

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD
IN THE MATTER OF:)

PROPOSED AMENDMENTS TO) R04-25
DISSOLVED OXYGEN STANDARD 35 ILL.) (Rulemaking - Water)
ADM. CODE 302.206)

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STATE OF ILLINOIS
Pollution Control Board

NOTICE OF FILING

TO: SEE ATTACHED SERVICE LIST.

PLEASE TAKE NOTICE that on Tuesday, April 18, 2006, we filed the attached *MOTION TO MODIFY AND SUPPLEMENT PRE-FILED TESTIMONY OF RICHARD LANYON FILED ON APRIL 4, 2006, ON BEHALF OF THE METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO IN SUPPORT OF PROPOSED AMENDMENTS TO DISSOLVED OXYGEN STANDARD* and the *"AMENDED PRE-FILED TESTIMONY OF RICHARD LANYON ON BEHALF OF THE METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO IN SUPPORT OF PROPOSED AMENDMENTS TO DISSOLVED OXYGEN STANDARD"* with the Clerk of the Pollution Control Board, a copy of which is herewith served upon you.

METROPOLITAN WATER RECLAMATION
DISTRICT OF GREATER CHICAGO

BY: Frederick M. Feldman
Frederick M. Feldman, its Attorney

Frederick M. Feldman/Ronald M. Hill
Metropolitan Water Reclamation
District of Greater Chicago
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CERTIFICATE OF SERVICE

I, Judith A. Pappalardo, being duly sworn on oath, certify that I caused a copy of the attached *MOTION TO MODIFY AND SUPPLEMENT PRE-FILED TESTIMONY OF RICHARD LANYON FILED ON APRIL 4, 2006, ON BEHALF OF THE METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO IN SUPPORT OF PROPOSED AMENDMENTS TO DISSOLVED OXYGEN STANDARD* and the *"AMENDED PRE-FILED TESTIMONY OF RICHARD LANYON ON BEHALF OF THE METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO IN SUPPORT OF PROPOSED AMENDMENTS TO DISSOLVED OXYGEN STANDARD"* to be sent via first class U.S. Mail to the individuals identified on the attached service list, at their addresses as shown, with proper postage prepaid, from 100 E. Erie Street, Chicago, Illinois, at or near the hour of 4:00 p.m., this 18th day of April, 2006.

Judith A. Pappalardo

SUBSCRIBED and SWORN to before me this 18th day of April, 2006.

Rosalie Bottari
Notary Public

RH:jp



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R04-25
(Rulemaking – Water)

STATE OF ILLINOIS
Pollution Control Board

MOTION TO MODIFY AND SUPPLEMENT PRE-FILED TESTIMONY OF RICHARD LANYON FILED ON APRIL 4, 2006, ON BEHALF OF THE METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO IN SUPPORT OF PROPOSED AMENDMENTS TO DISSOLVED OXYGEN STANDARD

The Metropolitan Water Reclamation District of Greater Chicago (“District”), by its Attorney, Frederick M. Feldman, hereby moves the Hearing Officer for leave to modify and supplement the pre-filed written testimony of Richard Lanyon that was filed on April 4, 2006. In support hereof, the District states as follows:

1. On April 4, 2006, the District pre-filed written testimony of its witness, Richard Lanyon. The District just discovered that Exhibit “3” to Lanyon’s testimony, which is labeled “Number and Percent of Dissolved Oxygen Values Measured in 2005 Above the Illinois Pollution Control Board’s Water Quality Standard,” is actually data for the year 2004. Therefore, the District wishes to correct Exhibit 3 by changing the caption to read “Number and Percent of Dissolved Oxygen Values Measured in 2004 Above the Illinois Pollution Control Board’s Water Quality Standard.”

2. In addition, Lanyon’s testimony refers to the data as “2005” data. (Page nine, first full paragraph, line two of Lanyon’s pre-filed testimony) The correct reference is “2004.” Therefore, the District requests leave to change the testimony accordingly.

3. The District has 2005 data available that is relevant to Lanyon’s testimony. The District requests leave to attach this additional data to Lanyon’s testimony as Exhibit “5.” A copy of the proposed Exhibit “5” is attached hereto. The District further requests leave to add the following paragraph to page nine of Lanyon’s testimony that explains the 2005 data:

A summary of DO data for 2005 is provided herewith in Exhibit 5. It is shown that the North Shore Channel upstream of the North Side WRP exceeds the

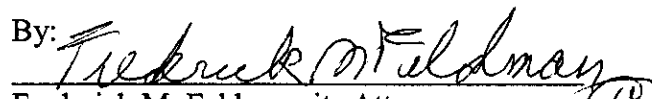

applicable DO standard 87 percent at Main Street in Skokie. By contrast, Bubbly Creek (South Fork) exceeds the applicable DO standard 63 percent of the time at 36th Street and 89 percent at Interstate 55, both in Chicago. Other locations that are less than 90 percent of the applicable DO standard include Route 83 and Lockport Powerhouse on the Chicago Sanitary and Ship Canal; Irving Park Road on the Des Plaines River; Hohman Avenue and Torrence Avenue on the Grand Calumet Rivers and Wentworth Avenue and Ashland Avenue on the Little Calumet River South. All other continuously monitored locations exceed the applicable DO standard over 90 percent of the time.

4. For the sake of clarity, the District has prepared and served along with this motion an amended copy of Lanyon's pre-filed testimony that incorporates the modifications and supplemental material identified herein, which is captioned "Amended Pre-filed Testimony of Richard Lanyon on Behalf of the Metropolitan Water Reclamation District of Greater Chicago in Support of Proposed Amendments to Dissolved Oxygen Standard." This way, if the Hearing Officer grants the District's motion, all of Lanyon's testimony will appear in one document as part of the record.

5. The requested modifications and supplementation of Lanyon's testimony will not materially prejudice any other person's participation at hearing, but rather will ensure that the Board has all the necessary information before it to render a decision.

WHEREFORE, the Metropolitan Water Reclamation District of Greater Chicago respectfully requests leave to file instanter the "Amended Pre-Filed Testimony of Richard Lanyon on Behalf of the Metropolitan Water Reclamation District of Greater Chicago in Support of Proposed Amendments to Dissolved Oxygen Standard."

