
F. pinnata															<1		
Gleocystis gigas																<1	
Melosira ambigua	<1	3	<1			<1											
M. islandica	9	27	20	41	5	20	6	3	1							<1	
Navicula radiosa							<1										
Nephrocytium obesum													<1				
Nitzschia obtusa																<1	
N. sigmoidea			<1														

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-1 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, WILMETTE HARBOR (STATION 2-B, FIGURE 1), 1985

Organisms	Number of Organisms/Milliliter																
	3/18	4/3	4/17	4/30	5/13	5/30	6/13	6/24	7/9	7/24	8/6	8/19	9/18	10/2	10/18	11/13	12/10
Pediastrum sculptatum											<1		<1				
Rhizosolenia eriensis			<1	2		<1	<1						<1				<1
R. sp.					<1												
Staurastrum johnsonii var. tetracadiatum																	<1
Staurastrum tetracerum var. evolutum													<1				
S. sp. 1			<1														
S. sp. 2			<1		<1	<1											
Stephanodiscus astraea				<1	<1	<1											<1
S. niagarae			<1														
Synedra affinis var. obtusa	<1	3	3	1	<1	<1	<1										

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-1 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, WILMETTE HARBOR (STATION 2-B, FIGURE 1), 1985

Organisms	Number of Organisms/Milliliter																
	3/18	4/3	4/17	4/30	5/13	5/30	6/13	6/24	7/9	7/24	8/6	8/19	9/18	10/2	10/18	11/13	12/10
Synedra acus var. angustissima	<1																
S. acus var. radians		<1															
S. delicatissima			<1	2	<1	2	1	2	<1		<1	<1	<1	2	3	2	
S. delicatissima var. angustissima	<1	1	1	5	<1	1	<1	<1							<1		<1
Synedra ulna var. chaseana	<1	3	4	2	<1	2	2	<1									
S. ulna var. danica		<1															
Tabellaria fenestrata	2	8	7	30	6	36	36	51	15	25	9	8	11	19	4	15	13
Tabellaria flocculosa	<1	2	1	13	4	24	10	20	9	21	7	4	9	14	4	7	5
Unknown diatom																	
Total	22	97	133	239	45	243	147	390	156	255	66	37	95	60	151	364	206

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-2

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, CHICAGO HARBOR (STATION 4-B, FIGURE 1), JANUARY 22 TO SEPTEMBER 16, 1985

Organisms	Number of Organisms/Milliliter														
	1/22	3/4	3/18	4/1	4/15	4/30	5/13	5/28	6/13	6/24	7/9	7/22	8/7	8/19	9/16
Asterionella formosa	<1	<1	3	16	93	60	7	23	19	23	8	6	<1	1	2
A. gracillima			4	9											
Amphora ovalis						<1									
Chroococcus dispersus								<1							
Coscinodiscus lacustris						<1									
Cyclotella bodanica					<1	<1									
C. kuetzingiana			<1									<1			
C. striata						<1	<1								
Cymatopleura solea var. apiculata			<1												

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-2 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, CHICAGO HARBOR (STATION 4-B, FIGURE 1), JANUARY 22 TO SEPTEMBER 16, 1985

Organisms	Number of Organisms/Milliliter														
	1/22	3/4	3/18	4/1	4/15	4/30	5/13	5/28	6/13	6/24	7/9	7/22	8/7	8/19	9/16
Cymbella sp.							<1								
Diatoma elongatum		<1			<1	<1				<1					
D. vulgare		<1				<1									
Dictyosphaerium pulchellum				<1											<1
Dimorphococcus lunatus											<1				
Dinobryon sertularia															
Fragilaria brevistriata		<1			7										
F. construens		4	<1	<1		7	<1								
F. construens var. subsalina			6	1	2		2			<1					

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-2 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, CHICAGO HARBOR (STATION 4-B, FIGURE 1), JANUARY 22 TO SEPTEMBER 16, 1985

Organisms	Number of Organisms/Milliliter														
	1/22	3/4	3/18	4/1	4/15	4/30	5/13	5/28	6/13	6/24	7/9	7/22	8/7	8/19	9/16
Fragilaria crotonensis	<1	4	13	12	15	40	2	80	87	149	48	89	16	17	9
E. intermedia		4	13	4	13	7	<1	25	35	7	2				3
E. pinnata									2						
Frustula vulgaris															<1
Gomphosphaeria lacustris								<1							
Gyrosigma sp.															
Melosira ambigua		<1	<1		<1										
M. islandica	1	3	12	14	24	14	3	2	<1	1					
Microspora loefgrensii					<1										
M. pachyderma			2												

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-2 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, CHICAGO HARBOR (STATION 4-B, FIGURE 1), JANUARY 22 TO SEPTEMBER 16, 1985

Organisms	Number of Organisms/Milliliter														
	1/22	3/4	3/18	4/1	4/15	4/30	5/13	5/28	6/13	6/24	7/9	7/22	8/7	8/19	9/16
Pediastrum sculptatum														<1	
Pinnularia alpina															
Rhizosolenia eriensis				<1	<1	1		<1	<1						
Staurastrum sp.									<1						
Stephanodiscus astraea		<1		<1		<1	<1		<1						
S. dubius							<1								
S. niagarae		<1													
Stephanodiscus sp.			<1												
Synedra affinis var. obtusa delicatissima		<1	<1	15	3	<1	<1	<1	<1			<1			

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-2 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, CHICAGO HARBOR (STATION 4-B, FIGURE 1), JANUARY 22 TO SEPTEMBER 16, 1985

Organisms	Number of Organisms/Milliliter														
	1/22	3/4	3/18	4/1	4/15	4/30	5/13	5/28	6/13	6/24	7/9	7/22	8/7	8/19	9/16
Synedra delicatissima var. angustissima		<1	<1	<1	1	1	<1	<1	<1			<1	<1		
S. capitata var. capitata		<1													
S.	<1		<1		<1	2		<1	<1	1	<1	<1		<1	
S. fulgens		<1													
S. rumpens		<1													
S. tabulata	<1														
S. ulna		<1	2	2	3	1	1	2	1	<1	<1	<1			
S. ulna var. chaseana															

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-2 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, CHICAGO HARBOR (STATION 4-B, FIGURE 1), JANUARY 22 TO SEPTEMBER 16, 1985

Organisms	Number of Organisms/Milliliter														
	1/22	3/4	3/18	4/1	4/15	4/30	5/13	5/28	6/13	6/24	7/9	7/22	8/7	8/19	9/16
Synedra ulna var. longissima		<1													
Tabellaria fenestrata	<1	3	11	13	10	19	19	29	27	11	18	14	9	8	7
Tabellaria flocculosa	<1	1	2	2	3	8	4	21	8	7	8	5	6	3	9
Total	7	33	76	103	180	168	46	188	186	202	87	119	33	31	32

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-3

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, CHICAGO HARBOR (STATION 4-B, FIGURE 1), OCTOBER 2 TO DECEMBER 9, 1985

	Number of Organisms/Milliliter					
	10/2	10/17	10/28	11/12	11/26	12/9
Asterionella formosa	12	30	16	16	17	22
A. gracillima						
Amphora ovalis						
Chroococcus dispersus						
Coscinodiscus lacustris						<1
Cyclotella bodanica						
C. kuetzingiana						
C. striata						
Cymatopleura solea var. apiculata		<1				

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-3 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, CHICAGO HARBOR (STATION 4-B, FIGURE 1), OCTOBER 2 TO DECEMBER 9, 1985

	Number of Organisms/Milliliter					
	10/2	10/17	10/28	11/12	11/26	12/9
Cymbella sp.						
Diatoma elongatum						
D. vulgare						
Dictyosphaerium pulchellum						
Dimorphococcus lunatus					<1	
Dinobryon sertularia						
Fragilaria brevistriata						
F. construens						
F. construens var. subsalina					7	6

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-3 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, CHICAGO HARBOR (STATION 4-B, FIGURE 1), OCTOBER 2 TO DECEMBER 9, 1985

	Number of Organisms/Milliliter					
	10/2	10/17	10/28	11/12	11/26	12/9
Fragilaria crotonensis	52	104	34	86	62	36
E. intermedia						
E. pinnata						
Frustula vulgaris						
Gomphosphaeria lacustris						
Gyrosigma sp.		<1				
Melosira ambigua						
M. islandica				3	1	<1
Microspora loefgrensii						
M. pachyderma						

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-3 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, CHICAGO HARBOR (STATION 4-B, FIGURE 1), OCTOBER 2 TO DECEMBER 9, 1985

	Number of Organisms/Milliliter					
	10/2	10/17	10/28	11/12	11/26	12/9
Pediastrum sculptatum						
Pinnularia alpina	<1					
Rhizosolenia eriensis		<1			<1	<1
Staurastrum sp.						
Stephanodiscus astraea		<1		<1	<1	
S. dubius						
S. niagarae						
Stephanodiscus sp.						
Synedra affinis var. obtusa				<1		<1

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-3 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, CHICAGO HARBOR (STATION 4-B, FIGURE 1), OCTOBER 2 TO DECEMBER 9, 1985

	Number of Organisms/Milliliter					
	10/2	10/17	10/28	11/12	11/26	12/9
Synedra capitata var. capitata						
S. capitata var. capitata	<1	2	1	<1	<1	
S. delicatissima				<1		
S. delicatissima var. angustissima						
S. fulgens						
S. rumpens						
S. tabulata						
S. ulna				<1		
Synedra ulna var. chaseana				<1	<1	<1

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-3 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, CHICAGO HARBOR (STATION 4-B, FIGURE 1), OCTOBER 2 TO DECEMBER 9, 1985

	Number of Organisms/Milliliter					
	10/2	10/17	10/28	11/12	11/26	12/9
Tabellaria fenestrata						
Tabellaria flocculosa	6	4	15	68	17	15
Total	81	153	85	193	137	108

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-4

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, CALUMET HARBOR (STATION 6-B, FIGURE 1), 1985

Organisms	Number of Organisms/Milliliter																	
	3/19	4/4	4/18	4/29	5/14	5/31	6/13	6/25	7/11	7/23	8/7	8/20	9/16	10/3	10/17	11/12	11/26	12/9
Asterionella formosa	<1	81	90	55	49	37	17	10	1	7	<1	<1	<1	16	24	11	25	21
A. formosa var. acaroides		<1																
A. gracillima	1	13																
Botrydium granulatum								<1										
Coscinodiscus lacustris																		<1
Cyclotella bodanica		<1	<1			<1			<1	<1	<1				<1			4
C. striata		<1																
Cymatopleura solea									<1									
Diatoma elongatum			9	3			<1											
Dinobryon sertularia		3	<1					<1										

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-4 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, CALUMET HARBOR (STATION 6-B, FIGURE 1), 1985

Organisms	Number of Organisms/Milliliter																	
	3/19	4/4	4/18	4/29	5/14	5/31	6/13	6/25	7/11	7/23	8/7	8/20	9/16	10/3	10/17	11/12	11/26	12/9
Euglena sanguinea				<1														
Fragilaria construens		1	2			5	8											
F. construens var. subsalina	1	1	12	2	<1	15												
F. crotonensis	3	46	27	20	35	92	80	169	9	64	24	16	5	56	117	95	113	97
F. intermedia	2	24	7	3	5	9	20	52										
F. pinnata			<1															
Frustulia vulgaris var. capitata									<1									
Gomphonema olivaceum					<1													
Gyrosigma kützingii				<1														

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-4 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, CALUMET HARBOR (STATION 6-B, FIGURE 1), 1985

Organisms	Number of Organisms/Milliliter																	
	3/19	4/4	4/18	4/29	5/14	5/31	6/13	6/25	7/11	7/23	8/7	8/20	9/16	10/3	10/17	11/12	11/26	12/9
Melosira ambigua	<1		2	1														
M. islandica	4	15	44	9	9	2	<1						<1					<1
Melosira italica		<1																
Micractinium quadrisetum																		<1
Microspora pachyderma	<1																	
Mougeotia elegantula																		1
M. punctata											<1							
M. tumidula																		<1
M. sp.					1													
Navicula sp.									<1									
Pediastrum sculptatum					<1													

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-4 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, CALUMET HARBOR (STATION 6-B, FIGURE 1), 1985

Organisms	Number of Organisms/Milliliter																	
	3/19	4/4	4/18	4/29	5/14	5/31	6/13	6/25	7/11	7/23	8/7	8/20	9/16	10/3	10/17	11/12	11/26	12/9
Rhizosolenia eriensi		<1	<1	4	1	3										<1	<1	2
Stephanodiscus astraea		<1	<1	<1	<1	<1										<1	<1	
Stephanodiscus niagara	<1																	
Synedra affinis	<1	6	3	2	<1	<1	<1									<1		
var. obtusa																		
S. delicatissima				1	3	1		<1	<1	<1	<1	<1	<1	1	3	<1	<1	
S. delicatissima	<1	2	2	1	1	<1	<1			<1								<1
var. angustissima																		
S. fasciculata			<1															
S. ulna	<1	3	6	3	2	3	<1	<1									<1	<1
var. chaseana																		
S. ulna	<1																	
var. danica																		

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-4 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN, COLUMN PLANKTON TOW, CALUMET HARBOR (STATION 6-B, FIGURE 1), 1985

Organisms	Number of Organisms/Milliliter																	
	3/19	4/4	4/18	4/29	5/14	5/31	6/13	6/25	7/11	7/23	8/7	8/20	9/16	10/3	10/17	11/12	11/26	12/9
Tabellaria fenestrata	6	16	13	14	25	37	14	10	21	13	17	2	4	19	10	22	54	38
T. flocculosa	<1	6	5	5	25	29	6	5	1	9	11	<1	1	9	5	12	27	15
Total	26	223	127	126	161	237	150	250	18	96	56	21	13	101	160	149	224	178

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-5

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES
COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT WILMETTE HARBOR (STATION 2-B, FIGURE 1), DURING 1985

Organisms	4/30-5/13 Number of Organisms per Square Centimeter
Bacillariophyceae	
Asterionella formosa	6
Cyclotella glomerata	3
C. kuetzingiana	3
Diatoma elongatum var. minor	58
Fragilaria intermedia	9
Gomphonema olivaceum	21
Melosira islandica	3
Nitzschia acicularis	3
N. linearis	6
Synedra acus	37
S. ulna var. chaseana	3
Tabellaria fenestrata	3
Chlorophyceae	
Ankistrodesmus convolutus	48
Total	203

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING MARCH 4 TO JULY 22, 1985

Organisms	3/4-3/18	3/18-4/1	4/1-4/15	4/15-4/29	4/29-5/13	5/28-6/11	6/11-6/24	6/24-7/9	7/9-7/22
	(Number per square centimeter)								
Bacillariophyceae	869	4,263	23,594	194	30,971	69,462	47,450	318,275	401,426
Achnanthes affinis	25	49	674	2	999	2,917	6,398	147,685	152,396
A. conspicua							191		
A. exigua						139			
A. haukiana									
A. linearis		99							
Amphipleura pellucida	2		45	1	59 176	139 139	286	1,019	382
Amphora delicatissima									
A. ovalis		8							
A. veneta	8			1	59		95		
Asterionella formosa	5	33	180	5	881	3,472	2,483	2,546	

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING MARCH 4 TO JULY 22, 1985

Organisms	3/4-3/18	3/18-4/1	4/1-4/15	4/15-4/29	4/29-5/13	5/28-6/11	6/11-6/24	6/24-7/9	7/9-7/22
	(Number per square centimeter)								
Cocconeis diminuta									
C. pediculus							95		
C. placentula			45		59				
Cyclotella glomerata	40	197	449	6	353	1,250	95		
C. iris				<1	59		95		
C. keutzingiana	7	66	315	3	646	417	382	3,056	187,153
C. ocellata									
C. pseudostelligera			45			278			
Cymatopleura solea									
Cymbella affinis			270 180						

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING MARCH 4 TO JULY 22, 1985

Organisms	3/4-3/18	3/18-4/1	4/1-4/15	4/15-4/29	4/29-5/13	5/28-6/11	6/11-6/24	6/24-7/9	7/9-7/22
	(Number per square centimeter)								
Cymbella cistula			180						
C. helvetica			45						
C. prostrata	20		225	2	235				2,292
C. protracta		49				1,111	1,719	9,167	
C. tumida							95		
C. ventricosa									
Diatoma elongatum	186	1,914	9,841	100		1,111	17,092	56,019	35,139
D. elongatum var. minor				22	13,045	42,222			
D. vulgare	2	99	854						
Diploneis ovalis					59				

