BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
PROPOSED AMENDMENTS TO	)	**R 04-25**
DISSOLVED OXYGEN STANDARD	)	
35 Ill. Adm. Code 302.206	)	

NOTICE OF FILING

See Attached Service List

PLEASE TAKE NOTICE that on Monday, **June 21, 2004,** we filed the attached **Motion To Replace Written Testimony of James E. Garvey Instanter** with the Clerk of the Illinois Pollution Control Board, a copy of which is herewith served upon you.

Respectfully submitted,

ILLINOIS ASSOCIATION OF WASTEWATER AGENCIES

BY: _____
One of Its Attorneys

Roy M. Harsch
Sheila H. Deely
GARDNER, CARTON & DOUGLAS
191 N. Wacker Drive - Suite 3700
Chicago, Illinois 60606-1698
(312) 569-1440

THIS FILING IS BEING SUBMITTED ON RECYCLED PAPER

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
PROPOSED AMENDMENTS TO	)	**R 04-25**
DISSOLVED OXYGEN STANDARD	)	
35 Ill. Adm. Code 302.206	)	

MOTION TO REPLACE WRITTEN TESTIMONY OF DR. JAMES E. GARVEY INSTANTER

The Illinois Association of Wastewater Agencies ("IAWA"), by its attorneys Gardner Carton & Douglas, moves to replace the written testimony of Dr. James E. Garvey filed on June 15, 2004. In support, IAWA states as follows:

1. IAWA pre-filed written testimony of its witnesses on April 19, 2004. Formatting on page 2 of the Written Testimony of Dr. James E. Garvey was faulty and resulted in one paragraph that was garbled.

2. IAWA moves to replace the written testimony with the attached document.

WHEREFORE, IAWA moves the Board to replace the Written Testimony of Dr. James E. Garvey.

Respectfully Submitted,

One of the Attorneys for Petitioner

Roy M. Harsch
Sheila H. Deely
GARDNER CARTON & DOUGLAS LLP
191 N. Wacker Drive – Suite 3700
Chicago, IL 60606
312-569-1440

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
PROPOSED AMENDMENTS TO	)	**R 04-25**
DISSOLVED OXYGEN STANDARD	)	
35 Ill. Adm. Code 302.206	)	

WRITTEN TESTIMONY OF DR. JAMES E. GARVEY
FISHERIES AND ILLINOIS AQUACULTURE CENTER
SOUTHERN ILLINOIS UNIVERSITY, CARBONDALE, ILLINOIS

I am Dr. James Garvey, Assistant Professor in the Fisheries and Illinois Aquaculture Center at Southern Illinois University in Carbondale. I have been engaged by the Illinois Association of Wastewater Agencies (IAWA), along with my colleague, Dr. Matt Whiles, to scientifically evaluate the current State of Illinois dissolved oxygen standard and to provide recommendations about how the Illinois standard might be revised and updated, if warranted by our scientific evaluation.

Both Dr. Whiles and I are broadly trained in aquatic ecology. My specialty is the ecology of fishes, with much of my research focusing on how environmental conditions affect fish physiology, abundance, and distribution. My Short Curriculum Vita has been submitted as IAWA's Exhibit 5. Dr. Whiles, a professor in the Department of Zoology, is an expert on the ecology of aquatic invertebrates and their role in streams and lakes. His Resume has been submitted as IAWA's Exhibit 6. Our combined experience qualified us to provide an objective assessment of the current state of knowledge about how dissolved oxygen affects aquatic organisms and to evaluate the current statewide, one-day minimum standard of 5 mg/L. We did not intensively evaluate the application of the state standards to Lake Michigan, and IAWA has not proposed to revise that standard.

Dr. Whiles and I began our assessment by reviewing published, typically peer-reviewed research on how dissolved oxygen affects aquatic organisms and how dissolved oxygen varies in lakes and streams. We also reviewed the National Ambient Water Quality Criteria Document for Dissolved Oxygen (NCD) published by the United States Environmental Protection Agency (USEPA) in 1986, and submitted as IAWA's Exhibit 2. We evaluated the current monitoring of water quality in Illinois and conferred with Illinois EPA concerning the scientific basis for the current Illinois dissolved oxygen standard. We then prepared a written report of our findings, which is submitted as IAWA Exhibit 1.

In the final report, Dr. Whiles and I emphasize that using biological- and habitat-quality criteria to evaluate suitability for aquatic life use in the surface waters of Illinois is of paramount importance and should be continued to be emphasized in monitoring programs. It is unlikely that any one water quality parameter such as dissolved oxygen concentration will capture the capacity of a stream or lake to support aquatic life. Although our recommended dissolved oxygen standards are sufficiently protective of aquatic life in Illinois, we recommend that regulators strive to maintain dissolved oxygen concentrations well above these minima when possible. We agree with the concerns voiced by some colleagues that the state should move toward a region-specific set of water-quality criteria and aquatic life goals, although comprehensive regional data to guide these decisions for Illinois are not yet available.