Metropolitan Water Reclamation District of
Greater Chicago,

By: 
Frederick M. Feldman, its Attorney 

April __, 2006

Frederick M. Feldman/Ronald M. Hill
Metropolitan Water Reclamation
District of Greater Chicago
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312.751.6583

EXHIBIT 5

NUMBER AND PERCENT OF DISSOLVED OXYGEN VALUES MEASURED IN 2005 ABOVE THE ILLINOIS POLLUTION CONTROL BOARD'S WATER QUALITY STANDARD¹

Monitoring Station	Waterway	IPCB DO Standard	Number of DO Values	Number of DO Values Above Standard	Percent of DO Values Above Standard
<u>Chicago River System</u>					
Main Street	North Shore Channel	5	8,115	7,080	87
Foster Avenue	North Shore Channel	4	8,365	8,362	100
Central Park Avenue	North Branch Chicago River	5	4,261	4,005	94
Addison Street	North Branch Chicago River	4	8,421	8,249	98
Fullerton Avenue	North Branch Chicago River	4	7,846	7,329	93
Kinzie Street	North Branch Chicago River	4	8,704	8,394	96
Clark Street	Chicago River	5	8,628	8,628	100
Loomis Street	South Branch Chicago River	4	8,733	8,717	>99
36 th Street	Bubbly Creek	4	7,646	4,808	63
Interstate Highway 55	Bubbly Creek	4	7,939	7,055	89
Cicero Avenue	Chicago Sanitary and Ship Canal	4	6,185	5,584	90
B&O Railroad	Chicago Sanitary and Ship Canal	4	8,083	8,038	99
Route 83	Chicago Sanitary and Ship Canal	4	7,002	5,807	83
Lockport Powerhouse	Chicago Sanitary and Ship Canal	4	8,289	6,794	82
<u>Des Plaines River System</u>					
Busse Lake Dam	Salt Creek	5	1,523	1,523	100
JFK Boulevard	Salt Creek	5	4,034	3,740	93
Thorndale Avenue	Salt Creek	5	4,111	3,810	93
Wolf Road	Salt Creek	5	4,223	3,998	95
Devon Avenue	Des Plaines River	5	1,570	1,570	100
Irving Park Road	Des Plaines River	5	4,096	2,961	72
Ogden Avenue	Des Plaines River	5	4,098	4,084	>99
Material Service	Des Plaines River	5	1,029	1,029	100
Jefferson Street	Des Plaines River	4	8,035	7,332	91
<u>Calumet River System</u>					
Hohman Avenue	Grand Calumet River	5	1,683	270	16
Torrence Avenue	Grand Calumet River	4	6,523	5,332	82
C&W Indiana Railroad	Little Calumet River	4	7,842	7,755	99
Halsted Street	Little Calumet River	4	8,230	8,184	99
Ashland Avenue	Little Calumet River	5	8,730	5,007	57
Wentworth Avenue	Little Calumet River	5	3,527	1,575	45
Cicero Avenue	Calumet-Sag Channel	3	8,733	8,708	>99
104 th Avenue	Calumet-Sag Channel	3	6,714	6,690	>99
Route 83	Calumet-Sag Channel	3	8,373	8,250	99

¹Dissolved oxygen was measured hourly using a YSI Model 6920 or Model 6600 continuous water quality monitor.

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AMENDED PRE-FILED TESTIMONY OF RICHARD LANYON ON BEHALF OF THE METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO IN SUPPORT OF PROPOSED AMENDMENTS TO DISSOLVED OXYGEN STANDARD

My name is Richard Lanyon. I am the Director of Research and Development for the Metropolitan Water Reclamation District of Greater Chicago (“District”). I am submitting the following testimony on behalf of the District in support of the subject proposed amendments to the dissolved oxygen standards for General Use waters in Illinois.

I have been the District’s Director of Research and Development (“R&D”) since 1999. As Director of R&D, I supervise the District’s R&D Department, which has a staff of 317. Prior to becoming Director of R&D, I was the Assistant Director of R&D. I held this position from 1975 until 1999. I have been employed by the District since 1963.

I received both Bachelors and Masters of Civil Engineering degrees from the University of Illinois at Urbana-Champaign (“UIUC”). I received the American Society of Civil Engineer’s National Government Civil Engineer of the Year Award in 1999 and Distinguished Alumnus of the Department of Civil and Environmental Engineering at the UIUC in 2003. I am also a past President of the Illinois Section of the American Society of Civil Engineers (ASCE) and have been involved in a variety of technical activities for ASCE, the Water Environment Federation, the Illinois Association of Wastewater Agencies, the U.S. Geological Survey and the Association of Metropolitan Sewerage Agencies.

My responsibilities as the District's Director of R&D include, but are not limited to, the following:

- Control of commercial and industrial waste discharges to the District's sewers and the waterways via the Sewage and Waste Control Ordinance;
- Recovery of certain District operating, maintenance and replacement costs via administration of the User Charge Ordinance;
- Providing analytical laboratory support for the control of commercial and industrial wastes and for control of treatment and other operations;
- Monitoring the water quality of Lake Michigan, Chicago area waterways and the Illinois Waterway; and
- Conducting basic and applied research on new wastewater and sludge treatment processes.

The District previously submitted comments in support of the proposed amendments to 35 Ill. Adm. Code 302.206. This testimony is being submitted to address certain other comments and testimony that has been filed, and in support of the District's prior comments.

The District appreciates the opportunity to express its views on the pending rulemaking for a dissolved oxygen (DO) water quality standard. We will address six areas:

- Difficulty of establishing realistic standards for DO in the limited number of designated use classes available in Illinois
- Difficulty of determining compliance with the current standard
- Use Attainability Analysis (UAA) Study for Chicago Area Waterways (CAWs)
- District experience with DO variability
- Comment on the testimony of others
- Comment on the proposed rule change by the Illinois Department of Natural Resources (IDNR) and the Illinois Environmental Protection Agency (IEPA)

Designated Use Class System

Illinois has virtually one designated use class. The General Use class applies to in excess of 99 percent of the miles of rivers and streams in the state. The Secondary Contact and Indigenous Species Aquatic Life (Secondary Contact) class in northeastern Illinois includes approximately 87 miles of canals, channels and rivers. There are no rivers or streams designated in the Outstanding Resource class and few in the Public Water Supply class. Thus, a DO standard for the General Use class means that the same standard applies to the large border rivers,

Mississippi, Ohio and Wabash, as well as the Illinois River, and it applies to small agricultural ditches, headwater streams, urban drainage channels and all rivers and streams in between these extremes. To have one DO standard apply to this variety of sizes and types of rivers is not scientifically defensible.

