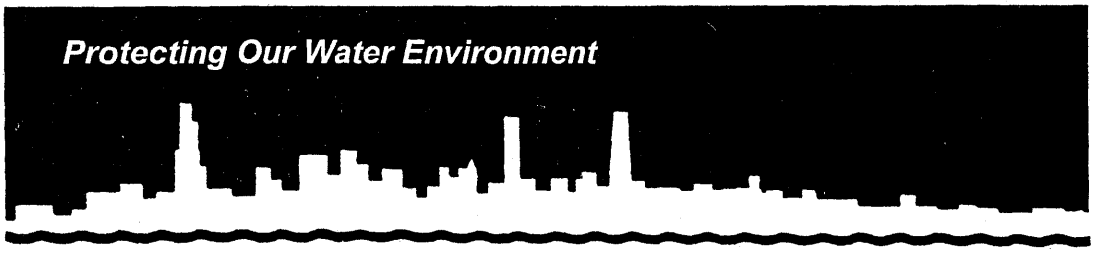

Metropolitan Water Reclamation District of Greater Chicago

RESEARCH AND DEVELOPMENT DEPARTMENT

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CHLOROPHYLL MONITORING IN CHICAGO AREA WATERWAYS DURING 2002 AND 2003

November 2004

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November 2004

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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

Summary

In 1998, the United States Environmental Protection Agency (USEPA) established a national strategy for the development and promulgation of regional water quality criteria for nutrients. Nutrient criteria are likely not only to include causal parameters like total phosphorus (TP) and total nitrogen (TN), but also response variables such as chlorophyll *a* and turbidity. In acknowledgment of the national nutrient strategy, the Metropolitan Water Reclamation District of Greater Chicago (District) developed a long-term monitoring program in 2000 for the collection and analysis of water samples for chlorophylls *a, b,* and *c*. In August of 2001, the District implemented the chlorophyll monitoring program. During the period studied in this report (2002–2003), water samples were collected monthly at 59 monitoring stations in natural and man-made waterways throughout the Chicago metropolitan area. Following filtration, grinding, and extraction with acetone, chlorophyll was measured by spectrophotometry. Although chlorophylls *a, b,* and *c* were analyzed, this report only discusses chlorophyll *a* because it is a pigment which is present in all algal cells. Chlorophylls *b* and *c* are present only in cells of certain taxonomic algal groups. Mean chlorophyll *a* concentrations for the sampled waterways ranged from 3 µg/L in the Chicago River to 36 µg/L in the Grand Calumet River. The highest single chlorophyll *a* concentrations were detected at stations in the Des Plaines River and the Grand Calumet River. At Material Service Road on the Des Plaines River, chlorophyll *a* concentration measured 214 µg/L on July 7, 2003. In the Grand Calumet River on March 24, 2003, the chlorophyll *a* concentration was 233 µg/L at Burnham Avenue.

Conclusions

The results of chlorophyll monitoring conducted in the Chicago metropolitan area suggest the following:

1. Mean chlorophyll *a* concentrations found in Chicago area waterways indicate that the current USEPA national criteria of 2.7 µg/L for streams in Ecoregion VI is unrealistically low and may be unattainable for waterways in the Cook County region.

2. Due to the wide variability of chlorophyll *a* concentrations, along with the many physical factors influencing chlorophyll levels, it is not clear that chlorophyll *a* would be a suitable parameter to indicate nutrient impairment in urban streams. The scientific literature also indicates that there is a weaker relationship between nutrients and chlorophyll in streams as opposed to lakes (Dodds et al., 2002).

3. Ecoregions may not be the appropriate scale by which to develop chlorophyll or nutrient criteria in Illinois. Standards for specific sub-regions or waterways may be necessary to account for great differences in land use and stream morphology.

4. Populations of algae are able to thrive in many of the Chicago area waterways during the winter months despite lower temperatures and diminished daylight hours.

INTRODUCTION

Water samples for analysis of chlorophyll and many other water quality parameters are collected as part of District's Ambient Water Quality Monitoring (AWQM) Program. There are 59 monitoring stations sampled monthly on 21 natural, constructed, or artificially altered waterways throughout the Chicago metropolitan area.

As a photosynthetic component of all algae cells, the determination of chlorophyll *a* concentration is an accepted way of quantifying algal biomass in lakes and streams. Chlorophyll values are of interest to regulatory agencies since it is also widely accepted that high algae concentrations may indicate nutrient impairment. The Illinois Environmental Protection Agency (IEPA) is cooperating with other state and local agencies to promulgate regional water quality criteria for nutrients and possibly chlorophyll. In light of this consideration, the District began monitoring chlorophyll on a monthly basis in August of 2001. This report will discuss chlorophyll *a* concentrations from January of 2002 through December of 2003, as well as their relationship to nutrient levels and dissolved oxygen (DO) concentrations. The effects of seasonal variation and water reclamation plant (WRP) discharges on chlorophyll *a* values will also be examined. Although chlorophylls *a, b,* and *c* are determined through analysis, the focus of this report will be on chlorophyll *a*, as it is the only chlorophyll pigment that is known to be present in all types of algae. The presence of chlorophyll *b* is characteristic of water with algae from the Euglenophyceae or Chlorophyceae group. The detection of chlorophyll *c* indicates algae in the Chrysophyceae, Bacillariophyceae (diatoms), or Dynophyceae group (Dodds, 2002).

Study Area

The sampling stations for the AWQM Program are located on natural and man-made waterways throughout the District's service area. A map of the 59 stations in the Chicago area is shown in Figure 1. The primary natural waterways include the Chicago River System branches flowing south from Lake County into the North Branch of the Chicago River; the Des Plaines River System flowing south from Lake County and joining with the discharge from the Chicago Sanitary and Ship Canal (CSSC) downstream of the powerhouse at Lockport; and the Calumet River System which flows into the Calumet-Sag Channel. The primary man-made waterways are the North Shore Channel connecting Lake Michigan at Wilmette to the North Branch of the Chicago River; the CSSC extending from Damen Avenue to the Lockport Powerhouse; and the Calumet-Sag Channel connecting the Little Calumet River with the CSSC.

Water samples for chlorophyll analysis were taken on Mondays of each month in accordance with the schedule in Table 1. Water samples were collected and analyzed weekly at the Lockport station.

FIGURE 1: AMBIENT WATER QUALITY MONITORING LOCATIONS

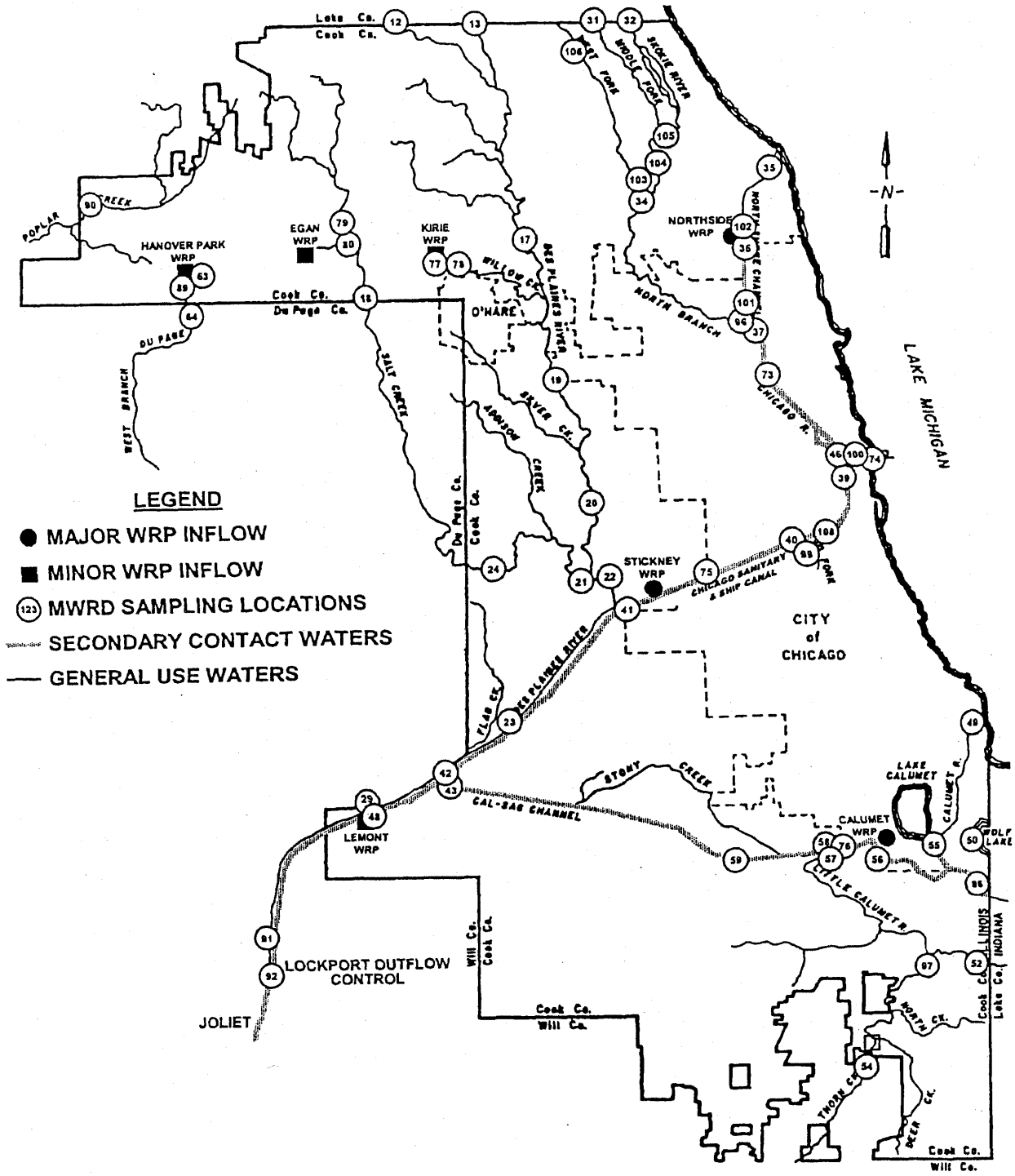


TABLE 1: MONTHLY MONITORING SCHEDULE FOR CHLOROPHYLL

Station No.	Sampling Station	Waterway	Monitoring Schedule
90	Route 19	Poplar Creek	First Monday of Month
63	Longmeadow Lane	West Branch DuPage River	First Monday of Month
89	Walnut Lane	West Branch DuPage River	First Monday of Month
64	Lake Avenue	West Branch DuPage River	First Monday of Month
79	Higgins Road	Salt Creek	First Monday of Month
80	Arlington Heights Rd.	Salt Creek	First Monday of Month
18	Devon Avenue	Salt Creek	First Monday of Month
24	Wolf Road	Salt Creek	First Monday of Month
109	Brookfield Avenue	Salt Creek	First Monday of Month
77	Elmhurst Road	Higgins Creek	First Monday of Month
78	Wille Road	Higgins Creek	First Monday of Month
12	Lake-Cook Road	Buffalo Creek	First Monday of Month
13	Lake-Cook Road	Des Plaines River	First Monday of Month
17	Oakton Street	Des Plaines River	First Monday of Month
19	Belmont Avenue	Des Plaines River	First Monday of Month
20	Roosevelt Road	Des Plaines River	First Monday of Month
22	Ogden Avenue	Des Plaines River	First Monday of Month
23	Willow Springs Rd.	Des Plaines River	First Monday of Month
29	Stephen Street	Des Plaines River	First Monday of Month
91	Material Service Rd.	Des Plaines River	First Monday of Month
106	Dundee Road	West Fork North Branch	Second Monday of Month
103	Golf Road	West Fork North Branch	Second Monday of Month
31	Lake-Cook Road	Middle Fork North Branch	Second Monday of Month
104	Glenview Road	Middle Fork North Branch	Second Monday of Month
32	Lake-Cook Road	Skokie River	Second Monday of Month
105	Frontage Road	Skokie River	Second Monday of Month
34	Dempster Street	North Branch Chicago River	Second Monday of Month
96	Albany Avenue	North Branch Chicago River	Second Monday of Month
35	Central Street	North Shore Channel	Second Monday of Month
102	Oakton Street	North Shore Channel	Second Monday of Month
36	Touhy Avenue	North Shore Channel	Second Monday of Month
101	Foster Avenue	North Shore Channel	Second Monday of Month

TABLE 1 (Continued): MONTHLY MONITORING SCHEDULE FOR CHLOROPHYLL

Station No.	Sampling Station	Waterway	Monitoring Schedule
37	Wilson Avenue	North Branch Chicago River	Second Monday of Month
73	Diversey Parkway	North Branch Chicago River	Second Monday of Month
46	Grand Avenue	North Branch Chicago River	Second Monday of Month
100	Wells Street	Chicago River	Third Monday of Month
39	Madison Street	South Branch Chicago River	Third Monday of Month
108	Loomis Street	South Branch Chicago River	Third Monday of Month
99	Archer Avenue	South Fork South Branch	Third Monday of Month
107	Western Avenue	Chicago Sanitary & Ship Canal	Third Monday of Month
75	Cicero Avenue	Chicago Sanitary & Ship Canal	Third Monday of Month
41	Harlem Avenue	Chicago Sanitary & Ship Canal	Third Monday of Month
42	Route 83	Chicago Sanitary & Ship Canal	Third Monday of Month
48	Stephen Street	Chicago Sanitary & Ship Canal	Third Monday of Month
92	Lockport	Chicago Sanitary & Ship Canal	Each Monday of Month
49	Ewing Avenue	Calumet River	Fourth Monday of Month
50	Burnham Avenue	Wolf Lake	Fourth Monday of Month
55	130th Street	Calumet River	Fourth Monday of Month
86	Burnham Avenue	Grand Calumet River	Fourth Monday of Month
56	Indiana Avenue	Little Calumet River	Fourth Monday of Month
76	Halsted Street	Little Calumet River	Fourth Monday of Month
52	Wentworth Avenue	Little Calumet River	Fourth Monday of Month
54	Joe Orr Road	Thorn Creek	Fourth Monday of Month
97	170th Street	Thorn Creek	Fourth Monday of Month
57	Ashland Avenue	Little Calumet River	Fourth Monday of Month
58	Ashland Avenue	Calumet-Sag Channel	Fourth Monday of Month
59	Cicero Avenue	Calumet-Sag Channel	Fourth Monday of Month
43	Route 83	Calumet-Sag Channel	Fourth Monday of Month

*See Figure 1.

MATERIALS AND METHODS

Field Collection

Surface water grab samples for chlorophyll analysis were collected using a stainless steel bucket. The bucket was lowered into the waterway, generally from the upstream side of the bridge, at the most central location. The bucket was submerged, filled, and then raised to the top of the bridge. An aliquot was poured into an amber, plastic one-liter bottle that was pre-preserved with 1-mg magnesium carbonate, leaving ½ inch airspace at the top. Samples were then placed in a cooler with ice and returned to the laboratory for processing.

Laboratory Analysis

Filtration. Prior to filtering samples, water was mixed by rapidly inverting sample bottles 25 times before the first pour. Samples were filtered through Whatman type GF/F glass-fiber filters (0.7 micrometers) using Millipore filtration equipment and vacuum pressure. Water samples were filtered until the rate of flow decreases, but before it becomes clogged. Following filtration, sample filters were folded and wrapped with aluminum foil and extracted the following day.

Extraction. Filters were placed in glass extraction tubes with 5 mL of 90 percent aqueous acetone solution. Using a motorized tissue grinder set at 500 rpm and a pestle, the top layer of the filter was separated. Samples were then transferred to centrifuge tubes and additional acetone was added until the total volume equaled 10 ml. These tubes were inverted five times and then placed at 4°C for approximately 24 hours to steep.

Spectrophotometric Analysis. After removing samples from refrigeration, they were centrifuged for 20 minutes at 2,500 rpm. Three ml of the supernatant was transferred into a spectrophotometric cell and the absorbance read at 750, 664, 647, and 630 nm. To correct for the degradation product pheophyton, 0.1 ml of 1 percent hydrochloric acid was added and after one minute, absorbance was read again at 750 and 665 nm. The spectrophotometer was programmed to calculate corrected chlorophyll *a, b,* and *c* values based on the volumes filtered and used to extract samples.

Quality Control. A reagent blank of 90 percent acetone was placed in the spectrophotometer every 10^{th} sample and read between -0.1 and 0.1 µg/L. A method blank of distilled water was prepared for each group of samples and run through the entire laboratory procedure. One duplicate sample was chosen randomly for each group of samples and would have to be within 20 relative percent difference of the original sample. Chlorophyll *a* and *b* standards from spinach were also analyzed every 20 samples and displayed at least a 90 percent recovery.