As the NCD suggests, dissolved oxygen concentrations in lakes and streams fluctuate diurnally. During warm, summer months, dissolved oxygen concentrations decline due to water's reduced capacity to hold oxygen at elevated temperatures and the

high respiratory demand of aquatic communities. A single dissolved oxygen standard such as that in Illinois does not realistically capture these diurnal and seasonal fluctuations. Although comprehensive surface water data are lacking for the state, many pristine aquatic systems largely unaffected by agricultural run-off or municipal discharges most likely experience occasional, non-lethal declines in dissolved oxygen below the state's current minimum of 5 mg/L.

Our recommendations in the report include seasonally appropriate means and minima that more realistically account for natural fluctuations in dissolved oxygen concentrations, while remaining sufficiently protective of aquatic life. These recommendations are based largely on potential responses of all life stages of native Illinois fishes that fall in the NCD's non-salmonid category. As with the NCD, we define these as typically warm-water fishes, although much variation in temperature and oxygen tolerance occurs among taxa in this group.

Research summarized in the 1986 NCD was used to set our recommended dissolved oxygen standards above those concentrations expected to slightly impair production of fishes. Research conducted since publication of the report generally confirms that the seasonal standards we recommend are sufficiently protective of fishes and other aquatic organisms in Illinois surface waters. During spring through early summer, most early life stages of fishes and other aquatic organisms are produced. These early reproducing organisms are typically the most susceptible to low dissolved oxygen concentrations and thus require the most stringent protection. Our reanalysis of data within the NCD and our review of the literature led to the development of a standard proposed to be applicable during March 1 through June 30, which specifically protects

these early life stages and includes both a one-day minimum identical to the current Illinois standard of 5 mg/L and a seven-day mean of 6 mg/L. During warmer, productive months throughout the remainder of the year when species with sensitive early life stages have largely completed reproduction, we recommend a one-day minimum of 3.5 mg/L and a seven-day mean minimum of 4 mg/L, which is a more realistic general expectation for Illinois surface waters than the current minimum standard of 5 mg/L.

Our recommended standards are based on our current understanding of the short- and long-term responses of aquatic organisms to low dissolved oxygen. In most natural aquatic systems, habitat use by juvenile and adult fish is largely unaffected by dissolved oxygen until concentrations decline below 3 mg/L. Acute lethal effects on post-larval, warm-water fishes do not occur until concentrations decline below 2 mg/L. As we note in the report, chronic effects of long-term exposure to low dissolved oxygen concentrations are not well understood. See IAWA Ex. 1 at 18. Some impairment of growth likely occurs in many warm-water species when dissolved oxygen concentrations are chronically below 4 mg/L, which none of our recommended standards allow.

Initially, Dr. Whiles and I summarized our findings and outlined our recommendations in a draft report that was distributed to IAWA and the Illinois Department of Natural Resources (IDNR). Dr. Whiles also presented our findings to a special meeting of IAWA this spring, where representatives from Illinois EPA (ILEPA) and Prairie Rivers Network were present. During this time, I also distributed the draft report to the U.S. Fish and Wildlife Service, Region 3, Carterville Fisheries Resource Office; the U.S. Fish and Wildlife Service, Region 3, Ecological Services Sub-Office; the IDNR, Office of Resource Conservation; the IDNR, Office of Realty and Environmental

Planning, Division of Natural Resource Review and Coordination; the Illinois Natural History Survey/U.S. Geological Service, Long-Term Resource Monitoring Program, Great Rivers Field Station; and the Illinois Chapter of the American Fisheries Society (ILAFS). On June 10, 2004, I met with the extended Executive Committee of the ILAFS to discuss the report. Questions voiced by many of the participants of the IAWA meeting held this spring were answered in the final draft of the report. After circulating the draft, I received informal comments from the IDNR Office of Resource Conservation, which also were addressed in the final draft. The IDNR Office of Realty and Planning informally found the science to support the recommended changes. During my recent meeting with the Executive Committee of the ILAFS, I answered questions about the report and the proposed changes to the current Illinois standards. I agreed with the primary conclusion of the group that a set of regional standards are needed for Illinois. The other groups have provided neither informal nor formal feedback to me to date.