As you may be aware, the IAWA has a project underway to develop a proposal for a new designated use classification system for Illinois. I serve as the chair of the subcommittee charged with this task. Work began on this project in March 2004 and a consultant was engaged by IAWA in March 2005. The subcommittee and consultant are working with the IEPA and a stakeholder group has been formed. The first meeting of the stakeholder group was on October 28, 2005. The IAWA is hopeful that a proposal with broad-based support can be brought before the Board in 2007.

Difficulty of Determining Compliance

Toby Frevert of the IEPA testified that it is extremely difficult to determine compliance with existing standards that require DO be not less than 6.0 mg/L for 16 hours of each day and not less than 5.0 mg/L at any time. The 5.0 to 6.0 mg/L range is not typical of daily variation in either man-made, modified or natural waterways and there is no specificity when the 16-hour period applies. Enforcement of the standard would require multiple grab samples be taken over a period of at least eight hours. Using continuous monitoring is problematical because no United States Environmental Protection Agency (USEPA) approved method is available. As a result, 5.0 mg/L becomes a default standard applied for grab samples taken at any time during the day.

The UAA Study

The UAA Study being conducted by the IEPA for the CAWs includes nearly 80 miles of waterways designated as Secondary Contact and General Use. Those designated as General Use include 4.0 miles of the North Shore Channel and 1.6 miles of the Chicago River. The remainder of the CAWs is designated as Secondary Contact. The UAA Study has demonstrated that based on water quality monitoring data from many sources, the CAWs is meeting most General Use water quality standards at most locations for most of the time, except for bacteria and DO. There is no bacterial standard for the Secondary Contact use designation and effluents discharged into

these waters are not required to be disinfected. In addition, all CAWs, including the General Use reaches are impacted by occasional combined sewer and stormwater overflows containing bacterial contamination and oxygen-demanding substances.

Lack of compliance with the DO standard result from periodic combined sewer overflows (CSOs), runoff from nonpoint areas, warm water temperatures and low velocities in the CAWs. Approximately 70 percent of the annual flow leaving the CAWs at Lockport consists of treated water reclamation plant effluent. Effluent typically has high DO concentrations in the range 5 to 7 mg/L. Effluent also contains biological oxygen demand (BOD) and suspended solids (SS) at concentrations slightly less than 5 mg/L. Therefore, the oxygen demanding substances in the effluent easily consume the available oxygen in the effluent, making it difficult for effluent alone to provide sufficient oxygen to maintain compliance with the standard.

It is for this reason that the District finds it necessary to provide supplemental aeration in waterways downstream of effluent outfalls to meet the applicable standard. Supplemental aeration is necessary because the slow moving water is incapable of sufficient natural re-aeration to maintain compliance with the standard. In support of the UAA Study, the District is investigating the engineering feasibility and cost of additional supplemental aeration facilities to ensure maintenance with the existing DO standard of 4.0 mg/L for Secondary Contact waters.

Variability of DO

In 1998, the District began to deploy automatic in-situ DO monitors throughout the Chicago Waterway System (CWS). The CWS is the name used by the District for the waterways that it controls to receive the treated effluents of the Calumet, Lemont, North Side and Stickney Water Reclamation Plants (WRPs) and consists of the waterways designated as Secondary Contact waters upstream of the Lockport Powerhouse and Lock plus the Chicago River and the upstream end of the North Shore Channel, which are designated as General Use waters. These are all deep draft waterways used primarily for commercial and recreational navigation and urban drainage. Most of the reaches in the CWS are man-made channels and the balance are irretrievably modified channels to accommodate the needs of urban drainage and commercial navigation. In addition, the CWS is artificially controlled by locks and dams under the supervision of the

District and in accordance with federal regulation. There has been an increase in recreational use of the CWS in recent years because of water quality improvements.

Variation of DO throughout the day due to photosynthetic activity is slight and hardly noticeable in the channel reaches conveying continuous flow. It is believed that turbidity in the water column prevents the penetration of light for photosynthetic activity to occur. However, in those reaches where there is little or no flow, diurnal variation is noticeable when water clarity and other conditions are appropriate. This variation can be as much as 5 mg/L and the minimum DO concentration can be as low as zero. Waterway reaches where this occurs include the Collateral Channel, North Shore Channel upstream of the North Side WRP and the South Fork of the South Branch, also known as Bubbly Creek.

In 2005, the District began to deploy continuous DO monitors in wadeable streams in the Cook County area, including the Des Plaines River, Grand Calumet River, Little Calumet River, North Branch and Salt Creek. With less than a year of data, significant daily DO variation has been observed. Continuous monitoring in shallow General Use waters occurs in the following locations:

- Des Plaines River at Irving Park Road, Schiller Park
- Des Plaines River at Ogden Avenue, Lyons
- Little Calumet River at Wentworth Avenue, Hammond
- North Branch Chicago River at Central Park Avenue, Chicago
- Salt Creek at JFK Boulevard, Elk Grove Village
- Salt Creek at Thorndale Avenue, Itasca
- Salt Creek at Wolf Road, Western Springs

Results during July, August, September and October 2005 exhibit the following characteristics:

Location	Dissolved Oxygen Concentration, mg/L		
	Minimum	Maximum	Mean
Des Plaines River at Irving Park Road	0.2	10.0	5.3
Des Plaines River at Ogden Avenue	4.6	11.3	7.5
Little Calumet River at Wentworth Avenue	0.0	12.4	4.6
North Branch at Central Park	0.0	10.8	6.6
Salt Creek at JFK Boulevard	3.4	13.0	7.0
Salt Creek at Thorndale Avenue	3.8	12.4	7.4
Salt Creek at Wolf Road	3.3	10.1	6.8

Similar results for the locations in the above table are shown for each of the four months in Exhibit 1. As shown in Exhibit 1 for each month, only two locations, Des Plaines River at Ogden

Avenue and Salt Creek at Thorndale Avenue, meet the proposed IAWA standard for each of the four months because the minimum DO concentration is never below 3.7 mg/L. The Des Plaines River at Ogden Avenue appears to meet the current standard of 5.0 mg/L in August, September and October, but not in July. Salt Creek at Thorndale Avenue appears to not meet the current standard in three of the four months. The Little Calumet River at Wentworth Avenue does not meet the proposed IAWA standard in any of the four months because the minimum DO concentration is always below 3.7 mg/L. In September and October, the proposed IAWA standard was met at all locations except the Little Calumet River at Wentworth Avenue.