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING MARCH 4 TO JULY 22, 1985

Organisms	3/4-3/18	3/18-4/1	4/1-4/15	4/15-4/29	4/29-5/13	5/28-6/11	6/11-6/24	6/24-7/9	7/9-7/22
	(Number per square centimeter)								
Fragilaria bicapitata	7	25			59	139	573	509	
F. construens var. subsalina	5		315	1	588	2,083	1,719	1,019	
F. crotonensis	15	197	539	5	646	3,333	4,392	4,583	3,056
F. harrissonii					59				
F. intermedia	20	197	809	3	294	972	1,050	5,093	10,694
F. pinnata	7	90	180	1	176	417	382	1,528	764
Gomphonema abbreviatum		8							
G. olivaceum	303	485	3,056	2	118		382	2,037	
G. olivaceum var. calcarea			494						
G. parvulum									

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING MARCH 4 TO JULY 22, 1985

Organisms	3/4-3/18	3/18-4/1	4/1-4/15	4/15-4/29	4/29-5/13	5/28-6/11	6/11-6/24	6/24-7/9	7/9-7/22
	(Number per square centimeter)								
Hantzschia elongatum	7	33			59				
Melosira granulata		33		3	176	278			
M. islandica	2	41	90	3	470	833	382	1,528	764
Navicula bacillum									
N. cryptocephala	7					278	95	509	
N. cryptocephala var. veneta				1	118			509	
N. exigua	2				59			509	
N. grimmei					59				
N. lanceolata									
N. placentula					59				

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING MARCH 4 TO JULY 22, 1985

Organisms	3/4-3/18	3/18-4/1	4/1-4/15	4/15-4/29	4/29-5/13	5/28-6/11	6/11-6/24	6/24-7/9	7/9-7/22
	(Number per square centimeter)								
Navicula tripunctata	235								
Nitzschia acicularis						139			
N. clausii	2			<1					
N. dissipata	10	8	45	<1	118	417	191		1,146
N. fonticola	12	33	180	<1	235	1,528	1,432	2,546	2,674
N. frustulum		8	45	<1	176	278	382		
N. gracilis	7	24	90	1	118	139	668	1,528	
N. hungarica									382
N. linearis				2	177	139	191		
N. recta	2					278	286		382

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING MARCH 4 TO JULY 22, 1985

Organisms	3/4-3/18	3/18-4/1	4/1-4/15	4/15-4/29	4/29-5/13	5/28-6/11	6/11-6/24	6/24-7/9	7/9-7/22
	(Number per square centimeter)								
Nitzschia sigmoidea							95		
Pinnularia viridis var. *sudeticus*	2								
Rhizosolenia longiseta						15			
Rhoicosphenia curvata		8							
Scoliopleura peisonis		8		59					382
Stephanodiscus astraea	7	58	45	1	294	139	477	509	
S. hantzschii									
S. minutus	20	140	1,303	3	529	278	95		
Surirella angustata	2								
S. linearis var. *constricta*							95		

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING MARCH 4 TO JULY 22, 1985

Organisms	3/4-3/18	3/18-4/1	4/1-4/15	4/15-4/29	4/29-5/13	5/28-6/11	6/11-6/24	6/24-7/9	7/9-7/22
	(Number per square centimeter)								
Synedra acus		41	674	14	5,876	833	859	1,528	382
S. gaillonii		74							
S. nana	5								
S. ulna	22	58	1,078	<1	176		191		
S. ulna var. *chaseana*	5	16	1,168	2	764	1,667			
Tabellaria fenestrata	25	214	180	2	2,644	1,806	4,201	9,167	3,438
T. flocculosa	5	8				278	286		
Chlorophyceae		608	120		2,739	64,387	14,152	174,504	104,253
Ankistrodesmus convolutus			18						
A. falcatus					30				
Cladophora sp. I					2,335	64,159	9,073	170,368	93,946

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING MARCH 4 TO JULY 22, 1985

Organisms	3/4-3/18	3/18-4/1	4/1-4/15	4/15-4/29	4/29-5/13	5/28-6/11	6/11-6/24	6/24-7/9	7/9-7/22
	(Number per square centimeter)								
Cladophora sp. II							1,259		
Cosmarium sp.								414	
Gleocystis vesiculosa									
Kirchneriella obesa									
Mougeotia sp. I			585						
M. sp. II									
Oedogonium sp.									
Oocystis pusilla									
O. solitaria								414	
Rhizoclonium hieroglyphicum									8,721
Scenedesmus bijuga						228		3,308	

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING MARCH 4 TO JULY 22, 1985

Organisms	3/4-3/18	3/18-4/1	4/1-4/15	4/15-4/29	4/29-5/13	5/28-6/11	6/11-6/24	6/24-7/9	7/9-7/22
	(Number per square centimeter)								
Scenedesmus quadricauda									1,586
Spirogyra sp.									
Stichococcus bacillaris				120	374				
Stigeoclonium polymorphum							2,865		
Ulothrix sp.							955		
Chrysophyceae					90	342	173	3,308	1,982
Dinobryon.							43	3,308	1,982
divergens									
D.					90	342	130		
sertularia									
Myxophyceae					1,676	1,941	3,906	49,522	105,055
Anabaena wisconsinense									
Chroococcus dispersus									
Gomphosphaeria lacustris							43		

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING MARCH 4 TO JULY 22, 1985

Organisms	3/4-3/18	3/18-4/1	4/1-4/15	4/15-4/29	4/29-5/13	5/28-6/11	6/11-6/24	6/24-7/9	7/9-7/22
	(Number per square centimeter)								
Gomphosphaeria lacustris var. compacta									
Lyngbya limnetica					853				
Merismopedia elegans									
Oscillatoria agardhii									4,767
O. limnetica					823	1,941	3,429	49,522	87,207
O. subbrevis									13,081
O. tenuis							434		
Spirulina laxa									
Dinophyceae									
Glenodinium borgei									
Peridinium inconspicuum									

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING MARCH 4 TO JULY 22, 1985

Organisms	3/4-3/18	3/18-4/1	4/1-4/15	4/15-4/29	4/29-5/13	5/28-6/11	6/11-6/24	6/24-7/9	7/9-7/22
	(Number per square centimeter)								
Number of species	35	33	34	32	45	37	43	27	23
Diatoms	869	4,263	23,594	194	30,971	69,462	47,450	318,275	401,426
Non diatoms	0	0	603	120	4,505	66,670	18,231	227,334	211,290
Total Peryphtic Algae	869	4,263	24,197	314	35,476	136,132	65,681	545,609	612,716

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING JULY 22 to OCTOBER 28, 1985

Organisms	7/22-8/5	8/5-8/19	9/16-10/2	10/2-10/17	10/17-10/28
	(Number per square centimeter)				
Bacillariophyceae	103,124	247,877	101,202	165	339
Achnanthes affinis	34,167	163,625	29,123	23	14
A. conspicua					7
A. exigua		917			
A. haukiana	1,042				
A. linearis					
Amphipleura pellucida			419		
Amphora delicatissima	208	458	419		7
A. ovalis	417		419		
A. veneta					
Asterionella formosa					

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING JULY 22 to OCTOBER 28, 1985

Organisms	7/22-8/5	8/5-8/19	9/16-10/2	10/2-10/17	10/17-10/28
	(Number per square centimeter)				
Cocconeis diminuta			210		
C. pediculus		1,375			
C. placentula	208	917	210		
Cyclotella glomerata					
C. iris					
C. keutzingiana	15,833	7,333	4,609	18	28
C. ocellata				5	
C. pseudostelligera					
Cymatopleura solea			210		
Cymbella affinis					

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING JULY 22 to OCTOBER 28, 1985

Organisms	7/22-8/5	8/5-8/19	9/16-10/2	10/2-10/17	10/17-10/28
	(Number per square centimeter)				
Cymbella cistula					
C. helvetica					
C. prostrata	416	1,375	2,514		
C. protracta					
C. tumida					
C. ventricosa	208	458			
Diatoma elongatum	16,875	34,833	27,238	28	62
Diatoma elongatum var. minor					
D. vulgare		419		7	
Diploneis ovalis					

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7(Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING JULY 22 to OCTOBER 28, 1985

Organisms	7/22-8/5	8/5-8/19	9/16-10/2	10/2-10/17	10/17-10/28
	(Number per square centimeter)				
Fragilaria bicapitata	417	458	629		
E. construens var. subsalina	625				
E. crotonensis	4,375	19,708	6,914	14	14
E. harrissonii					
E. intermedia	7,917	3,208	2,305	5	41
Fragilaria pinnata	1,042	1,833	2,305		
Gomphonema abbreviatum				5	
G. olivaceum	1,250	458	1,048		
G. olivaceum var. calcarea					
G. parvulum					7

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING JULY 22 to OCTOBER 28, 1985

Organisms	7/22-8/5	8/5-8/19	9/16-10/2	10/2-10/17	10/17-10/28
	(Number per square centimeter)				
Hantzschia elongatum			210		
Melosira granulata					
M. islandica	1,250	458	1,467		
Navicula bacillum		458			
N. cryptocephala	1,458	1,833	1,257		
N. cryptocephala var. veneta	833				
N. exigua	417				
N. grimmei					
N. lanceolata					7
N. placentula					

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING JULY 22 to OCTOBER 28, 1985

Organisms	7/22-8/5	8/5-8/19	9/16-10/2	10/2-10/17	10/17-10/28
	(Number per square centimeter)				
Navicula tripunctata	208				
Nitzschia acicularis					
N. clausii					
N. dissipata	208				
N. fonticola	4,375	2,292	2,514	9	28
N. frustulum	625		1,467		7
N. gracilis	2,292		2,305		14
N. hungarica	208	458	210		
N. linearis				5	
N. recta	208				7

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING JULY 22 to OCTOBER 28, 1985

Organisms	7/22-8/5	8/5-8/19	9/16-10/2	10/2-10/17	10/17-10/28
	(Number per square centimeter)				
Nitzschia sigmoidea					
Pinnularia viridis var. sudeticus					
Rhizosolenia longiseta					
Rhoicosphenia curvata					
Scoliopleura peisonis		419			
Stephanodiscus astraea	625	917	210		
S. hantzschii					
S. minutus					7
Surirella angustata					
S. linearis var. constricta					

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING JULY 22 to OCTOBER 28, 1985

Organisms	7/22-8/5	8/5-8/19	9/16-10/2	10/2-10/17	10/17-10/28
	(Number per square centimeter)				
Synedra acus			419	14	41
S. gaillonii					
S. nana					
S. ulna			419		
S. ulna var. chaseana			1,886		
Tabellaria fenestrata	5,000	3,667	10,266	32	48
T. flocculosa	417				
Chlorophyceae	10,307	95,853	11,552	78,458	
Ankistrodesmus convolutus					
A. falcatus					
Cladophora sp. I		93,946	8,822	34,127	

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING JULY 22 to OCTOBER 28, 1985

Organisms	7/22-8/5	8/5-8/19	9/16-10/2	10/2-10/17	10/17-10/28
	(Number per square centimeter)				
Cladophora sp. II					
Cosmarium sp.				91	
Gleocystis vesiculosa					
Kirchneriella obesa				364	
Mougeotia sp. I				18,934	
M. sp. II				24,942	
Oedogonium sp.			1,934		
Oocystis pusilla		187			
O. solitaria					
Rhizoclonium hieroglyphicum	8,721				
Scenedesmus bijuga					

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING JULY 22 to OCTOBER 28, 1985

Organisms	7/22-8/5	8/5-8/19	9/16-10/2	10/2-10/17	10/17-10/28
	(Number per square centimeter)				
Scenedesmus quadricauda	1,586	506	455		
Spirogyra sp.		1,214			
Stichococcus bacillaris			341		
Stigeoclonium polymorphum					
Ulothrix sp.					
Chrysophyceae	1982	560		546	
Dinobryon divergens	1,982	467		546	
D. sertularia		93			
Myxophyceae	2,660	24,344	1,547		
Anabaena wisconsinense			637		
Chroococcus dispersus	47				
Gomphosphaeria lacustris	93				

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING JULY 22 to OCTOBER 28, 1985

Organisms	7/22-8/5	8/5-8/19	9/16-10/2	10/2-10/17	10/17-10/28
	(Number per square centimeter)				
Gomphosphaeria lacustris var. compacta			91		
Lyngbya limnetica					
Merismopedia elegans		228			
Oscillatoria agardhii	93	341			
O. limnetica	2,427	23,661	819		
O. subbrevis					
O. tenuis					
Spirulina laxa		114			
Dinophyceae	93	228			
Glenodinium borgei		114			
Peridinium inconspicuum	93	114			

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING JULY 22 to OCTOBER 28, 1985

Organisms	7/22-8/5	8/5-8/19	9/16-10/2	10/2-10/17	10/17-10/28
	(Number per square centimeter)				
Number of species	37	35	34	18	16
Diatoms	103,124	247,877	101,202	165	339
Nondiatoms	15,042	120,985	13,099	79,004	0
Total Periphytic Algae	118,166	368,862	114,301	79,169	339

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), APRIL 4 TO NOVEMBER 26, 1985

Organisms	4/4-4/18	4/18-4/29	4/29-5/14	5/14-5/31	5/31-6/14	6/14-6/25	6/25-7/11	7/11-7/23	8/7-8/20	9/16-10/3	10/3-10/17	11/12-11/26
	(Number per square centimeter)											
Bacillariophyceae	849	4,384	5,998	15,932	271,738	14,247	238,718	357,500	85,896	768,684	91,658	1,979
Achnanthes affinis	3		12	183		53	3,438	3,056	1,188	2,118	180	25
A. conspicua								611				
A. exigua					407							
A. haukiana						26		3,056			6	
Amphipleura pellucida				61						1,956	1,618	25
Amphora ovalis								1,222	326			
A. veneta						26		611		180		
Asterionella formosa			35	275	5,296	922		611	163	4,134	31	
Cyclotella glomerata		9	12	275		237						38
C. iris								611				
C. keutzingiana			35	92	815	105	3,056	3,056	7,809	5,703	3,595	19
C. pseudostelligera								611				
C. stelligera						26						
Cymbella prostrata							2,674	4,278	489	719	6	
Diatoma elongatum	431			61	227,333	5,189	181,806	214,500	47,870	30,474	24,265	
D. elongatum var. minor		3,142	4,942	11,733								

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), APRIL 4 TO NOVEMBER 26, 1985

Organisms	4/4-4/18	4/18-4/29	4/29-5/14	5/14-5/31	5/31-6/14	6/14-6/25	6/25-7/11	7/11-7/23	8/7-8/20	9/16-10/3	10/3-10/17	11/12-11/26
	(Number per square centimeter)											
Diatoma elongatum var. tenue												597
D. vulgare	80	139		31						1,956	1,797	151
Fragilaria bicapitata				31	814	237				815	539	
F. capucina												101
F. construens											180	
F. construens var. subsalina	6	61			407	105	382			326		
F. crotonensis	19	52	23	397	4,889	2,134	6,875	34,222	18,333	11,570	6,650	25
F. intermedia	103	373	590	1,864	11,407	1,106	10,694	21,389	5,432	684,432	4,493	226
F. pinnata					1,630	237	2,674	4,278		978	2,157	19
Gomphonema abbreviatum											899	
G. olivaceum	132	269	12	31				611	3,585		346	
G. olivaceum var. calcerea	6								170			
G. parvulum											539	
Hantzschia elongata				31								

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), APRIL 4 TO NOVEMBER 26, 1985

Organisms	4/4-4/18	4/18-4/29	4/29-5/14	5/14-5/31	5/31-6/14	6/14-6/25	6/25-7/11	7/11-7/23	8/7-8/20	9/16-10/3	10/3-10/17	11/12-11/26
	(Number per square centimeter)											
Melosira granulata	3					211						
M. islandica	6				407		764	3,667		489	891	
Navicula cryptocephala					407	26					180	
N. cryptocephala var. veneta						26		611	170			
N. exigua											180	
N. hungarica var. lueneburgensis												6
N. pupula						26						
Navicula tripunctata						26	382				180	
Nedium dubium											180	
Nitzschia acicularis				31								31
N. dissipata				31							359	31
Nitzschia fonticola			12	214	4,074	316	764	2,444	2,037	1,141	4,134	38
N. frustulum		9		31	815	26		340	652	539	13	
N. gracilis		17		31	815				340	1,793	2,516	38
N. hungarica						26		611				

