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JAN 22 2002

STATE OF ILLINOIS  
Pollution Control Board

**BEFORE THE ILLINOIS POLLUTION CONTROL BOARD**

IN THE MATTER OF:

WATER QUALITY AMENDMENTS TO )  
35 Ill. Adm. Code 302.208(e)-(g), 302.504(a), ) R02-11  
302.575(d), 303.444, 309.141(h); and ) (Rulemaking - Water)  
PROPOSED 35 Ill. Adm. Code 301.267, )  
301.313, 301.413, 304.120, and 309.157 )

**NOTICE OF FILING**

Dorothy Gunn, Clerk  
Pollution Control Board  
100 West Randolph Street  
Suite 11-500  
Chicago, Illinois 60601

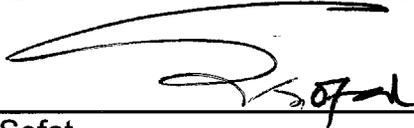
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524 South Second Street  
Springfield, Illinois 62701-1787

PLEASE TAKE NOTICE that I have today filed with the Office of the Clerk of the Pollution Control Board the **WRITTEN TESTIMONY OF ROBERT MOSHER, CLARK OLSON, AND ALAN KELLER** of the Illinois Environmental Protection Agency, a copy of which is herewith served upon you.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

By:   
Sanjay K Sofat  
Assistant Counsel  
Division of Legal Counsel

Dated: January 18, 2002  
Illinois Environmental Protection Agency  
1021 North Grand Avenue East  
Springfield, Illinois 62794-9276  
(217) 782-5544

**THIS FILING PRINTED ON RECYCLED PAPER**

IN THE MATTER OF:

WATER QUALITY AMENDMENTS TO	)	
35 Ill. Adm. Code 302.208(e)-(g), 302.504(a),	)	R02-11
302.575(d), 303.444, 309.141(h); and	)	(Rulemaking - Water)
PROPOSED 35 Ill. Adm. Code 301.267,	)	
301.313, 301.413, 304.120, and 309.157	)	

TESTIMONY OF ROBERT MOSHER

QUALIFICATIONS/INTRODUCTION

My name is Robert Mosher and I am the Manager of the Water Quality Standards Section within the Division of Water Pollution Control at the Illinois Environmental Protection Agency ("Illinois EPA" or "IEPA"). I have been with the Illinois EPA in excess of 16 years. Almost all of that time has been spent in my current capacity where my primary responsibility is the development and implementation of water quality standards. I have a Masters Degree in Zoology from Eastern Illinois University where I specialized in stream ecology. My testimony will cover three topics. First, I will discuss the background information concerning development of the instant proposal before the Illinois Pollution Control Board ("IPCB" or "Board"). Second, I will provide a brief discussion on the concepts contained in various sections of the Illinois EPA's proposal. Third, I will discuss the Illinois EPA's plans for successful implementation of this proposal.

BACKGROUND INFORMATION

The Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. §§1251-1387, is commonly known as the Clean Water Act ("CWA"). Pursuant to the CWA, states

are required to revise and update their water quality standards to ensure that they are protective of public health and welfare, enhance the quality of water and promote the purposes of the CWA. 33 U.S.C. §1313(c)(2)(A). The process of reviewing the state's standards is called the triennial water quality standards review. The changes to the water quality and effluent standards in the instant proposal are one element of Illinois EPA's current triennial review of water quality standards.

In September 2000, the Agency shared a packet of information concerning this rulemaking with a number of stakeholders involved in water quality standards affairs. These entities included municipal and industrial dischargers, environmentalists and other governmental agencies. A few helpful comments were received and were employed to clarify the intent of this proposal. There were no adverse comments, and generally speaking, the changes to the Board regulations that encompass this proposal should not be controversial since they represent the current state-of-the-art in water quality standards. The GLI rulemaking (R97-25) introduced Illinois stakeholders to several of the concepts leading to the new and revised standards for the General Use waters proposed here. The instant rulemaking is the result of careful consideration regarding the appropriateness of selected aspects of the GLI for General Use waters of the state.

