BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
WATER QUALITY STANDARDS AND	)	
EFFLUENT LIMITATIONS FOR THE	)	R08-9
CHICAGO AREA WATERWAY SYSTEM	)	(Rulemaking – Water)
AND THE LOWER DES PLAINES RIVER:	)	
PROPOSED AMENDMENTS TO 35 ILL..	)	(Subdocket B)
ADM. CODE PARTS 301, 302, 303 and 304	)	

NOTICE OF FILING

To:

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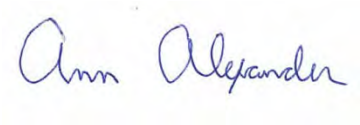
Please take notice that on the 3rd Day of January, 2011, I filed with the Office of the Clerk of the Illinois Pollution Control Board the attached **Comments of Environmental Groups on the Proposed Rules Establishing Recreational Use Designations for the Chicago Area Waterway System and the Lower Des Plaines River**, a copy of which is hereby served upon you.



By: _____
Ann Alexander, Natural Resources Defense Council

Dated: January 3rd, 2011

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CERTIFICATE OF SERVICE

I, Ann Alexander, the undersigned attorney, hereby certify that I have served the attached **Comments of Environmental Groups on the Proposed Rules Establishing Recreational Use Designations for the Chicago Area Waterway System and the Lower Des Plaines River** on all parties of record (Service List attached), by depositing said documents in the United States Mail, postage prepaid, from 227 W. Monroe, Chicago, IL 60606, before the hour of 5:00 p.m., on this 3rd Day of January, 2011.

_____

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BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
	)	
WATER QUALITY STANDARDS AND	)	
EFFLUENT LIMITATIONS FOR THE	)	R08-09B
CHICAGO AREA WATERWAYS SYSTEM	)	(Rulemaking- Water)
(CAWS) AND THE LOWER DES PLAINES	)	
RIVER: PROPOSED AMENDMENTS TO	)	
35 Ill. Adm. Code Parts 301, 302, 303 and 304	)	
(Recreational Use Designations)	)	

COMMENTS OF ENVIRONMENTAL GROUPS ON THE PROPOSED RULES ESTABLISHING RECREATIONAL USE DESIGNATIONS FOR THE CHICAGO AREA WATERWAY SYSTEM AND THE LOWER DES PLAINES RIVER

Natural Resources Defense Council ("NRDC"), Environmental Law & Policy Center, Friends of the Chicago River, Openlands, Alliance for the Great Lakes, Prairie Rivers Network, and Sierra Club-Illinois Chapter ("Environmental Groups") submit these comments in support of the proposed technology-based effluent disinfection requirement for the Chicago Area Waterway System ("CAWS") and the Lower Des Plaines River ("LDPR"). This measure is a critical step toward bringing Chicago's water quality in line with that of other major U.S. cities, which have been protecting public health through sewage disinfection for decades.

In summary, we urge the Pollution Control Board ("Board") to find the following in support of the technology-based discharge standard proposed by the Illinois Environmental Protection Agency ("IEPA"):

- *The proposed technology-based standard is appropriate and necessary.* Disinfection is essential to protect the recreational uses designated by the Board, regardless of what specific ambient criteria may be promulgated subsequently. The technology-based standard proposed by IEPA is designed to ensure that disinfection equipment is operating properly. Previous Board decisions have implemented a technology-based standard to protect designated uses prior to implementing ambient criteria.

- *Disinfection will reduce risks for CAWS and LDPR recreators.* Disinfection will reduce the risk to recreators, with no appreciable risk downside.

- *The MWRD epidemiologic and Risk Assessment studies fail to demonstrate that disinfection is unnecessary.* As USEPA recognized in comments recently submitted to this docket, the Chicago Health, Environmental Exposure, and Recreation Study ("CHEERS"), while conducted with reasonably sound methods, is a wholly insufficient basis to conclude that public health protections in widespread use are unnecessary; and in many respects reflects risks to CAWS recreators that should be remedied. The Risk Assessment suffers from severe methodological flaws, and has been heavily criticized by USEPA as well as the Environmental Groups' expert. It should not be afforded weight in the Board's decisionmaking in this matter.