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), APRIL 4 TO NOVEMBER 26, 1985

Organisms	4/4-4/18	4/18-4/29	4/29-5/14	5/14-5/31	5/31-6/14	6/14-6/25	6/25-7/11	7/11-7/23	8/7-8/20	9/16-10/3	10/3-10/17	11/12-11/26
	(Number per square centimeter)											
Nitzschia linearis				31							1,258	44
N. palea												13
N. recta						26						
N. unknown #5		9										
Pinnularia microstauron												6
Scoliopleura peisonis					407		382	1,222				
Stephanodiscus astraea		9			815	158	382	1,833	170	326	359	19
S. hantzschii	3										180	
S. minutus			35	30		53			170			
Synedra acus	6	208	243	336	1,222	132				7,822	8,987	
S. nana												6
S. pulchella		9										
S. ulna	19	52	12					611		489	359	
S. ulna var. *chaseana*	32	17		92			764	2,444	326			
Tabellaria fenestrata		9	35		8,963	2,608	22,535	47,667	1,867	10,592	19,052	119

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), APRIL 4 TO NOVEMBER 26, 1985

Organisms	4/4-4/18	4/18-4/29	4/29-5/14	5/14-5/31	5/31-6/14	6/14-6/25	6/25-7/11	7/11-7/23	8/7-8/20	9/16-10/3	10/3-10/17	11/12-11/26
	(Number per square centimeter)											
Tabellaria flocculosa				31	815	184	1,146	3,667	163	359		
Chlorophyceae												
Ankistrodesmus braunii					579		30,753	19,971	1,240	2,942	32	
Botryococcus sudeticus					83							
Cladophora sp.					248		28,887	19,971	1,240			
Mougeotia sp.										2,862		
Pediastrum boryanum										16		
Planktonema lauterbornii							1,217					
Scenedesmus bijuga					83							
S. quadricauda					165		649			64		
										32		
Chrysophyceae				20	41	61	1,379					
Dinobryon divergens						61	1,379			32		
D. sertularia				20	41							
Myxophyceae				281			9,088	84,000	1,098	627		
Gomphosphaeria lacustris										32		
Lyngbia limnetica				281								

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), APRIL 4 TO NOVEMBER 26, 1985

Organisms	4/4-4/18	4/18-4/29	4/29-5/14	5/14-5/31	5/31-6/14	6/14-6/25	6/25-7/11	7/11-7/23	8/7-8/20	9/16-10/3	10/3-10/17	11/12-11/26
	(Number per square centimeter)											
Oscillatoria limnetica							9,088	84,000	1,098	595		
Dinophyceae												
Peridinium inconspicuum							162					
Number of species	14	16	13	25	24	28	22	27	15	30	32	26
Diatoms	849	4,384	5,998	15,932	271,738	14,247	238,718	357,500	85,896	768,684	91,658	1,979
Nondiatoms	0	0	0	292	620	61	41,382	103,971	2,388	3,601	32	0
Total Periphytic Algae	849	4,384	5,998	16,224	272,358	14,308	280,100	461,471	88,234	772,285	91,690	1,979

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1), DURING 1985

Organisms	3/18	4/3	4/17	4/30	5/13	5/30	6/13	6/24	7/9	7/24	8/6	8/19	9/18	10/2	10/18	11/13	12/10
Bacillariophyceae (Diatoms)	1,439	3,471	4,298	5,655	5,568	8,208	4,266	4,621	3,370	7,117	6,655	2,607	3,275	2,566	1,452	2,078	3,761
Achnanthes affinis	10	17	8	7		13	25			48	16	121		2	2	18	26
A. conspicua			3				6			19						19	15
A exigua	14	31	11	11		18	55				4	21			6	23	50
A. haukiana	6	7	14				24			45		8			2	9	44
A. linearis		7															
A. montana																3	
Amphipleura pellucida							3										
Amphiprora ornata															2		
Amphora commutata								6									5
Amphora delicatissima	12	31	11					34	3		6	4	4	16		31	45
A. ovalis	1		<1						16					4			10
A. veneta	4					7		19			13			4		9	20
Asterionella formosa	65	575	925	1,094	1,338	1,975		674	695	282	150	25	60	459		161	207
Caloneis ladogensis								12									
Cocconeis diminuta	4	3									6						

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1), DURING 1985

Organisms	3/18	4/3	4/17	4/30	5/13	5/30	6/13	6/24	7/9	7/24	8/6	8/19	9/18	10/2	10/18	11/13	12/10
Cocconeis pediculus	1	7		5										4		3	10
C. placentula	1	3	3					3								1	
Cyclotella glomerata	39	14	24	58	11		219	7		36	41					95	20
C. iris	4	7	5							7	37	22	8	13	7	4	
C. kuetzingiana	35	37	24	31	41	20	33	63	228	2,322	4,719	1,234	2,623	520	92	21	82
C. kuetzingiana var. radiosa																1	
C. meneghiniana	1	3														3	
C. michiganiana							6										
C. ocellata	3	7	5				6	3	10	6				17		18	13
Cymatopleura solea	1	3	5					5			8					1	
Cymbella cistula													4				
C. naviculiformis							6										
C. prostata																	10
C. ventricosa	4						6										
Denticula elegans																1	

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1), DURING 1985

Organisms	3/18	4/3	4/17	4/30	5/13	5/30	6/13	6/24	7/9	7/24	8/6	8/19	9/18	10/2	10/18	11/13	12/10
Diatoma elongatum	6	20	116	296	231	360	191	15		7		24		2		12	13
Diploneis ovalis																	8
D. ovalis var. oblongella	1													2			
Fragilaria bicapitata	48	71	84	81		36	50				8	8	38	6	3	30	164
F. construens var. subsalina	11	31	27	72	33	82	95	109	39	20			4	4		12	42
F. crotonensis	98	102	100	87	306	322	291	1,017	697	1,294	291	133	124	282	769	418	864
F. harrisonii		3	5														
F. intermedia	12	17	5				12		9	20	12	15	40	6		3	28
F. pinnata	48	41	95		3	9	26		1	6		17		2	5	30	102
Gomphonema abbreviatum																5	20
G. olivaceum	1	3					22										10
G. parvulum																11	
Gyrosigma kützingii		3								14							
Hantzchia elongatum	4	10	16		3		6					1				8	10

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1), DURING 1985

Organisms	3/18	4/3	4/17	4/30	5/13	5/30	6/13	6/24	7/9	7/24	8/6	8/19	9/18	10/2	10/18	11/13	12/10
Melosira distans			6			18											
M. granulata	111	323	325	182	67	69	95	3									
M. islandica	309	528	380	583	294	416	150	40	7	62	17	42	8	34	5	139	340
Navicula anglica	1		5													4	
N. bacillaria													2				
N. bicontracta										8							
N. cari		7															
N. cryptocephala	6	3					12			29	8	4	12	2		4	3
N. cryptocephala var. veneta	4	10	16			7	45	3		20	4	8	4		2	11	43
N. exigua	4	3	3	5		13	12			19					4	6	
N. grimmei															2		
N. platystoma			5							7							
N. pupula		7															3
N. protracta	1																
N. similis													8				

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1), DURING 1985

Organisms	3/18	4/3	4/17	4/30	5/13	5/30	6/13	6/24	7/9	7/24	8/6	8/19	9/18	10/2	10/18	11/13	12/10
Navicula tripunctata		3															
Nedium dubium						9						4					5
Nitzschia acicularis					103		17							28		6	
N. capitellata																	5
N. dissipata		7	5				23		5	13		1	8	4		8	5
N. fonticola	6	7	6		7		35	3	15	155	21	70	116	52	4	73	35
N. frustulum	1	3	8				3			33		8	17	2	4	27	130
N. gracilis	3	3					36		2	6	16	41	57	29	13	56	85
N. hungarica			8									4				11	5
N. linearis	3	27	27	5	178	174	138			7						37	65
N. palea							7										
N. recta	4	3	6	104			19			6						3	15
N. unknown #5																	5
Pinnularia molaris															2		
Rhizosolenia eriensis					2										7	1	
R. longiseta		10	20		160	20											

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1), DURING 1985

Organisms	3/18	4/3	4/17	4/30	5/13	5/30	6/13	6/24	7/9	7/24	8/6	8/19	9/18	10/2	10/18	11/13	12/10
Rhoicosphenia curvata	1	3														3	
Scoliopleura peisons	4		5				6						4		2	11	3
Stephanodiscus astraea	107	238	252	194	10	67	101	17	7	6	4	17	8	6	2	68	235
S. hantzschii			20	11												18	10
S. minutus	72	556	308	222	72	67	62	7	1					8			
Surirella angustata							6					8			2	11	27
S. biseriata																1	
S. ovalis	1																
S. ovata			3														
Synedra acus	43	133	598	1,236	969	390	237	16	10	49	8		8	66	47	50	3
S. ulna	1																
S. ulna var. chaseana	65	184	355	151	124	306	103	16		7	4					20	23
Tabellaria fenestrata	230	299	423	1,170	1,457	3,351	1,968	2,365	1,640	2,332	1,262	717	82	977	464	560	880
T. flocculosa	28	61	27	50	159	459	109	168	1	232		50	32	19	4		18
Chlorophyceae	5	29	52	403	409	308	47	21	33	106	86	67	13	38	69	74	52
Ankistrodesmus braunii														2			

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1), DURING 1985

Organisms	3/18	4/3	4/17	4/30	5/13	5/30	6/13	6/24	7/9	7/24	8/6	8/19	9/18	10/2	10/18	11/13	12/10
Ankistrodesmus convolutus	5	3	3		2	10	11	3				2		7	11	16	
A. falcatus				5	7										7	1	1
Characium debaryanum						26											
Chlamydomonas globosa				4													
C. sphagnicola														<1		1	
Cladophora sp. 1						17						19					
Closteriopsis longissima		3				5											
C. longissima var. tropica				2										<1			
Closterium longissima							1										
C. venus					2												
Coelastrum microporum					2						2			<1		1	
Cosmarium pachydermum var. pussillum										2							
C. tenue				5								7					
Crucingenia quadrata														<1			
Dictyosphaerium pulchellum																	

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1), DURING 1985

Organisms	3/18	4/3	4/17	4/30	5/13	5/30	6/13	6/24	7/9	7/24	8/6	8/19	9/18	10/2	10/18	11/13	12/10
Dimorphococcus sp.														<1			
Gleocystis vesiculosa										2							
Kirchneriella obesa														2			
Lagerheimia ciliata											1						
Micractinium pusillum												2					
Mougeotia sp.					92												
Nephocytium obesum														<1			
Oocystis parva		13	13	25	15			14	28	35	44	10		14	22	11	19
O. pusilla											6						
O. solitaria								1		30	6	10	13				
Pandorina sp.														3			
Pediastrum boryanum																	1
P. duplex																1	
P. duplex var. clathratum																1	
Planktonema lauterbornii																	23

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1), DURING 1985

Organisms	3/18	4/3	4/17	4/30	5/13	5/30	6/13	6/24	7/9	7/24	8/6	8/19	9/18	10/2	10/18	11/13	12/10
Protococcus sp.															29		
Quadrigula lacustris					7			3	5	3		3					
Scenedesmus bijuga						3	18				3	14					
Scenedesmus dimorphus																	4
S. quadricauda					7					34	24			4			4
Stichococcus bacillaris		10	36	362	275	250	17										
Ulothrix sp.																41	
Unknown *coccoid green*						7											
Chrysophyceae			3	13	189	57	363	111	662	100	64	34	18	53	108	60	2
Dicera sp.										2				1	7	1	
Dinobryon divergens						2	23	20	656	71	6	22	5	47	75	27	2
D. sertularia			3	13	189	55	340	90	6	27	58	12	13	5	26	32	
Myxophyceae	40	155	236	529	782	1327	601	96	175	12	37	60	145	115	122	264	276
Anabaena affinis														3			
A.			20						138	7	7			17	90		2
A. flos-aquae				59	31												
A. scheremetievi			47														

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1), DURING 1985

Organisms	3/18	4/3	4/17	4/30	5/13	5/30	6/13	6/24	7/9	7/24	8/6	8/19	9/18	10/2	10/18	11/13	12/10
Anabaena wisconsinense																8	
Aphanocapsa delicatissima											7	7	26		18		1
Aphanothece gelatinosa										2							
A. nidulans									<1		8	17	5	2	4		
Chroococcus dispersus				2	2	2	1				1	21	41	7			
C. dispersus var. minor				4								5					
C. limneticus					20			12	23		13	5	62	5			
C. minor													8				
C. pallidus														3			
Gomphosphaeria lacustris										2	1	5	3	3			3
G. lacustris var. compacta														3			
Merismopedia punctata										<1							
Oscillatoria agardhii		74												31		113	
O. limnetica		61	169	464	649	1,294	593	84	6					23		89	19
O. lutea	40	20															
O. subbrevis														18	10		

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1), DURING 1985

Organisms	3/18	4/3	4/17	4/30	5/13	5/30	6/13	6/24	7/9	7/24	8/6	8/19	9/18	10/2	10/18	11/13	12/10
Oscillatoria tenuis					80	31	107		7							54	251
Dinophyceae				2	2				2	17	6	12	8	1			
Ceratium hirudinella											1						
Glenodinium borgei				2	2				2				8				
G. gymnodinium											2						
G. kulczynskii											2						
Peridinium cinctum												2					
P. inconspicuum										17	1	10		<1			
Euglenophyceae					21	5	3	7	11	2	1	2	5	5	4		
Euglena gracilis					19	5	3	7	11	2	1	2	5	5	4		
Phacus curvicauda					2												
Cryptophyceae																	
Cryptomonas erosa	3			5	5								6				
Number of Species	51	54	51	35	40	37	50	33	28	46	42	45	35	56	36	65	59
Diatoms	1,439	3,471	4,298	5,655	5,568	8,208	4,266	4,621	3,370	7,117	6,655	2,607	3,275	2,566	1,649	2,078	3,761
Nondiatoms	48	184	291	952	1,408	1,697	1,104	235	708	237	194	108	189	218	106	398	330
Total Periphytic Algae	1,487	3,655	4,589	6,607	6,976	9,905	5,370	4,856	4,078	7,354	6,849	2,715	3,464	2,784	1,755	2,416	4,091

*Density = organisms per mL.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JANUARY 9 TO JUNE 24, 1985

Organisms	1/9	1/22	2/20	3/4	3/18	4/1	4/15	4/29	5/13	5/28	6/11	6/24
Bacillariophyceae (Diatoms)	1,114	1,122	768	3,586	2,577	3,941	4,971	6,323	6,095	3,430	3,109	6,623
Achnanthes affinis	2	24	4	32	10	12	10	12	4	30	35	
A. clevei			1									
A. conspicua		2	1		5	10			15	15	2	16
A. exigua				11		16	10	4		11		
A. haukiana			1	25	10	9				7	2	
A. hungarica	2								4			
A. lanceolata		2										
A. lanceolata var. elliptica												
A. lanceolata var. rostrata												
A. marginulata			1									
Amphipleura pellucida									7			
Amphiprora ornata					5							
Amphora commutata												
A. delicatissima	4	4	5	35	21	10			37	11		
A. ovalis		2	2	3								
A. veneta	2		1	24	7	13						8
A. sp.				10								
Asterionella formosa			5	3	256	664	1,917	1,437	807	661	561	1,148
Caloneis ladogensis					3							
Cocconeis diminuta				3	10					4		
C. pediculus				7						4		

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JANUARY 9 TO JUNE 24, 1985

Organisms	1/9	1/22	2/20	3/4	3/18	4/1	4/15	4/29	5/13	5/28	6/11	6/24
Cocconeis placentula				4	3				7			
Cyclotella glomerata				7	121	25	52	59	31	37	6	27
C. iris			1	3	3	11						
C. kuetzingiana	4	9	37	25	162	60	43	37	133	85	21	38
C. ocellata	4	16	2	7	2	3				4	6	8
C. pseudostelligera			1		3					4		
Cymatopleura solea					2	4					2	
C. solea var. apiculata	2											
Cymbella amphicephala			1									
C. helvetica				3								
C. prostata				4		3						
C. protracta					2						4	
C. sinuata			<1									
C. ventricosa		2										
Diatoma elongatum		4	<1		22	67	163	220	100	107	92	29
D. elongatum var. minor												
D. tenue var. elongatum												
D. vulgare								4				
Diploneis oculata			<1									
D. ovalis												
D. ovalis var. oblongella			<1	11								