### ILLINOIS EPA'S PROPOSAL

This proposal is divided into five parts. Part I proposes adoption of new aquatic life acute and chronic water quality standards for benzene, ethyl benzene, toluene, and xylene(s) ("BETX") for both General Use waters and the Lake Michigan Basin. Part II contains revised acute and chronic water quality standards for zinc, nickel, and weak acid dissociable cyanide. Part III proposes that most General Use metals water quality

standards be specified in terms of dissolved concentration rather than the total concentration used in the existing standards. Part IV contains corrections to the GLI regulations at 35 Ill. Adm. Code 302.504(a), 302.575(d), and 309.141. Part V proposes to update the Board regulations at 304.120 to reflect that the carbonaceous component of BOD<sub>5</sub> be regulated in treated domestic waste effluents. I will cover the first four Parts of the Illinois EPA's proposal and Al Keller, Manager of the Agency's Northern Municipal Permit Unit will testify to Part V of the proposal.

Part I: We intend for all the newly derived standards to either replace existing General Use standards or to be added as new listed substances under 35 IAC 302.208(e) and (f). Each substance addressed has both an acute and a chronic value proposed. The regulatory constructs in 302.208 (a) through (d) will apply to newly added or revised standards. Several new STORET numbers are necessary because many metals standards are now proposed to be in the dissolved rather than total form. Standards to protect aquatic life for BETX substances will also be inserted into the Lake Michigan Basin water quality standards where none now exist. For the Lake Michigan Basin, these standards will be based on sensitive species from both cold and warm water. Additionally, benzene will have a General Use human health standard inserted at 302.208(f) identical to the Lake Michigan Basin human health standard that already exists.

Part II: A goal of the triennial review of standards that led to this proposed rulemaking before the Board was to update general use water quality standards for toxic metals found at 35 IAC 302.208(g). These metals have "one number" standards adopted in the 1970's as opposed to "two number" acute and chronic standards that have been the preferred method of adopting standards for the last 15 years or so. Nickel and zinc fall into this category. Selenium and silver are also considered to be significantly toxic metals

and still exist as one number standards in 302.208(g). New standards for selenium and silver are not proposed at this time because debate is still ongoing about just how standards for these metals should be derived. USEPA is pursuing these issues and when a consensus is reached at the national level, IEPA will propose updated standards for these metals. National consensus had not been achieved at the time the Agency filed its petition with the IPCB.

Part III: The national consensus indicates that the dissolved form of metals is the toxic component to aquatic organisms. It is widely believed that filterable metals are likely to be complexed with other water constituents and will have little toxic influence. For this reason, GLI water quality standards for metals were adopted in dissolved form and the Agency's petition in this matter lists metals water quality standards as dissolved metal. Since most researchers reported total metals when relating the concentrations that organisms were exposed to in toxicity tests, USEPA did some experimentation to determine the percentage of these reported concentrations that was actually dissolved metal. The result of this endeavor was a table of metals conversion factors. These were published by USEPA under the GLI. For example, if the final acute value for a given metal in the total form is 2.0 mg/L and the conversion factor is 0.8, as determined from measuring total vs. dissolved metal under the conditions of laboratory toxicity tests, then the dissolved metal final acute value is 1.6 mg/L. The proposed water quality standards have been converted to dissolved metal concentrations through the use of the stated conversion factor.

The BETX substances have no such toxicity relationship between dissolved and suspended components. The total form is presently considered to be that which should be regulated. Our proposal designates total BETX substances as the water quality

standards.