- *Cost of disinfection must be evaluated under UAA factor 6.* Factor 6 of the Use Attainability Analysis ("UAA") factors set forth in 40 CFR 131.10(g) establishes the only Clean Water Act ("CWA") standard for assessing the

economic impact of the proposed rulemaking. Even the Metropolitan Water Reclamation District of Greater Chicago ("MWRD" or "District") itself acknowledges that it has not demonstrated "substantial and widespread social and economic impact" resulting from a disinfection requirement, which is the Factor 6 standard. Moreover, all the available information indicates that the costs will be quite reasonable.

- *The presence of CSOs does not diminish the need for disinfection.* The District's treatment plant effluent flows on dry days as well as wet, making disinfection an essential part of reducing recreational risk on the CAWS; and the District is currently in the process of implementing measures to greatly reduce combined sewer overflows (CSOs). In any event, the District's analysis of the number of dry weather versus wet weather days on the CAWS is substantially flawed.

- *Energy use is not grounds to reject disinfection*. The testimony initially presented by MWRD contained gross errors in calculating greenhouse gas ("GHG") impacts, and reflects no effort on the part of the District to implement energy efficiency measures to reduce its GHG footprint. In any event, air emissions are governed by a separate statutory scheme from water emissions, and GHG impacts of disinfection – now governed by the Clean Air Act – is not relevant to determining what is necessary to protect water quality standards pursuant to the CWA.

For these reasons, the Board should adopt IEPA's proposed 400 cfu/100 ml standard for ensuring that the District installs disinfection equipment at its three wastewater treatment plants ("WWTPs") and keeps it operating properly.

I. IEPA's Proposed Technology-Based Disinfection Standard is an Appropriate and Necessary Means of Protecting the Recreational Uses Designated by the Board

IEPA, confronted with the fact that USEPA is undergoing an intensive process to develop updated recreational use criteria that will not be complete until at least 2012, made a decision to protect public health in the interim through a technology-based disinfection requirement. This decision was reasonable, consistent with applicable law, and consistent with prior Board decisions. As a practical matter, it is virtually inconceivable that any future instream recreational criteria will allow the very high levels of pathogen indicators currently found in the CAWS and LDPR. Therefore, regardless of what specific criteria may be adopted, disinfection will be required.

A. IEPA's Technology-Based Standard is a Reasonable Means of Protecting Public Health Pending Implementation of Numeric Criteria

In its Statement of Reasons ("SR") in support of the proposed rulemaking (Initial Filing October 26, 2007), IEPA sets forth its reasoning in promulgating a technology-based disinfection standard while deferring numeric criteria. The Agency explains that USEPA is currently in a multi-year process to develop a new set of criteria for and potentially a new indicator organism, in view of concerns that the 1986 criteria may be insufficiently protective. SR at 42-45 and Attachment Q. IEPA references the then-ongoing CHEERS study and suggests that its conclusions may further inform the setting of numeric instream criteria. Accordingly, to protect public health in the interim, IEPA

proposed a technology-based disinfection requirement of 400 cfu/ml fecal coliform. As explained in the SR,

> Technology-based disinfection has been a long standing requirement applied to numerous wastewater facilities throughout the State, dating back to the original 1970s Board regulations. 35 111. Adm. Code 304.121. The Agency believes strongly that effluent disinfection is technically feasible and that this long history of use of disinfection technologies supports this conclusion.

SR at 98. This determination was clearly reasonable, for several reasons.

First, the technology-based standard does not require any assumptions regarding the numeric criteria to be established in the future. The only thing one needs to assume – which can be assumed safely – is that those criteria, whatever they may turn out to be, will require lower levels of indicators (of whatever sort) than the sizable numbers measured in the water at present (*see infra* subsection C), such that disinfection will be required to achieve that end. The technology-based limit of 400 cfu/100 ml fecal coliform, identical to the standard in effect throughout the rest of the state, is designed solely to ensure that disinfection technology is installed and working. SR at 92. This limit is not tailored to achieve a specific level of instream water quality.