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JANUARY 9 TO JUNE 24, 1985

Organisms	1/9	1/22	2/20	3/4	3/18	4/1	4/15	4/29	5/13	5/28	6/11	6/24
Fragilaria bicapitata	42	27	19	120	79	104	48	32	60	15	2	46
F. construens var. subsalina	20	7	8	54	21	78	86	27	57	41	91	149
F. crotonensis	143	69	25	474	164	179	154	138	475	200	316	1,740
F. harrissonii			<1	3					7			
F. intermedia		4	7	55	21	47	25	13	7	4	4	13
F. pinnata	4	7	14	84	13	86	17		150	18	23	35
Gomphonema abbreviatum			<1			8					6	
G. olivaceum			2	9	3	9					10	
G. olivaceum var. calcarea							4					
G. parvulum												
Gyrosigma kutzingii												
Hantzschia elongatum		9	4		7	11		17	12			
Melosira distans						9						
M. granulata	29	111	90	257	168	333	261	137	137	18	27	9
M. islanidca	20	156	160	338	330	374	424	291	130	52	2	108
M. varians												
Navicula anglica		2										
N. bacillarum				4	5							
N. cryptocephala			<1	11	8	12						8
N. cryptocephala var. veneta	2	9	5	26	7	13		10		4	2	8
N. exigua		2	2		8	4			27	4		

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JANUARY 9 TO JUNE 24, 1985

Organisms	1/9	1/22	2/20	3/4	3/18	4/1	4/15	4/29	5/13	5/28	6/11	6/24
Navicula gastrum												
N. grimmei										4		
N. lanceolata												
N. mutica												
N. platystoma										4		
N. protracta			<1	3								
N. pseudocutiformis			<1									
N. pupula	2											
N. pupula var. rostrata												
N. scoliopleuroides					3							
N. schonfeldii												
N. tripunctata			<1	10							2	
N. tuscula			<1									
Nedium dubium												
Nitzschia acicularis								4				
N. acuta												
N. dissipata		4	1		2			6		7	2	5
N. fonticola			3	11	34	38	18	8	30	41	51	14
N. frustulum			1	29	10	12	6		7	4	12	8
N. gracilis		2	6	11	10	11	11	17			14	
N. hungarica				7	3						4	8
N. linearis			<1	4	7	21	6	38	45	41	8	
N. palea										4		
N. recta		2			3	4	31	6		4		

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JANUARY 9 TO JUNE 24, 1985

Organisms	1/9	1/22	2/20	3/4	3/18	4/1	4/15	4/29	5/13	5/28	6/11	6/24
Nitzschia tryblionella var. levidensis										4		
N. unknown			<1									
Pinnularia microstauron												
Rhizosolenia longiseta					5	1	42	130	146	47	3	
Rhoicosphenia curvata			<1			4						
Scoliopleura peisons	2					7			15			
Stauroneis parvula	2									18	16	8
Stephanodiscus astrae	24	105	70	517	130	231	90	91	84			
S. hantzschii							7		15	48	16	25
S. minutus		9	19	44	237	274	181	229	39	4		
Surirella angustata		2	<1		3							
S. ovalis				3		8						
S. ovata									7	233	49	33
Synedra acus			11	3	56	157	463	965	1,158			
S. amphicephala												
S. nana			1									
S. ulna						4	8					
S. ulna var. chaseana	4	4	18	56	99	298	375	251	291	30	16	5
Tabellaria fenestrata	721	485	204	1,133	473	622	392	1,141	2,051	1,408	1,555	2,871
T. flocculosa	79	42	20	100	21	75	27	134		189	147	256
Tropidoneis lepidoptera				3								

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JANUARY 9 TO JUNE 24, 1985

Organisms	1/9	1/22	2/20	3/4	3/18	4/1	4/15	4/29	5/13	5/28	6/11	6/24
Chlorophyceae (Green Algae)	102	151	66	73	6	29	82	270	136	147	378	3
Ankistrodesmus convolutus	24	74	37			2				5	4	
A. falcatus							3	8	10	2		
Botryococcus protuberans var. minor									2			
B. sudeticus												
Chlamydomonas cysts												
C. globosa	21		1	7			2					
Cladophora sp. 1		42	15							27	225	
Closteriopsis longissima			<1					2	4			
Closterium venus			1									
Coelastrum sphaericum				12								
Cosmarium pachydermum												
Crucigenia fenestrata												
C. quadrata						5						
Dictyosphaerium pulchellum												
Lagerheimia longiseta												
Mougeotia sp.												
Oocystis parva	38			13			20		17	11		3
O. pusilla												
Oocystis solitaria			<1									
Planktonema lauterbornii												
Quadrigula lacustris	5						6					
Rhizoclonium sp.												
Scenedesmus bijuga	5	35	10	7		2		3				

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JANUARY 9 TO JUNE 24, 1985

Organisms	1/9	1/22	2/20	3/4	3/18	4/1	4/15	4/29	5/13	5/28	6/11	6/24
Scenedesmus quadricauda				13	6						7	
Selenastrum minutus	9											
Stichococcus bacillaris				21		20	51	257	103	102		
Chrysophyceae	66	4		10	6	7	16	78	137	30	142	225
Diceras sp.												
Dinobryon bavaricum				3								
D. divergens		4		7							46	195
D. sertularia	66				3	7	16	78	119	30	96	30
Stiptococcus urceolatus									18			
Myxophyceae (Blue-green Algae)	184	102	109	212	163	78	366	676	713	1352	795	195
Anabaena circinalis												76
A. flos-aquae							<1	17	8			
A. spiroides		88	17									
A. wisconsinense	47											
Aphanocapsa delicatissima												
Aphanothece microspora												
A. nidulans	2	4					1					
Chroococcus dispersus	5		2	2								
C. dispersus var. minor						3		3				
C. limneticus								42				
C. turgida												
Gomphosphaeria lacustris								2	4			

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JANUARY 9 TO JUNE 24, 1985

Organisms	1/9	1/22	2/20	3/4	3/18	4/1	4/15	4/29	5/13	5/28	6/11	6/24
Merismopedia elegans												
M. glauca												
Oscillatoria agardhii	52		31	21	9							
O. limnetica	78	10	38	55	109	65	364	490	705	992	443	22
O. lutea					30							
O. subbrevis			18	134	15							
O. tenuis			3			10		122		356	352	97
			<1	<1				2		1		
Dinophyceae												
Ceratium hirundinella												
Glenodinium. borgei			<1	<1				2		1		
G. pulvisculus												
Peridinium inconspicuum												
P. willei												
Euglenophyceae												
Euglena gracilis									7	18		13
Cryptophyceae			8	3	1			2				
Cryptomonas erosa			8	3	1		3	2				
Number of species	33	36	66	59	54	52	37	41	42	51	41	34
Diatoms	1,114	1,122	768	3,586	2,577	3,941	4,971	6,323	6,095	3,430	3,109	6,623
Nondiatoms	352	257	175	299	173	114	464	1,028	993	1,548	1,173	436
Total Planktonic Algae	1,466	1,379	943	3,885	2,750	4,055	5,435	7,351	7,088	4,978	4,282	7,059

*Density = organisms per mL

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JULY 9 TO DECEMBER 9, 1985

Organisms	7/9	7/22	8/7	8/19	9/16	10/2	10/17	10/28	11/12	11/26	12/9
Bacillariophyceae (Diatoms)	5,260	6,185	2,301	885	3,065	3,045	3,034	4,691	6,438	6,618	2,690
Achnanthes affinis	6	30	2	12	48	18		31	76	29	
A. clevei	17				3				10		
A. conspicua	7	6		1	14	6		12	22	30	2
A. exigua		5		4	34	5	6	6	42	38	20
A. haukiana	7	1		1	31				76	13	7
A. hungarica											
A. lanceolata								6			
A. lanceolata var. elliptica							3				
A. lanceolata var. rostrata	15						2				
A. marginulata											
Amphipleura pellucida								6	13		
Amphiprora ornata											
Amphora commutata								7			
A. delicatissima	10		4	2	7	10		6	31	27	5
A. ovalis				7		2			14		
A. veneta	15		16		1	11	3	2		32	10
A. sp.											
Asterionella formosa	477	349		65		158	749	656	393	311	217
Caloneis ladogensis								7			
Cocconeis diminuta		4		3							
C. pediculus							6				

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JULY 9 TO DECEMBER 9, 1985

Organisms	7/9	7/22	8/7	8/19	9/16	10/2	10/17	10/28	11/12	11/26	12/9
Cocconeis placentula		2		3	3						
Cyclotella glomerata									44	141	29
C. iris		32	27	4	4	14	10	24	52		
C. kuetzingiana	472	2,827	1,567	615	2,021	1,518	170	823	487	418	150
C. ocellata	7		4		7		4	2	24	54	22
C. pseudostelligera	70	10	9	10	7	8					
Cymatopleura solea											
C. solea var. apiculata											
Cymbella amphicephala											
C. helvetica											
C. prostata											
C. protracta											
C. sinuata											
C. ventricosa											
Diatoma elongatum	99			4	10		8	9	6		7
D. elongatum var. minor						26					
D. tenue var. elongatum											2
D. vulgare									7		
Diploneis oculata						3					
D. ovalis						3					
D. ovalis var. oblongella					4						

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JULY 9 TO DECEMBER 9, 1985

Organisms	7/9	7/22	8/7	8/19	9/16	10/2	10/17	10/28	11/12	11/26	12/9
Fragilaria bicapitata	58	1	11	1	10	24	4	16	33	31	52
F. construens var. subsalina	3				17		2	9			
F. crotonensis	792	725	64	28	148	259	782	554	1,028	709	300
F. harrissonii		5						6		7	
F. intermedia	59	11	5	3	28	15	8	15	84	50	3
F. pinnata	44	46		5	45	31	18	22	87	105	17
Gomphonema abbreviatum							2				2
G. olivaceum										13	
G. olivaceum var. calcarea											
G. parvulum								3	6		
Gyrosigma kutzingii									14		
Hantzschia elongatum		6						6	20	13	
Melosira distans											
M. granulata		11							97		25
M. islanidca	89	43	16	10	31	34	28	28	16	148	11
M. varians									35		
Navicula anglica								6	7	13	
N. bacillarum									7	10	
N. cryptocephala	10	5	2	2	17	9	4	19			4
N. cryptocephala var. veneta	17		4	4	10				43	7	4
N. exigua	6				7			6	14		

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JULY 9 TO DECEMBER 9, 1985

Organisms	7/9	7/22	8/7	8/19	9/16	10/2	10/17	10/28	11/12	11/26	12/9
Navicula gastrum											
N. grimmei									16		
N. lanceolata						3		6			
N. mutica					3						
N. platystoma										1	
N. protracta											
N. pseudocutiformis											
N. pupula										5	
N. pupula var. rostrata						3					
N. scoliopleuroides											
N. schonfeldii					3						
N. tripunctata									33	5	
N. tuscula											
Nedium dubium							4				
Nitzschia acicularis					7	3		22		7	
N. acuta									6		
N. dissipata				1		3	8	6	22	38	7
N. fonticola	37	44	7	5	157	38	10	59	100	110	7
N. frustulum	10				21	17	4	16	158	123	11
N. gracilis	10	5	9		110	38	38	53	261	154	27
N. hungarica	15					7	2	9	7	13	
N. linearis	7	5			3		8	12	51	15	21
N. palea											
N. recta							2				

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII- 11 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JULY 9 TO DECEMBER 9, 1985

Organisms	7/9	7/22	8/7	8/19	9/16	10/2	10/17	10/28	11/12	11/26	12/9
Nitzschia tryblionella var. levidensis											
N. unknown											
Pinnularia microstauron						3				7	
Rhizosolenia longiseta									1		
Rhoicosphenia curvata									6		
Scoliopleura peisons		10					6				
Stephanodiscus astrae	69	28	7		24	22					
S. hantzschii	3					20	16	43	154	120	27
S. minutus	38	19	5		17	7	2		18	10	7
Surirella angustata								19		15	7
S. ovalis											
S. ovata											
Synedra acus	56	5			3	31					
S. amphicephala							43	68	75	30	4
S. nana										35	
S. ulna							8		20		
S. ulna var. chaseana	28	6	2		7				25	15	
Tabellaria fenestrata	2,535	1,869	530	157	521	661	1,070	2,100	2,626	3,497	1,608
T. flocculosa	189	45	20	15		39	12		50	204	58
Tropidoneis lepidoptera											

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JULY 9 TO DECEMBER 9, 1985

Organisms	7/9	7/22	8/7	8/19	9/16	10/2	10/17	10/28	11/12	11/26	12/9
Chlorophyceae (Green Algae)		20	43	60	35	22	41	4	61	1	
Ankistrodesmus convolutus				2			4		2		
A. falcatus								1	13		
Botryococcus protuberan var. minor											
B. sudeticus										1	
Chlamydomonas cysts						<1					
C. globosa				2							
Cladophora sp. 1											
Closteriopsis longissim											
Closterium venus											
Coelastrum sphaericum											
Cosmarium pachydermum					3						
Crucigenia fenestrata									4		
C. quadrata											
Dictyosphaerium pulchellum							3				
Lagerheimia longiseta							4				
Mougeotia sp.						10					
Oocystis parva		6	3	31	32	8	19		22		
O. pusilla			21								
O. solitaria			17	5							
Planktonema lauterbornii									20		
Quadrigula lacustris		2	2	2							
Rhizoclonium sp.						3					
Scenedesmus bijuga				11							

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JULY 9 TO DECEMBER 9, 1985

Organisms	7/9	7/22	8/7	8/19	9/16	10/2	10/17	10/28	11/12	11/26	12/9
Scenedesmus quadricauda		12		7			14				
Selenastrum minutus											
Stichococcus bacillaris											
Chrysophyceae	468	131	71	43	353	27	43	28	2	1	
Dicera sp.		2	2								
Dinobryon bavaricum											
D. divergens	466	120	50	34	53	24	40			1	
D. sertularia	2	9	19	9	300	3	3	28	2		
Stiptococcus urceolatus											
Myxophyceae (Blue-green Algae)	132	269	39	145	32	38	3	6	91	38	1
Anabaena circinalis	53	249		75		38			17		
A. flos-aquae											
A. spiroides											
A. wisconsinense											
Aphanocapsa delicatissima			2	29	13	<1					
Aphanothece microspora					3						
A. nidulans		3	22	30	13			2			
Chroococcus dispersus			8	9	3	4	3	3	1		1
C. dispersus var. minor											
C. limneticus		15				23			38		
C. turgida											
Gomphosphaeria lacustris		2	7	2		4		1	1		

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JULY 9 TO DECEMBER 9, 1985

Organisms	7/9	7/22	8/7	8/19	9/16	10/2	10/17	10/28	11/12	11/26	12/9
Merismopedia elegans						<1					
M. glauca						<1					
Oscillatoria agardhii						47			47		
O. limnetica	45								25		
O. lutea											
O. subbrevis											
O. tenuis	34										
Dinophyceae		10	7	6	8	1					
Ceratium hirundinella		2									
Glenodinium. borgei				2	8						
G. pulvisculus		2									
Peridinium inconspicuum		6	5	4		<1					
P. willei			2								
Euglenophyceae											
Euglena gracilis	5			11	3				1		
Cryptophyceae											
Cryptomonas erosa									1		
Number of species	38	41	34	38	47	51	39	41	62	46	33
Diatoms	5,260	6,185	2,301	885	3,065	3,045	3,034	4,691	6,438	6,618	2,690
Nondiatoms	605	430	160	205	431	87	87	38	156	40	1
Total Planktonic Algae	5,865	6,615	2,461	1,090	3,496	3,132	3,121	4,729	6,594	6,658	2,691

*Density = organisms per mL.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-12

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), MARCH 19 TO JULY 11, 1985

Organisms	3/19	4/4	4/18	4/29	5/14	5/31	6/14	6/25	7/11
Bacillariophyceae (Diatoms)	2,806	5,158	8,962	8,426	4,599	5,527	6,590	6,799	7,437
Achnanthes affinis	14	8	17				26	5	2
A. conspicua		11	10		8	8		5	12
A. exigua		6	39		5	8	39	8	
A. haukiana	5		10				6	25	12
A. hungarica					4		10		
A. lanceolata									
A. lanceolata var. rostrata									33
Amphipleura pellucida									
Amphiprora ornata	3								
Amphora commutata			20						
A. delicatissima	25		45					8	25
A. ornata									12
A. ovalis	3		29	9	4				
A. veneta	6	11						8	
Asterionella formosa	87	1,223	1,295	2,964	1,112	884	797	882	402
Caloneisbacillum									
C. ladogensis	5						3		
Caloneis schumanniana var. biconstricta									
C. silicula			10						
Cocconeis diminuta	3								
C. pediculus									
C. placentula									
Cyclotella glomerata	160	247	23	85	9	26	210	33	19