Statistical Methods

SAS® software (SAS Institute, Cary, North Carolina) with customized programming was used to determine the relationship of chlorophyll *a* with total nitrogen (TN) and total phosphorus (TP). Linear regressions were found to be inappropriate for these data. A nonlinear model was constructed that resulted in a closer fit which yielded higher R^2 values.

RESULTS AND DISCUSSION

In order to describe chlorophyll values, the study area will be discussed by watershed. All of the chlorophyll *a*, *b*, and *c* data for each sampling date and station are available in Appendix A. Entries of "No Data" were usually a result of either there not being enough river flow to sample or of ice cover. A summary of the range and mean chlorophyll *a* values for each waterway during 2002–2003 is located in Table 2.

Calumet River System

Calumet River. The maximum chlorophyll *a* value in the Calumet River measured 22 µg/L and occurred on March 25, 2002 at 130th Street, while the minimum value of <1 µg/L was recorded on several dates at 130th Street and Ewing Avenue. The mean chlorophyll *a* during 2002 and 2003 was 5 µg/L.

Calumet-Sag Channel. During 2002 and 2003, the mean chlorophyll *a* concentration in the Calumet-Sag Channel was 17 µg/L. The maximum value (93 µg/L) was measured on June 23, 2003 at Route 83, while the minimum (<1 µg/L) was recorded at Ashland Avenue on December 22, 2003.

TABLE 2: RANGE AND MEAN CHLOROPHYLL *a* VALUES FOR VARIOUS CHICAGO AREA WATERWAYS DURING 2002–2003

Waterway	N[1]	Mean µg/L	Minimum µg/L	Maximum µg/L	Std. Dev.[2] µg/L
Buffalo Creek	15	33	12	65	14
Calumet-Sag Channel	68	17	<1	93	16
Calumet River	42	5	<1	22	5
Chicago River	45	3	<1	12	3
Chicago Sanitary & Ship Canal	217	6	<1	37	5
Des Plaines River	163	30	<1	214	35
Grand Calumet River	20	36	3	233	55
Higgins Creek	34	7	<1	23	6
Little Calumet River	88	14	<1	64	13
Middle Fork North Branch Chicago River	19	11	<1	35	9
North Branch Chicago River	128	10	<1	56	10
North Shore Channel	84	6	<1	91	15
Poplar Creek	18	15	2	32	9
Salt Creek	99	20	1	114	17
Skokie River	42	17	1	59	14
South Branch Chicago River	46	5	<1	26	5
South Fork South Branch Chicago River	24	10	<1	26	6
Thorn Creek	32	10	1	33	8
West Branch DuPage River	46	18	1	103	19
West Fork North Branch Chicago River	28	19	3	118	23
Wolf Lake	24	6	<1	18	5

[1]Number of Observations.
[2]Standard Deviation.

Grand Calumet River. The maximum chlorophyll *a* value at the only sampling station located on the Grand Calumet River (Burnham Avenue) measured 233 µg/L and occurred on March 24, 2003, while the minimum value of 3 µg/L was recorded on November 24, 2003. The mean chlorophyll *a* during 2002 and 2003 was 36 µg/L. The maximum measured at this site marks the highest chlorophyll *a* concentration detected at any station during 2002–2003.

Little Calumet River. During 2002 and 2003, the mean chlorophyll *a* concentration in the Little Calumet River was 14 µg/L. The maximum value (64 µg/L) was measured on March 25, 2002 at Indiana Avenue, while the minimum (<1 µg/L) was recorded at Wentworth Avenue on December 22, 2003.

Thorn Creek. The maximum chlorophyll *a* value in Thorn Creek measured 33 µg/L and occurred on February 25, 2002 at Joe Orr Road, while the minimum value of 1 µg/L was recorded on August 22, 2002 at Joe Orr Road. The mean chlorophyll *a* during 2002 and 2003 was 10 µg/L.

Wolf Lake. During 2002 and 2003, the mean chlorophyll *a* concentration at the only sampling station located in Wolf Lake (Burnham Avenue) was 6 µg/L. The maximum value (18 µg/L) was measured on January 27, 2003, while the minimum (<1 µg/L) was recorded on several dates.

Chicago River System

Chicago River. The maximum chlorophyll *a* value in the Chicago River measured 12 µg/L and occurred on May 19, 2003 at Wells Street, while the minimum value of <1 µg/L was recorded on several dates at both Wells Street and Lake Shore Drive. The mean chlorophyll *a* during 2002 and 2003 was 3 µg/L.

Chicago Sanitary and Ship Canal. During 2002 and 2003, the mean chlorophyll *a* concentration in the Chicago Sanitary and Ship Canal was 6 µg/L. The maximum value (37 µg/L) was measured on July 7, 2003 at Lockport, while the minimum (<1 µg/L) was recorded on several dates at Damen, Harlem, Route 83, and Lockport.

Middle Fork North Branch Chicago River. The maximum chlorophyll *a* value at the only sampling station located in the Middle Fork North Branch of the Chicago River (Lake-Cook Road) measured 35 µg/L and occurred on November 12, 2002, while the minimum value of <1 µg/L was recorded on October 14. The mean chlorophyll *a* during 2002 and 2003 was 11 µg/L.

North Branch Chicago River. During 2002 and 2003, the mean chlorophyll *a* concentration in the North Branch of the Chicago River was 10 µg/L. The maximum value (56 µg/L) was measured on April 14, 2003 at Albany Avenue, while the minimum (<1 µg/L) was recorded on several dates at Diversey Parkway, Grand Avenue, and Wilson Avenue.

North Shore Channel. The maximum chlorophyll *a* value in the North Shore Channel measured 91 µg/L and occurred on March 11, 2002 at Central Street, while the minimum value of <1 µg/L was recorded on several dates at each station. The chlorophyll *a* mean during 2002 and 2003 was 6 µg/L.

Skokie River. During 2002 and 2003, the mean chlorophyll *a* concentration in the Skokie River was 17 µg/L. The maximum value (59 µg/L) was measured on April 14, 2003 at Frontage Road, while the minimum (1 µg/L) was recorded on October 14, 2002 at Lake-Cook Road.

South Branch Chicago River. The maximum chlorophyll *a* value in the South Branch of the Chicago River measured 26 µg/L and occurred on April 21, 2003 at Loomis Street, while the minimum value of <1 µg/L was recorded on several dates at Loomis Street. The chlorophyll *a* mean during 2002 and 2003 was 5 µg/L.

South Fork South Branch Chicago River (Bubbly Creek). During 2002 and 2003, the mean chlorophyll *a* concentration in the only sampling station in Bubbly Creek (Archer Avenue) was 10 µg/L. The maximum value (26 µg/L) was measured on April 21, 2003, while the minimum (<1 µg/L) was recorded on February 19, 2002.

West Fork North Branch Chicago River. The maximum chlorophyll *a* value in the West Fork North Branch of the Chicago River measured 118 µg/L and occurred on July 14, 2003 at Dundee Road, while the minimum value of 3 µg/L was recorded on November 10, 2003 at Golf Road. The mean chlorophyll *a* during 2002 and 2003 was 19 µg/L.

Des Plaines River System

Buffalo Creek. During 2002 and 2003, the mean chlorophyll *a* concentration in the only sampling station in Buffalo Creek (Lake-Cook Road) was 33 µg/L. The maximum value (65 µg/L) was measured on May 6, 2002, while the minimum (12 µg/L) was recorded on December 1, 2003.

Des Plaines River. The maximum chlorophyll *a* value in the Des Plaines River measured 214 µg/L and occurred on July 7, 2003 at Material Service Road, while the minimum value of <1 µg/L was recorded on November 4, 2002 at Belmont Avenue and Roosevelt Road, and October 6, 2003 at Roosevelt Road. The mean chlorophyll *a* during 2002 and 2003 was 30 µg/L.

Higgins Creek. During 2002 and 2003, the mean chlorophyll *a* concentration in Higgins Creek was 7 µg/L. The maximum value (23 µg/L) was measured on May 6, 2002 at Elmhurst Road, while the minimum (<1 µg/L) was recorded on February 4, 2002 at Wille Road.

Poplar Creek. The maximum chlorophyll *a* value at the only sampling station in Poplar Creek (Route 19) measured 32 µg/L and occurred on August 5, 2002, while the minimum value of 2 µg/L was recorded on September 2, 2003. The mean chlorophyll *a* during 2002 and 2003 was 15 µg/L.

Salt Creek. During 2002 and 2003, the mean chlorophyll *a* concentration in Salt Creek was 20 µg/L. The maximum value (114 µg/L) was measured on July 7, 2003 at Higgins Road, while the minimum (1 µg/L) was recorded on October 7, 2002 at Wolf Road, and November 4, 2002 at Brookfield Avenue.

West Branch DuPage River. The maximum chlorophyll *a* value in the West Branch DuPage River measured 103 µg/L and occurred on June 2, 2003 at Lake Street, while the minimum value of 1 µg/L was recorded on several dates at Walnut Lane. The mean chlorophyll *a* during 2002 and 2003 was 18 µg/L.

Factors Influencing Chlorophyll *a*

Nutrients. A comparison of mean chlorophyll *a* values, TP, and TN concentrations for each monitored waterway is included in Table 3.

Figures 2–7 depict mean TP, TN, and chlorophyll *a* concentrations along the North Shore Channel, North Branch Chicago River, Chicago Sanitary and Ship Canal, Little Calumet River/Calumet-Sag Channel, Des Plaines River, and Salt Creek,

TABLE 3: MEAN CHLOROPHYLL *a*, TOTAL PHOSPHORUS, AND TOTAL NITROGEN FOR VARIOUS CHICAGO AREA WATERWAYS DURING 2002–2003

Waterway	Mean Chlorophyll *a* µg/L	Mean TP mg/L	Mean TN mg/L
Buffalo Creek	33	0.15	1.79
Calumet-Sag Channel	17	1.93	6.11
Calumet River	5	0.04	0.94
Chicago River	3	0.38	3.20
Chicago Sanitary and Ship Canal	6	1.05	7.72
Des Plaines River	30	1.05	6.62
Grand Calumet River	36	0.61	10.53
Higgins Creek	7	0.51	5.16
Little Calumet River	14	1.14	5.32
Middle Fork North Branch Chicago River	11	0.14	1.62
North Branch Chicago River	10	1.08	7.23
North Shore Channel	6	0.84	6.42
Poplar Creek	15	0.09	1.40
Salt Creek	20	1.53	7.43
Skokie River	17	1.02	4.96
South Branch Chicago River	5	0.85	6.72
South Fork South Branch Chicago River	10	0.79	6.45
Thorn Creek	10	3.14	9.13
West Branch DuPage River	18	2.35	9.14
West Fork North Branch Chicago River	19	0.85	5.57
Wolf Lake	6	0.03	0.60

respectively. Figures 2, 3, 4, 5, and 7 all display an increase in nutrients and a decrease in chlorophyll *a* directly downstream of WRPs as the treated wastewater becomes the main component of these waterways. Chlorophyll *a* is generally low at these stations due to this effluent dilution effect. The algae populations appear to increase in areas where there is shallow slow moving water with an abundance of available light, as in the Des Plaines River and Salt Creek.

The USEPA recommended numeric criteria for chlorophyll *a* in streams of the "Corn Belt" Ecoregion (Ecoregion VI) is 2.7 µg/L, and is depicted with a dotted line on Figures 2–7. The equivalent criteria for TP is 0.076 mg/L and 2.18 mg/L for TN. These graphs clearly show that all stations except for Touhy Avenue on the North Shore Channel are above the Ecoregion VI criterion for chlorophyll *a*. Touhy Avenue is located downstream of the Northside WRP where the channel flow consists mostly of treated effluent and there is extensive, but not complete tree canopy cover shading the waterway.

A non-linear regression model was developed to describe the relationship between chlorophyll *a* and nutrients, TN and TP.

FIGURE 2: MEAN TOTAL PHOSPHORUS, TOTAL NITROGEN, AND CHLOROPHYLL *a* ALONG THE NORTH SHORE CHANNEL DURING 2002–2003

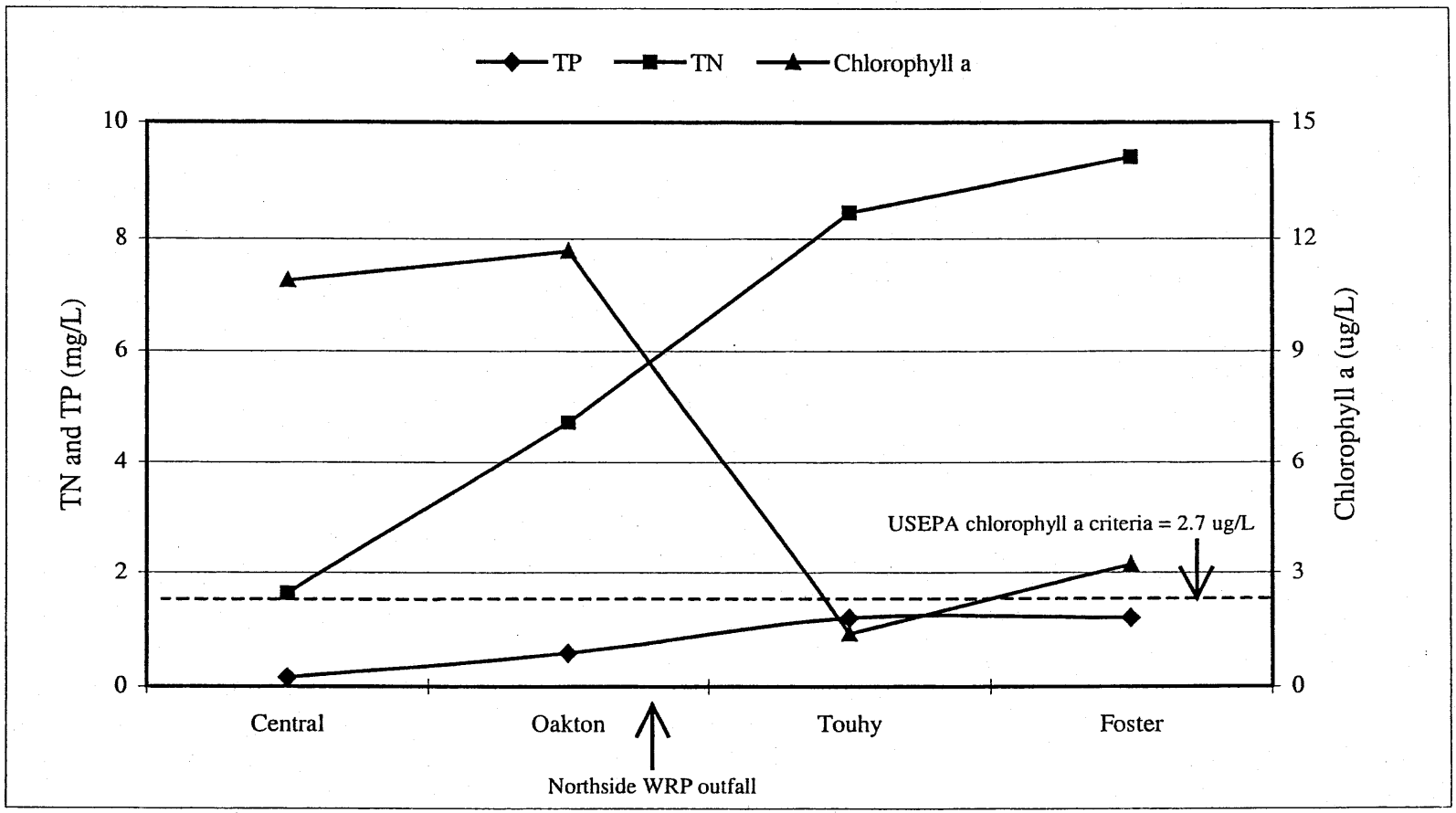


FIGURE 3: MEAN TOTAL PHOSPHORUS, TOTAL NITROGEN, AND CHLOROPHYLL *a* ALONG THE NORTH BRANCH CHICAGO RIVER DURING 2002-2003