Second, IEPA is correct that the scientific data that would appropriately inform the establishment of instream criteria are still a work in progress – and somewhat slow progress at that. As discussed in subsection III.A.6, *infra*, the supplemental CHEERS study data concerning study objective #2, submitted December 6, 2010, do not provide a basis for establishing criteria. In the settlement agreement with USEPA reached by the NRDC concerning timing for establishing new federal bacteria criteria under the BEACH Act (Ex. 58) ("BEACH Act Settlement"), USEPA has agreed to issue draft criteria in October, 2012. Ex 58 ¶ 11. After that, the criteria will need to be vetted through a public

rulemaking process. And after that, IEPA would need to study them to determine how to appropriately apply them, and the underlying science, to the CAWS and LDPR waters. And then after that, the Board will need to hold hearings on the proposal, which may be lengthy (although probably not as lengthy as the current proceeding). All in all, it is clear that even in a reasonably expeditious scenario, numeric criteria for the CAWS are many years away. The public, which is increasingly flocking to the CAWS and LDPR for recreation, should not be forced to wait for a basic health protection while that process lumbers on. As discussed in subsection C, *infra*, protection is needed now.[1]

And third, USEPA, which has ultimate authority to determine the adequacy of IEPA's proposed regulation, has not objected to IEPA's proposed technology-based standard in advance of ambient criteria. In an April 15, 2010 letter from USEPA Region 5 to IEPA, USEPA observes only that IEPA "will *eventually* need to adopt water quality criteria to protect all of its designated uses" (emphasis added).

B. Applicable Law and Board Precedent Supports Immediate Implementation of a Technology-Based Standard Pending a Subsequent Numeric Criteria Standard

The CWA regulation governing protection of designated uses, 40 C.F.R. § 131.11, provides as follows:

> (a) *Inclusion of pollutants:* (1) States must adopt those water quality criteria that protect the designated use. Such criteria must be based on sound scientific rationale and must contain sufficient parameters or constituents to protect the designated use. For waters with multiple use designations, the criteria shall
> support the most sensitive use. . . .
>
> (b) Form of criteria: In establishing criteria, States should:

[1] Disinfection would also serve to protect wildlife that is susceptible to human pathogens living in the CAWS. *See* Von Bonn Testimony (Ex. 240).

(1) Establish numerical values based on:

(i) 304(a) Guidance; or

(ii) 304(a) Guidance modified to reflect site-specific conditions; or

(iii) Other scientifically defensible methods;

(2) Establish narrative criteria or criteria based upon biomonitoring method where numerical criteria cannot be established or to supplement numerical criteria.

Clearly, numeric criteria will be necessary once the information necessary to determine them becomes available from USEPA, with consideration given also to upcoming Objective 3 of the CHEERS study (see Section III, *infra*). However, in the meantime, the regulation allows narrative criteria to protect the use.

Here, IEPA is treating the use designations effectively as temporary narrative criteria, and is using the technology-based disinfection requirement to meet those criteria. This approach was expressly allowed by the Board in its earlier decisions concerning nutrient standards. In that proceeding, IEPA informed the Board that it was in the middle of a multi-year process to develop numeric nutrient criteria, but proposed a technology-based phosphorus limit as an interim measure to protect the state's waters from algal growth. The Board adopted that approach. *See In the Matter of PROPOSED 35 ILL. ADM. CODE 304.123(g), 304.123(h), 304.123(i), 304.123(j), and 304.123(k)*, Docket No. R04-26, September 15, 2005 and January 19, 2006 (attached collectively as Appendix 1).[2]

[2] We note, in this regard, that while IEPA assured the Board during the course of the nutrient proceeding that it would have nutrient standards petition filed by 2007 (Id., September 15, 2005 at 1), three years later no such petition is in the works. This delay underscores the fact that it would be unreasonable to force the public to wait for an indefinite and likely far-off water quality criteria proceeding before being granted basic protections against sewage pathogens enjoyed throughout the rest of the nation.