The extent of diurnal variation in DO concentration is suggested by the difference between maximum and minimum concentrations shown in Exhibit 1. Based on an examination of the hourly observations, daily variation in DO concentration is as little as 1 to 2 mg/L in the Des Plaines River at the 2 locations and in Salt Creek at Wolf Road; 3 mg/L in the North Branch at Central Park Avenue; 4 mg/L in Salt Creek at JFK Boulevard and Thorndale Avenue; and 8 mg/L in the Little Calumet River at Wentworth Avenue. Daily variation in October was reduced at all stations, probably as a result of reduced intensity of sunlight and cooler temperatures.

Comment on the Testimony of Others

Both the live testimony of certain witnesses and pre-filed testimony of opponents to the IAWA petition for the August 25, 2005, hearing may lead to a misunderstanding of both existing conditions in the Chicago River and of particulars about dissolved oxygen in water. The District wishes to address some misstatements contained in the record and clarify certain issues.

In pre-filed testimony for the August 25, 2005, hearing, Todd Main, representing the Friends of the Chicago River (FOCR), it is indicated on page 2 that lowering the current standard would jeopardize “the progress that has already been achieved by significant public investment in structural storm water controls like the Tunnel and Reservoir Plan.” Any change in the water quality standards will not adversely affect progress already achieved. The TARP system and the District’s water reclamation plant improvements will be operated to their full potential as required in the District’s NPDES permits. Backsliding is not permissible under the Clean Water

Act and is not a policy or practice embraced by the District and other wastewater treatment utilities in Illinois.

On page 3, Mr. Main also cites work by the Shedd Aquarium and FOCR to survey the occurrence of freshwater mussels in the North Branch indicating that the mussels would be stressed by DO levels below 20 percent of saturation. Saturation in freshwater at 20 degrees C is approximately 9.0 mg/L and 20 percent thereof is 1.8 mg/L, far below the IAWA proposed standard. It is also far below the standard proposed by the IDNR and IEPA. Obviously, mussels are more tolerant of low DO concentrations than are fish because mussels survive in the substrate, whereas fish survive in the water column. Incidentally, Mr. Main is giving this testimony without establishing his qualifications. In his testimony at the August 25, 2005 hearing, Mr. Main (page 173, line 3) indicates that the mussel survey was conducted in the Chicago River. In truth, the survey was conducted as stated in the pre-filed testimony in the North Branch in the northern suburbs of Chicago. We believe that the Board should give little weight to the testimony of Mr. Main on pages 173 and 174 of the August 25, 2005, hearing transcript regarding freshwater mussels in view of his apparent lack of qualifications and misunderstanding concerning the survey upon which his testimony is based.

On page 5, Mr. Main finds it hard to understand the rationale for the IAWA proposed standard. This may be due to his lack of scientific expertise. He mentions the need for civic and political leadership and the need to finish the task, ignoring the District's commitment and on-going efforts for the past 30 years to construct the TARP system to reduce combined sewer overflows and improve the operation of the water reclamation plants to achieve better effluent quality. Wastewater treatment authorities throughout Illinois have been striving to comply with the CWA and Illinois water pollution regulations for the past 30+ years.

Also on page 5, Mr. Main discusses deteriorating water quality and the disappearance of species from the watershed in recent decades. Contradicting himself, Mr. Main responds affirmatively in oral testimony (page 181, line 8), to a question by Mr. Harsch about fish and wildlife that "The health of the river has improved dramatically all through the watershed."

In his oral testimony (page 177, line 3), Mr. Main is not clear regarding the area in the river system where the mussel survey was conducted. As stated, “the area of the river that is north of Clark Park where the Skokie and the Middle Branch and West Fork all come together” is very confusing. Clark Park is on the North Branch at Addison Street in Chicago, some 5.6 river miles above the mouth of the North Branch in downtown Chicago. The Skokie River and the North Branch confluence is near Wilmette, 23.0 river miles upstream of the mouth of the North Branch. The West Fork joins the North Branch near Glenview, 19.5 miles upstream of the mouth of the North Branch. We believe this clarifies the location of the mussel survey in General Use waters.

Later (page 177, line 18), Mr. Main refers to the “area that’s under the UAA is sort of the north channel – the north shore channel all the way down through the city and then out past Bubbly Creek.” The CAWs UAA Study includes approximately 78 miles of waterways from Wilmette on the north, to Lockport on the southwest, to Calumet Harbor on the southeast, as shown on Exhibit 2. Later (page 182, line 21), Mr. Main testifies about the location of the North Shore Channel as “the area of the river south of sort of Evanston that runs along the lake.” Actually, as shown on Exhibit 2, the North Shore Channel begins at the lakefront in Wilmette and runs southward through Evanston, Skokie, Lincolnwood and into Chicago, terminating near Foster Avenue where it joins the North Branch. From the lakefront at Wilmette to the treated effluent outfall of the District’s North Side WRP, a distance of 4.4 river miles, the North Shore Channel is designated as General Use water. From the plant outfall to its downstream terminus, a distance of 3.3 river miles, the channel is designated as Secondary Contact water. At its southern terminus, the North Shore Channel is approximately three miles west of the Lake Michigan shoreline. This clarifies the location and use designation of the North Shore Channel.

Mr. Main’s testimony (page 180, line 12 and page 181, line 2) retracts statements made in the pre-filed testimony on pages 2 and 3 regarding DO concentrations in the Chicago Area Waterways, which are not General Use waters. Later (page 181, line 14), Mr. Main defers to the experts as to what DO concentration can be achieved in the North Shore Channel. This is the subject of the UAA Study and has yet to be determined. At the request of the IEPA, the District is currently evaluating the feasibility, technology and the cost to achieve DO concentrations of 4.0, 5.0 and 6.0 mg/L in the CAWs. The results of this evaluation will not be available until the

third quarter of 2006. Preliminary results indicate that the cost of supplementary aeration facilities will probably exceed \$100 million.