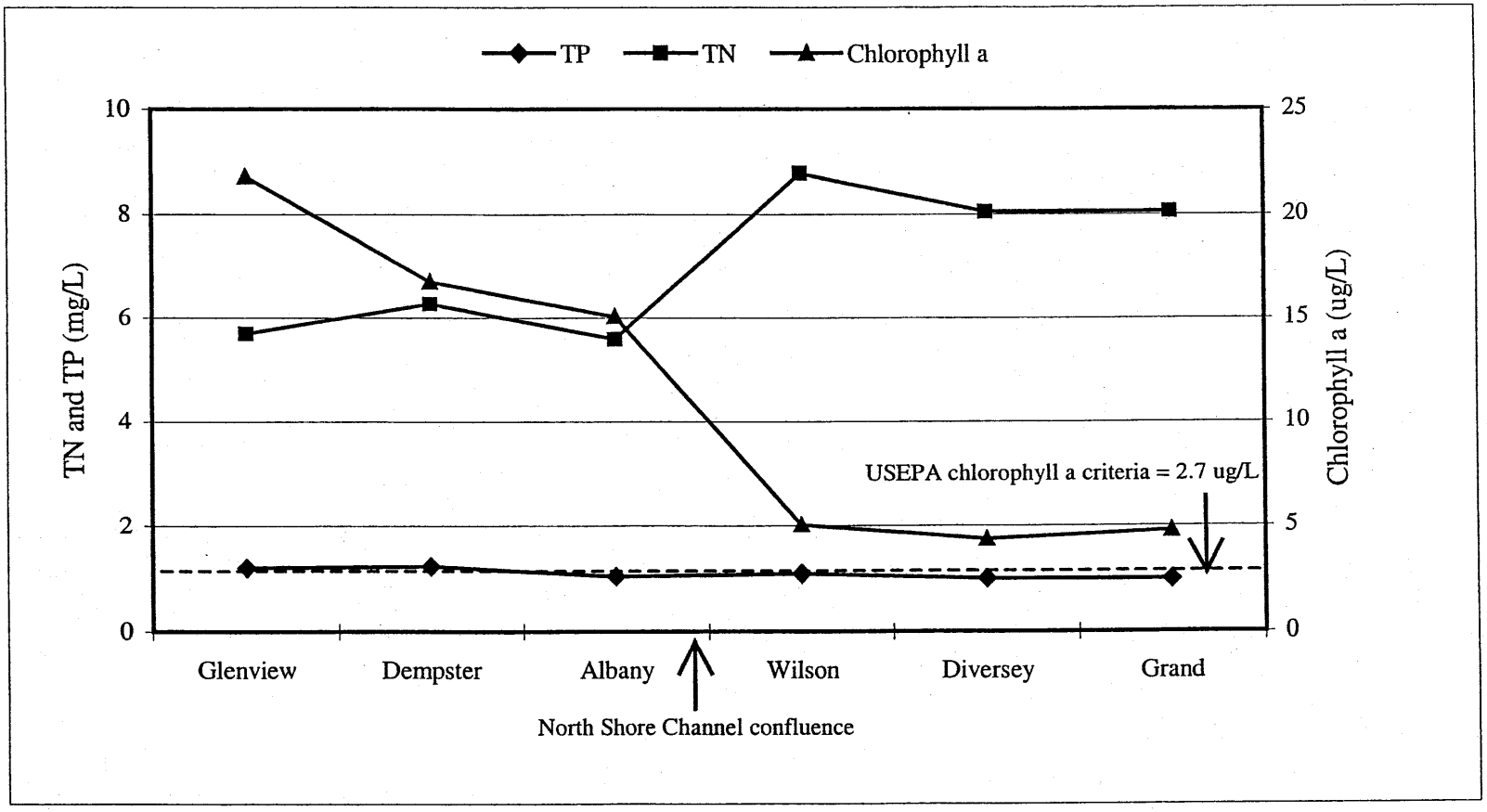


FIGURE 4: MEAN TOTAL PHOSPHORUS, TOTAL NITROGEN, AND CHLOROPHYLL *a* ALONG THE CHICAGO SANITARY AND SHIP CANAL DURING 2002-2003

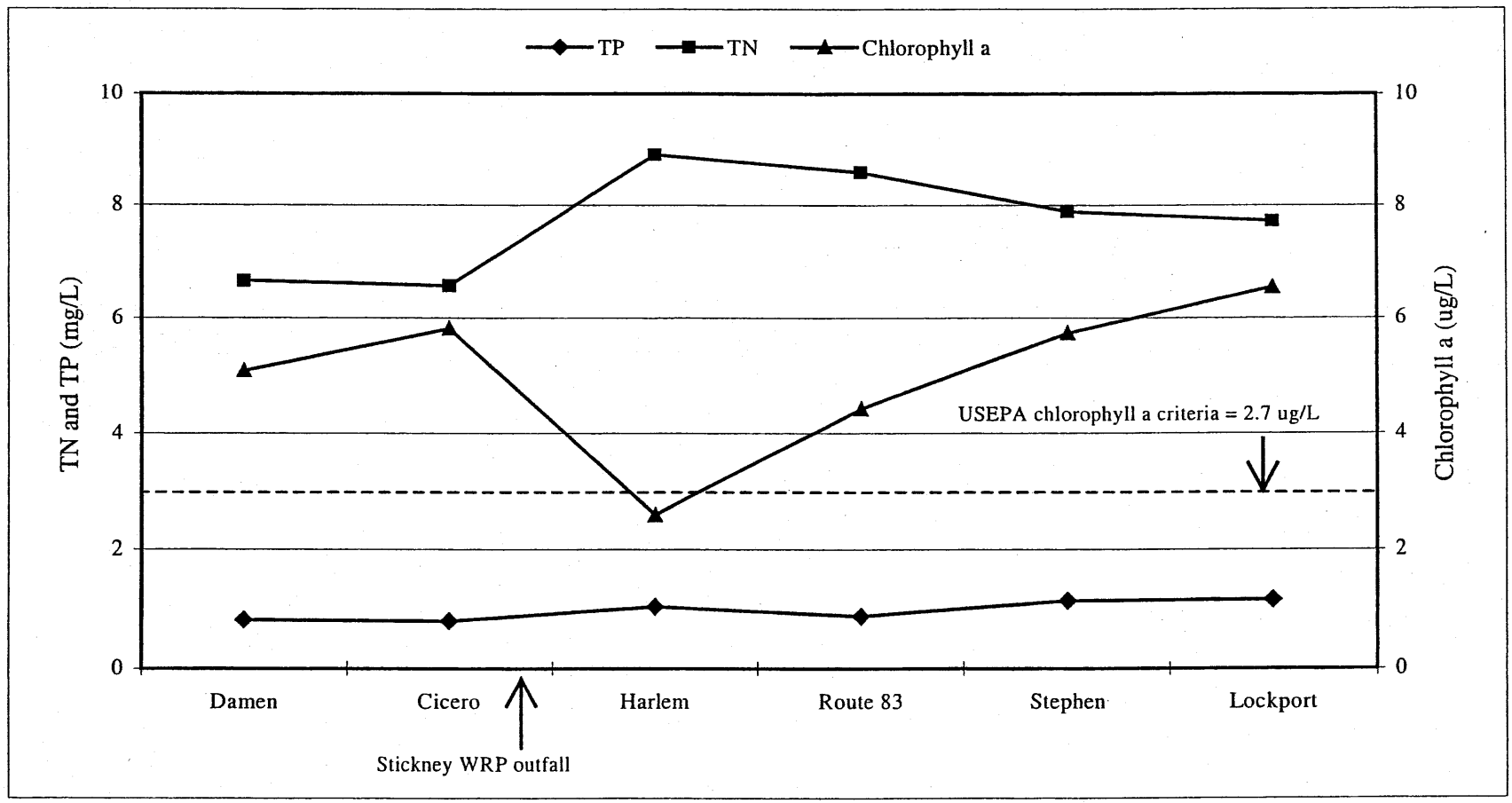


FIGURE 5: MEAN TOTAL PHOSPHORUS, TOTAL NITROGEN, AND CHLOROPHYLL *a* ALONG THE LITTLE CALUMET RIVER AND THE CALUMET-SAG CHANNEL DURING 2002-2003

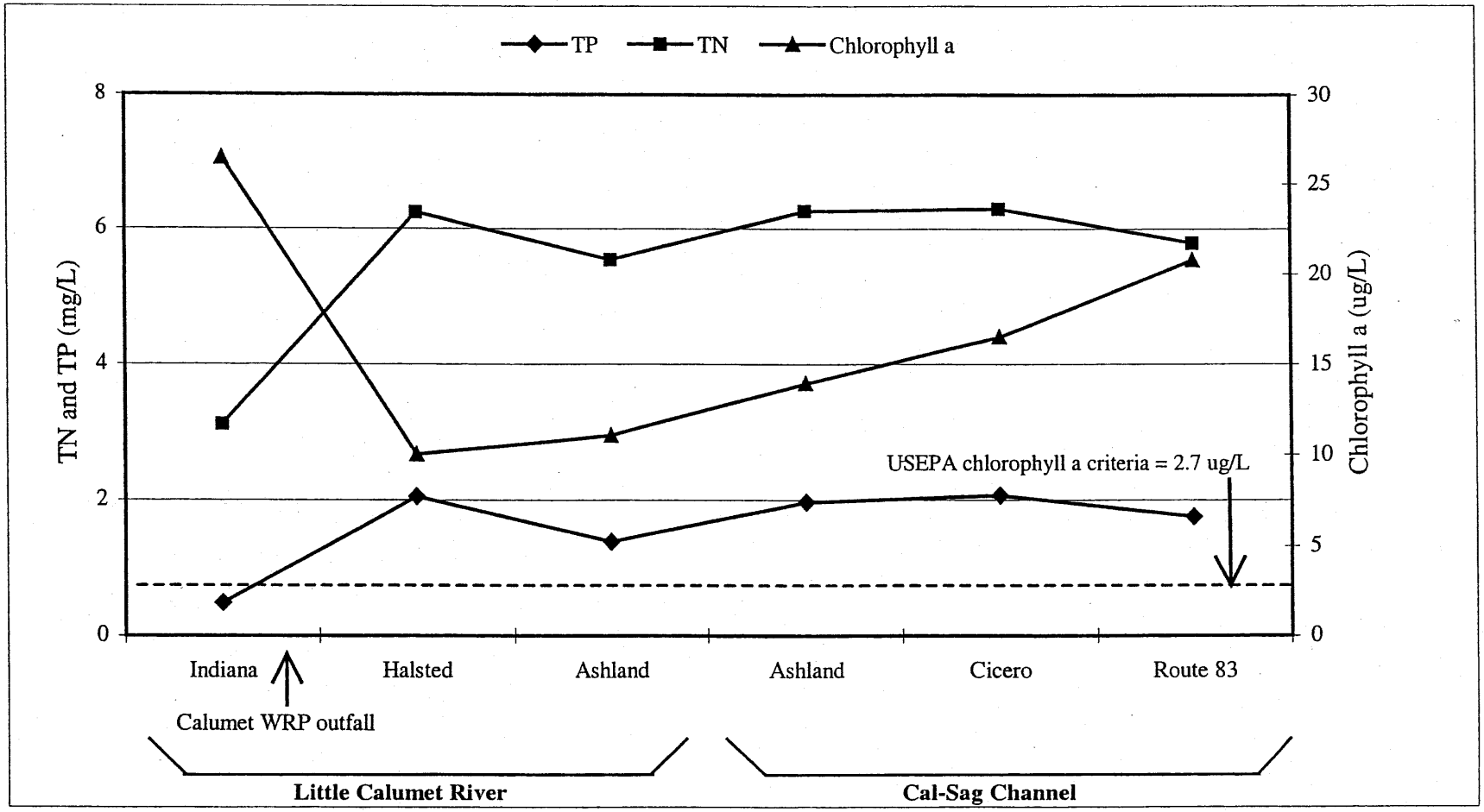


FIGURE 6: MEAN TOTAL PHOSPHORUS, TOTAL NITROGEN, AND CHLOROPHYLL *a* ALONG THE DES PLAINES RIVER DURING 2002-2003

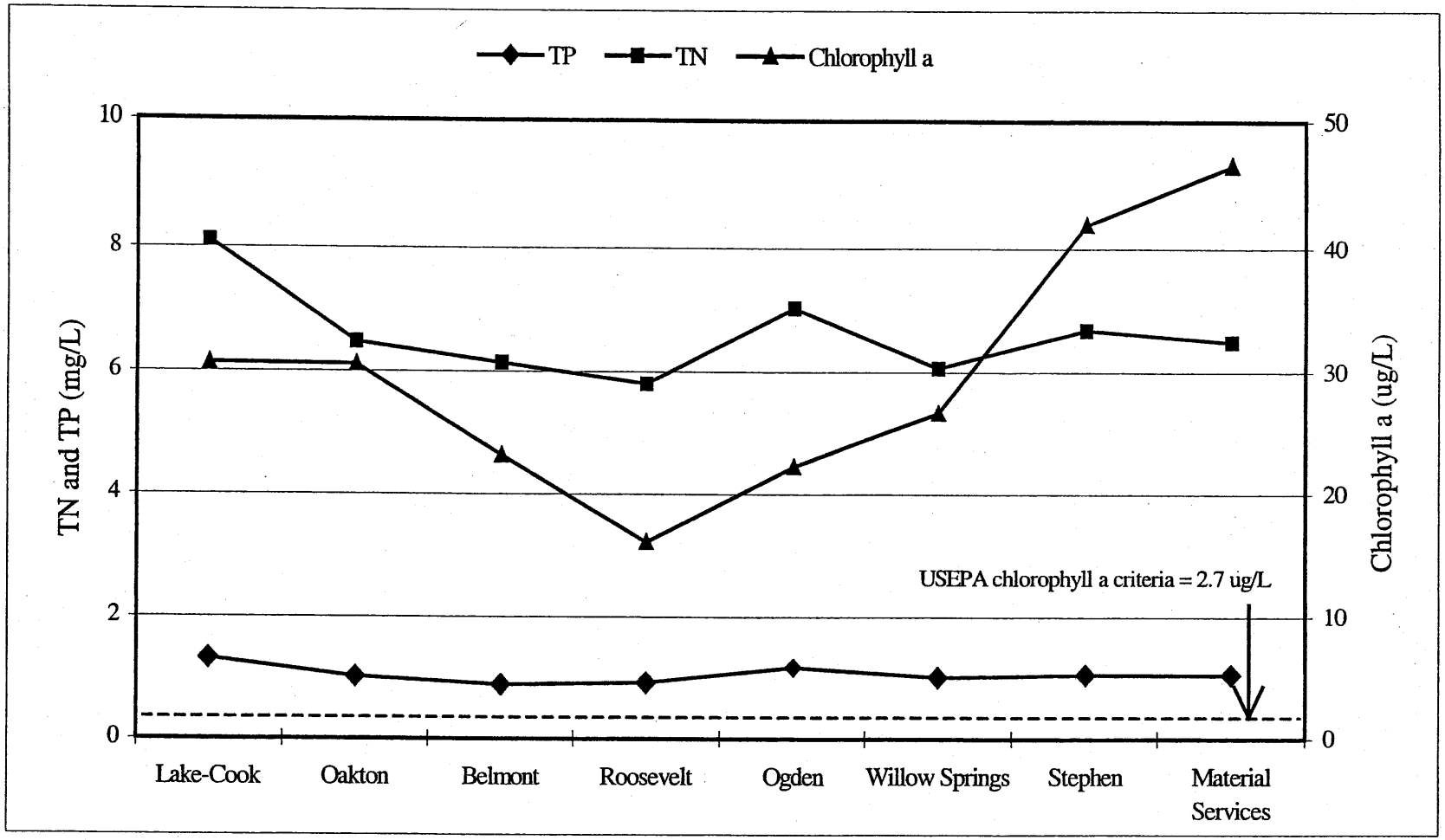
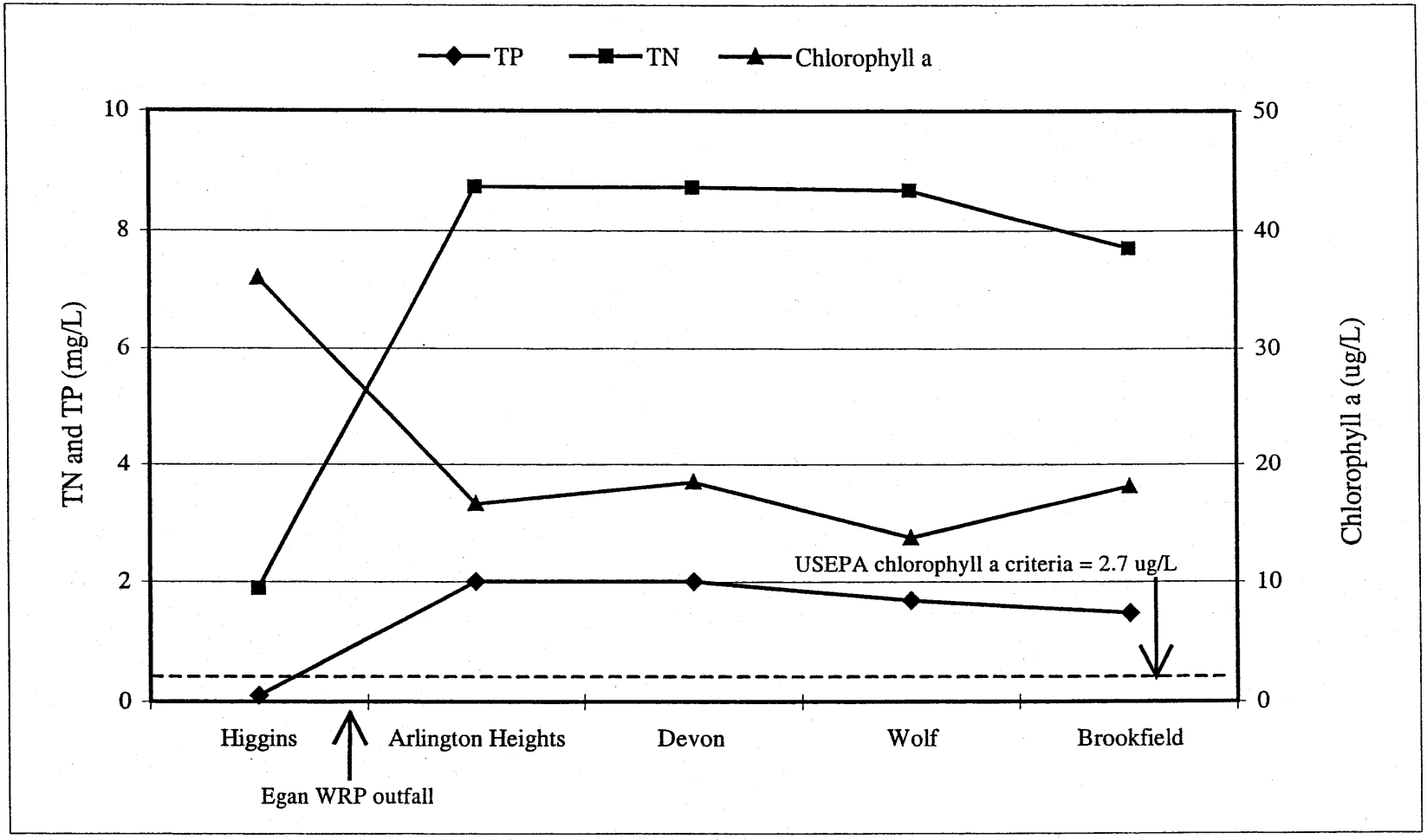


FIGURE 7: MEAN TOTAL PHOSPHORUS, TOTAL NITROGEN, AND CHLOROPHYLL *a* ALONG SALT CREEK DURING 2002-2003



The equation for this model in all waterway systems is given below:

$$Y = \begin{cases} \frac{N^a}{P^b} & if\ P > 0 \\ N^c & if\ P = 0 \end{cases} \quad (1)$$

Where a, b, and c are waterway specific constants greater than 0, Y is the chlorophyll *a* concentration, N is the total nitrogen concentration, and P is the total phosphorus concentration.