C. Immediate Disinfection is Necessary to Protect Public Health

Notwithstanding the extensive testimony in this proceeding concerning the science of health risk and disinfection, three facts remain indisputably clear. First, exposure to waterborne sewage pathogens can cause illness to recreators. Second, both indicator and pathogen levels in the CAWS are substantially elevated during dry weather as a result of the District's undisinfected WWTP effluent. And third, disinfection technology will significantly reduce those levels, without any appreciable downside risk.

As NRDC's witness Peter Orris, senior colleague of CHEERS researcher Samuel Dorevich at University of Illinois at Chicago, put it in his testimony,

> You have one of the oldest known associations between the environment and disease and that is the ingestion of pathogens from water. We have known since antiquity that the ingestion[3] of pathogens from water causes disease. We have known for many years that one of the most important public health initiatives, one of the most important public health preventive measures taken in the last 100, 200 years is the disinfection of water when it comes into contact with human beings in a variety of ways.

4/15/09 at 12.[4] A couple of "novel" studies from the District (*see* 6/29/10 at 26-27), one of overall dubious quality and neither without analytical gaps and flaws (*see* Section III *infra*) do not negate the established fact that sewage pathogens and illness are one of the best established correlations in medical literature, and that removal of pathogens reduces risk of disease.

It is important to note that, notwithstanding District witness Dr. Dorevich's testimony suggesting otherwise (*see* Dorevich 8/04/08 Testimony (Ex.

[3] Due to a transcription error, "ingestion" appears as "injection" in the transcript.
[4] Consistent with the citation method used by the Board, transcripts will be cited by date and, where applicable, followed by A or P to signify whether the morning or afternoon transcript is being cited.

100)), it is clear that the lack of documented disease outbreaks on the CAWS has no bearing on an assessment of the risk for purposes of this proceeding. USEPA expressly concurs, having criticized the District's Risk Assessment for its focus on outbreaks as a health indicator. 9/9/10A at 43 (quoting Ex. 73). The symptoms of infection from waterborne pathogenic microorganisms are notoriously hard to trace, and commonly have multiple causes. Thus, as District witness Dr. Gerba conceded (9/9/08A at 49), even large-scale outbreaks frequently go undetected, since treating physicians and their patients are often unlikely to report their symptoms to public health authorities; and, as acknowledged by District witness Dr. Blatchley, as few as ten percent of outbreaks have been documented. Yates Testimony (Ex. 249) at 15; 5/5/09P at 145-46; 9/23/08P at 20. They may be even harder to trace to large natural waterbodies, as opposed to physically limited venues such as swimming pools, since it is harder to identify recreators to the natural waterbodies. 5/5/08A at 96-97. An additional complicating factor is that many types of waterborne pathogen infections can be asymptomatic for a substantial number of people – these people may infect others, but those infections would never be connected to the contaminated waterbody from which they were first contracted. *Id*.

1. Recreational Exposure to Sewage-Related Waterborne Pathogens Causes Illness

Multiple witnesses set forth in detail the sewage-associated pathogens that can cause illness in humans exposed to them through recreation. Dr. Marylynn Yates stated that wastewater treatment plant ("WWTP") effluent can contain more than 100 different types of waterborne pathogens capable of causing illness in

humans, and summarized information concerning some of the most harmful and/or prevalent[5] pathogens in her Table 1. Yates Testimony (Ex. 249) at 9 - 11 and Ex. 6.[6] Drs. Gorelick and Orris similarly provided summaries of the more harmful and/or prevalent pathogens, noting that there are many more besides these associated with sewage-contaminated wastewater. Gorelick 8/4/08 Testimony (Ex. 233) at 4; Orris Testimony (Ex. 234) at 3-4.