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-12 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), MARCH 19 TO JULY 11, 1985

Organisms	3/19	4/4	4/18	4/29	5/14	5/31	6/14	6/25	7/11
Cyclotella iris			10			8	10		27
C. kuetzingiana	108	182	87	62	71	81	27	76	695
C. kuetzingiana var. planctophora									
C. meneghiniana								8	
C. michiganiana									
C. ocellata	8	10	15				6		2
C. pseudostelligera			8					5	34
C. stelligera							3		
Cymatopleura elliptica									
C. solea			17						12
Diatoma elongatum	17	110	84	402	91	133		25	29
D. tenue var. elongatum							124		
Diploneis ovalis							3	8	
D. ovalis var. oblongella									
Fragilaria bicapitata	83	157	518	32	12	8	121	25	234
F. construens	19	83	72	64	40	43	205	73	50
F. crotonensis var. subsalina	281	239	424	231	201	307	887	2,434	764
F. harrissonii	3	8	10						12
F. intermedia	14	34	76	16	4	3	32	8	23
F. pinnata	50	56	547	9		40	104	29	349
Gomphonema olivaceum		10							12
G. parvulum					4				

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-12 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), MARCH 19 TO JULY 11, 1985

Organisms	3/19	4/4	4/18	4/29	5/14	5/31	6/14	6/25	7/11
Gyrosigma kützingii								16	
Hantzschia elongatum	6	11	45	50	9	23	10	8	74
Melosira distans			35				20		
M. granulata	306	254	678	259	40	35	104	37	235
M. islandica	404	268	933	257	107	60	91	34	347
M. varians		34							
Navicula anglica		10						2	
N. bacillum	3						10		
N. capitata		4							
N. cryptocephala	5	20	49				29	8	37
N. cryptocephala var. veneta	22	4	17	7		7	33	25	27
N. exigua	6	14	20		5				25
N. gastrum									
N. protracta									12
N. pupula	5								2
N. radiosa						3			
N. tripunctata							10		
Nitzschia acicularis						3	6		
N. dissipata	3	4		14			6	8	
N. fonticola	19	42	23		25	45	107	46	73
N. frustulum	17	12	76				3		25
N. gracilis	45	45	31	16			27		68
N. hungarica	3		17						12
N. linearis		10		9	32	11		25	
N. palea			8				9		
N. recta	3								

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-12 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), MARCH 19 TO JULY 11, 1985

Organisms	3/19	4/4	4/18	4/29	5/14	5/31	6/14	6/25	7/11
Nitzschia thermalis				14					
N. unknown V									
Pinnularia microstauron									
P. viridis	3								
Rhizosolenia longiseta		43		142	47	19			
Scoliopleura peisons			20				6		25
Stauroneis parvula									12
Stephanodiscus astrae	156	84	787	50	36	3	180	26	339
S. astrae var. minutula	110	356	264	134	31	44	137		
S. hantzschii	35		15						
S. minutus									
Surirella angustata		8							17
S. birostrata									
S. ovalis									
S. ovata			8		4				
Synedra acus	31	268	444	1,303	893	318	92	34	324
S. nana									
S. ulna					4				
S. ulna var. chaseana	102	314	453	534	105	121	124	13	434
Tabellaria fenestrata	583	858	1,490	1,600	1,511	2,866	2,712	2,606	2,344
T. flocculosa	39	96	173	163	185	420	261	244	245
Tropidoneis lepidoptera		4							
Chlorophyceae (Green Algae)	32	206	83	385	133	114	47	6	61
Ankistrodesmus braunii									

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-12 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), MARCH 19 TO JULY 11, 1985

Organisms	3/19	4/4	4/18	4/29	5/14	5/31	6/14	6/25	7/11
Ankistrodesmus convolutus	8	3	8			5	2		
A. falcatus				10	5	2			
Chlamydomonas snowii									
Chlorella ellipsoidea									
Cladophora sp. 1						76	28		
Closteriopsis longissima	3				1				
C. longissima var. tropica				6					
Cosmarium sp.									2
C. pachydermum var. pussillum		2			2				
Crucigenia quadrata		6							
Dictyosphaerium pulchellum	2								
Eudorina elegans				2					
Gleocystis major									29
Micractinium pusilla									
Mougeotia sp.			19						
Oocystis parva		6	32	7	18	14		3	25
O. pusilla									
O. solitaria					3				5
Pediastrum boryanum									
P. sculptatum									
Protococcus sp.									
Quadrigula lacustris				7					
Scenedesmus arcuatus var. platydisca									

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-12 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), MARCH 3/19 TO JULY 11, 1985

Organisms	3/19	4/4	4/18	4/29	5/14	5/31	6/14	6/25	7/11
Scenedesmus bijuga					3				
S. denticulatus									
S. longus									
S. quadricauda		6					17	3	
Selenastrum contorta				8					
S. minutus									
Stichococcus bacillaris	19	185	24	345	101	17			
Tetraedron minimum									
Westella botryoides									
Chrysophyceae	8	40	33	96	226	228	99	315	414
Diceras sp									
Dinobryon bavaricum	3								
D. divergens	5						41	315	352
D. sertularia		40	33	94	226	228	58		60
Mallomonas caudata				2					
Synura uvella									2
Myxophyceae (Blue-green Algae)	91	279	525	852	783	1,073	398	81	57
Anabaena affinis									
A. circinalis						7	43	69	29
A. flos-aque			80	7	40	13			
A. scheremetievi				45					
Apanocapsa delicatissima				1	3				
Aphanothece nidulans	2			1					
A. saxicola									
Chroococcus dispersus				2	2				

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-12 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), DURING MARCH 19 TO JULY 11, 1985

Organisms	3/19	4/4	4/18	4/29	5/14	5/31	6/14	6/25	7/11
Chroococcus dispersus var. minor									
C. limneticus	19								
Coelosphaerium kuetzingianum									
Gomphosphaeria lacustris									
Merismopedia elegans									
M. punctata									
Oscillatoria agardhii		112		86					
Oscillatoria limnetica	46	140	445	643	498	600	226	12	28
O. subbrevis	24								
O. tenuis		27		68	240	453	129		
Phormidium corium									
Dinophyceae		3		4	4	3	3	3	8
Glenodinium borgei		3		4	4	3	3	3	
Peridinium inconspicuum									8
P. willei									
Euglenophyceae					7		5	13	2
Euglena gracilis					7		5	13	2
E. minutus									
Cryptophyceae		5		4	3				
Cryptomonas erosa		5		4	3				
Number of species	52	51	50	44	44	38	49	40	52
Diatoms	2,806	5,158	8,962	8,426	4,599	5,527	6,590	6,799	7,437
Nondiatoms	131	533	641	1,341	1,156	1,418	552	418	542
Total Planktonic Algae	2,937	5,691	9,603	9,767	5,755	6,945	7,142	7,217	7,979

*Density = organisms per mL

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-13

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), JULY 23 TO DECEMBER 9, 1985

Organisms	7/23	8/7	8/20	9/16	10/3	10/17	11/12	11/26	12/9
Bacillariophyceae (Diatoms)	4,616	4,601	60,834	2,056	3,683	2,478	5,872	7,654	5,556
Achnanthes affinis	9	40	475	19	7	3	28		13
A. conspicua	5			4		3	21		4
A. exigua	15		119	5	5		9	31	7
A. haukiana	16	41	119	6			28	15	13
A. hungarica									
A. lanceolata								6	
A. lanceolata var. rostrata							14		
Amphipleura pellucida				2	3			9	
Amphiprora ornata									
Amphora commutata									
A. delicatissima		23		2	5		26	20	28
A. ornata									
A. ovalis	10	11	1	2	5			6	
A. veneta		23			5	7	18	19	
Asterionella formosa	117			5	259	511	374	240	308
Caloneis bacillum		11							
C. ladogensis	4								
Caloneis. schumanniana var. biconstricta		11							
C. silicula									
Cocconeis diminuta									
C. pediculus				2					
Cyclotella glomerata							18	209	40

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-13 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), JULY 23 TO DECEMBER 9, 1985

Organisms	7/23	8/7	8/20	9/16	10/3	10/17	11/12	11/26	12/9
Cyclotella iris	10	91		11	12	16			
C. kuetzingiana	1,712	1,578	55,405	1,309	1,103	182	508	435	214
C. kuetzingiana var. planctophora									8
C. meneghiniana				7					
C. michiganiana									
C. ocellata				2	5		16	8	7
C. pseudostelligera	13	4	357	11			7		
C. stelligera									
Cymatopleura elliptica		11	1						
C. solea								5	6
Diatoma elongatum		11		7	5	1	53	6	7
D. tenue var. elongatum									
Diploneis ovalis									
D. ovalis var. oblongella	14			2		1	5		
Fragilaria bicapitata	19	313	3	6	20	7	35	105	65
F. construens var. subsalina	18			4			16		7
F. crotonensis	725	622	1,677	92	389	603	782	1,061	584
F. harrissonii		11		4					
F. intermedia	23		119	8	17	3	25	34	7
F. pinnata	39	210	6	19	14	7	70	6	21
Gomphonema olivaceum				8					
G. parvulum				10			5	6	

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-13 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), JULY 23 TO DECEMBER 9, 1985

Organisms	7/23	8/7	8/20	9/16	10/3	10/17	11/12	11/26	12/9
Gyrosigma kützingii	5	11		2	3				
Hantzschia elongatum						5	12	15	
Melosira distans									
M. granulata							23		21
M. islandica	65	526	123	36	39		35	97	33
M. varians									
Navicula anglica				2	5			6	
N. bacillum							9		
N. capitata									
N. cryptocephala	25	30	1	7	5				20
N. cryptocephala var. veneta	11	23		16			33	15	7
N. exigua		11		5	5	5	12		
N. gastrum								6	
N. protracta									
N. pupula							5		
N. radiosa	4			4					
N. tripunctata			1				7		
Nitzschia acicularis									
N. dissipata	7	4		2		3	30	9	11
N. fonticola	92	41		64	64	18	186	60	41
N. frustulum	9	46	1		10	5	127	11	17
N. gracilis	16	11	120	31	43	23	229	233	131
N. hungarica		38		2	10	3		6	7
N. linearis					3	10	12	34	4
N. palea									
N. recta	4				10	3	21		

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-13 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), JULY 23 TO DECEMBER 9, 1985

Organisms	7/23	8/7	8/20	9/16	10/3	10/17	11/12	11/26	12/9
N. thermalis									
N. unknown V					2				
Pinnularia microstauron							7	19	7
P. viridis									
Rhizosolenia longiseta									
Scoliopleura peisons	4	46							
Stauroneis parvula									
Stephanodiscus astrae	28	252	5		29	7	40	106	28
S. astrae var. minutula	21	11							
S. birostrata						3			
S. ovalis	5								
S. ovata									
Synedra acus	11			6	59	63	77	6	7
S. nana									4
S. ulna									
S. ulna var. chaseana	4		1	4	5				
Tabellaria fenestrata	1,556	464	2,300	306	1,443	956	2,842	4,648	3,739
T. flocculosa		76		9	84	30	70	141	133
Tropidoneis lepideptera									
Chlorophyceae	86	100	21	73	44	5			70
Ankistrodesmus braunii									1

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-13 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), JULY 23 TO DECEMBER 9, 1985

Organisms	7/23	8/7	8/20	9/16	10/3	10/17	11/12	11/26	12/9
A. convolutus				3	1				
A. falcatus									
Chlamydomonas snowii				2					
Chlorella ellipsoidea	25								
Cladophora sp. 1									
Closteriopsis longissima									1
C. longissima var. tropica									
Cosmarium sp.									
C. pachydermum var. pussilla									
Crucigenia quadrata				7					
Dictyosphaerium pulchellum									
Eudorina elegans									
Gleocystis major									
Micractinium pusilla					2				
Mougeotia sp.									
Oocystis parva	45		13	14	9	5			8
O. pusilla		7							
O. solitaria	3	93	5	3	2				
Pediastrum boryanum					<1				
P. sculptatum				2					
Protococcus sp.					28				
Quadrigula lacustris	3								
Scenedesmus arcuatus var. platydisca				14					

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-13 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), JULY 23 TO DECEMBER 9, 1985

Organisms	7/23	8/7	8/20	9/16	10/3	10/17	11/12	11/26	12/9
S. bijuga			<1	7					
S. denticulatus				7					
S. longus				7					
S. quadricauda	10								
Selenastrum contorta									
S. minutus			2						
Stichococcus bacillaris									
Tetraetron minimum					<1				
Westella botryoides				7					
Chrysophyceae	67	278	67	28	18	6	45		
Diceras sp	2		2	3	2				
Dinobryon bavaricum									
D. divergens	49	283	39	10	14	3			
D. sertularia	16	95	26	15	2	3	45		
Mallomonas caudata									
Synura uvella									
Myxophyceae	275	804	54	198	90	8	2	1	159
Anabaena affinis									148
A. circinalis			15		2				
A. flos-aque	5			125					
A. scheremetievi									
Apanocapsa delicatissima			8	9					
Aphanothece nidulans		73	21	7		5			3
A. saxicola	3								
Chroococcus dispersus		2	10	7	16	3			1

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-13 (Continued)

AVERAGE POPULATION DENSITY* OF PLANKTONIC ALGAL SPECIES COLLECTED BY KEMMERER BOTLE FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), JULY 23 TO DECEMBER 9, 1985

Organisms	7/23	8/7	8/20	9/16	10/3	10/17	11/12	11/26	12/9
C. dispersus var. minor				24					
C. limneticus	156	7		24	36				
Coelosphaerium kuetzingianum							2		
Gomphosphaeria lacustris				2	4			1	
Merismopedia elegans					2				
M. punctata		30							
Oscillatoria agardhii					24				
Q. limnetica	19	21							7
Q. subbrevis	7	671							
Q. tenuis					6				
Phormidium corium	85								
Dinophyceae									
Glenodinium borgei									
Peridinium inconspicuum	18	9	3	3					
P. willei	2		2						
Euglenophyceae									
Euglena gracilis			7	10					
E. minutus					3				
Cryptophyceae		30							1
Cryptomonas erosa		30							1
Number of Species	49	43	33	64	51	31	43	38	41
Diatoms	4,616	4,601	60,834	2,056	3,683	2,478	5,872	7,654	5,556
Nondiatoms	448	1,321	165	312	155	19	47	1	140
Total Planktonic Algae	5,064	5,922	60,988	2,368	3,838	2,497	5,919	7,655	5,726

*Density = organisms per mL.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-14

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1), MARCH 18 TO JULY 9, 1985

Constituents	Units	Dates of Collection - 1985								
		3/18	4/3	4/17	4/30	5/13	5/30	6/13	6/24	7/9
Temperature	°C	4	6	7	11	12	13	14	16	20
Turbidity	NTU	27	18	23	5.4	0.8	5.8	2.0	0.7	1.5
Secchi Disk	m	0.25	0.5	0.5	1.0	3.25	0.75	1.5	3.5	NA
pH-Laboratory	STD Units	8.2	8.0	8.2	7.7	8.3	7.8	8.0	8.0	8.0
pH-Field	STD Units	7.25	7.03	6.98	7.45	7.34	NA	7.9	7.01	7.27
Alkalinity as $CaCO_3$	mg/L	118	120	130	112	112	143	116	112	134
Sulfates	mg/L	26	29	29	23	20	21	20	20	21
Fluorides	mg/L	0.21	0.28	0.19	0.17	0.17	0.12	0.16	0.14	0.14
Chlorides	mg/L	18	16	14	11	12	12	12	12	11
Phosphorus, Total	mg/L	0.015	NA	NA	0.020	0.020	0.020	0.017	0.013	0.017
Phosphorus, Dissolved	mg/L	0.003	NA	NA	0.017	0.013	0.013	0.013	0.010	0.083
Silica, Total	mg/L	0.9	3.5	3.8	1.1	0.3	1.0	0.7	0.4	0.3
Calcium	mg/L	25	26	34	29	30	31	33	28	28
Magnesium	mg/L	11	13	14	11	11	11	14	11	11
Potassium	mg/L	1	1	1	1	1	1	1	1	1
Sodium	mg/L	5	8	7	5	5	5	5	5	3
Solids, Total	mg/L	207	224	270	177	155	189	180	181	193
Solids, Total Volatile	mg/L	36	57	58	51	26	36	70	72	81
Solids, Suspended	mg/L	37	35	51	6	2	14	8	1	1
Solids, Volatile Suspended	mg/L	2	2	4	NA	NA	5	NA	NA	NA
Oxygen, Dissolved	mg/L	13.1	NA	12.5	11.7	11.2	10.5	10.0	10.0	8.7
Oxygen Demand, Chemical	mg/L	10	21	8	6	12	4	2	14	2