Equation (1) for the Chicago River System was determined to be:

$$Y = \begin{cases} \frac{N^{0.70}}{P^{0.61}} & if\ P > 0;\ R^2 = 0.61 \\ N^{0.71} & if\ P = 0;\ R^2 = 0.50 \end{cases} \quad (2)$$

Equation (1) for the Calumet River System was determined to be:

$$Y = \begin{cases} \frac{N^{1.21}}{P^{0.57}} & if\ P > 0;\ R^2 = 0.75 \\ N^{1.09} & if\ P = 0;\ R^2 = 0.63 \end{cases} \quad (3)$$

Equation (1) for the Des Plaines River System was determined to be:

$$Y = \begin{cases} \frac{N^{1.32}}{P^{0.95}} & if\ P > 0;\ R^2 = 0.81 \\ N^{1.26} & if\ P = 0;\ R^2 = 0.66 \end{cases} \quad (4)$$

These equations (2, 3, and 4) seem to indicate that chlorophyll *a* and thus planktonic algae, is colimited by TN and TP in all studied waterway systems. As TP becomes more available (exceeding 1 mg/L), its effect on chlorophyll *a* concentration lessens and TN concentrations become more important. According to several studies, in streams where TP is highly available, the average concentration of phytoplankton may be more highly correlated with physical factors such as stream morphology, flow regime, turbidity, or land-use practices than with nutrients (Baker et al., 1979; Kilkus et al., 1975; Soballe et al., 1987).

Seasonal Changes. In lentic systems, it is often predicted that there will be algal blooms and increased chlorophyll during the spring and autumn months. On the other hand, lotic systems like the inland waterways around Chicago do not always show a seasonal pattern of chlorophyll *a* variation. Figure 8 displays seasonal variation of chlorophyll *a* at selected sampling stations throughout the Chicago area. Comparing the chlorophyll *a* values, it does appear that spring and summer months yield the highest concentrations at most of these stations, while during autumn months lower concentrations are observed. Interestingly, during winter months the sampling stations at Belmont Avenue, Wolf Road, and Oakton Street have average chlorophyll *a* values of 11–29 mg/L for 2002–2003. These data suggest that there are indeed algae populations that can thrive in the winter despite colder temperatures and limited daylight hours.

Chlorophyll *a* Concentrations Downstream of WRPs

Chlorophyll monitoring stations are located upstream and downstream of the Stickney, John E. Egan, Calumet, Northside, James C. Kirie, and Hanover Park WRPs. As shown in Figure 9, chlorophyll *a* concentrations are consistently lower at the station directly downstream of each WRP than the station directly upstream. Since the majority of flow in these waterways immediately downstream of the WRPs constitutes treated wastewater, the lower chlorophyll *a* values at the first station following each WRP are likely due to simple dilution by the effluent.

FIGURE 8: SEASONAL VARIATION OF MEAN CHLOROPHYLL *a* AT SELECTED SAMPLING STATIONS IN CHICAGO AREA WATERWAYS DURING 2002-2003

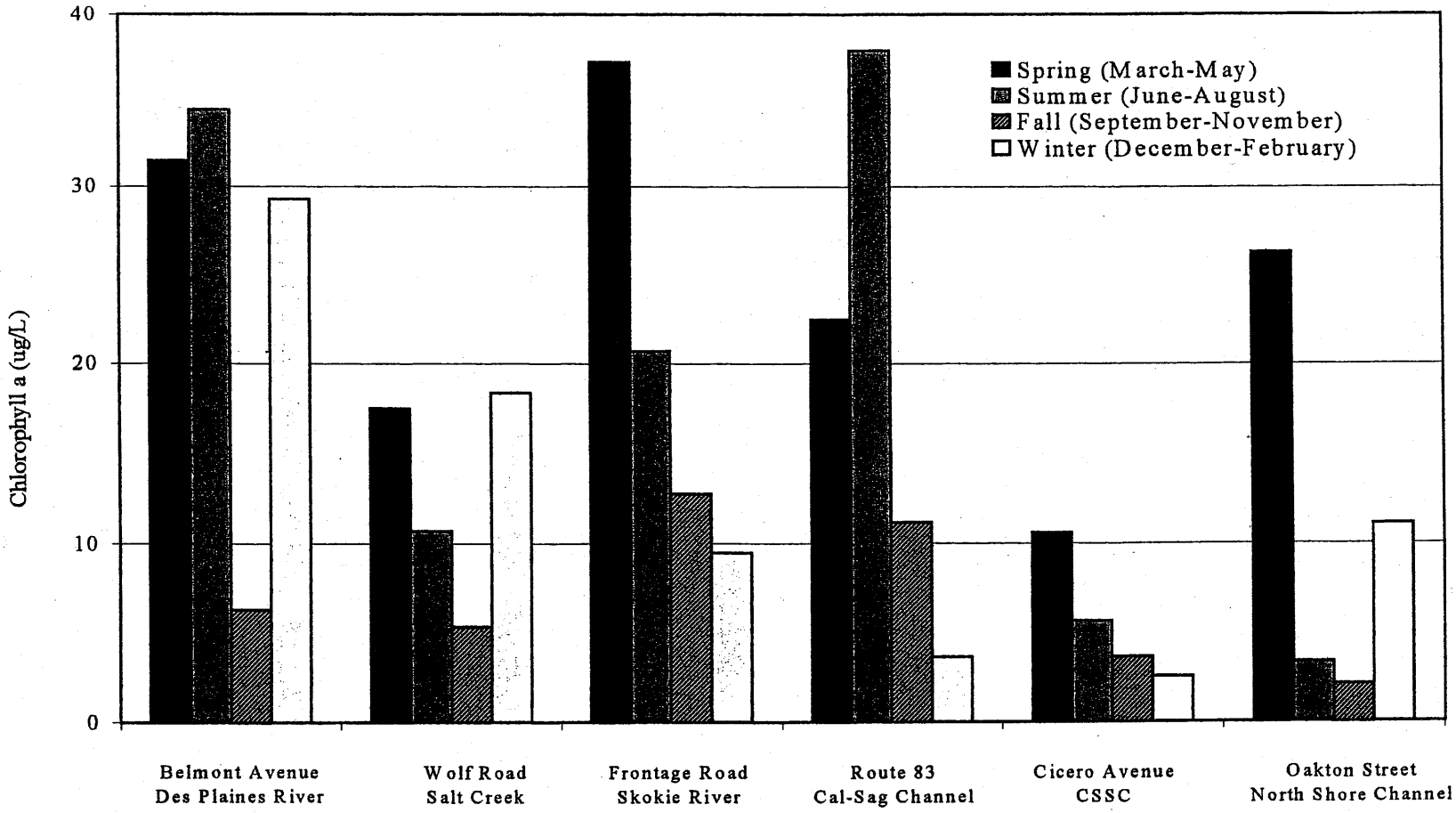
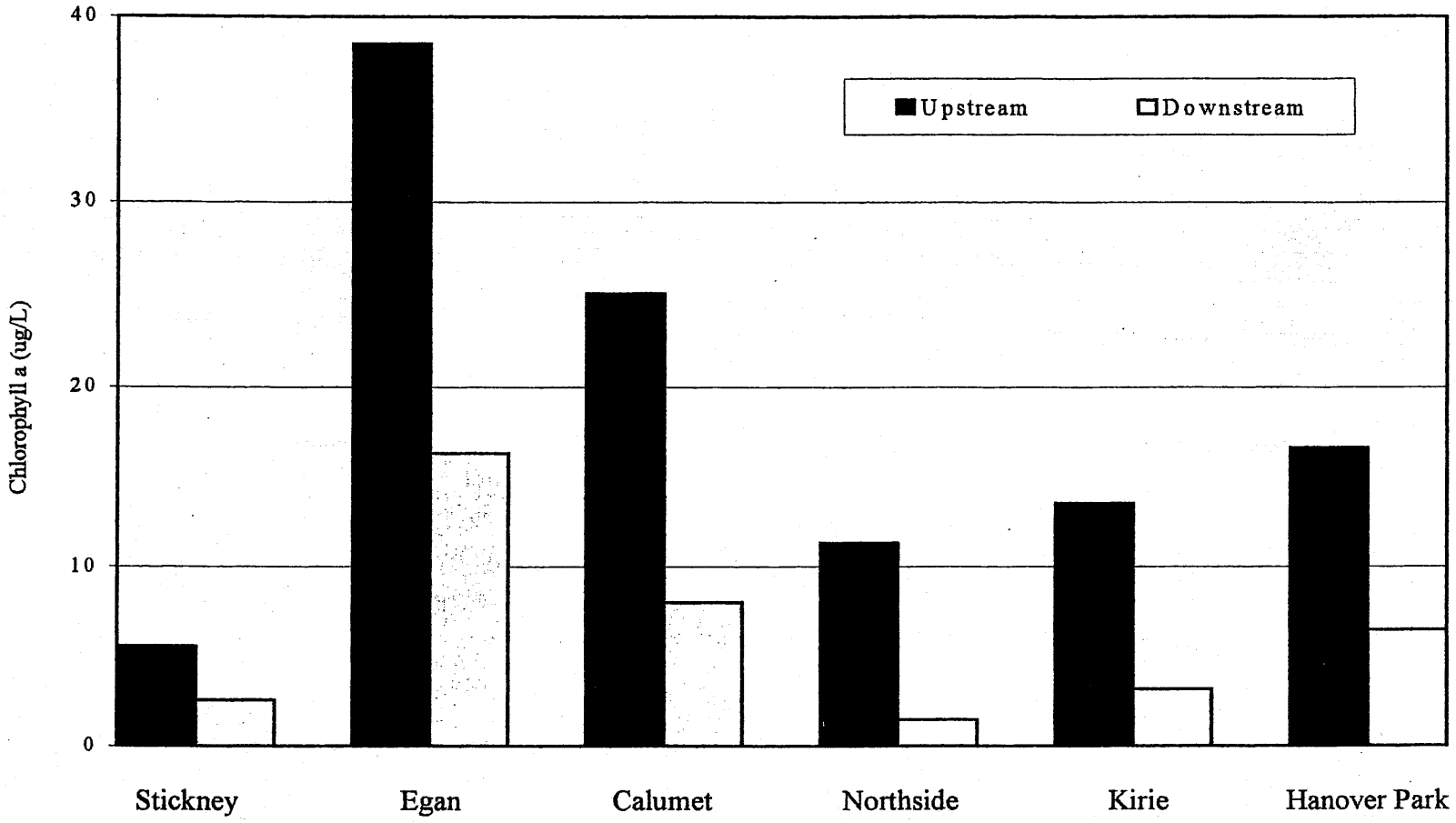


FIGURE 9: MEAN CHLOROPHYLL *a* CONCENTRATIONS AT MONITORING STATIONS LOCATED UPSTREAM AND DOWNSTREAM OF WATER RECLAMATION PLANTS DURING 2002-2003



Diurnal Fluctuations in Dissolved Oxygen

Elevated levels of algae in aquatic systems are widely known to be linked to diurnal fluctuations of dissolved oxygen (DO) due to increased photosynthesis during the day and respiration throughout the night. During 2002–2003, there were 35 locations throughout the Chicago Waterway System which the District continuously monitored for DO. Only nine of these locations coincided exactly with stations sampled for chlorophyll, although many were within a mile of chlorophyll stations. Of the 35 DO monitoring sites, only 3 exhibited diurnal fluctuations on a regular basis during the 2002–2003 period. The three DO stations to show this "signature" response were 36th Street on Bubbly Creek, Ashland Avenue on the Little Calumet River, and Torrence Avenue on the Grand Calumet River. Figures 10, 11, and 12 depict continuously monitored DO concentrations during selected weeks in 2002 and 2003 at these stations.

As seen in Figure 10, levels of DO fell below the Illinois Pollution Control Board (IPCB) DO standard of 4 mg/L during most nights of this particular week at 36th Street on Bubbly Creek. This short reach of waterway has no flow most of the time because it serves as the outlet channel for a combined sewer overflow pumping station. It also has a significant sediment oxygen demand. It is typical at this site for DO to fall below the standard during the summer months at night. The DO monitor at 36th Street is located 0.7 miles from the chlorophyll sampling station at Archer Avenue. There was no clear threshold chlorophyll *a* concentration that seemed to cause the DO fluctuation at 36th Street. There were diurnal fluctuations present when chlorophyll *a* value was as low as 1 µg/L at Archer, and absent when chlorophyll *a* was as high as 21 µg/L.

At Ashland Avenue on the Little Calumet River, DO levels were close to the DO standard of 5 mg/L during the day, but fell to around 3 mg/L at night during this selected week (Figure 11). During 2002–2003, it appears that chlorophyll *a* values above about 10 µg/L elicited diurnal fluctuations of DO at Ashland Avenue, where the DO monitor is located at the same bridge from which chlorophyll samples are taken. However, chlorophyll *a* concentrations of 5-9 µg/L also caused this signature response of DO during six sampling events. In general, diurnal fluctuations were likely to cause nighttime DO violations of <5 mg/L during the summer months at Ashland Avenue.

Finally, at Torrence Avenue on the Grand Calumet River (Figure 12) DO levels only fell below the IPCB DO standard of 4 mg/L on three nights during the depicted week. DO concentrations were above the standard a majority of the time during the summer months, but there were several occasions in which diurnal fluctuations caused DO to fall below 4 mg/L nightly. Generally, chlorophyll *a* concentrations of 8 µg/L or more at Burnham Avenue on the Grand Calumet River elicited diurnal fluctuations of DO at Torrence Avenue. The Torrence Avenue DO monitoring station is located approximately one mile downstream from the Burnham Avenue chlorophyll sampling station.

There were many monitoring stations with chlorophyll *a* means similar to these three locations that did not display diurnal DO fluctuations, indicating that there was not excessive primary productivity (gross photosynthesis – respiration) at all monitoring stations with elevated chlorophyll *a* concentrations (Amidon, 2004). It is therefore dubious to apply one chlorophyll *a* standard to every waterway and use it as an indicator of nutrient impairment. A given chlorophyll *a* concentration may cause nighttime DO violations and nuisance algal conditions at one location and not at others.