A letter dated 28 May 2004 written by Ms. Beth Wentzel of Prairie Rivers Network to the Division of Water Pollution Control, ILEPA raised several specific concerns about our report. Ms. Wentzel noted that our report was not entirely consistent with the NCD. Although the NCD recommends adopting the most conservative standards for all early life stages of fish through thirty-days post hatching whenever these life stages occur, our report only recommends adopting these conservative standards through June. Of the forty-eight fish taxa in Illinois that we surveyed, forty likely complete the reproductive portion of their life cycle by the end of June or earlier throughout Illinois. Given that fluctuating oxygen concentrations occur naturally in Midwestern streams and lakes during summer, the remainder of species that continue to

reproduce during these months must have adaptations that allow them to persist when ambient oxygen concentrations occasionally approach our recommended summer minimum. Hence, our report indeed departs from the NCD in that it attempts to generate more realistic expectations for dissolved oxygen concentrations and the responses of native aquatic life in Illinois.

Another criticism voiced by Ms. Wentzel was that we failed to address the responses of cool-water species such as smallmouth bass in our recommended criteria. This is untrue. These species were generally grouped under our warm-water categorization, because temperature requirements of non-salmonid fishes are not well-delineated. Rather, species-specific temperature needs vary widely along a gradient from cool to warm water among fish in the Midwest. Although cold-water salmonids can be categorized by their high oxygen and low temperature requirements, I know of no specific research that identifies Midwestern cool-water fishes as having substantially different oxygen requirements during non-reproductive periods than warm-water counterparts. The main difference between species with cool- and warm- water requirements appears to be their temperature-dependent growth optima and lethal maximum temperatures, which is a separate issue regarding the interaction between habitat quality and temperature. Interestingly, although smallmouth bass is specifically listed in the NCD as a sensitive, cool-water fish, it has similar temperature requirements as many conventional warm-water fishes. Further, smallmouth bass adults have a minimum lethal dissolved oxygen limit of 1.2 mg/L (see Table I, IAWA Ex. 1), which is well below our recommended Illinois minimum standard.

Ms. Wentzel noted that we omitted a thirty-day mean standard from our recommendations, although such a long-term moving average is recommended in the NCD. In our view, fishes and other aquatic organisms will respond at a much shorter time scale to declining oxygen than thirty days, requiring a more frequently updated moving average of seven days. A thirty-day mean may erroneously miss periods of chronically low dissolved oxygen if high concentrations occur during the remainder of the thirty-day monitoring period.

Another argument made against our report's validity is that it focuses primarily on fish. Fish were selected as the regulatory focus because they were the model in the NCD and, as it was in 1986, most research on dissolved oxygen is available for this group. Fish are also of recreational and economic importance. Although the data for other taxa are indeed quite limited, we did address the influence of dissolved oxygen on other organisms, specifically mussels and aquatic insects, and have found a pattern that appears to be consistent with that for fish. As we outline in the report, species that have high oxygen requirements tend to inhabit areas of consistently high and environmentally predictable dissolved oxygen concentrations. In a stream, this would be a riffle habitat in which high gaseous exchange occurs between the water and the atmosphere. In our report, we recommend quantifying oxygen in areas and during times when dissolved oxygen concentrations are expected to be lowest such as a stream pool before dawn. These locations should be more susceptible to declining oxygen than areas in which high exchange elevates oxygen concentrations and typically harbors the most sensitive species such as darters and mayflies.

We take issue with Ms. Wentzel's supposition that our recommendations would render Illinois's dissolved oxygen standards the weakest in the nation. I have assessed the standards for our peer State of Ohio. From what I understand, Ohio has various aquatic use designations that are similar to but more specific than those recommended for Illinois. Each of these specific designations has a different daily minimum and one-day average dissolved oxygen concentration. Probably the most common designation for surface waters in Ohio is "warm water" which includes a daily minimum of 4 mg/L and a one-day average of 5 mg/L, which appears to apply to the entire year. Clearly, Ohio's general standard is less conservative than our recommended statewide standard during spring, because its minimum of 4 mg/L is 1 mg/L less than our proposed minimum standard. And Ohio's minimum is not significantly different than our proposed minimum standard of 3.5 mg/L during the remainder of the year. Ohio's seasonal salmonid and coldwater designations are analogous to the Lake Michigan standards, which we do not recommend modifying.

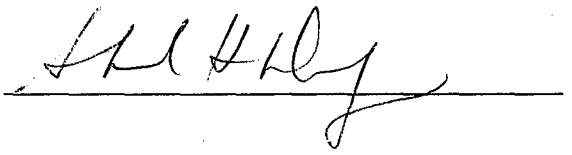
In my assessment, the largest difference between current standards within Ohio and Illinois is that Ohio has developed more regional-specific criteria to protect waters that they deem important. Ohio's "exceptional warm water" criteria are very similar to those that Illinois currently has adopted for the entire state, where Ohio's daily minimum is 5 mg/L and its one-day average is 6 mg/L. Given that all the surface waters in Illinois would certainly not be categorized as "exceptional", it is clear that the current general aquatic use Illinois dissolved oxygen standard is too strict. Our recommended standards do provide similar protection as Ohio's "exceptional" waters during the critical peak reproductive times of the year.