Extensive scientific research – including in some respects the CHEERS study – supports the basic correlation between recreational exposure to sewage-related pathogens and illness. Dr. Dorevich testified that the CHEERS study confirmed an association between recreational water exposure and illness (10/19/10 at 117-18), and agreed that the scientific literature supports a correlation between gastrointestinal illness ("GI") and exposure to waterborne pathogens. (*Id*. at 168-69).

The scientific literature also supports a correlation between pathogen indicator organisms, such as fecal coliform, and risk of illness to recreators. Dr. Dorevich referenced these studies (Dorevich 8/4/08 Testimony (Ex. 100) Attachment 4 at 7-10; 10/19/10 at 168-69), and Dr. Yates provided a list of the existing epidemiologic literature supporting this correlation in Table 2. Yates Testimony (Ex. 249) at 16-17; *see* 5/5/05A at 12, 17-18. *See* also 10/23/08A at 21 (acknowledgement by District witness Dr. Blatchley of some correlation between indicators and pathogens). As acknowledged by

[5] Note that Dr. Yates is clear that these pathogens vary widely in potential harm, dose response level, and frequency in the US. All, however, have been documented as occurring in the US, in many cases as outbreaks. *See generally* 5/5/09A at 23-26; 5/5/09P at 4-5, 101-11; Yates Testimony at 12.
[6] Prefiled testimony will be referenced as [Witness] Testimony (Ex. __) at X, except that a date will be added where one witness filed multiple prefiled testimonies.

Dr. Dorevich, the ongoing research being conducted by the United States Environmental Protection Agency ("USEPA") has also confirmed a correlation between indicators and health risk. 9/24/08A at 41. *See* USEPA summary of BEACH Act settlement research, *available at* http://water.epa.gov/scitech/swguidance/waterquality/standards/criteria/health/recreation/index.cfm (last accessed December 28, 2010). Dr. Yates further testified that a committee (which included Dr. Charles Haas, one of the District's witnesses) convened by the National Research Council – associated with the National Academy of Science – concluded that "it is generally but not always the case that the greater the number of indicator organisms in the water, the greater the number of pathogens." 5/5/09A at 12, quoting Ex. 97. District witness Dr. Ernest Blatchley generally confirmed this correlation as well. 9/23/08A at 21.

As discussed by Dr. Yates in her testimony, USEPA is currently re-evaluating its existing fecal coliform indicator standards in a process that will culminate in issuance of proposed new standards in 2012, under the terms of the BEACH Act Settlement. Yates Testimony (Ex. 249) at 18-21 Ex. 58. The concern with the existing indicator standard is primarily that it *under*predicts, not overpredicts, the level of risk. Yates Testimony (Ex. 249) at 18-19.

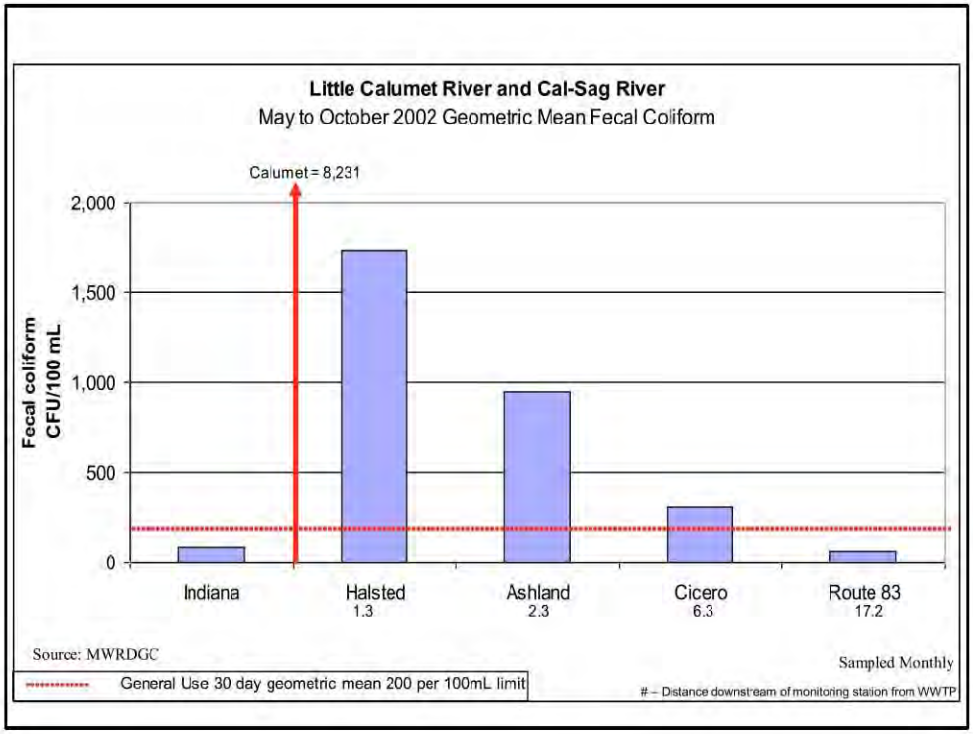
The risk applies in any circumstances in which water is ingested or comes in contact with the body, whether during primary or incidental contact recreation. As discussed in more depth in subsection III.A.3.a, *infra*, the significant variable in assessing specifically non-primary contact recreational risk, as opposed to primary contact risk or risk of ingestion generally, is the magnitude of such ingestion or contact. The greater the ingestion or contact, the greater the risk.