FIGURE 10: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT 36TH STREET IN BUBBLY CREEK JULY 3, 2003 THROUGH JULY 9, 2003

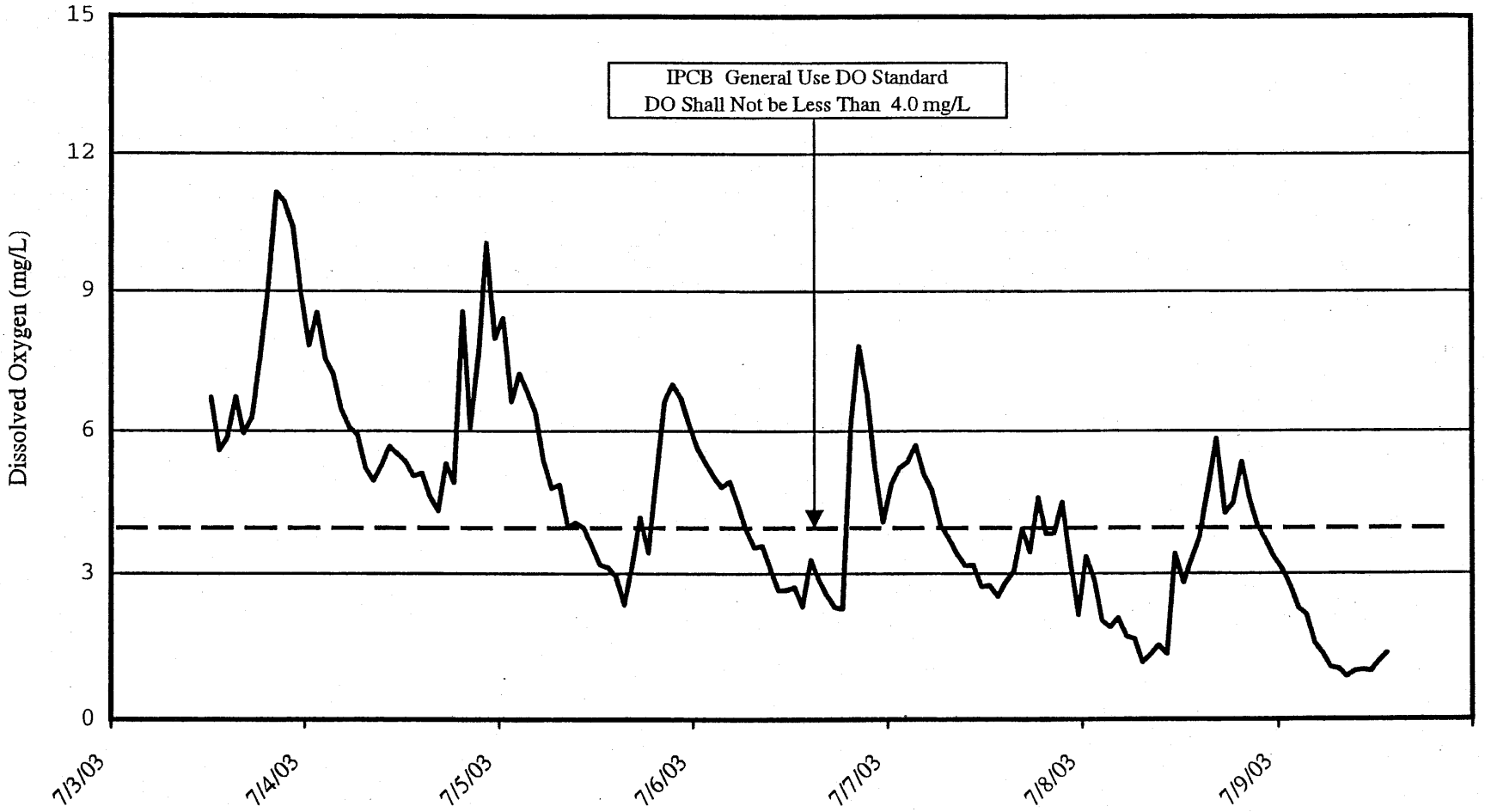


FIGURE 11: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT ASHLAND AVENUE IN LITTLE CALUMET RIVER JUNE 26, 2003 THROUGH JULY 2, 2003

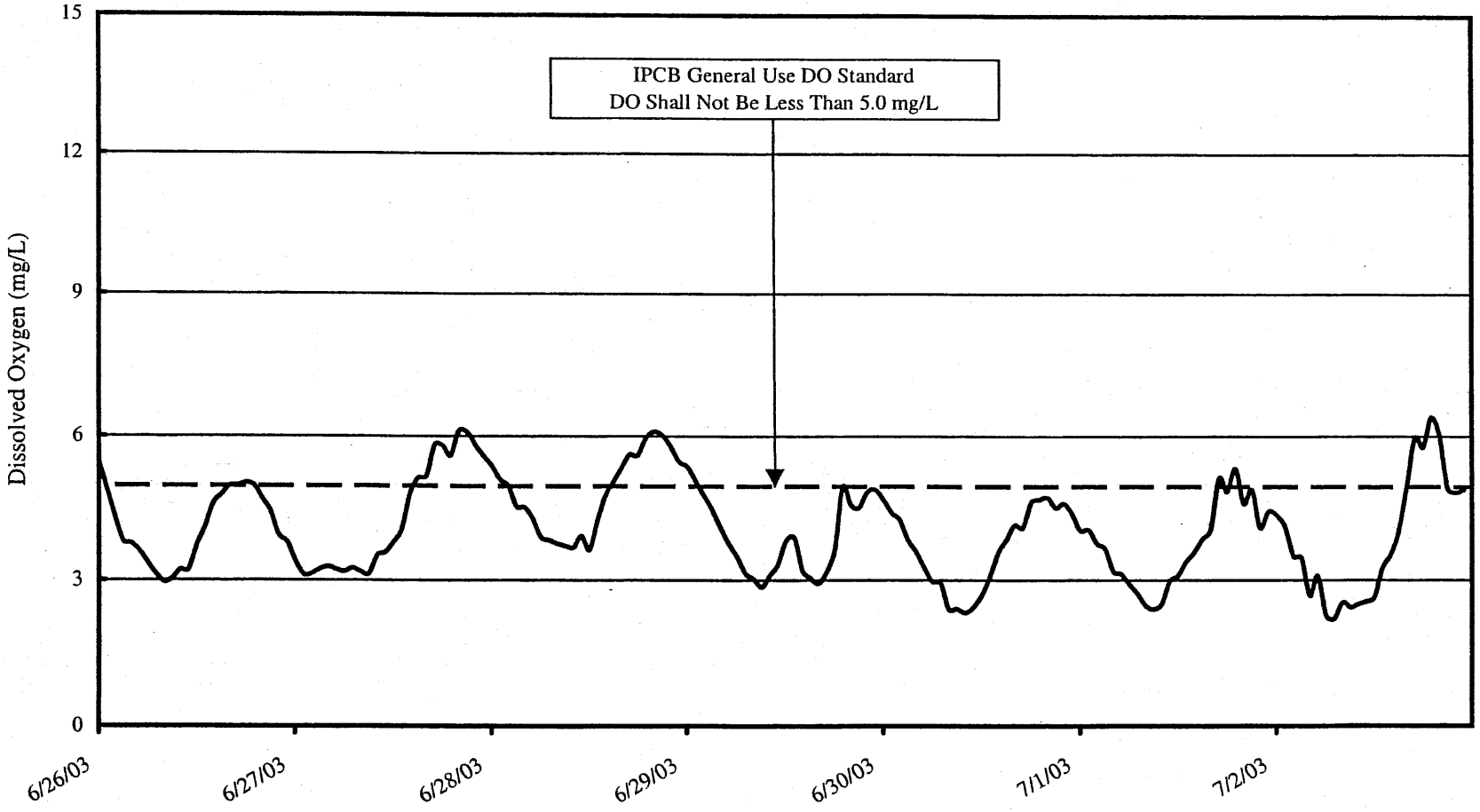
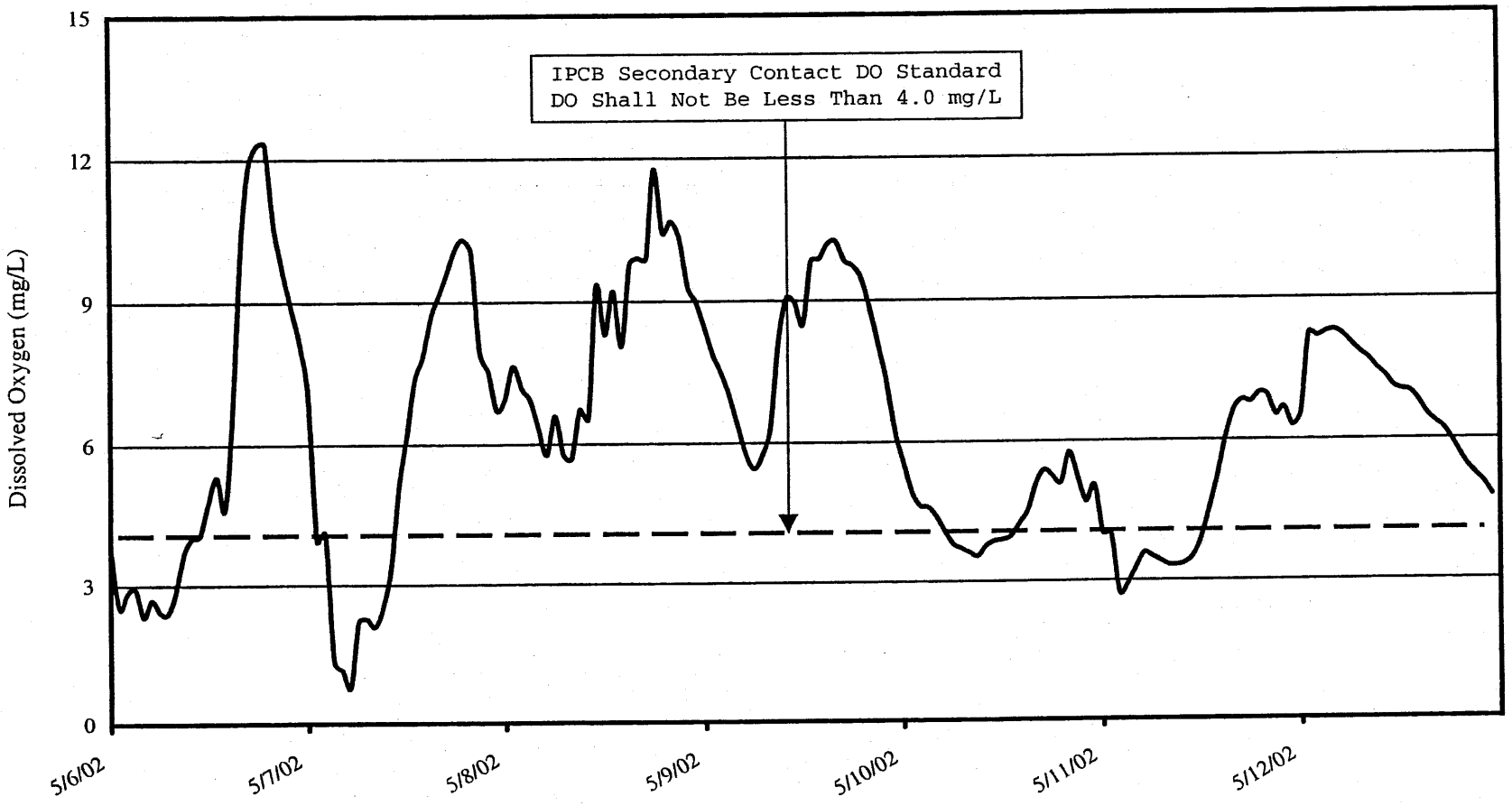


FIGURE 12: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT TORRENCE AVENUE IN GRAND CALUMET RIVER MAY 6, 2002 THROUGH MAY 12, 2002



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APPENDIX AI

CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS IN THE CHICAGO RIVER SYSTEM DURING 2002–2003

TABLE AI-1: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT DUNDEE ROAD ON THE WEST FORK NORTH BRANCH CHICAGO RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/14/02	ND	ND	ND
02/11/02	16	<1	2
03/11/02	10	1	1
04/08/02	12	<1	1
05/13/02	12	<1	1
06/10/02	6	<1	1
07/08/02	ND	ND	ND
08/12/02	4	1	1
09/09/02	ND	ND	ND
10/14/02	ND	ND	ND
11/12/02	ND	ND	ND
12/09/02	ND	ND	ND
01/13/03	ND	ND	ND
02/10/03	ND	ND	ND
03/10/03	ND	ND	ND
04/14/03	ND	ND	ND
05/12/03	14	1	4
06/09/03	ND	ND	ND
07/14/03	118	<1	7
08/12/03	ND	ND	ND
09/08/03	ND	ND	ND
10/13/03	11	1	2
11/10/03	ND	ND	ND
12/08/03	ND	ND	ND

ND = No Data.

TABLE AI-2: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT GOLF ROAD ON THE WEST FORK NORTH BRANCH CHICAGO RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/14/02	11	1	4
02/11/02	21	<1	2
03/11/02	9	<1	2
04/08/02	25	<1	2
05/13/02	14	<1	2
06/10/02	22	<1	3
07/08/02	23	3	2
08/12/02	8	1	1
09/09/02	7	1	1
10/14/02	5	1	2
11/12/02	13	1	2
12/09/02	ND	ND	ND
01/13/03	ND	ND	ND
02/10/03	ND	ND	ND
03/10/03	ND	ND	ND
04/14/03	20	2	6
05/12/03	23	4	6
06/09/03	36	<1	4
07/14/03	54	3	3
08/12/03	3	1	1
09/08/03	4	1	1
10/13/03	ND	ND	ND
11/10/03	3	<1	1
12/08/03	9	1	1

ND = No Data.

TABLE AI-3: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT LAKE-COOK ROAD ON THE MIDDLE FORK NORTH BRANCH CHICAGO RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/14/02	ND	ND	ND
02/11/02	12	<1	1
03/11/02	12	2	4
04/08/02	12	<1	1
05/13/02	16	<1	2
06/10/02	5	<1	<1
07/08/02	10	1	1
08/12/02	13	2	3
09/09/02	2	<1	1
10/14/02	1	1	1
11/12/02	35	<1	4
12/09/02	ND	ND	ND
01/13/03	ND	ND	ND
02/10/03	ND	ND	ND
03/10/03	ND	ND	ND
04/14/03	31	2	3
05/12/03	14	1	3
06/09/03	8	1	1
07/14/03	3	1	2
08/12/03	1	<1	<1
09/08/03	4	<1	<1
10/13/03	2	<1	<1
11/10/03	12	1	1
12/08/03	26	3	4

ND = No Data.

TABLE AI-4: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT GLENVIEW ROAD ON THE NORTH BRANCH CHICAGO RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/14/02	14	1	3
02/11/02	19	<1	2
03/11/02	35	1	5
04/08/02	17	<1	2
05/13/02	27	<1	5
06/10/02	ND	ND	ND
07/08/02	ND	ND	ND
08/12/02	5	1	1
09/09/02	17	3	2
10/14/02	23	2	3
11/12/02	7	<1	1
12/09/02	ND	ND	ND
01/13/03	ND	ND	ND
02/10/03	ND	ND	ND
03/10/03	ND	ND	ND
04/14/03	47	1	5
05/12/03	34	1	4
06/09/03	ND	ND	ND
07/14/03	ND	ND	ND
08/12/03	18	6	3
09/08/03	ND	ND	ND
10/13/03	ND	ND	ND
11/10/03	ND	ND	ND
12/08/03	ND	ND	ND

ND = No Data.

TABLE AI-5: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT LAKE-COOK ROAD ON SKOKIE RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/14/02	ND	ND	ND
02/11/02	18	<1	3
03/11/02	13	1	3
04/08/02	25	1	3
05/13/02	13	<1	2
06/10/02	14	<1	2
07/08/02	10	<1	1
08/12/02	4	1	1
09/09/02	3	<1	<1
10/14/02	1	<1	<1
11/12/02	15	<1	2
12/09/02	ND	ND	ND
01/13/03	ND	ND	ND
02/10/03	ND	ND	ND
03/10/03	ND	ND	ND
04/14/03	19	1	3
05/12/03	15	5	8
06/09/03	15	1	3
07/14/03	3	2	5
08/12/03	15	<1	1
09/08/03	3	1	1
10/13/03	ND	ND	ND
11/10/03	7	<1	1
12/08/03	6	<1	1

ND = No Data

TABLE AI-6: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT FRONTAGE ROAD ON SKOKIE RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/14/02	16	<1	3
02/11/02	30	<1	4
03/11/02	47	1	6
04/08/02	14	<1	2
05/13/02	42	<1	7
06/10/02	40	<1	6
07/08/02	7	3	4
08/12/02	4	1	1
09/09/02	22	5	3
10/14/02	23	4	4
11/12/02	6	<1	1
12/09/02	8	<1	2
01/13/03	15	<1	2
02/10/03	9	1	2
03/10/03	14	<1	2
04/14/03	59	<1	6
05/12/03	48	1	6
06/09/03	13	1	3
07/14/03	40	7	5
08/12/03	20	6	2
09/08/03	5	1	<1
10/13/03	6	<1	1
11/10/03	16	1	2
12/08/03	14	<1	2

TABLE AI-7: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT DEMPSTER STREET ON THE NORTH BRANCH CHICAGO RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/14/02	12	1	2
02/11/02	28	1	4
03/11/02	22	1	4
04/08/02	24	<1	4
05/13/02	17	<1	3
06/10/02	27	1	5
07/08/02	12	2	2
08/12/02	6	1	1
09/09/02	16	1	2
10/14/02	15	2	3
11/12/02	10	<1	1
12/09/02	8	<1	1
01/13/03	14	1	3
02/10/03	ND	ND	ND
03/10/03	13	<1	3
04/14/03	39	1	4
05/12/03	29	2	5
06/09/03	17	<1	6
07/14/03	26	6	8
08/12/03	10	2	1
09/08/03	4	1	1
10/13/03	14	1	2
11/10/03	8	1	1
12/08/03	10	<1	2

ND = No Data.