Federal regulations at 40 CFR 122.45 require that NPDES permit limits for metals be established as total measurable metal. When water quality based effluent limits (WQBELs) are required in a permit, this would mean converting the dissolved metal water quality standard value into a total metal value. A translator factor is used for this purpose and, in the absence of site-specific data concerning the ratio of total to dissolved metal, consists simply of the reciprocal of the conversion factor. This means that if a mixing zone is not involved in a WQBEL, the total metal limit would be what the water quality standard would have been in the "total metal" form. That is, the differential between total and dissolved metals in the toxicity tests would not be factored out. We have included a site-specific metals translator provision in the *proposed* IPCB regulations. This would allow dischargers to measure the ratio of dissolved to total metal in their effluent and thereby apply to the Agency for establishment of total metal WQBELs based on this effluent specific relationship. Effluents will therefore essentially be regulated on their potential to discharge dissolved metals at levels consistent with the water quality standards yet within the bounds of the total metals effluent standards at 35 Ill. Adm. Code Part 304.

At this time recalculated standards are not being proposed for six metals, arsenic, cadmium, copper, lead, mercury and trivalent chromium, found at 35 Ill. Adm. Code 302.208(e). Lead and mercury standards were updated in 1996, there has been no indication that the arsenic, copper and trivalent chromium standards are in need of revision and cadmium is currently under federal review. However, it is appropriate to convert these standards to the dissolved form to conform to USEPA guidance. This simply involves the application of the correct conversion factor. The other substances in 302.208(e) are not amenable to regulation in the dissolved form. TRC (total residual

chlorine) is by nature an inclusive parameter. Hexavalent chromium standards were adopted as total metal in the Board's GLI rulemaking. It may be best to continue to regulate this substance in the total metal form.

Part IV: Additionally, we propose several corrections to recently adopted Board regulations. The GLI rulemaking intended to list metals standards in the dissolved form. The conversion factors that accomplish this were inadvertently left out, however. We now correct this mistake by inserting the proper conversion factors into 35 Ill. Adm. Code 302.504(a). Section 302.575 was missing several pieces of essential information that we also now correct. 35 Ill. Adm. Code 303.444 is a site-specific regulation that is no longer pertinent given the changes to the General Use cyanide standards and therefore we propose that the Board delete this regulation. We are also proposing to replace language at 35 Ill. Adm. Code 309.141(h)(3) with a more accurate instruction for implementing the metals translator in NPDES permits.

### ILLINOIS EPA'S FUTURE PLANS

The proposed changes to the standards give rise to several issues regarding the implementation of water quality standards in NPDES permits and in other Agency programs. The Illinois EPA intends to provide the Board a draft Agency rule for implementing water quality based effluent limits at hearing under R02-11. This rule will later pass through the JCAR approval process before becoming finalized. The Agency rule will allow the Board and stakeholders to envision how the new Board water quality standards will be implemented in the day-to-day activities of the Agency.

This concludes my pre-filed testimony. I will be supplementing this testimony as needed during the hearing. I would be happy to address any questions.

By: 

Robert Mosher

January 29, 2002

Illinois Environmental Protection Agency  
1021 North Grand Avenue East  
P.O. Box 19276  
Springfield, Illinois 62794-9276

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PROPOSED 35 Ill. Adm. Code 301.267,	)	
301.313, 301.413, 304.120, and 309.157	)	

TESTIMONY OF CLARK OLSON

QUALIFICATIONS/INTRODUCTION

My name is Clark Olson and I have been employed by the Illinois Environmental Protection Agency ("Illinois EPA" or "Agency") for over 20 years. I work in the Water Quality Standards Unit of the Division of Water Pollution Control as a toxicologist. I have been involved with water quality standards issues throughout my career with the Agency and have participated in several previous rulemakings of this type. I have a PhD in Biology from University of Miami (Florida) and have done postdoctoral research in toxicology at North Carolina State University. My testimony will discuss the development process of the instant proposal before the Illinois Pollution Control Board ("IPCB" or "Board").