During my conversations with other scientists, resource managers, and water regulators, I have received many comments about how the recommended standards are based on sound science and needed in the state. I recognize and somewhat understand the perception by some individuals that our recommendations would weaken the Illinois standards. However, the weight of information available for aquatic organisms suggests that the proposed standards set more realistic expectations for surface waters in Illinois and will not degrade the biological integrity of these systems. I agree that more research is needed in many areas and hope that the proposed standard changes will be viewed as one step in a dynamic, continuing process. It is my view that the state should move toward developing region-specific biotic integrity, habitat quality, and water quality criteria, as credible long-term data sets become available.

CH02/ 22318249.2

CERTIFICATE OF SERVICE

The undersigned certifies that a copy of the **Motion To Replace Written Testimony of James E. Garvey** was filed by hand delivery with the Clerk of the Illinois Pollution Control Board and served upon the parties to whom said Notice is directed by first class mail, postage prepaid, by depositing in the U.S. Mail at 191 Wacker Drive, Chicago, IL on Monday, June 21, 2004.



CH01/ 12369943.1

Service List

R2004-025

Fred L. Hubbard 415 North Gilbert Street Danville, IL 61834-0012	Alex Messina Illinois Environmental Regulatory Group 3150 Roland Avenue Springfield, IL 62703
Bernard Sawyer Metropolitan Water Reclamation District 6001 W. Pershing Rd. Cicero, IL 60650-4112	Charles W. Wesselhoft Ross & Hardies 150 North Michigan Avenue Suite 2500 Chicago, IL 60601-7567
Claire A. Manning Posegate & Denes, P.C. 111 N. Sixth Street Springfield, IL 62705	Connie L. Tonsor IEPA 1021 North Grand Avenue P.O. Box 19276 Springfield, IL 62794-9276
Deborah J. Williams IEPA 1021 North Grand Avenue P.O. Box 19276 Springfield, IL 62794-9276	Dennis L. Duffield City of Joliet, Department of Public Works and Utilities 921 E. Washington Street Joliet, IL 60431
Dorothy M. Gunn Illinois Pollution Control Boark 100 W. Randolph St. Suite 11-500 Chicago, IL 60601	Erika K. Powers Barnes & Thornburg 1 N. Wacker Suite 4400 Chicago, IL 60606
Frederick D. Keady Vermilion Coal 1979 Johns Drive Glenview, IL 60025	James L. Daugherty Thorn Creek Basin Sanitary District 700 West End Avenue Chicago Heights, IL 60411
James T. Harrington Ross & Hardies 150 North Michigan Avenue Suite 2500 Chicago, IL 60601-7567	Joel J. Sternstein Office of the Attorney General 188 West Randolph 20th Floor Chicago, IL 60601

Service List

R2004-025

John Donahue City of Geneva 22 South First Street Geneva, IL 60134-2203	Jonathan Furr Illinois Department of Natural Resources One Natural Resources Way Springfield, IL 62702-1271
Ketherine D. Hodge Hodge Dwyer Zeman 3150 Roland Avenue P.O. Box 5776 Springfield, IL 62705-5776	Larry Cox Downers Grove Sanitary District 2710 Curtiss Street Downers Grove, IL 60515
Lisa Frede Chemical Industry Council of Illinois 2250 E. Devon Avenue Suite 239 Des Plaines, IL 60018-4509	Margaret Hedinger 2601 South Fifth Street Springfield, IL 62703
Matthew J. Dunn Office of the Attorney General 188 West Randolph 20th Floor Chicago, IL 60601	Michael G. Rosenberg, Esq. Metropolitan Water Reclamation District 100 East Erie Street Chicago, IL 60611
Mike Callahan Bloomington Normal Water Reclamation District PO Box 3307 Bloomington, IL 61702-3307	Richard Lanyon Metropolitan Water Reclamation District 100 East Erie Street Chicago, IL 60611
Richard McGill Illinois Pollution Control Board 100 W. Randolph St. Suite 11-500 Chicago, IL 60601	Sanjay K. Sofat IEPA 1021 North Grand Avenue East P.O. Box 19276 Springfield, IL 62794-9276
Stephanie N. Diers IEPA 1021 North Grand Avenue East P.O. Box 19276 Springfield, IL 62794-9276	Sue Schultz Illinois American Water Company 300 North Water Works Drive P.O. Box 24040 Belleville, IL 62223-9040

Service List

R2004-025

Susan M. Franzetti 10 South LaSalle Street Suite 3600 Chicago, IL 60603	Tom Muth Fox Metro Water Reclamation District 682 State Route 31 Oswego, IL 60543
Vicky McKinley Evanston Environment Board 23 Grey Avenue Evanston, IL 60202	W.C. Blanton Blackwell Sanders Peper Martin LLP 2300 Main Street Suite 1000 Kansas City, MO 64108

CH02/ 22319597.1