TABLE AI-8: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT ALBANY AVENUE ON THE NORTH BRANCH CHICAGO RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/14/02	9	1	2
02/11/02	27	<1	3
03/11/02	22	1	4
04/08/02	ND	ND	ND
05/13/02	15	<1	3
06/10/02	19	<1	3
07/08/02	9	1	2
08/12/02	4	<1	<1
09/09/02	9	<1	1
10/14/02	8	3	4
11/12/02	4	<1	1
12/09/02	5	<1	<1
01/13/03	11	1	2
02/10/03	ND	ND	ND
03/10/03	ND	ND	ND
04/14/03	56	1	6
05/12/03	26	1	3
06/09/03	30	<1	4
07/14/03	19	3	3
08/12/03	4	2	1
09/08/03	5	2	2
10/13/03	13	1	2
11/10/03	9	1	2
12/08/03	9	<1	1

ND = No Data.

TABLE AI-9: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT CENTRAL STREET ON THE NORTH SHORE CHANNEL DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/14/02	ND	ND	ND
02/11/02	ND	ND	ND
03/11/02	91	<1	13
04/08/02	5	1	1
05/13/02	5	<1	1
06/10/02	2	<1	<1
07/08/02	2	<1	<1
08/12/02	1	<1	<1
09/09/02	1	<1	<1
10/14/02	1	<1	<1
11/12/02	6	<1	1
12/09/02	ND	ND	ND
01/13/03	ND	ND	ND
02/10/03	ND	ND	ND
03/10/03	ND	ND	ND
04/14/03	58	11	6
05/12/03	4	<1	3
06/09/03	4	<1	1
07/14/03	1	<1	<1
08/12/03	1	<1	<1
09/08/03	2	1	1
10/13/03	3	<1	<1
11/10/03	<1	<1	<1
12/08/03	<1	<1	<1

ND = No Data.

TABLE AI-10: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT OAKTON STREET ON THE NORTH SHORE CHANNEL DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/14/02	37	10	1
02/11/02	60	3	7
03/11/02	65	6	7
04/08/02	10	<1	3
05/13/02	ND	ND	ND
06/10/02	5	<1	1
07/08/02	3	1	2
08/12/02	2	<1	<1
09/09/02	1	1	1
10/14/02	1	1	1
11/12/02	3	<1	<1
12/09/02	1	<1	<1
01/13/03	ND	ND	ND
02/10/03	1	<1	<1
03/10/03	ND	ND	ND
04/14/03	22	3	4
05/12/03	8	<1	5
06/09/03	7	<1	1
07/14/03	1	1	1
08/12/03	2	1	1
09/08/03	2	<1	<1
10/13/03	3	<1	<1
11/10/03	<1	<1	<1
12/08/03	2	<1	<1

ND = No Data.

TABLE AI-11: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT TOUHY AVENUE ON THE NORTH SHORE CHANNEL DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/14/02	2	1	1
02/11/02	3	1	1
03/11/02	4	1	1
04/08/02	1	<1	<1
05/13/02	2	<1	1
06/10/02	2	<1	1
07/08/02	2	<1	1
08/12/02	2	<1	<1
09/09/02	1	<1	<1
10/14/02	1	<1	1
11/12/02	1	<1	<1
12/09/02	<1	<1	<1
01/13/03	<1	2	3
02/10/03	1	<1	<1
03/10/03	2	1	2
04/14/03	1	1	1
05/12/03	2	2	2
06/09/03	5	<1	1
07/14/03	1	1	2
08/12/03	1	<1	<1
09/08/03	1	<1	<1
10/13/03	1	<1	<1
11/10/03	<1	<1	<1
12/08/03	1	<1	<1

TABLE AI-12: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT FOSTER AVENUE ON THE NORTH SHORE CHANNEL DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/14/02	1	1	1
02/11/02	2	<1	<1
03/11/02	7	1	1
04/08/02	2	<1	1
05/13/02	2	<1	1
06/10/02	2	<1	1
07/08/02	2	1	1
08/12/02	2	<1	<1
09/09/02	1	<1	<1
10/14/02	1	1	1
11/12/02	1	<1	<1
12/09/02	<1	<1	<1
01/13/03	1	<1	<1
02/10/03	<1	<1	1
03/10/03	3	<1	1
04/14/03	31	<1	2
05/12/03	2	<1	<1
06/09/03	11	<1	1
07/14/03	1	<1	<1
08/12/03	1	<1	<1
09/08/03	<1	<1	<1
10/13/03	1	<1	<1
11/10/03	<1	<1	<1
12/08/03	1	<1	<1

TABLE AI-13: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT WILSON AVENUE ON THE NORTH BRANCH CHICAGO RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/14/02	3	1	2
02/11/02	10	<1	2
03/11/02	14	2	3
04/08/02	11	1	2
05/13/02	8	<1	1
06/10/02	7	1	1
07/08/02	1	<1	<1
08/12/02	2	<1	1
09/09/02	2	<1	<1
10/14/02	1	<1	<1
11/12/02	1	<1	<1
12/09/02	<1	<1	<1
01/13/03	1	<1	1
02/10/03	1	<1	<1
03/10/03	2	<1	1
04/14/03	12	<1	<1
05/12/03	14	<1	1
06/09/03	18	<1	2
07/14/03	4	1	1
08/12/03	3	2	2
09/08/03	1	<1	<1
10/13/03	1	<1	<1
11/10/03	2	<1	<1
12/08/03	1	<1	<1

TABLE AI-14: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT DIVERSEY PARKWAY ON THE NORTH BRANCH CHICAGO RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/14/02	2	2	2
02/11/02	8	1	2
03/11/02	9	1	2
04/08/02	5	1	1
05/13/02	8	1	3
06/10/02	4	<1	1
07/08/02	4	<1	1
08/12/02	1	<1	1
09/09/02	3	2	3
10/14/02	2	1	2
11/12/02	1	<1	1
12/09/02	<1	<1	<1
01/13/03	1	<1	<1
02/10/03	1	<1	<1
03/10/03	2	<1	1
04/14/03	11	1	3
05/12/03	12	<1	2
06/09/03	7	1	2
07/14/03	4	1	2
08/12/03	6	4	5
09/08/03	5	4	6
10/13/03	1	<1	<1
11/10/03	2	1	1
12/08/03	3	1	<1

TABLE AI-15: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT GRAND AVENUE ON THE NORTH BRANCH CHICAGO RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/14/02	2	1	1
02/11/02	4	<1	1
03/11/02	9	1	2
04/08/02	4	<1	<1
05/13/02	5	<1	1
06/10/02	5	<1	1
07/08/02	3	1	1
08/12/02	2	<1	<1
09/09/02	3	<1	1
10/14/02	5	1	1
11/12/02	1	<1	1
12/09/02	1	<1	<1
01/13/03	2	1	1
02/10/03	1	<1	<1
03/10/03	11	2	1
04/14/03	18	2	4
05/12/03	10	<1	1
06/09/03	7	1	2
07/14/03	7	3	5
08/12/03	1	<1	1
09/08/03	1	<1	<1
10/13/03	4	<1	1
11/10/03	4	<1	1
12/08/03	2	<1	<1

TABLE AI-16: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT LAKE SHORE DRIVE ON THE CHICAGO RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/22/02	1	<1	1
02/19/02	10	1	1
03/18/02	3	<1	<1
04/15/02	6	<1	1
05/20/02	3	<1	1
06/17/02	1	<1	<1
07/15/02	2	<1	<1
08/19/02	1	<1	<1
09/16/02	1	<1	<1
10/14/02	2	<1	<1
11/18/02	2	<1	<1
12/16/02	2	<1	<1
01/21/03	ND	ND	ND
02/18/03	ND	ND	ND
03/17/03	5	1	1
04/21/03	10	<1	2
05/19/03	5	<1	1
06/16/03	2	<1	1
07/21/03	1	<1	1
08/18/03	1	<1	<1
09/15/03	1	<1	1
10/20/03	4	<1	1
11/17/03	1	<1	<1
12/15/03	1	<1	1

ND = No Data.

TABLE AI-17: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT WELLS STREET ON THE CHICAGO RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/22/02	2	1	1
02/19/02	6	<1	<1
03/18/02	6	1	1
04/15/02	8	<1	1
05/20/02	4	<1	1
06/17/02	2	<1	<1
07/15/02	2	<1	<1
08/19/02	1	<1	<1
09/16/02	2	<1	<1
10/24/02	1	<1	<1
11/18/02	1	<1	<1
12/16/02	1	1	1
01/21/03	2	<1	<1
02/18/03	1	<1	<1
03/17/03	2	<1	1
04/21/03	11	<1	1
05/19/03	12	<1	3
06/16/03	3	<1	1
07/21/03	1	<1	<1
08/18/03	1	<1	<1
09/15/03	ND	ND	ND
10/20/03	3	<1	<1
11/17/03	1	<1	<1
12/15/03	4	<1	2

ND = No Data.

TABLE AI-18: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT MADISON STREET ON THE SOUTH BRANCH CHICAGO RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/22/02	4	2	3
02/19/02	11	<1	1
03/18/02	10	1	2
04/15/02	11	1	2
05/20/02	7	1	2
06/17/02	2	1	1
07/15/02	1	<1	<1
08/19/02	3	<1	<1
09/16/02	2	1	1
10/14/02	2	<1	1
11/18/02	1	<1	<1
12/16/02	1	<1	<1
01/21/03	ND	ND	ND
02/18/03	1	<1	<1
03/17/03	3	1	1
04/21/03	12	<1	1
05/19/03	16	1	3
06/16/03	5	1	2
07/21/03	3	<1	1
08/18/03	1	<1	<1
09/15/03	ND	ND	ND
10/20/03	4	<1	1
11/17/03	2	1	2
12/15/03	6	1	1

ND = No Data.

TABLE AI-19: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT LOOMIS STREET ON THE SOUTH BRANCH CHICAGO RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/22/02	6	1	2
02/19/02	5	<1	<1
03/18/02	6	1	1
04/15/02	9	1	2
05/20/02	4	<1	<1
06/17/02	1	2	<1
07/15/02	1	<1	<1
08/19/02	3	<1	1
09/16/02	2	<1	<1
10/14/02	2	<1	1
11/18/02	1	<1	<1
12/16/02	2	<1	<1
01/21/03	2	<1	<1
02/18/03	<1	<1	<1
03/17/03	2	<1	1
04/21/03	26	<1	3
05/19/03	16	<1	2
06/16/03	6	<1	1
07/21/03	8	1	<1
08/18/03	1	<1	<1
09/15/03	1	<1	<1
10/20/03	4	<1	<1
11/17/03	2	<1	<1
12/15/03	4	<1	1

TABLE AI-20: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT ARCHER AVENUE ON THE SOUTH FORK SOUTH BRANCH CHICAGO RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/22/02	4	1	1
02/19/02	<1	<1	<1
03/18/02	12	2	<1
04/15/02	13	4	3
05/20/02	6	<1	1
06/17/02	11	2	2
07/15/02	14	2	1
08/19/02	9	1	2
09/16/02	5	<1	1
10/14/02	22	<1	3
11/18/02	13	<1	1
12/16/02	2	1	1
01/21/03	4	<1	<1
02/18/03	8	2	<1
03/17/03	7	2	1
04/21/03	26	2	3
05/19/03	21	<1	2
06/16/03	7	1	2
07/21/03	24	6	7
08/18/03	1	<1	<1
09/15/03	5	1	1
10/20/03	4	<1	<1
11/17/03	4	<1	<1
12/15/03	3	<1	<1

TABLE AI-21: CHLOROPHYLL *a, b,* AND *c* CONCENTRATIONS AT WESTERN* AND DAMEN AVENUES ON THE CHICAGO SANITARY AND SHIP CANAL DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/22/02	2	<1	1
02/19/02	5	<1	<1
03/18/02	6	1	1
04/15/02	7	1	2
05/20/02	4	<1	1
06/17/02	2	<1	1
07/15/02	2	<1	<1
08/19/02	2	<1	1
09/16/02	3	<1	1
10/14/02	3	1	1
11/18/02	3	<1	<1
12/16/02	1	<1	1
01/21/03	2	<1	1
02/18/03	2	<1	<1
03/17/03	6	1	1
04/21/03	20	1	2
05/19/03	25	<1	3
06/16/03	7	1	2
07/21/03	7	1	1
08/18/03	1	<1	<1
09/15/03	3	<1	1
10/20/03	4	<1	1
11/17/03	2	<1	<1
12/15/03	4	<1	1

*samples were taken at Western Avenue during 2002 due to bridge construction at Damen Avenue.

TABLE AI-22: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT CICERO AVENUE ON THE CHICAGO SANITARY AND SHIP CANAL DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/22/02	4	1	1
02/19/02	5	1	1
03/18/02	7	1	1
04/15/02	6	2	3
05/20/02	6	<1	1
06/17/02	4	<1	<1
07/15/02	10	3	4
08/19/02	3	<1	<1
09/16/02	8	1	1
10/14/02	1	1	1
11/18/02	3	<1	<1
12/16/02	3	1	3
01/21/03	1	<1	<1
02/18/03	2	1	1
03/17/03	11	3	1
04/21/03	18	1	3
05/19/03	15	<1	2
06/16/03	8	1	2
07/21/03	7	2	3
08/18/03	2	<1	<1
09/15/03	3	<1	1
10/20/03	5	<1	1
11/17/03	2	<1	<1
12/15/03	2	<1	1

TABLE AI-23: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT HARLEM AVENUE ON THE CHICAGO SANITARY AND SHIP CANAL DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/22/02	1	1	1
02/19/02	2	1	2
03/18/02	5	1	1
04/15/02	3	1	2
05/20/02	2	<1	1
06/17/02	1	<1	<1
07/15/02	4	<1	<1
08/19/02	2	1	<1
09/16/02	4	1	1
10/14/02	2	<1	1
11/18/02	2	<1	1
12/16/02	1	<1	1
01/21/03	1	1	2
02/18/03	2	<1	<1
03/17/03	4	1	1
04/21/03	6	<1	1
05/19/03	7	<1	1
06/16/03	4	<1	1
07/21/03	1	<1	1
08/18/03	1	<1	<1
09/15/03	1	1	2
10/20/03	2	<1	<1
11/17/03	2	1	1
12/15/03	2	1	2

TABLE AI-24: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT ROUTE 83 ON THE CHICAGO SANITARY AND SHIP CANAL DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/22/02	1	<1	1
02/19/02	2	<1	<1
03/18/02	1	<1	<1
04/15/02	5	<1	1
05/20/02	4	1	1
06/17/02	4	<1	1
07/15/02	24	<1	2
08/19/02	2	1	1
09/16/02	4	1	1
10/14/02	2	1	1
11/18/02	2	<1	<1
12/16/02	1	4	3
01/21/03	1	1	1
02/18/03	1	<1	<1
03/17/03	5	2	1
04/21/03	11	1	2
05/19/03	6	<1	<1
06/16/03	7	1	2
07/21/03	11	3	5
08/18/03	3	1	<1
09/15/03	1	2	<1
10/20/03	3	<1	<1
11/17/03	2	<1	1
12/15/03	1	<1	1

TABLE AI-25: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT STEPHEN STREET ON THE CHICAGO SANITARY AND SHIP CANAL DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/22/02	2	<1	<1
02/19/02	3	<1	1
03/18/02	2	<1	<1
04/15/02	4	1	3
05/20/02	4	<1	1
06/17/02	4	<1	1
07/15/02	7	<1	<1
08/19/02	5	<1	1
09/16/02	7	<1	1
10/14/02	5	1	1
11/18/02	2	<1	<1
12/16/02	2	<1	<1
01/21/03	3	<1	1
02/18/03	1	<1	<1
03/17/03	6	1	2
04/21/03	3	<1	1
05/19/03	18	1	2
06/16/03	20	<1	4
07/21/03	9	1	1
08/18/03	11	1	2
09/15/03	8	<1	1
10/20/03	4	<1	2
11/17/03	2	<1	1
12/15/03	2	<1	1