DEVELOPMENT PROCESS

Early in the year 2000, I began to gather toxicity data for the instant proposal. I developed numeric values suitable for water quality standards for several substances using USEPA sanctioned methods. New aquatic life acute and chronic standards were derived for benzene, ethyl benzene, toluene and xylenes ("BETX") for both General Use

and Lake Michigan Basin waters and human health standards were developed for General Use waters. New General Use aquatic life acute and chronic standards were derived for zinc, nickel and weak acid dissociable cyanide. There are presently single number standards for zinc and nickel for General Use waters and current practice recommends acute and chronic numbers.

In general, I followed the procedure laid down by USEPA in the *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*, ("the Guidelines") 1985 (NTIS PB85-227049) which have been followed in standards' development by the USEPA and by other states. These guidelines have also been used as a basis of the procedures in 35 Ill. Adm. Code Part 302 Subpart E and Subpart F for deriving water quality criteria.

In the full USEPA method, often referred to as "Tier I", the minimum database consists of toxicity data for representatives of 8 (reduced to 5 in Subpart F) different groups of animals. A statistical procedure then finds the 5<sup>th</sup> percentile of the distribution of the data. That is, 95% of the organisms are considered less sensitive than the one(s) at the 5th percentile level. For the acute criterion, this number is divided by 2, and in the chronic criterion it is used as is. However, the chronic criterion is often derived by using an acute to chronic ratio ("ACR") obtained from data for several species when adequate chronic tests are not available for all the specified groups of organisms. In the proposed standards presented here, the quality of the databases available does not always allow use of the Tier I procedure for all substances and so a default ("Tier II") procedure is used.

The Guidelines process involves several steps. First, data for each substance was obtained from the USEPA AQUIRE database and any other sources that were found coincidentally. USEPA Ambient Water Quality Criterion documents and Great Lakes

Water Quality Standards Initiative documents were also consulted for all substances.

Second, the data was tabulated as directed by the Guidelines. Third, much of the original literature (mostly journal articles) where the original data was presented was obtained from our library or other libraries, so that the data could be verified. This was especially necessary for the data for the most sensitive species since this data is most important in determining the actual value of the criterion. Fourth, statistical calculations were made by use of a spreadsheet according to the equations in the Guidelines. Finally, documents were prepared for each of the substances and are part of the package submitted.

With the exception of the BETX parameters, the standards for the substances in this rulemaking are to apply only to General Use waters. Therefore, I used data from only warm-water organisms in the derivations for zinc, nickel and cyanide standards. Trout, salmon and other cold-water species were included in the development of the BETX standards for the Lake Michigan Basin, but not for General Use waters, because these species do not occur in Illinois waters outside of Lake Michigan. Additionally, only species with reproducing wild populations in the Midwest were utilized in the derivations.

Metals that have toxicity influenced by water hardness have standards expressed as an equation containing a factor for slope for the hardness relationship. Slope values for nickel and zinc in our proposed standards are the same values as found in the most recent national criteria documents for GLI standards. Given that all these substances had a large database of toxicity test results when the national criteria were published, the additional tests I found should have very little impact on the slope value and we therefore saw no need to change them.

Of all the substances considered in this rulemaking, only benzene is believed to have significant human health effects – cancer - such that a separate human health

standard is necessary since such standards are lower than those necessary to protect aquatic life. I reported human health criteria for the other BETX substances under the individual summaries for the purpose of demonstrating that these values are much higher than the standards protective of aquatic life. The metals likewise are not harmful to humans at the concentrations regulated for aquatic life. The Human health standard for benzene is the same as the Lake Michigan standard in 302.504(a).

There are currently acute and chronic General Use standards under the weak acid dissociable cyanide form. The reason they are being readdressed stems from the fact that they were taken directly from USEPA national criteria document, which means that cold-water species such as trout and salmon were used in the criteria derivation. Since General Use waters are virtually all warm water habitats, these standards have come under scrutiny. The Metropolitan Water Reclamation District of Greater Chicago obtained site-specific relief from the IPCB several years ago for weak acid dissociable cyanide based on the premise that warm water species were not as sensitive. The site-specific standards they obtained are very similar to the values we propose.