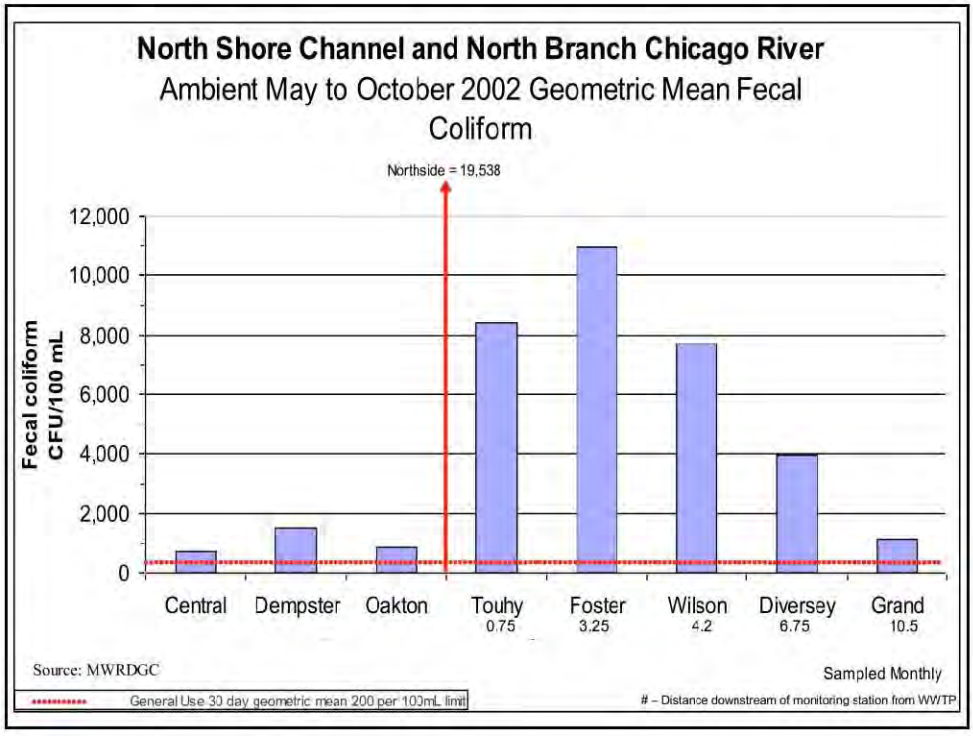
The purpose of the CHEERS study was to evaluate specifically the risk of ingestion and contact levels occurring during non-primary contact activities on the CAWS. But, as explained *infra*, assessing exposure is a weak link in the study, as the exposure survey was problematic and difficult to verify.