TABLE AI-26: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT LOCKPORT ON THE CHICAGO SANITARY AND SHIP CANAL DURING 2002–2003*

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/09/02	<1	<1	<1
01/14/02	7	<1	2
01/22/02	1	1	1
01/28/02	2	<1	<1
02/04/02	2	<1	<1
02/11/02	3	<1	<1
02/19/02	5	<1	1
02/25/02	ND	ND	ND
03/04/02	4	<1	<1
03/11/02	7	1	3
03/18/02	4	<1	1
03/25/02	5	<1	1
04/01/02	5	<1	1
04/08/02	16	<1	3
04/15/02	4	<1	1
04/22/02	7	<1	1
04/29/02	4	1	2
05/06/02	4	1	2
05/13/02	4	<1	1
05/20/02	4	<1	1
05/28/02	3	<1	<1
06/03/02	8	<1	3
06/10/02	5	<1	1
06/17/02	5	<1	1
06/24/02	12	<1	2
07/01/02	ND	ND	ND
07/08/02	5	<1	1
07/15/02	6	1	<1
07/22/02	12	<1	2
07/29/02	3	<1	<1
08/05/02	12	<1	1
08/12/02	8	1	2
08/19/02	2	<1	<1
08/26/02	3	<1	<1

TABLE AI-26 (Continued): CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT LOCKPORT ON THE CHICAGO SANITARY AND SHIP CANAL DURING 2002–2003*

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
09/03/02	19	<1	3
09/09/02	10	<1	1
09/16/02	7	<1	1
09/23/02	5	<1	1
10/01/02	8	<1	2
10/07/02	5	<1	1
10/14/02	4	<1	1
10/21/02	4	<1	1
10/28/02	3	<1	1
11/04/02	3	<1	1
11/12/02	2	<1	<1
11/18/02	2	<1	<1
11/25/02	2	<1	2
12/02/02	2	<1	1
12/09/02	4	<1	1
12/16/02	2	<1	1
12/23/02	2	1	1
01/06/03	2	<1	1
01/13/03	4	2	3
01/21/03	3	<1	<1
01/27/03	3	<1	1
02/03/03	3	1	1
02/10/03	2	1	1
02/18/03	2	<1	<1
02/24/03	4	1	2
03/03/03	4	<1	1
03/10/03	3	<1	1
03/17/03	5	1	1
03/24/03	7	1	2
03/31/03	7	1	1
04/07/03	9	1	2
04/14/03	7	<1	2
04/21/03	6	1	2
04/28/03	10	<1	2
05/05/03	9	<1	2
05/12/03	6	1	1

TABLE AI-26 (Continued): CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT LOCKPORT ON THE CHICAGO SANITARY AND SHIP CANAL DURING 2002–2003*

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
05/19/03	9	1	2
05/27/03	20	<1	3
06/02/03	11	<1	2
06/09/03	8	<1	2
06/16/03	17	<1	3
06/23/03	27	<1	3
06/30/03	11	2	2
07/07/03	37	<1	6
07/14/03	10	<1	2
07/21/03	8	<1	1
07/28/03	12	<1	1
08/04/03	18	4	7
08/11/03	6	<1	2
08/18/03	10	1	1
08/25/03	9	<1	1
09/02/03	4	1	2
09/08/03	8	1	6
09/15/03	9	<1	1
09/22/03	7	<1	1
09/27/03	5	1	1
10/06/03	3	<1	1
10/13/03	10	<1	2
10/20/03	4	<1	1
10/27/03	3	<1	1
11/03/03	4	<1	1
11/10/03	1	<1	<1
11/17/03	1	<1	<1
11/24/03	1	<1	1
12/01/03	2	1	1
12/08/03	1	<1	1
12/15/03	1	<1	1
12/22/03	1	<1	1
12/29/03	2	<1	<1

*Lockport sampled weekly.
ND = No Data.

APPENDIX AII

CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS IN THE CALUMET RIVER SYSTEM DURING 2002–2003

TABLE AII-1: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT EWING AVENUE ON THE CALUMET RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/28/02	1	<1	<1
02/25/02	2	<1	1
03/25/02	4	<1	1
04/22/02	2	<1	<1
05/28/02	3	<1	1
06/24/02	1	<1	<1
07/22/02	1	<1	<1
08/26/02	1	<1	<1
09/23/02	1	<1	<1
10/28/02	1	<1	<1
11/25/02	1	<1	1
12/23/02	1	<1	<1
01/27/03	1	<1	<1
02/24/03	ND	ND	ND
03/24/03	1	1	<1
04/28/03	5	<1	<1
05/27/03	2	1	1
06/23/03	1	<1	<1
07/28/03	1	<1	<1
08/25/03	2	<1	1
09/22/03	3	<1	<1
10/27/03	1	<1	<1
11/24/03	1	<1	<1
12/22/03	1	<1	<1

ND = No Data.

TABLE AII-2: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT BURNHAM AVENUE ON WOLF LAKE DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/28/02	1	<1	<1
02/25/02	1	<1	<1
03/25/02	3	<1	<1
04/22/02	11	<1	<1
05/28/02	1	<1	<1
06/24/02	1	<1	<1
07/22/02	<1	<1	<1
08/26/02	2	<1	<1
09/23/02	3	2	4
10/28/02	3	<1	1
11/25/02	10	<1	2
12/23/02	9	<1	2
01/27/03	18	<1	3
02/24/03	16	1	4
03/24/03	15	<1	2
04/28/03	11	<1	2
05/27/03	7	<1	1
06/23/03	5	<1	1
07/28/03	7	<1	<1
08/25/03	4	<1	1
09/22/03	5	<1	<1
10/27/03	4	<1	1
11/24/03	3	<1	<1
12/22/03	8	<1	1

TABLE AII-3: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT 130th STREET ON THE CALUMET RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/28/02	14	<1	2
02/25/02	21	<1	3
03/25/02	22	<1	4
04/22/02	12	<1	1
05/28/02	6	<1	1
06/24/02	6	<1	1
07/22/02	10	<1	1
08/26/02	8	<1	1
09/23/02	5	<1	1
10/28/02	4	<1	1
11/25/02	6	<1	2
12/23/02	7	<1	1
01/27/03	ND	ND	ND
02/24/03	ND	ND	ND
03/24/03	16	1	2
04/28/03	9	<1	2
05/27/03	9	<1	1
06/23/03	5	<1	1
07/28/03	9	<1	1
08/25/03	5	<1	1
09/22/03	7	<1	1
10/27/03	5	<1	1
11/24/03	4	<1	<1
12/22/03	1	<1	<1

ND = No Data.

TABLE AII-4: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT BURNHAM AVENUE ON THE GRAND CALUMET RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/28/02	9	2	1
02/25/02	96	22	5
03/25/02	4	1	1
04/22/02	4	<1	<1
05/28/02	44	9	2
06/24/02	29	8	2
07/22/02	43	<1	4
08/26/02	8	1	2
09/23/02	78	12	5
10/28/02	3	1	<1
11/25/02	25	5	1
12/23/02	ND	ND	ND
01/27/03	ND	ND	ND
02/24/03	ND	ND	ND
03/24/03	233	55	8
04/28/03	7	2	1
05/27/03	4	1	2
06/23/03	21	4	1
07/28/03	5	1	1
08/25/03	ND	ND	ND
09/22/03	45	1	5
10/27/03	21	4	<1
11/24/03	3	1	1
12/22/03	5	1	1

ND = No Data.

TABLE AII-5: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT INDIANA AVENUE ON THE LITTLE CALUMET RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/28/02	26	<1	3
02/25/02	57	<1	7
03/25/02	64	<1	10
04/22/02	23	<1	2
05/28/02	35	<1	6
06/24/02	14	<1	2
07/22/02	19	<1	2
08/26/02	15	<1	2
09/23/02	15	<1	2
10/28/02	11	<1	2
11/25/02	19	<1	4
12/23/02	19	<1	4
01/27/03	ND	ND	ND
02/24/03	31	<1	5
03/24/03	20	<1	3
04/28/03	29	<1	5
05/27/03	34	1	4
06/23/03	27	<1	5
07/28/03	28	<1	3
08/25/03	32	1	6
09/22/03	18	<1	2
10/27/03	32	<1	5
11/24/03	15	<1	2
12/22/03	4	<1	1

ND = No Data.

TABLE AII-6: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT HALSTED STREET ON THE LITTLE CALUMET RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/28/02	2	<1	<1
02/25/02	5	<1	1
03/25/02	11	<1	2
04/22/02	9	<1	<1
05/28/02	16	<1	3
06/24/02	11	<1	2
07/22/02	28	<1	3
08/26/02	8	<1	1
09/23/02	7	<1	1
10/28/02	4	<1	1
11/25/02	5	1	1
12/23/02	3	<1	1
01/27/03	3	<1	1
02/24/03	5	<1	1
03/24/03	4	1	1
04/28/03	7	<1	1
05/27/03	ND	ND	ND
06/23/03	29	<1	5
07/28/03	10	<1	1
08/25/03	27	<1	4
09/22/03	16	<1	2
10/27/03	10	<1	1
11/24/03	2	<1	<1
12/22/03	1	<1	<1

TABLE AII-7: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT WENTWORTH AVENUE ON THE LITTLE CALUMET RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/28/02	12	<1	1
02/25/02	9	1	2
03/25/02	8	1	1
04/22/02	7	<1	<1
05/28/02	6	1	2
06/24/02	2	1	1
07/22/02	2	<1	<1
08/26/02	4	1	1
09/23/02	4	1	1
10/28/02	4	1	2
11/25/02	4	1	1
12/23/02	ND	ND	ND
01/27/03	ND	ND	ND
02/24/03	ND	ND	ND
03/24/03	40	3	7
04/28/03	23	2	3
05/27/03	6	1	<1
06/23/03	3	<1	<1
07/28/03	7	1	1
08/25/03	3	1	<1
09/22/03	2	<1	<1
10/27/03	3	1	1
11/24/03	5	1	3
12/22/03	1	<1	<1

ND = No Data.

TABLE AII-8: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT JOE ORR ROAD ON THORN CREEK DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/28/02	9	<1	1
02/25/02	33	<1	4
03/25/02	10	<1	2
04/22/02	6	<1	<1
05/28/02	ND	ND	ND
06/24/02	3	1	<1
07/22/02	3	<1	<1
08/26/02	1	<1	<1
09/23/02	ND	ND	ND
10/28/02	ND	ND	ND
11/25/02	ND	ND	ND
12/23/02	ND	ND	ND
01/27/03	ND	ND	ND
02/24/03	ND	ND	ND
03/24/03	ND	ND	ND
04/28/03	ND	ND	ND
05/27/03	ND	ND	ND
06/23/03	4	<1	<1
07/28/03	19	8	4
08/25/03	ND	ND	ND
09/22/03	ND	ND	ND
10/27/03	ND	ND	ND
11/24/03	3	<1	<1
12/22/03	ND	ND	ND

ND = No Data.

TABLE AII-9: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT 170th STREET ON THORN CREEK DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/28/02	12	<1	2
02/25/02	17	<1	2
03/25/02	7	<1	1
04/22/02	9	<1	<1
05/28/02	3	<1	<1
06/24/02	12	1	1
07/22/02	16	<1	2
08/26/02	11	<1	2
09/23/02	4	<1	1
10/28/02	3	<1	1
11/25/02	22	<1	3
12/23/02	10	1	1
01/27/03	ND	ND	ND
02/24/03	16	<1	3
03/24/03	32	1	5
04/28/03	26	1	3
05/27/03	4	1	2
06/23/03	10	2	2
07/28/03	9	<1	1
08/25/03	ND	ND	ND
09/22/03	7	<1	1
10/27/03	6	<1	1
11/24/03	4	<1	<1
12/22/03	2	<1	<1

ND = No Data.

TABLE AII-10: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT ASHLAND AVENUE ON THE LITTLE CALUMET RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/28/02	9	<1	2
02/25/02	14	<1	2
03/25/02	8	<1	1
04/22/02	9	<1	<1
05/28/02	6	1	<1
06/24/02	ND	ND	ND
07/22/02	36	<1	4
08/26/02	16	6	10
09/23/02	5	<1	1
10/28/02	4	<1	1
11/25/02	7	<1	2
12/23/02	8	2	4
01/27/03	ND	ND	ND
02/24/03	ND	ND	ND
03/24/03	43	1	4
04/28/03	13	<1	2
05/27/03	5	<1	1
06/23/03	10	1	1
07/28/03	8	<1	<1
08/25/03	5	<1	4
09/22/03	5	<1	1
10/27/03	7	<1	1
11/24/03	3	<1	<1
12/22/03	2	<1	<1

ND = No Data.

TABLE AII-11: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT ASHLAND AVENUE ON THE CALUMET-SAG CHANNEL DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/28/02	3	<1	<1
02/25/02	5	<1	1
03/25/02	11	<1	2
04/22/02	12	<1	<1
05/28/02	8	<1	1
06/24/02	32	<1	4
07/22/02	35	<1	4
08/26/02	12	3	2
09/23/02	8	<1	2
10/28/02	5	<1	1
11/25/02	2	<1	1
12/23/02	7	<1	2
01/27/03	3	<1	<1
02/24/03	3	1	2
03/24/03	13	1	3
04/28/03	33	<1	4
05/27/03	24	1	3
06/23/03	24	<1	3
07/28/03	19	7	6
08/25/03	30	<1	3
09/22/03	22	<1	2
10/27/03	11	<1	1
11/24/03	2	<1	<1
12/22/03	1	<1	<1

TABLE AII-12: CHLOROPHYLL *a, b,* AND *c* CONCENTRATIONS AT CICERO AVENUE ON THE CALUMET-SAG CHANNEL DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/28/02	3	<1	1
02/25/02	6	<1	1
03/25/02	13	<1	2
04/22/02	9	<1	<1
05/28/02	9	<1	1
06/24/02	40	<1	5
07/22/02	25	<1	4
08/26/02	10	<1	<1
09/23/02	11	<1	1
10/28/02	5	<1	2
11/25/02	4	<1	1
12/23/02	7	<1	1
01/27/03	ND	ND	ND
02/24/03	3	<1	1
03/24/03	18	3	6
04/28/03	28	<1	3
05/27/03	30	2	2
06/23/03	40	<1	7
07/28/03	7	<1	<1
08/25/03	56	<1	7
09/22/03	24	<1	3
10/27/03	11	<1	2
11/24/03	4	<1	1
12/22/03	2	<1	<1

ND = No Data.

TABLE AII-13: CHLOROPHYLL *a, b,* AND *c* CONCENTRATIONS AT ROUTE 83 ON THE CALUMET-SAG CHANNEL DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/28/02	4	1	1
02/25/02	13	2	5
03/25/02	21	1	4
04/22/02	13	<1	<1
05/28/02	7	<1	1
06/24/02	53	<1	8
07/22/02	26	<1	4
08/26/02	18	<1	3
09/23/02	19	<1	3
10/28/02	5	<1	1
11/25/02	4	2	3
12/23/02	5	3	5
01/27/03	ND	ND	ND
02/24/03	4	1	2
03/24/03	17	1	2
04/28/03	48	<1	9
05/27/03	29	<1	5
06/23/03	93	<1	15
07/28/03	7	<1	1
08/25/03	31	3	9
09/22/03	24	<1	5
10/27/03	9	<1	1
11/24/03	5	2	3
12/22/03	2	1	2

ND = No Data.

APPENDIX AIII

CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS IN THE DES PLAINES RIVER SYSTEM DURING 2002–2003

TABLE AIII-1: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT ROUTE 19 ON POPLAR CREEK DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	ND	ND	ND
02/04/02	19	<1	3
03/04/02	ND	ND	ND
04/01/02	12	<1	2
05/06/02	26	1	5
06/03/02	7	1	2
07/01/02	ND	ND	ND
08/05/02	32	6	3
09/03/02	16	1	2
10/07/02	13	<1	2
11/04/02	3	<1	<1
12/02/02	ND	ND	ND
01/06/03	17	<1	3
02/03/03	ND	ND	ND
03/03/03	ND	ND	ND
04/07/03	25	1	3
05/05/03	17	<1	<1
06/02/03	21	<1	2
07/07/03	5	1	1
08/04/03	27	<1	3
09/02/03	2	<1	<1
10/06/03	4	1	1
11/03/03	15	1	2
12/01/03	14	<1	2

ND = No Data

TABLE AIII-2: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT LONGMEADOW LANE* ON THE WEST BRANCH DUPAGE RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	ND	ND	ND
02/04/02	ND	ND	ND
03/04/02	ND	ND	ND
04/01/02	ND	ND	ND
05/06/02	ND	ND	ND
06/03/02	ND	ND	ND
07/01/02	ND	ND	ND
08/05/02	ND	ND	ND
09/03/02	ND	ND	ND
10/07/02	ND	ND	ND
11/04/02	ND	ND	ND
12/02/02	ND	ND	ND
01/06/03	ND	ND	ND
02/03/03	ND	ND	ND
03/03/03	ND	ND	ND
04/07/03	ND	ND	ND
05/05/03	25	<1	<1
06/02/03	ND	ND	ND
07/07/03	ND	ND	ND
08/04/03	ND	ND	ND
09/02/03	ND	ND	ND
10/06/03	ND	ND	ND
11/03/03	ND	ND	ND
12/01/03	ND	ND	ND

*Longmeadow Lane replaced in 2004 by Springinsguth Road due to frequent low flow.
ND = No Data.