Mr. Main indicated that he would provide DO concentrations to the Board (page 184, line 4). The District's data are published annually and a summary for 2004 is provided herewith in Exhibit 3. It is shown that the North Shore Channel upstream of the North Side WRP exceeds the DO standard of 5.0 mg/L 71 percent of the time at Linden Avenue in Wilmette; 48 percent at Simpson Street in Evanston and 81 percent at Main Street in Skokie. By contrast, Bubbly Creek (South Fork) exceeds the DO standard of 4.0 mg/L 71 percent of the time at 36th Street and 60 percent at Interstate 55, both in Chicago. Other locations that are less than 90 percent include Cicero Avenue, Route 83 and Lockport Powerhouse on the Chicago Sanitary and Ship Canal; Torrence Avenue on the Grand Calumet River and Ashland Avenue on the Little Calumet River South. It should be noted that at Ashland Avenue, the Little Calumet River South is a General Use water. All other continuously monitored locations exceed the applicable DO standard over 90 percent of the time.

A summary of DO data for 2005 is provided herewith in Exhibit 5. It is shown that the North Shore Channel upstream of the North Side WRP exceeds the applicable DO standard 87 percent at Main Street in Skokie. By contrast, Bubbly Creek (South Fork) exceeds the applicable DO standard 63 percent of the time at 36th Street and 89 percent at Interstate 55, both in Chicago. Other locations that are less than 90 percent of the applicable DO standard include Route 83 and Lockport Powerhouse on the Chicago Sanitary and Ship Canal; Irving Park Road on the Des Plaines River; Hohman Avenue and Torrence Avenue on the Grand Calumet Rivers and Wentworth Avenue and Ashland Avenue on the Little Calumet River South. All other continuously monitored locations exceed the applicable DO standard over 90 percent of the time.

Dr. Murphy's pre-filed and oral testimony serves to cast doubt on a scientifically sound and credible record in this proceeding. His criticism of the 1986 National Criteria Document (NCD) is based on the age of the document and questions regarding the quality of the data. If the NCD were flawed its deficiencies would have been brought to light long before this proceeding. We are confident that the USEPA would not have issued the NCD if proper laboratory procedures and quality assurance protocols were not followed. Despite his criticism of the NCD, Dr.

Murphy does not suggest an alternative scientific reference that could be used as the basis for a DO standard.

In pre-filed testimony (page 3, item 3) and in oral testimony (page 188, line 13 through 24), Dr. Murphy references the percent saturation of DO at 0° C and the oxygen tension at the peak of Mt. Everest. The relevance of these conditions in this proceeding is questionable. Dr. Murphy continues to suggest that to allow DO levels below 25 percent saturation can cause harm to fish and aquatic organisms, makes other statements regarding conditions that would cause harm to fish and suggests that oxygen tension or percent saturation be used as the standard rather than DO concentration because this is what governs the availability of oxygen to fish and other aquatic organisms. The Board is reminded that Dr. Murphy qualified himself as a chemist, not as a fish biologist.

Dr. Murphy (page 3, item 7) questions if the proposed rule will be and if the current standard is being violated. The Board has already received testimony from Mr. Terrio regarding current conditions in Illinois waters. The District has provided data above on this same matter. Apparently, Dr. Murphy did not review Mr. Terrio's testimony and he did not request to review District data before casting doubt on this matter. He raises (page 4, item 8) other irrelevant issues regarding enforcement of the proposed standard.

In oral testimony (page 189, line 2), Dr. Murphy questions data quality in chemical measurement, casting doubt on the data used in these proceedings. We believe that undue caution is given to this matter. Laboratory data presented by the District and data used in the NCD is governed by strict protocols for quality assurance and quality control. Further, the performance of laboratories is under accreditation requirements administered by the USEPA and IEPA. All District laboratories are accredited under the National Environmental Laboratory Accreditation Program. Both field sample collection and laboratory analytical protocols for the District's Ambient Water Quality Monitoring and Continuous DO Monitoring Programs are conducted in accordance with Quality Assurance Project Plans reviewed, approved and audited by the IEPA.

The ambient monitoring programs of both the IEPA and District are representative of actual field conditions. In contrast, Dr. Murphy suggests otherwise in his oral testimony (pages 191 and

192), inferring that these programs do not produce representative data. Dr. Murphy does not offer alternative sources of representative data. Dr. Murphy is incorrect in suggesting in his oral testimony (page 193, line 4) that adoption of the IAWA proposal will cause an increase in the discharge of oxygen-demanding substances. Such a practice would not occur because existing regulations prohibit backsliding and degradation from current conditions. Confirming his lack of knowledge regarding actual conditions in Illinois rivers and streams, Dr. Murphy answers “no” to a series of questions by Mr. Harsch (page 196, lines 1 through 24 and page 198, line 18). Dr. Murphy admitted the following:

- having no knowledge of the number of stream segments in Illinois that do not comply with water quality standards,
- not having evaluated the USGS report on DO concentrations,
- not having reviewed the analysis of DO conditions by Paul Terrio,
- not considering himself an expert in the study of the biological inter-relationships of water quality in streams, and
- not having familiarity with the Illinois rules on anti-degradation and their application.

Given these admissions, we believe that the Board should give little or no weight to the testimony of Dr. Murphy.

Comments on the IDNR/IEPA proposal

At the time of preparation of this pre-filed testimony, the only reference available regarding the standard proposed by IDNR and IEPA was a draft dated February 16, 2006. The proposal includes two sets of standards, one for specific named rivers and streams referred to as “(d) Other Dissolved Oxygen Streams” and the other being all other waters in subsection (b). The latter, subsection (b), is divided into two time periods, (1) March through July and (2) August through February. The standards for the March through July period are similar to the current General Use DO standards, a minimum of (A) “5.0 mg/L at any time” and (B) “6.0 mg/L as a daily mean averaged over 7 days.” This is an improvement over the current General Use standard as it is enforceable whether measurements are made by grab sampling once or multiple times per day, or if measurements are made by in-situ continuous monitors, provided that a sufficient number of data values are available. It is unclear if the daily mean is calculated based on seven consecutive days or any seven days in the five month period. If grab samples are collected once per month there would be insufficient data upon which to calculate a daily mean. These proposed

standards are similar to the IAWA proposed standards, except for the month of July. The scientific justification for this difference was not available at this writing.

The subsection (b) standards for August through February include a minimum of (A) “3.5 mg/L at any time,” (B) “4.0 mg/L as a daily minimum averaged over 7 days” and (C) “5.5 mg/L as a daily mean averaged over 30 days.” Again, it is unclear if the 7 and 30 day averages are based on consecutive days or any 7 or 30 daily values in the 7-month period. Further, if measurements are made by grab samples collected once per day, the difference between the daily minimum and daily mean is just a difference in calculation, having no difference in reality. The absolute minimum (3.5 mg/L) and the daily minimum averaged over 7 days (4.0 mg/L) are similar to the IAWA proposal, except for the month of July. The 5.5 mg/L daily mean averaged over 30 days was not part of the IAWA proposal and scientific justification is lacking.