2. Pathogen and Indicator Levels are Elevated in the CAWS During Dry Weather as a Result of the District's Undisinfected WWTP Effluent

There is no genuine dispute that, during dry weather, both pathogen and indicator bacteria levels in the CAWS are elevated downstream of the District's three CAWS WWTPs; and that the cause of this elevation is the undisinfected sewage effluent being discharged from these facilities 24 hours a day, 7 days a week, containing fecal coliform levels between 42,000 and 56,000.[7] 9/9/08P at 105. Dr. Marylynn Yates included in her testimony the following two charts prepared by USEPA Region 5, which clearly show high indicator levels coming out of the WWTPs, gradually attenuating downstream:

[7] District witnesses made the point on several occasions that since primary and secondary treatment remove 99 percent of pathogens, disinfection must not be necessary. Accepting this figure as accurate for purposes of discussion, it is meaningless. As Dr. Yates pointed out, one percent of a very high number can still yield a number that risks public health. The relevant comparison is not pre- versus post-secondary treatment numbers, but rather pre- to post-disinfection numbers. 5/5/08A at 87-88.


Little Calumet River and Cal-Sag River
May to October 2002 Geometric Mean Fecal Coliform
Calumet = 8,231
Fecal coliform CFU/100 mL
2,000
1,500
1,000
500
0
Indiana
Halsted
1.3
Ashland
2.3
Cicero
6.3
Route 83
17.2
Source: MWRDGC
Sampled Monthly
General Use 30 day geometric mean 200 per 100mL limit
– Distance downstream of monitoring station from WWTP


North Shore Channel and North Branch Chicago River
Ambient May to October 2002 Geometric Mean Fecal Coliform
Northside = 19,538
Fecal coliform CFU/100 mL
12,000
10,000
8,000
6,000
4,000
2,000
0
Central
Dempster
Oakton
Touhy
0.75
Foster
3.25
Wilson
4.2
Diversey
6.75
Grand
10.5
Source: MWRDGC
Sampled Monthly
General Use 30 day geometric mean 200 per 100mL limit
– Distance downstream of monitoring station from WWTP

Yates Testimony (Ex. 249) at 6-7, Figures 1 and 2. As the District has repeatedly acknowledged, the CAWS is an effluent-dominated waterbody, with virtually 100 percent of the flow coming from the District's WWTPs and other WWTPs on the tributary streams during dry weather. Lanyon Testimony (Ex. 60) at 5. Dr. Yates pointed out in her testimony the facially obvious conclusion that the observed high levels of indicators are associated with the WWTPs and not other sources of contamination, such as animal excrement:

> If the major dry-weather contributor of fecal coliforms were animal sources – e.g., seagulls and other wildlife – one would expect that the concentration would be relatively consistent upstream and downstream of the treatment plant. Where, as here, that is not the case, it is more likely than not that the high concentrations of fecal coliforms are due to inputs from the wastewater treatment plant.

Although many of the District's witnesses made reference to a hypothetical possibility of other dry weather inputs of fecal contamination to the CAWS (overhanging vegetation, bird droppings), none were quantified. *See* 9/9/08A at 103-6, 9/9/08P at 69. Most of the District's references to non-effluent sources of fecal contamination – CSOs and stormwater runoff – occur only during wet weather.

The District presented three studies concerning fecal coliform indicator levels in the CAWS. None, however, contradicts the USEPA sampling results presented and described by Dr. Yates concerning the source and level of dry weather fecal coliform indicators. The first, District Report No. 2003-20, concerns only the question of pathogen die-off and attenuation many miles downstream of the wastewater treatment plants, as opposed to the areas near Chicago where incidental contact recreation has been documented in this proceeding. Dr. Geeta Rijal, who presented these studies, testified that

the Chicago Sanitary and Ship Canal ("CSSC") sampling location in Report No. 2003-20 is 25 miles downstream from the Stickney plant. Rijal Testimony (Ex. 113) at 2, 10/24/08A at 92. The second, District Report No. 2007-79, looked at the impacts of disinfection, and contrasted upstream levels of fecal coliform to the technology-based standard of 400 cfu/100 ml proposed by IEPA – as discussed in subsection I.C.3.c., *infra*, an irrelevant apples-to-oranges comparison. Rijal Testimony (Ex. 113) at 3.