TABLE AIII-3: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT WALNUT LANE ON THE WEST BRANCH DUPAGE RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	2	2	3
02/04/02	4	<1	<1
03/04/02	6	1	<1
04/01/02	12	1	1
05/06/02	11	1	2
06/03/02	4	1	1
07/01/02	ND	ND	ND
08/05/02	10	1	1
09/03/02	13	3	4
10/07/02	2	<1	<1
11/04/02	2	<1	<1
12/02/02	1	<1	<1
01/06/03	2	<1	<1
02/03/03	4	1	2
03/03/03	2	<1	1
04/07/03	7	<1	<1
05/05/03	31	2	2
06/02/03	ND	ND	ND
07/07/03	6	1	<1
08/04/03	22	<1	2
09/02/03	1	<1	<1
10/06/03	1	<1	<1
11/03/03	20	<1	1
12/01/03	2	<1	<1

ND = No Data.

TABLE AIII-4: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT LAKE STREET ON THE WEST BRANCH DUPAGE RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	8	1	1
02/04/02	11	1	4
03/04/02	18	1	1
04/01/02	19	2	1
05/06/02	28	8	20
06/03/02	33	<1	6
07/01/02	ND	ND	ND
08/05/02	66	7	7
09/03/02	41	1	3
10/07/02	17	1	2
11/04/02	26	<1	4
12/02/02	7	<1	1
01/06/03	10	<1	1
02/03/03	10	2	3
03/03/03	9	3	5
04/07/03	33	1	2
05/05/03	30	<1	<1
06/02/03	103	<1	15
07/07/03	32	7	1
08/04/03	42	2	4
09/02/03	9	1	1
10/06/03	42	4	5
11/03/03	24	<1	3
12/01/03	11	<1	2

ND = No Data.

TABLE AIII-5: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT HIGGINS ROAD ON SALT CREEK DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	ND	ND	ND
02/04/02	ND	ND	ND
03/04/02	ND	ND	ND
04/01/02	21	2	3
05/06/02	33	2	8
06/03/02	23	<1	2
07/01/02	ND	ND	ND
08/05/02	72	9	6
09/03/02	21	1	3
10/07/02	31	<1	4
11/04/02	13	<1	2
12/02/02	ND	ND	ND
01/06/03	ND	ND	ND
02/03/03	ND	ND	ND
03/03/03	ND	ND	ND
04/07/03	27	1	2
05/05/03	16	<1	1
06/02/03	49	<1	6
07/07/03	114	5	10
08/04/03	29	2	3
09/02/03	57	6	5
10/06/03	20	1	2
11/03/03	16	2	6
12/01/03	10	1	1

ND = No Data.

TABLE AIII-6: CHLOROPHYLL *a, b,* AND *c* CONCENTRATIONS AT ARLINGTON HEIGHTS ROAD ON SALT CREEK DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	6	<1	1
02/04/02	10	<1	2
03/04/02	15	<1	3
04/01/02	15	<1	2
05/06/02	18	<1	3
06/03/02	3	<1	1
07/01/02	ND	ND	ND
08/05/02	11	<1	2
09/03/02	34	<1	3
10/07/02	ND	ND	ND
11/04/02	ND	ND	ND
12/02/02	6	<1	1
01/06/03	22	<1	3
02/03/03	20	<1	5
03/03/03	4	<1	1
04/07/03	35	2	3
05/05/03	18	<1	2
06/02/03	3	<1	<1
07/07/03	22	<1	1
08/04/03	37	1	4
09/02/03	2	<1	<1
10/06/03	18	1	2
11/03/03	34	<1	3
12/01/03	8	<1	1

ND = No Data.

TABLE AIII-7: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT DEVON AVENUE ON SALT CREEK DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	20	<1	5
02/04/02	13	<1	3
03/04/02	23	<1	4
04/01/02	19	1	3
05/06/02	21	1	5
06/03/02	ND	ND	ND
07/01/02	ND	ND	ND
08/05/02	4	15	6
09/03/02	27	<1	2
10/07/02	16	<1	2
11/04/02	4	<1	1
12/02/02	ND	ND	ND
01/06/03	25	<1	3
02/03/03	21	<1	6
03/03/03	10	<1	2
04/07/03	29	1	3
05/05/03	17	<1	2
06/02/03	11	<1	3
07/07/03	25	1	2
08/04/03	45	2	7
09/02/03	4	<1	1
10/06/03	14	1	2
11/03/03	24	<1	2
12/01/03	10	<1	1

ND = No Data.

TABLE AIII-8: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT WOLF ROAD ON SALT CREEK DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	15	<1	2
02/04/02	14	1	2
03/04/02	9	<1	1
04/01/02	36	<1	5
05/06/02	12	2	4
06/03/02	4	<1	1
07/01/02	ND	ND	ND
08/05/02	4	2	2
09/03/02	4	1	1
10/07/02	1	<1	<1
11/04/02	3	<1	1
12/02/02	49	<1	7
01/06/03	15	<1	2
02/03/03	19	2	5
03/03/03	16	<1	2
04/07/03	29	1	4
05/05/03	3	<1	<1
06/02/03	3	<1	1
07/07/03	17	3	3
08/04/03	25	2	4
09/02/03	3	1	1
10/06/03	3	1	2
11/03/03	18	2	6
12/01/03	4	<1	<1

ND = No Data.

TABLE AIII-9: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT FIRST AVENUE AND BROOKFIELD AVENUE* ON SALT CREEK DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	11	<1	2
02/04/02	12	<1	2
03/04/02	10	<1	2
04/01/02	46	<1	5
05/06/02	ND	ND	ND
06/03/02	ND	ND	ND
07/01/02	ND	ND	ND
08/05/02	4	1	1
09/03/02	7	1	1
10/07/02	2	1	1
11/04/02	1	<1	<1
12/02/02	50	<1	7
01/06/03	11	<1	1
02/03/03	ND	ND	ND
03/03/03	ND	ND	ND
04/07/03	38	1	5
05/05/03	26	10	13
06/02/03	4	1	1
07/07/03	14	1	2
08/04/03	47	20	31
09/02/03	ND	ND	ND
10/06/03	3	1	<1
11/03/03	14	3	5
12/01/03	4	<1	1

*Brookfield Avenue replaced First Avenue in July 2002 due to low flow at the sampling site.
ND = No Data.

TABLE AIII-10: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT ELMHURST ROAD ON HIGGINS CREEK DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	ND	ND	ND
02/04/02	ND	ND	ND
03/04/02	6	<1	1
04/01/02	10	1	1
05/06/02	23	5	8
06/03/02	ND	ND	ND
07/01/02	ND	ND	ND
08/05/02	18	4	5
09/03/02	16	2	2
10/07/02	13	3	5
11/04/02	ND	ND	ND
12/02/02	ND	ND	ND
01/06/03	ND	ND	ND
02/03/03	10	3	4
03/03/03	ND	ND	ND
04/07/03	ND	ND	ND
05/05/03	6	<1	<1
06/02/03	ND	ND	ND
07/07/03	10	2	1
08/04/03	16	2	1
09/02/03	ND	ND	ND
10/06/03	ND	ND	ND
11/03/03	16	1	2
12/01/03	ND	ND	ND

ND = No Data.

TABLE AIII-11: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT WILLE ROAD ON HIGGINS CREEK DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	1	<1	<1
02/04/02	<1	<1	<1
03/04/02	2	<1	<1
04/01/02	2	<1	1
05/06/02	3	<1	1
06/03/02	6	1	1
07/01/02	ND	ND	ND
08/05/02	7	1	1
09/03/02	4	1	1
10/07/02	2	<1	1
11/04/02	1	<1	<1
12/02/02	2	1	<1
01/06/03	1	<1	<1
02/03/03	2	1	2
03/03/03	8	<1	2
04/07/03	4	<1	<1
05/05/03	2	<1	1
06/02/03	2	<1	<1
07/07/03	7	1	<1
08/04/03	6	<1	<1
09/02/03	2	<1	<1
10/06/03	2	<1	<1
11/03/03	15	2	5
12/01/03	1	<1	<1

ND = No Data.

TABLE AIII-12: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT LAKE-COOK ROAD ON BUFFALO CREEK DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	30	<1	4
02/04/02	ND	ND	ND
03/04/02	ND	ND	ND
04/01/02	20	1	2
05/06/02	65	2	9
06/03/02	20	<1	3
07/01/02	ND	ND	ND
08/05/02	48	4	4
09/03/02	27	3	3
10/07/02	38	2	6
11/04/02	ND	ND	ND
12/02/02	ND	ND	ND
01/06/03	ND	ND	ND
02/03/03	ND	ND	ND
03/03/03	ND	ND	ND
04/07/03	28	3	5
05/05/03	22	1	4
06/02/03	32	<1	4
07/07/03	43	6	6
08/04/03	53	3	7
09/02/03	ND	ND	ND
10/06/03	30	<1	4
11/03/03	23	2	7
12/01/03	12	1	2

ND = No Data.

TABLE AIII-13: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT LAKE-COOK ROAD ON THE DES PLAINES RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	9	<1	1
02/04/02	8	1	2
03/04/02	8	<1	1
04/01/02	23	<1	3
05/06/02	38	<1	6
06/03/02	60	<1	8
07/01/02	ND	ND	ND
08/05/02	53	2	5
09/03/02	20	1	2
10/07/02	14	2	3
11/04/02	15	2	1
12/02/02	51	<1	7
01/06/03	53	<1	8
02/03/03	9	2	2
03/03/03	105	<1	14
04/07/03	44	<1	6
05/05/03	30	2	7
06/02/03	31	<1	4
07/07/03	27	3	4
08/04/03	42	2	4
09/02/03	7	<1	1
10/06/03	9	1	2
11/03/03	18	<1	3
12/01/03	35	<1	5

ND = No Data.

TABLE AIII-14: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT OAKTON STREET ON THE DES PLAINES RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	ND	ND	ND
02/04/02	10	<1	2
03/04/02	9	1	1
04/01/02	26	1	3
05/06/02	45	1	8
06/03/02	32	<1	4
07/01/02	ND	ND	ND
08/05/02	7	1	2
09/03/02	16	2	2
10/07/02	3	1	2
11/04/02	3	2	3
12/02/02	52	<1	7
01/06/03	66	<1	10
02/03/03	ND	ND	ND
03/03/03	ND	ND	ND
04/07/03	41	<1	6
05/05/03	28	<1	4
06/02/03	45	<1	6
07/07/03	49	4	7
08/04/03	108	<1	12
09/02/03	21	6	7
10/06/03	13	4	6
11/03/03	5	<1	<1
12/01/03	46	<1	7

ND = No Data.

TABLE AIII-15: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT BELMONT STREET ON THE DES PLAINES RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	5	<1	2
02/04/02	9	<1	1
03/04/02	8	<1	1
04/01/02	22	<1	3
05/06/02	16	<1	3
06/03/02	4	1	1
07/01/02	ND	ND	ND
08/05/02	7	2	3
09/03/02	15	7	9
10/07/02	3	1	2
11/04/02	<1	<1	<1
12/02/02	34	<1	4
01/06/03	54	<1	8
02/03/03	8	1	2
03/03/03	91	<1	13
04/07/03	36	<1	5
05/05/03	16	<1	1
06/02/03	32	<1	4
07/07/03	42	1	5
08/04/03	88	<1	14
09/02/03	1	1	2
10/06/03	3	1	<1
11/03/03	15	3	3
12/01/03	39	<1	5

ND = No Data.

TABLE AIII-16: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT ROOSEVELT STREET ON THE DES PLAINES RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	5	2	3
02/04/02	9	<1	1
03/04/02	8	<1	2
04/01/02	21	<1	3
05/06/02	18	1	4
06/03/02	3	1	1
07/01/02	ND	ND	ND
08/05/02	3	<1	1
09/03/02	4	<1	<1
10/07/02	1	1	2
11/04/02	1	<1	<1
12/02/02	36	<1	5
01/06/03	63	<1	9
02/03/03	ND	ND	ND
03/03/03	ND	ND	ND
04/07/03	ND	ND	ND
05/05/03	ND	ND	ND
06/02/03	32	<1	4
07/07/03	ND	ND	ND
08/04/03	59	2	13
09/02/03	3	<1	1
10/06/03	1	<1	<1
11/03/03	11	1	2
12/01/03	33	<1	4

ND = No Data.

TABLE AIII-17: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT OGDEN AVENUE ON THE DES PLAINES RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	6	<1	2
02/04/02	9	<1	1
03/04/02	8	<1	1
04/01/02	36	<1	4
05/06/02	13	<1	7
06/03/02	6	1	1
07/01/02	ND	ND	ND
08/05/02	4	1	1
09/03/02	6	1	1
10/07/02	2	2	5
11/04/02	1	<1	1
12/02/02	51	<1	7
01/06/03	51	<1	8
02/03/03	ND	ND	ND
03/03/03	94	<1	13
04/07/03	34	<1	4
05/05/03	ND	ND	ND
06/02/03	ND	ND	ND
07/07/03	ND	ND	ND
08/04/03	ND	ND	ND
09/02/03	ND	ND	ND
10/06/03	ND	ND	ND
11/03/03	13	1	2
12/01/03	36	<1	6

ND = No Data.

TABLE AIII-18: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT WILLOW SPRINGS ROAD ON THE DES PLAINES RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	ND	ND	ND
02/04/02	9	<1	1
03/04/02	ND	ND	ND
04/01/02	54	<1	6
05/06/02	25	<1	4
06/03/02	6	<1	1
07/01/02	ND	ND	ND
08/05/02	16	2	2
09/03/02	4	<1	<1
10/07/02	1	1	1
11/04/02	1	<1	<1
12/02/02	70	<1	10
01/06/03	56	<1	8
02/03/03	ND	ND	ND
03/03/03	ND	ND	ND
04/07/03	32	<1	4
05/05/03	24	<1	1
06/02/03	47	<1	5
07/07/03	91	3	18
08/04/03	32	5	11
09/02/03	4	<1	1
10/06/03	4	1	1
11/03/03	5	2	4
12/01/03	36	<1	5

ND = No Data.

TABLE AIII-19: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT STEPHEN STREET ON THE DES PLAINES RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	6	<1	1
02/04/02	9	<1	1
03/04/02	7	<1	1
04/01/02	39	<1	5
05/06/02	44	<1	7
06/03/02	14	1	2
07/01/02	ND	ND	ND
08/05/02	179	<1	19
09/03/02	8	1	1
10/07/02	1	<1	<1
11/04/02	1	<1	<1
12/02/02	73	<1	10
01/06/03	70	<1	10
02/03/03	ND	ND	ND
03/03/03	115	<1	16
04/07/03	37	<1	5
05/05/03	20	<1	1
06/02/03	33	<1	4
07/07/03	174	<1	23
08/04/03	33	<1	4
09/02/03	9	1	2
10/06/03	3	<1	1
11/03/03	7	1	2
12/01/03	39	<1	5

ND = No Data.

TABLE AIII-20: CHLOROPHYLL *a*, *b*, AND *c* CONCENTRATIONS AT MATERIAL SERVICE ROAD ON THE DES PLAINES RIVER DURING 2002–2003

Date	Chlorophyll *a* µg/L	Chlorophyll *b* µg/L	Chlorophyll *c* µg/L
01/07/02	12	<1	2
02/04/02	12	<1	2
03/04/02	12	<1	1
04/01/02	65	<1	9
05/06/02	58	<1	7
06/03/02	36	1	4
07/01/02	ND	ND	ND
08/05/02	89	<1	9
09/03/02	31	1	3
10/07/02	5	<1	1
11/04/02	5	<1	1
12/02/02	65	<1	10
01/06/03	58	<1	8
02/03/03	ND	ND	ND
03/03/03	123	<1	17
04/07/03	42	<1	6
05/05/03	24	<1	4
06/02/03	44	<1	5
07/07/03	214	<1	28
08/04/03	72	41	66
09/02/03	16	2	4
10/06/03	5	1	2
11/03/03	20	<1	3
12/01/03	38	<1	6

ND = No Data.