The R88-21 rulemaking ("Toxics") recognized that total cyanide was not representative of the toxic component of this substance. Total cyanide laboratory analysis measures complexed forms of cyanide, such as some of the iron-cyanide compounds that are known to be nontoxic. Free cyanide is a rough equivalent of dissolved metals, but unfortunately free cyanide is difficult to measure and other, weakly bound forms of cyanide not measurable as free cyanide are probably also toxic. A few analytical methods measure forms of cyanide that are not all inclusive as is total cyanide. One of these, weak acid dissociable cyanide, was chosen as the best available alternative. A primary reason for revising the cyanide standard is because the original R88-21 two number cyanide

standard was derived using cold-water species. New data from native warm water species is considered in this update because no search for new data has been conducted, to our knowledge, since the early 1980s. We are retaining weak acid dissociable cyanide as the best available form to regulate.

This concludes my pre-filed testimony. I will be supplementing this testimony as needed during the hearing. I would be happy to address any questions.

By: Clark Olson  
Clark Olson

January 29, 2002

Illinois Environmental Protection Agency  
1021 North Grand Avenue East  
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Springfield, Illinois 62794-9276

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PROPOSED 35 Ill. Adm. Code 301.267, )  
301.313, 301.413, 304.120, and 309.157 )

TESTIMONY OF ALAN KELLER

QUALIFICATIONS/INTRODUCTION

My name is Alan Keller and I am the Supervisor of the Northern Municipal Unit of the Permit Section of the Division of Water Pollution Control. I have worked for the Agency since June 1972. I have worked in the Permit Section my entire career with the Agency and have been responsible at one time or another with all of the permit programs. In my present capacity, I manage a unit, which reviews construction permits and NPDES permits for municipal and semi-public facilities and also perform other duties associated with municipalities. I also serve on two design criteria groups, which establish the specific design criteria for sewers, lift stations and treatment plants for municipal facilities. One group is the Agency Division of Water Pollution Control Design Criteria Committee and the other group is the Wastewater Design Criteria Committee for the Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers. I have a Bachelor of Science Degree in Civil Engineering from the University of Illinois concentrating in Environmental Engineering and I am a Registered Professional Engineer in Illinois. My testimony will discuss the reasoning behind development of the CBOD<sub>5</sub> test.

## REASONING BEHIND CBOD<sub>5</sub> TEST

The Agency has interpreted the intent of 35 Ill. Adm. Code 304.120, with respect to compliance with the respective 5-day biochemical oxygen demand (BOD<sub>5</sub>) effluent requirements, to be the 5-day carbonaceous biochemical oxygen demand (CBOD<sub>5</sub>). 35 Ill. Adm. Code 309.141 allows the Agency to establish the terms and conditions of each NPDES permit and directs the Agency to ensure compliance with the effluent limitations under Sections 301 and 302 of the Clean Water Act. 40 CFR 133 provides for the use of CBOD<sub>5</sub> for determining compliance with the definition of secondary treatment requirement. This regulation was revised in the September 20, 1984 Federal Register to allow for the use of CBOD<sub>5</sub>. The Agency has implemented the use of CBOD<sub>5</sub> in lieu of BOD<sub>5</sub> in NPDES permits since 1986 and also incorporates ammonia nitrogen water quality based effluent limits where appropriate.