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-14 (Continued)

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1), MARCH 18 TO JULY 9, 1985

Constituents	Units	Dates of Collection - 1985								
		3/18	4/3	4/17	4/30	5/13	5/30	6/13	6/24	7/9
Oxygen Demand, 5-Day Biochemical	mg/L	<2	<2	<2	<2	<2	<2	<2	2	<2
Nitrogen, Total Kjeldahl	mg/L	0.250	NA	NA	0.170	0.183	0.207	0.247	0.253	0.197
Nitrogen, Dissolved Total Kjeldahl	mg/L	0.163	NA	NA	0.157	0.173	0.157	0.190	0.193	0.473
Nitrogen, Nitrate	mg/L	0.27	0.37	NA	0.21	0.19	0.21	0.17	0.25	0.20
Nitrogen, Nitrite	mg/L	0.01	<0.01	NA	0.01	0.01	<0.01	0.01	<0.01	<0.01
Fats, Oils, and Greases	mg/L	<1	4	<1	<1	1	<1	<1	<1	<1
Foaming Agents-MBAS	mg/L	NA	0.03	0.04	0.02	0.02	<0.01	0.01	0.06	0.01
Hardness Titration as $CaCO_3$	mg/L	136	124	184	136	132	132	148	156	180
Hardness Atomic Absorption determination of Ca and Mg then calculated as $CaCO_3$	mg/L	108	118	143	118	120	123	140	115	115
Aluminum	mg/L	<1.0	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic	mg/L	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Barium	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium	mg/L	<1.0	<1.0	2.0	<1.0	1.0	1.0	<1.0	<1.0	2.0
Chromium	mg/L	2.0	<1.0	2.0	2.0	1.0	3.0	2.0	<1.0	<1.0
Copper	mg/L	1.0	23.0	23.0	9.0	14.0	8.0	8.0	10.0	8.0
Iron, Total	mg/L	367	655	791	163	10	204	83	43	41
Lead	mg/L	1	3	4	10	2	3	1	1	1

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-14 (Continued)

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1), MARCH 18 TO JULY 9, 1985

Constituents	Units	Dates of Collection - 1985								
		3/18	4/3	4/17	4/30	5/13	5/30	6/13	6/24	7/9
Manganese	mg/L	14	19	30	3	2	6	5	4	4
Mercury	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.2
Nickel	mg/L	2	2	<1	1	2	7	6	2	1
Selenium	mg/L	<1	<1	<1	<1	1	<1	1	1	1
Zinc	mg/L	51	33	15	7	4	8	9	9	11
Phenol-like Substances as Phenol	mg/L	1	1	2	1	<1	<1	1	1	<1
Silver	mg/L	<1	<1	1	<1	<1	1	1	1	<1
Cyanides, Total	mg/L	0.000	0.001	0.001	0.002	0.003	0.001	0.004	0.004	0.001
Conductivity	µmhos/cm	264	282	289	258	290	282	282	268	277
Plankton-Surface	org/mL	1,543	3,622	5,838	6,744	3,812	9,226	4,688	3,587	1,608
Chlorophyll a	µg/cm^2	4.41	3.87	7.10	3.44	1.88	NA	2.10	2.15	0.87
Organic Matter	µg/cm^2	43.2	50.4	57.2	49.6	46.4	44.0	32.4	47.6	39.6
No. Spp.		39	37	38	35	26	32	39	27	22
Spp. Div.	bits/cell	1.23	1.15	1.13	1.05	0.99	0.98	1.12	0.78	0.89
Plankton-Bottom	org/mL	1,512	3,698	2,956	8,226	10,110	10,016	7,362	6,038	6,072
Chlorophyll a	µg/cm^2	1.63	4.32	57.6	5.06	5.11	4.73	3.82	2.96	3.62
Organic Matter	µg/cm^2	42.4	49.2	57.6	51.6	51.6	39.2	42.0	51.2	40.8
No. Spp.		38	40	37	26	35	28	46	19	17
Spp. Div.	bits/cell	1.18	1.22	1.23	1.04	1.12	0.88	1.16	0.65	0.66
Periphyton	org/cm^2	802			204					
Chlorophyll a	µg/cm^2						0.070			
Organic Matter	µg/cm^2				14.2					
No. Spp.		34			13					
Spp. Div.	bits/cell	1.00			0.86					

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-15

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1), JULY 24 TO DECEMBER 10, 1985

Constituents	Units	Dates of Collection - 1985							
		7/24	8/6	8/19	9/18	10/2	10/18	11/13	12/10
Temperature	°C	20.5	22	18	17	13	14	7	3
Turbidity	NTU	1.2	1.0	1.6	2.2	0.7	1.6	1.2	12.0
Secchi Disk	m	2.0	2.25	2.5	1.5	4.0	2.5	0.75	0.5
pH-Laboratory	STD Units	8.1	8.0	8.2	8.1	7.9	7.9	7.7	7.6
pH-Field	STD Units	7.30	6.85	6.79	7.49	7.40	6.93	7.51	7.90
Alkalinity as $CaCO_3$	mg/L	114	116	110	114	110	114	110	120
Sulfates	mg/L	18	19	23	17	23	25	21	26
Fluorides	mg/L	0.13	0.14	0.17	0.15	0.16	0.16	0.15	0.14
Chlorides	mg/L	10	10	10	12	12	12	25	8
Phosphorus, Total	mg/L	0.020	0.010	0.003	<0.001	NA	<0.001	0.002	0.010
Phosphorus, Dissolved	mg/L	0.023	0.007	0.003	0.004	NA	<0.001	NS	NS
Silica, Total	mg/L	0.3	0.6	0.6	1.2	0.9	0.5	1.6	4.7
Calcium	mg/L	29	26	30	30	30	37	32	30
Magnesium	mg/L	10	10	11	11	11	11	12	12
Potassium	mg/L	1	1	1	1	1	1	1	1
Sodium	mg/L	5	5	5	5	5	5	4	5
Solids, Total	mg/L	184	169	185	171	171	184	193	197
Solids, Total Volatile	mg/L	55	31	34	56	40	50	67	52
Solids, Suspended	mg/L	5	3	3	6	2	4	29	24
Solids, Volatile Suspended	mg/L	NA	NA	NA	NA	NA	NA	2	3
Oxygen, Dissolved	mg/L	7.8	7.5	9.9	9.4	10.0	10.5	11.2	13.4
Oxygen Demand, Chemical	mg/L	13	13	17	35	16	10	3	5

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-15 (Continued)

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1), JULY 24 TO DECEMBER 10, 1985

Constituents	Units	Dates of Collection - 1985							
		7/24	8/6	8/19	9/18	10/2	10/18	11/13	12/10
Oxygen Demand, 5-Day Biochemical	mg/L	<2	2	<2	<2	<2	<2	<2	2
Nitrogen, Total Kjeldahl	mg/L	0.253	0.223	0.237	0.238	NA	0.314	0.352	0.411
Nitrogen, Dissolved Total Kjeldahl	mg/L	0.180	0.193	0.187	0.240	NA	0.246	NS	NS
Nitrogen, Nitrate	mg/L	0.24	0.19	0.20	0.04	NA	0.04	0.07	0.20
Nitrogen, Nitrite	mg/L	<0.01	<0.01	<0.01	<0.01	NA	<0.01	<0.01	<0.01
Fats, Oils, and Greases	mg/L	<1	2	1	2	3	2	<1	<1
Foaming Agents-MBAS	mg/L	0.01	0.01	0.01	NA	<0.01	NA	<0.01	<0.01
Hardness Titration as $CaCO_3$	mg/L	180	160	128	154	164	135	134	142
Hardness Atomic Absorption determination of Ca and Mg then calculated as $CaCO_3$	mg/L	114	106	120	120	120	138	129	124
Aluminum	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic	mg/L	<1.0	<1.0	<1.0	1.0	1.0	<1.0	1.0	1.0
Barium	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium	mg/L	<1.0	1.0	1.0	1.0	1.0	<1.0	<1.0	<1.0
Chromium	mg/L	<1.0	<1.0	1.0	2.0	2.0	2.0	4.0	1.0
Copper	mg/L	4.0	18.0	10.0	9.0	11.0	8.0	14.0	3.0
Iron, Total	mg/L	91	55	26	109	27	58	333	683
Lead	mg/L	<1	1	1	1	1	1	<1	1

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-15 (Continued)

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1), JULY 24 TO DECEMBER 10, 1985

Constituents	Units	Dates of Collection - 1985							
		7/24	8/6	8/19	9/18	10/2	10/18	11/13	12/10
Manganese	mg/L	3	<1	<1	6	6	3	19	14
Mercury	µg/L	<0.05	<0.05	<0.05	<0.05	0.2	<0.05	<0.05	<0.05
Nickel	mg/L	1	3	1	7	9	7	10	3
Selenium	mg/L	NA	NA	NA	<1	1	<1	<1	<1
Zinc	mg/L	3	29	18	10	19	10	30	19
Phenol-like Substances as Phenol	µg/L	1	1	<1	<1	1	<1	1	<1
Silver	mg/L	<1	<1	<1	<1	<1	<1	<1	<1
Cyanides, Total	mg/L	0.001	0.002	0.001	0.002	0.004	0.001	0.002	0.004
Conductivity	µmhos/cm	276	261	258	266	262	254	277	263
Plankton-Surface	org/mL	6,834	8,829	1,328	4,533	2,450	2,625	3,234	2,911
Chlorophyll a	µg/cm^2	1.98	1.53	0.88	2.39	2.42	4.00	6.64	2.70
Organic Matter	µg/cm^2	55.2	45.6	49.2	40.8	45.6	45.2	53.2	45.2
No. Spp.		39	30	29	32	38	34	56	39
Spp. Div.	bits/cell	0.79	0.49	0.51	0.70	0.90	0.90	1.30	1.11
Plankton-Bottom	org/mL	5,783	4,594	4,207	3,933	2,256	1,845	1,742	5,267
Chlorophyll a	µg/cm^2	4.54	5.99	1.29	3.32	2.60	4.44	7.46	4.46
Organic Matter	µg/cm^2	53.2	52.0	48.0	48.4	41.2	34.0	49.4	41.6
No. Spp.		32	21	38	28	46	26	49	49
Spp. Div.	bits/cell	0.71	0.36	0.90	0.55	0.87	0.81	1.28	1.23
Periphyton									
Chlorophyll a									
Organic Matter									
No. Spp.									
Spp. Div.									

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-16

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JANUARY 22 TO JUNE 24, 1985

Constituents	Units	Dates of Collection - 1985										
		1/22	2/20	3/4	3/18	4/1	4/15	4/30	5/13	5/18	6/11	6/24
Temperature	°C	1.0	1.0	2.0	4.0	4.0	2.0	11.0	13.0	12.0	15.0	16.0
Turbidity	NTU	6.7	5.0	16.0	4.7	6.1	NA	2.2	0.7	1.0	1.4	1.2
Secchi Disk	m	NA	1.0	0.5	1.0	0.75	1.25	2.5	3.0	1.5	2.0	2.0
pH-Laboratory	STD Units	8.0	8.1	8.1	8.2	8.1	8.0	7.9	8.3	8.0	7.9	8.1
pH-Field	STD UNITS	6.93	6.97	7.20	7.30	6.76	7.07	7.15	6.94	6.75	7.90	7.17
Alkalinity as $CaCO_3$	mg/L	120	130	130	116	112	120	114	112	100	118	112
Sulfates	mg/L	29	27	23	23	21	23	23	20	22	25	20
Fluorides	mg/L	0.21	0.22	0.17	0.20	0.31	0.18	0.17	0.18	0.16	0.13	0.15
Chlorides	mg/L	16	12	10	24	22	12	12	12	10	10	11
Phosphorus, Total*	mg/L	0.1	<0.1	NA	0.005	NA	NA	0.020	0.017	0.013	0.017	0.013
Phosphorus, Dissolved*	mg/L	<0.1	<0.1	NA	0.005	NA	NA	0.017	0.017	0.010	0.017	0.010
Silica, Total	mg/L	0.8	0.9	0.7	2.3	1.5	1.3	0.4	0.3	0.6	0.7	0.6
Calcium	mg/L	37	30	26	25	34	26	28	30	31	30	29
Magnesium	mg/L	12	12	12	11	12	11	11	11	11	11	11
Potassium	mg/L	2	1	1	1	1	1	1	1	1	1	1
Sodium	mg/L	8	8	6	6	7	8	5	5	5	5	5
Solids, Total	mg/L	209	190	167	161	191	191	170	153	193	163	186
Solids, Total Volatile	mg/L	56	48	45	32	38	44	42	17	58	33	60
Solids, Suspended	mg/L	7	6	32	8	12	6	2	2	3	2	5
Solids, Volatile Suspended	mg/L	NA	NA	8	NA	2	1	NA	NA	NA	NA	NA
Oxygen, Dissolved	mg/L	NA	13.8	13.1	13.2	12.1	NA	13.2	11.3	9.6	9.5	9.4
Oxygen demand, Chemical	mg/L	12	11	19	12	8	12	14	10	2	11	14
Oxygen demand, 5-Day Biochemical	mg/L	2	<2	2	<2	2	<2	<2	<2	<2	2	<2

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-16 (Continued)

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JANUARY 22 TO JUNE 24, 1985

Constituents	Units	Dates of Collection - 1985										
		1/22	2/20	3/4	3/18	4/1	4/15	4/30	5/13	5/18	6/11	6/24
Nitrogen, Total Kjeldahl	mg/L	0.9	0.5	NA	0.273	NA	NA	0.203	0.223	0.177	0.197	0.230
Nitrogen, Dissolved Total Kjeldahl	mg/L	0.6	0.5	NA	0.273	NA	NA	0.183	0.190	0.173	0.180	0.193
Nitrogen, Ammonia	mg/L	<0.1	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Nitrate	mg/L	0.4	0.4	NA	0.30	0.28	NA	0.24	0.19	0.20	0.17	0.24
Nitrogen, Nitrite	mg/L	<0.01	<0.01	NA	0.01	<0.01	NA	0.01	0.01	<0.01	0.01	<0.01
Fats, Oils, and Greases	mg/L	<1	2	2	<1	5	1	<1	2	1	<1	1
Foaming Agents-MBAS	mg/L	0.01	NA	0.02	NA	0.02	<0.01	0.02	0.04	0.01	<0.01	0.05
Hardness Titration as $CaCO_3$	mg/L	164	156	132	120	140	NA	154	136	128	140	164
Hardness Atomic Absorption determination of Ca and Mg then calculated as $CaCO_3$	mg/L	142	124	114	108	134	110	115	120	123	120	118
Aluminum	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic	mg/L	<1.0	<1.0	1.0	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Barium	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium	mg/L	<1	<1	<1	<1	<1	3	<1	<1	<1	<1	<1
Chromium	mg/L	<1	<1	5	2	1	<1	<1	<1	3	2	<1
Copper	mg/L	30	20	11	15	311	7	12	7	7	8	10
Iron, Total	mg/L	200	<200	621	119	160	NA	33	20	77	47	63
Lead	mg/L	20	<1	6	9	8	3	10	3	2	2	1
Manganese**	mg/L	<20	<20	16	3	6	6	3	4	6	4	6
Mercury	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	6	<0.05	<0.05	<0.05

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-16 (Continued)