In subsection (c), a similar set of standards are proposed for the streams defined in subsection (d). We have similar comments on these numerical values regarding the calculated averages. The scientific justification for these numerical values was not available at this writing.

In subsection (d), no streams were defined. A map of the state was provided which was purported to identify these “other streams,” however, the map used the term “enhanced dissolved oxygen protection.” Presumably, this difference in nomenclature will be cleared up. There was no justification for the inclusion of the streams as needing enhanced protection. An examination of the map shows that stream segments are not sufficiently defined. For this to be meaningful to the scientific community, a standard identification, such as river miles should be used and the streams should also be listed in a table. The map shows several segments of the border rivers, including the Mississippi, Ohio and Wabash Rivers. It must be demonstrated that the standards for these segments are consistent with the standards of the neighboring states. An examination of the map also reveals that there are intermittent segments of higher quality streams in several watersheds. In two locations along the northern border of Illinois, streams are identified in Wisconsin.

It appears that the Illinois River from a point in Will County to a point in LaSalle County is to meet the higher standards, whereas the upstream and downstream segments only need to meet

the lower standard. Obviously, this will present an enforcement ambiguity because a slight change in sample location would change the standard to be applied. The Illinois River is part of the Illinois Waterway, a federal navigation project. Barge traffic on the Illinois Waterway causes sediment re-suspension in the navigation channel and considerable wave wash along channel shorelines. It is not realistic to expect the water quality, including DO, to increase at the upstream end of this segment and decrease at the downstream end.

The District conducts water quality monitoring of the Illinois Waterway between Peoria and Lockport three times each year in May, August and October. In each month samples are collected twice by boat. A review of our 2005 data reveals that the Illinois Waterway referred to above to meet the higher standard will have no problem meeting the minimum-concentration-at-any-time standard. The Illinois Waterway upstream and downstream of this reach will meet the lower standard. However, we have insufficient data to calculate 7- and 30-day averages.

In subsection (e), definitions are given. The daily mean is defined in (1)(A). It is rare for several samples to be collected in a single day. Thus, this definition may have little practical value, unless the IEPA is intending to expand its monitoring programs or require permittees to conduct more frequent monitoring. An example of this is demonstrated by the District's ambient water quality monitoring program wherein samples are collected monthly. One such location is on Poplar Creek at Illinois Route 19 near Elgin. The DO never fell below 5.0 mg/L for monthly samples collected during the years 2003 through 2005. With once-per-month samples, there are insufficient data for calculation of daily mean, 7- or 30-day averages.

The use of in-situ water quality monitors has become more common, yielding observations at pre-set intervals, usually hourly. However, the use of these monitors is not an approved USEPA method so they cannot be used for enforcement purposes. The IDNR/IEPA proposal does not mention any intent to require the use of in-situ monitors.

Daily minimum, defined in (1)(B) lacks clarity. Perhaps the words "calculation of" and "of" should be stricken and "values" changed to "value." Given an array of values for a day, only one is a minimum.

Additional explanation is needed for the definition in (1)(C). As given, this definition asks the question “What are untrue daily minima and means?” As written, it appears to imply that measurements will be misrepresented or fraudulent.

In the definition given in (1)(D), “air-saturation” should be stricken and replaced with “dissolved-oxygen-saturation.” When considering dissolved oxygen saturation in water, one should not include nitrogen and other gaseous compounds and elements.

An examination of the data set used for Exhibit 1 has been made for the IDNR/IEPA proposal and this is shown in Exhibit 4. These urban-impacted streams, some being impacted also by combined sewer overflows (CSOs), do not all fair well under the proposal. For the month of July 2005, the Des Plaines River at Ogden Avenue almost complies fully with the minimum of 5.0 mg/L. Two locations known to be impacted by CSOs, Des Plaines River at Irving Park Road and Little Calumet River at Wentworth Avenue, have poor records of compliance. The remaining five locations comply about three-fourths of the time. Only three locations comply fully with the daily mean averaged over seven days, two locations comply about 60 percent of the time and the remaining two fail completely.

Results for the months of August, September and October show that as colder weather sets in, compliance with the IDNR/IEPA proposal improves. For August, compliance with the 3.5 mg/L minimum is excellent for five of the seven locations. Again, the Des Plaines River at Irving Park and Little Calumet River at Wentworth Avenue show problems with compliance. Compliance with the daily minimum averaged over seven days of 4.0 mg/L is excellent at six locations, with the Little Calumet River at Wentworth Avenue exhibiting only 32 percent compliance. For compliance with the 5.5 mg/L daily mean averaged over 30 days, five locations comply fully, while the Des Plaines River at Irving Park Road and Little Calumet River at Wentworth Avenue completely failed to comply. For September and October, the Little Calumet River at Wentworth Avenue is the only location not meeting the 3.5 mg/L minimum. This location is not in compliance with the daily minimum averaged over seven days and the daily mean averaged over 30 days in September, but it is in compliance in October. The Little Calumet River at Wentworth Avenue is located at the Illinois-Indiana border and is believed to be impacted by CSOs originating in Indiana.

Actual monitoring using continuous monitors gives us critical insight into the impact of a water quality standard proposal. Before adopting any proposal there must be a reasonable chance that compliance will occur. It is suggested that the Board give consideration to the following:

- For urban-impacted and CSO-impacted streams, a waiver provision should be allowed for time for further study of the affordability and feasibility of technology that must be installed for these streams to come into compliance.
- A separate wet weather standard applicable to the time following stormwater runoff that would allow reduced DO levels for a limited period.

In closing, several areas have been identified where the IDNR/IEPA proposal requires clarification and scientific justification. To the extent that these needs will be satisfied at the April 25, 2006 hearing remains to be seen.