At treatment facilities where complete nitrification occurs and treatment facilities where no nitrification occurs, the CBOD<sub>5</sub> would not be substantially less. The use of the BOD<sub>5</sub> test on raw sewage or influent only measures the carbonaceous demand in the sample because insufficient nitrifying bacteria would be present during the five-day test period. It normally takes about ten days for a sufficient number of nitrifying bacteria to develop to have a measurable effect on the BOD<sub>5</sub> test. (See Attachment 1). However, in a treatment process where partial nitrification occurs, large numbers of nitrifying bacteria are present and nitrification can occur during the effluent BOD<sub>5</sub> test. The BOD<sub>5</sub> test is designed to measure the carbonaceous demand in a sample and to measure the efficiency of a treatment process by comparing the carbonaceous demand before and after the treatment process. In treatment processes that do not nitrify or completely nitrify,

the use of the BOD<sub>5</sub> test on both the influent and effluent will provide satisfactory results. However, in treatment processes that partially nitrify, the use of the BOD<sub>5</sub> test on both the influent and effluent will compare the carbonaceous demand in the influent with the carbonaceous and nitrogenous demand in the effluent. Such a procedure would provide no useful information on the carbonaceous removal efficiency in a treatment process. An accurate determination of the removal efficiency of a treatment process in which partial nitrification occurs would require the carbonaceous demand of the influent to be measured by the BOD<sub>5</sub> test and the carbonaceous demand of the effluent to be measured by the CBOD<sub>5</sub> test, which suppresses the nitrogenous demand. Requiring the BOD<sub>5</sub> test on the influent and the CBOD<sub>5</sub> test on the effluent of all facilities would allow a uniform policy on carbonaceous removal throughout the state. The effluent from a treatment plant consists of many components, the Agency believes that the quality of the effluent can best be assessed, and controlled, when each of the components are analyzed and controlled individually. The characteristics of the effluent can best be assessed when the CBOD<sub>5</sub> test is used to measure the carbonaceous demand, and where ammonia nitrogen effluent standards are appropriate, use the ammonia nitrogen test to measure the nitrogenous demand. This procedure would be more logical than trying to measure the combined carbonaceous and nitrogenous demand with the BOD<sub>5</sub> test, which has been proven to provide inconsistent and misleading results.

In addition, the attached figures depict the influence of nitrification on the BOD test. Attachment 1 was taken from Metcalf and Eddy's, "Wastewater Engineering: Treatment Disposal, Reuse" Second Edition, page 90. Attachment 2 was taken from Metcalf and Eddy's, Third Edition, Page 76. The Third Edition also states the following: "Because the reproductive rate of the nitrifying bacteria is slow it normally takes from 6 to 10 days for

them to reach significant numbers and to exert a measurable oxygen demand. However, if a sufficient number of nitrifying bacteria are present initially, the interference caused by nitrification can be significant. When nitrification occurs in the BOD test, erroneous interpretations of treatment operating data are possible.” The Agency regulates the nitrogenous biochemical oxygen demand of wastewater by incorporating the ammonia nitrogen water quality based effluent limits in NPDES Permits as appropriate under Sections 304.105 and 304.122 of Subtitle C: Water Pollution.

This concludes my pre-filed testimony. I will be supplementing this testimony as needed during the hearing. I would be happy to address any questions.

By: Alan Keller

Alan Keller

January 29, 2002

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## 90 WASTEWATER ENGINEERING