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JANUARY 22 TO JUNE 24, 1985

Constituents	Units	Dates of Collection - 1985										
		1/22	2/20	3/4	3/18	4/1	4/15	4/30	5/13	5/28	6/11	6/24
Nickel	mg/L	<1	<1	2	1	2	2	<1	2	8	8	1
Selenium	mg/L	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	1
Zinc	mg/L	NA	NA	20	23	175	16	16	3	4	7	10
Phenol-like Substances as Phenol	µg/L	2	1	1	1	<1	<1	1	<1	<1	<1	2
Silver	mg/L	<1	<1	<1	<1	<1	2	<1	<1	1	1	2
Cyanides, Total	mg/L	NA	NA	NA	0.013	0.118	0.002	0.001	0.003	0.001	0.003	0.004
Conductivity	µmhos/cm	301	231	300	269	259	283	259	290	273	276	272
Plankton-Surface	org/mL	1,383	1,113	3,128	2,887	4,568	4,393	5,327	5,408	5,358	5,814	5,152
Chlorophyll a	µg/cm^2	2.91	2.13	2.32	2.13	2.46	3.18	1.73	2.50	2.32	3.82	5.00
Organic Matter	µg/cm^2	NA	44.8	44.4	40.0	46.4	37.2	41.6	49.2	59.2	42.4	60.4
No. Spp.		36	42	44	43	37	31	32	28	35	31	21
Spp. Div.	bits/cell	1.06	1.23	1.13	1.25	1.20	0.98	1.00	0.94	1.05	0.98	0.72
Plankton-Bottom	org/mL	NS	912	4,279	2,615	3,530	6,513	7,714	8,659	4,885	2,750	8,990
Chlorophyll a	µg/cm^2	NS	2.24	3.39	1.40	3.45	5.86	NA	4.23	4.98	3.31	1.19
Organic Matter	µg/cm^2	NS	41.6	44.8	41.6	46.0	35.6	55.6	52.8	60.0	46.4	51.2
No. Spp.		NS	42	46	42	42	34	33	35	43	39	29
Spp. Div.	bits/cell	NS	1.21	1.13	1.25	1.26	1.11	1.16	1.09	1.09	0.98	0.81
Periphyton	org/cm^2	NS	NS	NS	802	4,247	24,196	237	35,467	NS	136,405	65,697
Chlorophyll a	µg/cm^2	NS	NS	NS	0.003	0.000	0.010	NA	NA	NS	0.124	0.070
Organic Matter	µg/cm^2	NS	NS	NS	9.3	NA	17.3	NA	26.7	NS	65.3	55.3
No. Spp.		NS	NS	NS	34	34	34	32	46	NS	37	43
Spp. Div.	bits/cell	NS	NS	NS	1.00	0.99	1.03	0.96	1.08	NS	0.75	1.18

NA = No Analysis
NS = No Sample
*For 1/22 and 2/20 detection limits were 0.1 mg/L, thereafter detection limits were 0.005.
**For 1/22 and 2/20 detection limits were 20 mg/L, thereafter detection limits were 2 mg/L.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-17

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JULY 9 TO DECEMBER 9, 1985

Constituents	Units	Dates of Collection - 1985										
		7/9	7/22	8/7	8/19	9/16	10/2	10/17	10/28	11/12	11/26	12/9
Temperature	°C	20.0	20.0	20.0	18.0	17.5	15.0	13.0	13.0	7.0	5.0	2.0
Turbidity	NTU	2.1	2.2	0.98	1.8	1.3	2.7	3.2	1.0	2.0	7.3	5.7
Secchi Disk	m	2.5	2.5	2.75	3.75	1.25	2.0	1.5	1.5	0.5	1.0	1.0
pH-Laboratory	STD Units	7.9	7.9	8.1	8.2	8.0	8.0	7.8	8.2	7.8	7.8	7.8
pH-Field	STD Units	6.94	6.92	6.80	6.83	7.71	7.32	6.91	6.98	7.36	7.8	7.46
Alkalinity as $CaCO_3$	mg/L	114	122	112	110	112	110	114	120	120	116	112
Sulfates	mg/L	22	18	23	21	4.9	24	21	22	23	19	24
Fluorides	mg/L	0.16	0.14	0.14	0.16	0.16	0.17	0.17	0.17	0.16	0.14	0.15
Chlorides	mg/L	14	8	10	12	12	12	14	14	11	2	8
Phosphorus, Total*	mg/L	0.013	0.017	0.007	0.007	<0.001	NA	0.001	<0.001	0.005	0.007	<0.001
Phosphorus, Dissolved*	mg/L	0.013	0.017	0.007	0.003	<0.001	NA	<0.001	<0.001	<0.001	<0.001	<0.001
Silica, Total	mg/L	0.4	NA	0.6	1.0	1.1	0.4	0.6	1.7	1.6	1.4	1.8
Calcium	mg/L	29	NA	26	30	31	27	37	37	32	27	27
Magnesium	mg/L	11	NA	10	11	11	11	11	10	12	11	11
Potassium	mg/L	1	NA	1	1	2	1	1	1	1	1	1
Sodium	mg/L	4	NA	5	5	5	5	5	6	5	5	5
Solids, Total	mg/L	186	203	215	189	203	175	196	181	193	175	180
Solids, Total Volatile	mg/L	83	80	106	63	62	33	77	51	49	32	39
Solids, Suspended	mg/L	4	4	3	3	6	6	6	5	19	10	8
Solids, Volatile Suspended	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	2	1	NA
Oxygen, Dissolved	mg/L	8.2	8.3	8.2	9.8	8.9	9.6	9.8	9.7	10.8	11.6	12.8
Oxygen Demand, Chemical	mg/L	2	20	4	6	15	7	10	1	6	9	<1
Oxygen Demand, 5-Day Biochemical	mg/L	<2	4	<2	<2	<2	<2	<2	<2	<2	2	<2

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-17 (Continued)

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JULY 9 TO DECEMBER 9, 1985

Constituents	Units	Dates of Collection - 1985										
		7/9	7/22	8/7	8/19	9/16	10/2	10/17	10/28	11/12	11/26	12/9
Nitrogen, Total Kjeldahl	mg/L	0.253	0.230	0.230	0.223	0.290	NA	0.377	0.248	0.385	0.444	0.458
Nitrogen, Dissolved Total Kjeldahl	mg/L	0.205	0.183	0.217	0.183	0.282	NA	0.254	0.302	0.270	0.305	0.324
Nitrogen, Ammonia	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Nitrate	mg/L	0.21	0.25	0.19	0.20	0.02	NA	0.14	0.01	0.07	0.10	0.15
Nitrogen, Nitrite	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01
Fats, Oils, and Greases	mg/L	<1	1	1	1	1	3	1	1	<1	1	<1
Foaming Agents-MBAS	mg/L	0.01	0.02	<0.01	0.01	NA	NA	<0.01	<0.01	<0.01	<0.01	0.05
Hardness Titration as $CaCO_3$	mg/L	172	140	140	144	158	174	137	143	140	131	134
Hardness Atomic Absorption determination of Ca and Mg then calculated as $CaCO_3$	mg/L	118	NA	106	120	123	112	138	134	129	112	112
Aluminum	mg/L	<1.0	NA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic	mg/L	<1.0	NA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	<1.0
Barium	mg/L	<0.2	NA	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium	mg/L	<1	NA	1	1	<1	1	1	<1	<1	1	<1
Chromium	mg/L	1	NA	4	2	<1	4	2	1	4	<1	2
Copper	mg/L	6	NA	36	10	4	8	10	11	20	8	3
Iron, Total	mg/L	74	NA	99	59	97	152	124	145	442	153	221
Lead	mg/L	1	NA	2	<1	1	<1	1	<1	5	<1	1
Manganese**	mg/L	3	NA	4	4	3	8	6	5	13	7	5
Mercury	µg/L	<0.05	NA	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.2	<0.05

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-17 (Continued)

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1), JULY 9 TO DECEMBER 9, 1985

Constituents	Units	Dates of Collection - 1985										
		7/9	7/22	8/7	8/19	9/16	10/2	10/17	10/28	11/12	11/26	12/9
Nickel	mg/L	<1	NA	2	2	3	7	10	8	13	10	2
Selenium	mg/L	1	NA	NA	<1	<1	1	<1	<1	1	1	<1
Zinc	mg/L	15	NA	58	17	8	14	16	25	21	11	16
Phenol-like Substances as Phenol	µg/L	<1	1	1	<1	<1	1	<1	<1	<1	1	3
Silver	mg/L	<1	NA	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cyanides, Total	mg/L	0.002	0.001	0.001	0.003	0.003	0.003	0.001	0.001	0.001	0.002	0.002
Conductivity	µmhos/cm	288	277	272	261	277	267	256	260	272	268	258
Plankton-Surface	org/mL	3,566	5,009	2,369	1,163	3,721	2,905	2,069	3,155	7,246	7,900	3,771
Chlorophyll a	µg/cm^2	0.90	1.86	1.36	1.32	2.19	2.47	4.40	3.37	5.93	3.68	4.29
Organic Matter	µg/cm^2	42.4	67.6	36.8	50.8	44.8	41.2	45.2	45.6	48.8	37.2	40.4
No. Spp.		26	32	21	29	34	37	28	30	42	38	28
Spp. Div.	bits/cell	0.89	0.65	0.29	0.61	0.73	0.88	0.76	0.79	0.97	0.89	0.75
Plankton-Bottom	org/mL	8,164	8,217	2,548	1,131	4,027	3,506	4,156	6,324	5,894	5,425	1,611
Chlorophyll a	µg/cm^2	393	4.35	3.31	5.28	2.22	2.38	3.97	4.04	4.05	2.77	3.64
Organic Matter	µg/cm^2	45.2	58.8	33.2	50.0	52.0	49.2	39.2	45.6	53.6	40.0	41.6
No. Spp.		32	29	28	29	40	34	26	34	45	35	20
Spp. Div.	bits/cell	0.88	0.74	0.73	0.94	0.91	0.78	0.76	0.80	1.10	0.86	0.58
Periphyton	org/cm^2	47,924	444,407	119,365	308,628	NS	148,405	157	361	NS	4	NA
Chlorophyll a	µg/cm^2	0.210	0.358	0.081	0.423	NS	0.467	0.033	0.017	NS	0.000	0.000
Organic Matter	µg/cm^2	119.3	122.0	68.7	108.7	NS	101.3	32.0	14.0	NS	14.0	17.3
No. Spp.		27	23	42	32	NS	37	11	18	NS	2	NA
Spp. Div.	bits/cell	0.78	0.83	1.10	0.75	NS	1.07	0.94	1.12	NS	0.30	NA

NA = No Analysis.
NS = No Sample.
**For 1/22 and 2/20 detection limits were 20 mg/L, thereafter detection limits were 2 mg/L.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-18

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), MARCH 19 TO JULY 11, 1985

Constituents	Units	Dates of Collection - 1985								
		3/19	4/4	4/18	4/29	5/14	5/31	6/14	6/25	7/11
Temperature	°C	4.0	6.0	8.0	10.0	9.0	14.0	16.0	19.0	20.0
Turbidity	NTU	4.1	3.8	3.5	0.6	0.8	1.2	1.9	1.5	1.6
Secchi Disk	m	1.25	1.5	0.75	2.75	3.0	2.5	1.5	3.0	3.0
pH-Laboratory	STD units	8.0	8.2	7.7	8.3	7.7	7.7	8.0	8.1	8.0
pH-Field	STD units	7.05	7.12	7.20	7.08	7.29	6.98	8.1	6.96	7.08
Alkalinity as $CaCO_3$	mg/L	112	120	114	112	116	116	116	144	110
Sulfates	mg/L	24	24	25	23	20	20	21	20	22
Fluorides	mg/L	0.19	0.18	0.21	0.18	0.17	0.16	0.15	0.14	0.17
Chlorides	mg/L	16	14	17	12	12	8	12	20	20
Phosphorus, Total	mg/L	0.005	NA	NA	0.020	0.020	0.013	0.040	0.017	0.013
Phosphorus, Dissolved	mg/L	0.003	NA	NA	0.017	0.013	0.010	0.013	0.010	0.010
Silica, Total	mg/L	1.1	0.9	1.2	0.6	0.3	0.4	0.7	0.4	0.4
Calcium	mg/L	23	23	29	29	31	31	33	29	30
Magnesium	mg/L	10	12	12	11	11	11	14	11	10
Potassium	mg/L	1	1	1	1	1	1	1	1	1
Sodium	mg/L	5	6	8	5	5	5	5	5	5
Solids, Total	mg/L	172	186	200	198	180	186	221	206	158
Solids, Total Volatile	mg/L	35	39	55	62	51	86	103	130	43
Solids, Suspended	mg/L	8	6	10	2	3	3	3	2	2
Solids, Volatile Suspended	mg/L	NA	1	1	NA	NA	NA	NA	NA	NA
Oxygen, Dissolved	mg/L	13.1	12.4	12.4	11.6	11.7	10.0	9.5	9.0	8.6
Oxygen Demand, Chemical	mg/L	6	6	6	6	2	2		17	5

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-18 (Continued)

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), MARCH 19 TO JULY 11, 1985

Constituents	Units	Dates of Collection - 1985								
		3/19	4/4	4/18	4/29	5/14	5/31	6/14	6/25	7/11
Oxygen Demand, 5-Day Biochemical	mg/L	<2	<2	<2	<2	<2	<2	<2	<2	<2
Nitrogen, Total Kjeldahl	mg/L	0.215	NA	NA	0.210	0.203	0.213	0.250	0.230	0.253
Nitrogen, Dissolved Total Kjeldahl	mg/L	0.185	NA	NA	0.173	0.177	0.177	0.203	0.190	0.190
Nitrogen, Nitrate	mg/L	0.28	0.32	NA	0.24	0.20	0.20	0.15	0.24	0.21
Nitrogen, Nitrite	mg/L	0.01	0.01	NA	0.01	0.01	<0.01	0.01	<0.01	0.01
Fats, Oils, and Greases	mg/L	<1	1	<1	2	2	<1	<1	<1	<1
Foaming Agents-MBAS	mg/L	NA	0.03	0.02	0.05	<0.01	0.01	0.03	0.06	0.06
Hardness Titration as $CaCO_3$	mg/L	132	NA	156	136	136	136	148	152	148
Hardness Atomic Absorption determination as Ca and Mg then calculated as $CaCO_3$	mg/L	99	107	122	118	123	123	140	118	116
Aluminum	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1
Arsenic	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1
Barium	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium	mg/L	<1	<1	2	<1	<1	<1	1	1	<1
Chromium	mg/L	2	1	3	<1	3	3	3	1	1
Copper	mg/L	3	29	38	16	9	5	15	7	6
Iron, Total	mg/L	195	121	250	46	14	41	91	50	70
Lead	mg/L	4	3	10	9	2	1	3	1	1
Selenium	mg/L	<1	<1	1	1	1	1	<1	1	<1

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-18 (Continued)

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), MARCH 19 TO JULY 11, 1985

Constituents	Units	Dates of Collection - 1985								
		3/19	4/4	4/18	4/29	5/14	5/31	6/14	6/25	7/11
Manganese	mg/L	5	4	6	2	2	5	6	4	7
Mercury	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	mg/L	<1	1	<1	2	2	5	7	5	<1
Zinc	mg/L	25	22	19	18	6	4	16	9	5
Phenol-like Substances as Phenol	µg/L	<1	1	1	2	1	<1	3	1	5
Silver	mg/L	<1	1	1	<1	<1	1	<1	1	<1
Cyanides, Total	mg/L	NA	0.006	0.004	NA	0.004	0.002	0.002	0.002	0.002
Conductivity	µmhos/cm	260	272	301	259	278	265	278	277	290
Plankton-Surface	org/mL	2,847	6,523	8,676	9,030	5,939	9,117	3,340	5,220	2,810
Chlorophyll a	µg/cm^2	1.92	3.23	4.12	NA	1.29	2.91	1.11	6.07	1.79
Organic Matter	µg/cm^2	44.4	31.6	45.4	44.8	48.8	42.8	40.8	49.2	58.8
No Spp.		38	38	37	36	28	28	38	20	33
Spp. Div.	bits/cell	1.19	1.20	1.14	1.06	0.95	0.90	1.11	0.69	0.97
Plankton-Bottom	org/mL	3,022	4,825	10,541	10,554	5,686	4,750	10,921	9,213	13,195
Chlorophyll a	µg/cm^2	2.17	4.90	12.29	NA	3.37	2.83	4.97	2.86	6.91
Organic Matter	µg/cm^2	50.0	35.6	60.8	42.0	54.0	46.0	43.2	48.4	62.0
No. Spp		44	40	42	34	37	30	35	34	43
Spp. Div.	bits/cell	1.26	1.28	1.22	1.02	1.11	1.00	1.03	0.81	1.16
Periphyton	org/cm^2	NS	NS	851	4,382	5,997	16,206	272,519	14,310	280,267
Chlorophyll a	µg/cm^2	NS	NS	0.000	0.000	0.007	0.006	NA	0.007	0.150
Organic Matter	µg/cm^2	NS	NS	17.8	37.3	17.3	8.9	40.0	38.7	70.0
No. Spp.		NS	NS	14	16	13	25	24	28	22
Spp. Div.	bits/cell	NS	NS	0.70	0.50	0.31	0.53	0.36	0.91	0.61