Metropolitan Water Reclamation District of
Greater Chicago,

By:



Richard Lanyon, Director of R&D

April 18, 2006

Metropolitan Water Reclamation
District of Greater Chicago
100 East Erie
Chicago, Illinois 60611
312.751.5190

EXHIBIT 1

Metropolitan Water Reclamation District of Greater Chicago

Dissolved Oxygen Concentration Summary at Selected Locations in General Use Waters
For July, August, September and October 2005

July 1 – July 31, 2005

Location	Dissolved Oxygen Concentration, mg/L		
	Minimum	Maximum	Mean
Des Plaines River at Irving Park Road	0.2	5.6	3.0
Des Plaines River at Ogden Avenue	4.6	8.6	6.5
Little Calumet River at Wentworth Avenue	0.0	12.4	3.8
North Branch at Central Park Avenue	0.0	10.7	5.9
Salt Creek at JFK Boulevard	3.4	13.0	7.0
Salt Creek at Thorndale Avenue	3.8	12.4	7.4
Salt Creek at Wolf Road	3.3	9.6	6.1

August 1 – August 31, 2005

Location	Dissolved Oxygen Concentration, mg/L		
	Minimum	Maximum	Mean
Des Plaines River at Irving Park Road	2.6	6.4	4.6
Des Plaines River at Ogden Avenue	5.6	8.0	6.8
Little Calumet River at Wentworth Avenue	0.6	9.1	3.8
North Branch at Central Park Avenue	3.5	10.8	6.1
Salt Creek at JFK Boulevard	4.3	12.6	7.1
Salt Creek at Thorndale Avenue	4.2	12.3	7.2
Salt Creek at Wolf Road	3.8	9.1	6.3

September 1 – September 30, 2005

Location	Dissolved Oxygen Concentration, mg/L		
	Minimum	Maximum	Mean
Des Plaines River at Irving Park Road	4.2	7.3	5.4
Des Plaines River at Ogden Avenue	6.2	8.8	7.4
Little Calumet River at Wentworth Avenue	1.8	8.2	4.4
North Branch at Central Park Avenue	4.7	8.0	6.4
Salt Creek at JFK Boulevard	4.4	10.9	7.0
Salt Creek at Thorndale Avenue	4.4	11.4	7.4
Salt Creek at Wolf Road	4.9	9.3	6.8

October 1 – October 31, 2005

Location	Dissolved Oxygen Concentration, mg/L		
	Minimum	Maximum	Mean
Des Plaines River at Irving Park Road	5.1	10.0	7.7
Des Plaines River at Ogden Avenue	6.6	11.3	8.9
Little Calumet River at Wentworth Avenue	1.0	11.2	6.3
North Branch Chicago River	5.1	9.8	7.8
Salt Creek at JFK Boulevard	4.2	10.0	6.9
Salt Creek at Thorndale Avenue	5.3	11.3	7.4
Salt Creek at Wolf Road	5.7	10.1	8.0

EXHIBIT 3

NUMBER AND PERCENT OF DISSOLVED OXYGEN VALUES MEASURED IN 2004 ABOVE THE ILLINOIS POLLUTION CONTROL BOARD'S WATER QUALITY STANDARD¹

Monitoring Station	Waterway	IPCB DO Standard	Number of DO Values	Number of DO Values Above Standard	Percent of DO Values Above Standard
<u>Chicago River System</u>					
Linden Street	North Shore Channel	5	335	237	71
Simpson Street	North Shore Channel	5	1,981	961	48
Main Street	North Shore Channel	5	7,827	6,314	81
Foster Avenue	North Shore Channel	4	3,362	3,362	100
Addison Street	North Branch Chicago River	4	8,276	8,195	99
Fullerton Avenue	North Branch Chicago River	4	8,610	8,261	96
Division Street	North Branch Chicago River	4	1,676	1,665	99
Kinzie Street	North Branch Chicago River	4	8,530	8,268	97
Chicago River	Chicago River	5	1,508	1,508	100
Controlling Works					
Michigan Avenue	Chicago River	5	1,641	1,641	100
Clark Street	Chicago River	5	8,590	8,403	98
Jackson Boulevard	South Branch Chicago River	4	1,834	1,834	100
Loomis Street	South Branch Chicago River	4	8,279	8,214	99
36 th Street	Bubbly Creek	4	7,605	5,396	71
Interstate Highway 55	Bubbly Creek	4	8,109	4,891	60
Cicero Avenue	Chicago Sanitary and Ship Canal	4	8,588	6,591	77
B&O Railroad	Chicago Sanitary and Ship Canal	4	8,416	8,146	97
Route 83	Chicago Sanitary and Ship Canal	4	8,114	5,913	73
River Mile 302.6	Chicago Sanitary and Ship Canal	4	2,026	2,026	100
Romeoville Road	Chicago Sanitary and Ship Canal	4	2,003	2,003	100
Lockport Powerhouse	Chicago Sanitary and Ship Canal	4	8,611	6,311	73
<u>Des Plaines River System</u>					
Jefferson Street	Des Plaines River	4	8,176	8,021	98
<u>Calumet River System</u>					
130 th Street	Calumet River	5	1,749	1,749	100
Torrence Avenue	Grand Calumet River	4	8,781	6,818	78
Conrail Railroad	Little Calumet River	4	2,005	2,005	100
C&W Indiana Railroad	Little Calumet River	4	7,604	7,554	99
Halsted Street	Little Calumet River	4	8,610	8,570	>99
Ashland Avenue	Little Calumet River	5	8,327	4,713	57
Division Street	Calumet-Sag Channel	3	3,516	3,516	100
Kedzie Avenue	Calumet-Sag Channel	3	1,798	1,798	100
Cicero Avenue	Calumet-Sag Channel	3	8,731	8,674	99
River Mile 311.7	Calumet-Sag Channel	3	3,342	3,342	100
Southwest Highway	Calumet-Sag Channel	3	1,883	1,883	100
104 th Avenue	Calumet-Sag Channel	3	7,710	7,205	93
Route 83	Calumet-Sag Channel	3	8,783	8,719	99

¹Dissolved oxygen was measured hourly using a YSI Model 6920 or Model 6600 continuous water quality monitor.