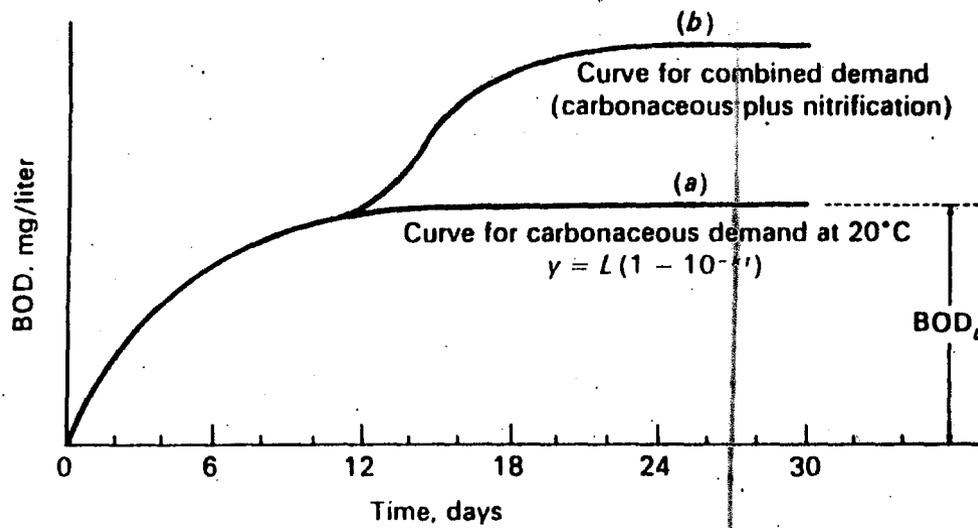
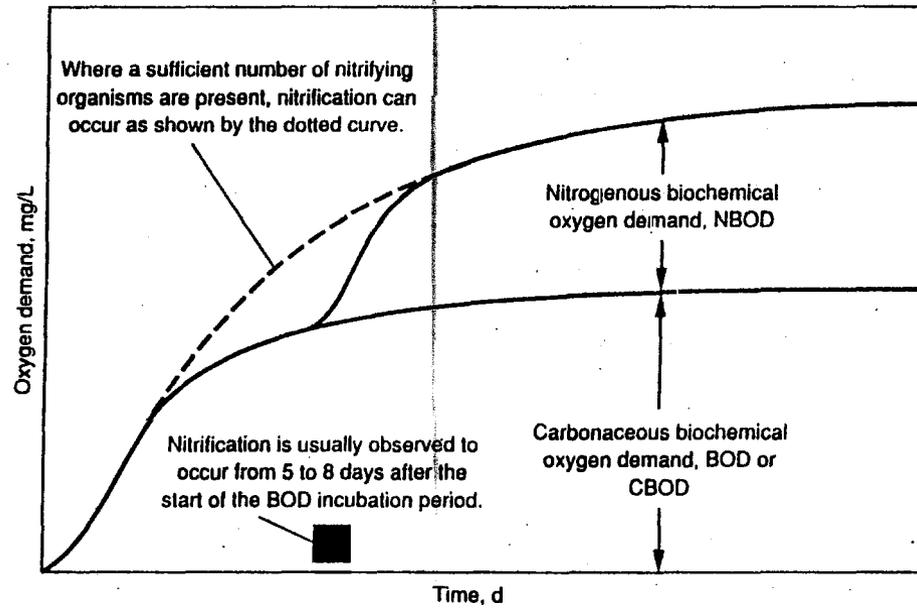


Figure 3-13 The BOD curve [32]. (a) Normal curve for oxidation of organic matter; (b) influence of nitrification. Note: mg/L = g/m<sup>3</sup>.



**FIGURE 3-15**  
Definition sketch for the exertion of the carbonaceous and nitrogenous biochemical oxygen demand in a waste sample.

STATE OF ILLINOIS

COUNTY OF SANGAMON

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)

SS

**PROOF OF SERVICE**

I, the undersigned, on oath state that I have served the attached **WRITTEN TESTIMONY OF ROBERT MOSHER, CLARK OLSON, AND ALAN KELLER** upon the person to whom it is directed, by placing a copy in an envelop addressed to:

Dorothy Gunn, Clerk  
Pollution Control Board  
100 West Randolph Street  
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Chicago, Illinois 60601

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James R. Thompson Center  
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Legal Service  
Illinois Department of Natural Resources  
524 South Second Street  
Springfield, Illinois 62701-1787

**(Federal Express)**

and mailing it from Springfield, Illinois on January 18, 2002, with sufficient postage affixed as indicated above.

*Nancy J. D. Lampert*  
\_\_\_\_\_

**SUBSCRIBED AND SWORN TO BEFORE ME**

this day of January 18, 2002.

*Brenda Bohner*  
\_\_\_\_\_

Notary Public



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