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-19

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), JULY 23 TO DECEMBER 9, 1985

Constituents	Units	Dates of Collection - 1985								
		7/23	8/7	8/20	9/16	10/3	10/17	11/12	11/26	12/9
Temperature	°C	21.0	21.0	19.0	18.0	15.0	13.0	8.0	6.5	3.0
Turbidity	NTU	1.9	0.73	1.3	1.0	0.5	1.3	1.3	4.5	3.5
Secchi Disk	m	3.0	2.75	3.0	3.0	3.5	2.5	0.75	2.0	1.5
pH-Laboratory	STD units	8.1	8.2	8.3	8.1	8.1	8.0	7.9	7.8	7.8
pH-Field	STD units	7.20	6.82	6.81	7.33	7.46	6.90	7.45	7.36	7.60
Alkalinity as $CaCO_3$	mg/L	112	114	116	110	112	114	116	112	110
Sulfates	mg/L	17	21	23	9.8	24	22	23	115	24
Fluorides	mg/L	0.14	0.14	0.13	0.16	0.18	0.16	0.16	0.16	0.17
Chlorides	mg/L	10	10	10	14	12	12	11	6	8
Phosphorus, Total	mg/L	0.017	0.010	0.010	<0.001	NA	<0.001	0.003	<0.001	0.001
Phosphorus, Dissolved	mg/L	0.017	0.003	0.007	<0.001	NA	<0.001	0.002	0.001	<0.001
Silica, Total	mg/L	0.3	0.5	0.6	1.6	0.6	1.1	0.5	1.5	1.5
Calcium	mg/L	29	26	30	30	30	37	32	28	28
Magnesium	mg/L	11	10	11	11	11	11	11	11	11
Potassium	mg/L	1	1	1	1	1	1	1	1	1
Sodium	mg/L	5	5	5	5	5	6	5	7	5
Solids, Total	mg/L	244	205	188	189	204	182	190	187	181
Solids, Total Volatile	mg/L	122	89	49	39	60	46	50	43	35
Solids, Suspended	mg/L	3	3	1	3	3	3	10	5	6
Solids, Volatile Suspended	mg/L	NA	NA	NA	NA	NA	NA	2	NA	NA
Oxygen, Dissolved	mg/L	8.4	8.5	9.5	8.8	9.5	10.0	10.8	11.8	12.8
Oxygen Demand, Chemical	mg/L	16	6	17	15	8	12	6	8	<1

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-19 (Continued)

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), JULY 23 TO DECEMBER 9, 1985

Constituents	Units	Dates of Collection - 1985								
		7/23	8/7	8/20	9/16	10/3	10/17	11/12	11/26	12/9
Oxygen Demand, 5-Day Biochemical	mg/L	<2	<2	<2	5	<2	<2	<2	3	<2
Nitrogen, Total Kjeldahl	mg/L	0.240	0.240	0.260	0.221	NA	0.328	0.364	0.315	0.383
Nitrogen, Dissolved Total Kjeldahl	mg/L	0.197	0.193	0.180	0.256	NA	0.362	0.345	0.362	0.410
Nitrogen, Nitrate	mg/L	0.25	0.20	0.20	0.20	NA	0.01	0.01	0.28	0.24
Nitrogen, Nitrite	mg/L	0.01	<0.01	0.01	<0.01	NA	<0.01	<0.01	0.01	<0.01
Fats, Oils, and Greases	mg/L	1	2	1	2	1	1	<1	<1	<1
Foaming Agents-MBAS	mg/L	<0.01	<0.01	<0.01	<0.01	NA	<0.01	<0.01	<0.01	<0.01
Hardness Titration as $CaCO_3$	mg/L	176	152	132	134	138	155	144	140	147
Hardness Atomic Absorption determination as Ca and Mg then calculated as $CaCO_3$	mg/L	118	106	120	120	120	138	125	115	115
Aluminum	mg/L	<1	<1	<1	1	<1	<1	<1	<1	<1
Arsenic	mg/L	<1	<1	<1	<1	1	<1	<1	1	1
Barium	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium	mg/L	1	<1	1	1	3	2	<1	1	<1
Chromium	mg/L	4	3	1	1	2	2	3	4	1
Copper	mg/L	3	9	7	8	29	11	6	8	4
Iron, Total	mg/L	71	42	12	65	71	56	371	74	159
Lead	mg/L	1	1	1	1	2	1	<1	<1	<1
Selenium	mg/L	NA	NA	NA	1	<1	<1	<1	<1	<1

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-19 (Continued)

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1), JULY 23 TO DECEMBER 9, 1985

Constituents	Units	Dates of Collection - 1985								
		7/23	8/7	8/20	9/16	10/3	10/17	11/12	11/26	12/9
Manganese	mg/L	3	6	5	6	6	5	15	7	7
Mercury	µg/L	0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	mg/L	2	2	3	7	8	10	7	11	6
Zinc	mg/L	5	23	25	23	52	9	20	11	18
Phenol-like Substances as Phenol	µg/L	1	2	1	<1	<1	<1	<1	<1	<1
Silver	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cyanides, Total	mg/L	0.002	0.001	0.001	0.003	NA	0.001	0.001	0.002	0.002
Conductivity	µmhos/cm	267	273	275	286	267	258	274	284	268
Plankton-Surface	org/mL	4,467	3,811	121,237	2,801	2,657	1,401	4,620	5,957	4,350
Chlorophyll a	µg/cm^2	2.16	1.37	1.05	1.35	2.07	4.46	5.62	2.90	0.11
Organic Matter	µg/cm^2	NA	34.0	58.4	45.6	43.2	41.2	46.8	NA	43.2
No Spp.		39	25	20	47	26	23	13	33	21
Spp. Div.	bits/cell	0.92	0.52	0.19	0.88	0.75	0.83	0.50	0.65	0.51
Plankton-Bottom	org/mL	5,676	14,053	823	1,910	4,950	3,599	7,234	9,428	7,087
Chlorophyll a	µg/cm^2	2.29	6.20	0.94	2.39	3.95	4.06	5.61	5.52	4.05
Organic Matter	µg/cm^2	40.0	37.2	55.6	50.0	39.2	40.0	48.0	51.2	45.6
No. Spp		34	36	29	43	39	23	33	24	33
Spp. Div.	bits/cell	0.80	0.97	0.75	0.77	0.86	0.70	0.83	1.03	0.71
Periphyton	org/cm^2	488,609	NS	88,223	NS	95,381	91,681	NS	1,981	NS
Chlorophyll a	µg/cm^2	0.105	NS	0.041	NS	0.187	0.029	NS	NA	NS
Organic Matter	µg/cm^2	95.1	NS	69.3	NS	104.0	70.7	NS	40.4	NS
No. Spp.		27	NS	15	NS	33	31	NS	26	NS
Spp. Div.	bits/cell	0.83	NS	0.64	NS	1.03	1.06	NS	1.04	NS

APPENDIX AIII

POPULATION DENSITIES OF BENTHIC INVERTEBRATES COLLECTED FROM THE INSHORE AREAS OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-1

MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT WILMETTE HARBOR (STATION 2-C) IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Taxon	Sampling Dates 4/85	8/85	11/85
	----Number of Organisms/m^2----		
Annelida			
Enchytraeidae		6	
Naididae			
Piguetiella michiganensis	44	1,039	32
Vejdovskyella intermedia		19	19
Uncinais uncinata		266	
Tubificidae			
Limnodrilus hoffmesteri			44
Limnodrilus udekemianus			6
Potamothrix moldaviensis			6
Undetermined immatures			
with capilliforms	6		
without capilliforms	25	19	551
Hirudinea			
Helobdella stagnalis			6
Arthropoda			
Crustacea			
Amphipoda			
Gammarus pseudolimnaeus	13		
Hyalella azteca	19		13
Pontoporeia hoyi	57	51	52
Insecta			
Tricoptera			
Hydropsychidae	6		
Diptera			
Tanypodinae			
Conchapetopia sp.			6
Prodiamesinae			
Monodiamesa cf. *tuberculata*	19	32	222

Table continued on following page.

METROPOLITAN WATER RECLAMATON DISTRICT OF GREATER CHICAGO

TABLE AIII-1 (Continued)

MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT WILMETTE HARBOR (STATION 2-C) IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Taxon	Sampling Dates 4/85	8/85	11/85
	----Number of Organisms/m^2----		
Orthocladinae			
Heterotrissocladius cf. *changi*			6
Nanocladius sp.	6		
Parakiefferiella sp.	222		
Chironominae			
Chironomini			
Chironomus anthraeinus gr.			6
Chironomus fluviatilis gr.	44	279	114
Chironmus sp.		32	6
Cryptochironomus digitatus	6	32	51
Cryptochironomus cf. *fulvus*	25	63	165
Cyphomella sp.	697	51	1,146
Glyptotendipes sp.		6	
Microtendipes cf. *pedellus*	6		
Paracladopelma camptolabis-gr.	25	38	63
Paracladopelma nereis		38	
Paracladopelma undine		25	
Polypedilium cf. *scalaenum*	735	234	260
Pseudochironomus sp.			6
Tanytarsini			
Tanytarsus sp.	32		

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-1 (Continued)

MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT WILMETTE HARBOR (STATION 2-C) IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Taxon	Sampling Dates 4/85	8/85	11/85
	----Number of Organisms/m^2----		
Mollusca			
Gastropoda			
Amnicola limosa		6	
Pelecypoda			
Pisidium casertanum			6
Pisidium fallax		6	
Sphaerium corneum		6	
Sphaerium rhomboideum			6
Sphaerium striatinum		6	6

*Three replicate bottom samples were collected once during the spring, summer, and fall.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-2

MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT CHICAGO HARBOR (STATION 4-C) IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Taxon	Sampling Dates 4/85	8/85	11/85
	----Number of Organisms/m^2----		
Coelenterata			
Hydra sp.	6		51
Annelida			
Enchytraeidae	6	6	
Lumbriculidae			
Stylodrilus heringianus		13	13
Naididae			
Amphicaeta leydigi	6		
Nais communis			6
Nais simplex		6	
Nais variablilis		13	
Piguetiella michiganensis	57		38
Slavina appendiculata		6	
Vejdovskyella intermedia	6	6	6
Tubificidae			
Aulodrilus americanus	6		
Aulodrilus pluriseta		6	13
Ilyodrilus templetoni	6		
Limnodrilus cervix	32	19	
Limnodrilus hoffmeisteri	272	44	6
Limnodrilus maumaensis		6	
Potamothrix moldaviensis	203	44	6
Potamothrix vejdovskyi	158	266	890
Tubifex superiorensis	6		
Undetermined immatures			
with capilliforms	184	481	532
without capilliforms	513	4,180	1,241
Hirudinea			
Helobtella stagnalis	6	139	158

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-2 (Continued)

MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT CHICAGO HARBOR (STATION 4-C) IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Taxon	Sampling Dates 4/85	8/85	11/85
	----Number of Organisms/m^2----		
Arthropoda			
Crustacea			
Isopoda			
Asellus sp.		6	
Amphipoda			
Gammarus pseudolimnaeus	51	329	120
Pontoporeia hoyi		13	
Insecta			
Diptera			
Tanypodinae			
Procladius sp.		89	6
Diamesinae			
Potthastia cf. *longimanus*	6	32	44
Prodiamesinae			
Monodiamesa cf. *depectinata*		6	
Monodiamesa cf. *tuberculata*		260	6
Orthocladinae			
Heterotrissocladius cf. *changi*	6	32	19
Parakiefferiella sp.	665	25	63
Chironominae			
Chironomini			
Chironomus anthracinus-gr.	6	114	25
Chironomus fluviatilis-gr.	13	513	76

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-2 (Continued)

MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT CHICAGO HARBOR (STATION 4-C) IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Taxon	Sampling Dates 4/85	8/85	11/85
	----Number of Organisms/m^2----		
Chironomus plumosus-gr.		13	
Chironomus sp.		127	
Cladopelma sp.		13	
Cryptochironomus digitatus	13	44	
Cryptochironomus cf. fulvus	38	57	
Cyphomella sp.			6
Demicryptochironomus sp.	51	108	63
Dicrotendipes sp.		13	
Paracladopelma camptolabis-gr.	6		6
Paracladopelma winnelli	19		
Polypedilium cf. scalaenum	108	241	317
Polypedilium tuberculum	82		
Pseudochironomus sp.	13	6	76
Mollusca			
Gastropoda			
Amnicola limosa		6	
Bithynia tentaculata		6	
Physella gyrina sayi	6		
Physella vinosa		13	
Physella sp.			6
Valvata perdepressa	6		

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-2 (Continued)

MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT CHICAGO HARBOR (STATION 4-C) IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Taxon	Sampling Dates 4/85	8/85	11/85
	----Number of Organisms/m^2----		
Valvata sincera	6	13	
Valvata tricarinata		25	
Pelecypoda			
Musculium transversum	13	6	
Pisidium casertanum	57	19	6
Pisidium compressum	6		
Pisidium fallax	6	241	
Pisidium henslowanum		13	
Pisidium nitidium	6		
cf. pauperculatum			
Pisidium subtruncatum	6		
Pisidium variabile		19	
Sphaerium striatinum	13		

*Three replicate bottom samples were collected once during the spring, summer, and fall.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-3

MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT CALUMET HARBOR (STATION 6-C) IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Taxon	Sampling Dates 4/85	8/85	11/85
	----Number of Organisms/m^2----		
Coelenterata			
Hydra sp.	165		6
Annelida			
Enchytraeidae	19	13	
Naididae			
Amphicaeta leydigi	19		
Chaetogaster diaphanus		51	
Nais communis		6	
Nais variabilis		203	38
Piguetiella michiganensis	190	51	177
Pristina foreli	19	19	32
Pristina osborni	13	6	
Stylaria lacustris	6	13	
Vejdovskyella intermedia	108	19	
Uncinais uncinata	6	38	
Tubificidae			
Aulodrilus pluriseta		6	
Limnodrilus hoffmeisteri	6	25	
Potamothrix moldaviensis	13		
Potamothrix vejdovskyi	13		
Undetermined immatures			
with capilliforms	82	6	
without capilliforms	25	82	89
Arthropoda			
Crustacea			
Amphipoda			
Gammarus pseudolimnaeus		13	6
Pontoporeia hoyi	13	38	
Insecta			
Diptera			

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-3 (Continued)

MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT CALUMET HARBOR (STATION 6-C) IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Taxon	Sampling Dates 4/85	8/85	11/85
	----Number of Organisms/m^2----		
Tanypodinae			
Procladius sp.		19	
Diamesinae			
Potthastia cf. *longimanus*			19
Prodiamesinae			
Monodiamesa depectinata		19	
Monodiamesa cf. *tuberculata*		120	
Orthocladinae			
Heterotrissocladius cf. *changi*		25	13
Parakiefferiella sp.	25	6	6
Chironominae			
Chironomini			
Chironomus anthracinus-gr.		101	
Chironomus fluviatilis-gr.		697	89
Chironomus plumosus-gr.		6	
Chironomus sp.		6	
Cryptochironomus digitatus		6	6
Cryptochironomus fulvus		6	
Cyphomella sp.		19	
Demicryptochironomus sp.	6		25

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-3 (Continued)

MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT CALUMET HARBOR (STATION 6-C) IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN DURING 1985

Taxon	Sampling Dates 4/85	8/85	11/85
	----Number of Organisms/m^2----		
Paracladopelma camptolabis-gr.	44	6	25
Paracladopelma undine		82	
Polypedillium cf. scalaenum	133	19	28
Polypedilium cf. tuberculum	177	6	
Pseudochironomus sp.			13
Tanytarsini			
Microspecta sp.		25	
Tanytarsus sp.	25		
Mollusca			
Gastropoda			
Amnicola limosa		6	
Pelecypoda			
Pisidium casertanum		6	
Pisidium fallax		13	

*Three replicate bottom samples were collected once during the spring, summer, and fall.