EXHIBIT 4

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

Dissolved Oxygen Observations and Summary at Selected Locations in General Use Waters for July, August, September and October 2005

July 1 - July 31, 2005

Location	Number of Observations	Concentrations Greater than 5.0 mg/L	Minimum 7-Day Average	Percent of 7-Day Average Greater than 6.0 mg/L
Des Plaines River at Irving Park Road	614	3.6	2.3	0.0
Des Plaines River at Ogden Avenue	567	97.5	6.1	100.0
Little Calumet River at Wentworth Avenue	597	25.3	2.8	0.0
North Branch River at Central Park Avenue	585	77.1	4.2	57.9
Salt Creek River at JFK Boulevard	614	76.5	6.2	100.0
Salt Creek River at Thorndale Avenue	615	76.3	6.7	100.0
Salt Creek River at Wolf Road	591	75.5	5.4	63.2

August 1 - August 31, 2005

Location	Number of Observations	Percent of Concentration Greater than 3.5 mg/L	Minimum 7-Day Average	Percent of 7-Day Average Greater than 4.0 mg/L	Minimum 30-Day Average	Percent of 30-Day Average Greater than 5.5 mg/L
Des Plaines River at Irving Park Road	578	84.9	4.0	100.0	4.6	0.0
Des Plaines River at Ogden Ave.	722	100.0	6.5	100.0	6.7	100.0
Little Calumet River at Wentworth Ave.	744	57.3	3.1	32.0	3.8	0.0
North Branch River at Central Park Ave.	744	99.9	5.4	100.0	6.0	100.0
Salt Creek River at JFK Boulevard	712	100.0	6.5	100.0	7.0	100.0
Salt Creek River at Thorndale Avenue	691	100.0	6.8	100.0	7.2	100.0
Salt Creek River at Wolf Road	744	100.0	6.0	100.0	6.3	100.0

EXHIBIT 4

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

Dissolved Oxygen Observations and Summary at Selected Locations in General Use Waters for July, August, September and October 2005

September 1 – September 30, 2005

Location	Number of Observations	Percent of Concentration Greater than 3.5 mg/L	Minimum 7-Day Average	Percent of 7-Day Average Greater than 4.0 mg/L	Minimum 30-Day Average	Percent of 30-Day Average Greater than 5.5 mg/L
Des Plaines River at Irving Park Road	720	100.0	4.9	100.0	5.4	0.0
Des Plaines River at Ogden Ave.	720	100.0	7.0	100.0	7.4	100.0
Little Calumet River at Wentworth Ave.	720	67.8	3.7	75.0	4.4	0.0
North Branch River at Central Park Ave.	719	100.0	5.9	100.0	6.3	100.0
Salt Creek River at JFK Boulevard	589	100.0	6.6	100.0	7.0	100.0
Salt Creek River at Thorndale Avenue	631	100.0	7.2	100.0	7.4	100.0
Salt Creek River at Wolf Road	719	100.0	6.3	100.0	6.8	100.0

October 1 – October 31, 2005

Location	Number of Observations	Percent of Concentration Greater than 3.5 mg/L	Minimum 7-Day Average	Percent of 7-Day Average Greater than 4.0 mg/L	Minimum 30-Day Average	Percent of 30-Day Average Greater than 5.5 mg/L
Des Plaines River at Irving Park Road	743	100.0	6.2	100.0	7.6	100.0
Des Plaines River at Ogden Ave.	744	100.0	7.7	100.0	8.8	100.0
Little Calumet River at Wentworth Ave.	744	93.4	4.4	100.0	6.3	100.0
North Branch River at Central Park Ave.	744	100.0	6.4	100.0	7.7	100.0
Salt Creek River at JFK Boulevard	681	100.0	6.3	100.0	6.9	100.0
Salt Creek River at Thorndale Avenue	735	100.0	7.1	100.0	7.4	100.0
Salt Creek River at Wolf Road	743	100.0	7.1	100.0	8.0	100.0

EXHIBIT 5

**NUMBER AND PERCENT OF DISSOLVED OXYGEN VALUES MEASURED IN 2005
ABOVE THE ILLINOIS POLLUTION CONTROL BOARD'S WATER QUALITY STANDARD¹**

Monitoring Station	Waterway	IPCB DO Standard	Number of DO Values	Number of DO Values Above Standard	Percent of DO Values Above Standard
<u>Chicago River System</u>					
Main Street	North Shore Channel	5	8,115	7,080	87
Foster Avenue	North Shore Channel	4	8,365	8,362	100
Central Park Avenue	North Branch Chicago River	5	4,261	4,005	94
Addison Street	North Branch Chicago River	4	8,421	8,249	98
Fullerton Avenue	North Branch Chicago River	4	7,846	7,329	93
Kinzie Street	North Branch Chicago River	4	8,704	8,394	96
Clark Street	Chicago River	5	8,628	8,628	100
Loomis Street	South Branch Chicago River	4	8,733	8,717	>99
36 th Street	Bubbly Creek	4	7,646	4,808	63
Interstate Highway 55	Bubbly Creek	4	7,939	7,055	89
Cicero Avenue	Chicago Sanitary and Ship Canal	4	6,185	5,584	90
B&O Railroad	Chicago Sanitary and Ship Canal	4	8,083	8,038	99
Route 83	Chicago Sanitary and Ship Canal	4	7,002	5,807	83
Lockport Powerhouse	Chicago Sanitary and Ship Canal	4	8,289	6,794	82
<u>Des Plaines River System</u>					
Busse Lake Dam	Salt Creek	5	1,523	1,523	100
JFK Boulevard	Salt Creek	5	4,034	3,740	93
Thorndale Avenue	Salt Creek	5	4,111	3,810	93
Wolf Road	Salt Creek	5	4,223	3,998	95
Devon Avenue	Des Plaines River	5	1,570	1,570	100
Irving Park Road	Des Plaines River	5	4,096	2,961	72
Ogden Avenue	Des Plaines River	5	4,098	4,084	>99
Material Service	Des Plaines River	5	1,029	1,029	100
Jefferson Street	Des Plaines River	4	8,035	7,332	91
<u>Calumet River System</u>					
Hohman Avenue	Grand Calumet River	5	1,683	270	16
Torrence Avenue	Grand Calumet River	4	6,523	5,332	82
C&W Indiana Railroad	Little Calumet River	4	7,842	7,755	99
Halsted Street	Little Calumet River	4	8,230	8,184	99
Ashland Avenue	Little Calumet River	5	8,730	5,007	57
Wentworth Avenue	Little Calumet River	5	3,527	1,575	45
Cicero Avenue	Calumet-Sag Channel	3	8,733	8,708	>99
104 th Avenue	Calumet-Sag Channel	3	6,714	6,690	>99
Route 83	Calumet-Sag Channel	3	8,373	8,250	99

¹Dissolved oxygen was measured hourly using a YSI Model 6920 or Model 6600 continuous water quality monitor.