The District's studies also show in most instances higher pathogen levels downstream of the District's CAWS WWTPs during dry weather. In the District's Dry and Wet Weather Risk Assessment of Human Health Impacts of Disinfection vs. No Disinfection of the Chicago Area Waterways System (CAWS) ("Risk Assessment") (Ex. 71), levels of both enteric viruses and adenoviruses were in most cases found to be substantially higher downstream than upstream. Ex. 71 at 48-52. Likewise, the CHEERS study concluded, "With the exception of *Cryptosporidium*, microbe concentrations were generally higher downstream of the water reclamation plants compared to upstream of the plants." CHEERS Supplement (PC # 556[8])

at ES-4.

The CHEERS study is analyzed at length in Section III, *infra*. However, it bears note that the study did find that one type of illness – eye symptoms – appears to be associated specifically with recreation on pathogen-contaminated waters of the CAWS. CHEERS Final Report ("CHEERS Report") (PC #478) at IX-43 *et seq*. Additionally, the CHEERS Report found a high level of risk of gastrointestinal (GI) illness to CAWS

[8] Public comments shall be referenced as "PC #__."

recreators – 12.5 illnesses per 1,000 recreators as compared with USEPA's risk benchmark of 8 illnesses per 1,000 recreators – leaving aside the not entirely pertinent question of comparative risk levels in general use waters ("GUW"). CHEERS Report at V-1 *et seq. See infra* Section III (factors such as heterogeneity bias and elevated indicator levels in GUW limit the significance of the CAWS/GUW risk comparison).

3. Disinfection Would Significantly Reduce Indicator Levels and Pathogen Loading in the CAWS

As has been documented throughout this proceeding, disinfection of wastewater (at least seasonally) is near universal in large US cities[9] and in most smaller cities as well[10], with Chicago being the outlier.[11] The District itself currently disinfects at its three suburban WWTPs. Its challenge to IEPA's proposal that the CAWS WWTPs join the rest of the nation, on the purported grounds that it yields no public health benefit, is in some measure a larger challenge to the entire science and practice of disinfection that has been in place for decades. Nothing the District has presented at hearing, however, comes close to overcoming the overwhelming evidence that disinfection as currently practiced throughout the nation is beneficial to public health.

There is also no genuine dispute that disinfection – using either chlorination/dechlorination or ultraviolet ("UV") methods – would dramatically reduce both pathogen and indicator loadings in the CAWS. Given the well-known correlation between pathogens and indicators and health risk, there is strong basis in longstanding

[9] The District's witness Dr. Ernest Blatchley testified that disinfection is not as widely practiced in Europe as it is in the U.S. Blatchley Testimony at 9. However, he admitted at hearing that his views were based on personal anecdotal observation; that he had no actual data concerning recreational practices in other nations; and that he was unaware of disinfection practices in several European cities cited to him by the Environmental Groups. 9/23/08A at 84-88.

[10] *See* SR at 92 (disinfection is a longstanding and widespread requirement in Illinois).

[11] As discussed in subdocket A comments, Memphis and St. Louis – previously outliers as well – are now subject to disinfection requirements.

medical knowledge to conclude that a reduction in these organisms will result in a reduction in health risk – regardless of the partially negative results of the CHEERS study (*see* Section III, *infra*).

With respect to indicator organisms, District Superintendent Richard Lanyon testified that the level of fecal coliform indicators in disinfected sewage effluent is "near zero." This means that at the District WTTPs at which the 400 cfu/100 ml technology based limit is currently in effect (Kirie, Egan, and Hanover Park), the actual level of fecal coliform in the effluent is much lower than that, since "when you're going to kill, you kill them all." 9/08/08A at 65, 70.

With respect to pathogens, as Dr. Yates testified, it is clear that "disinfection will reduce the concentration of pathogens, thereby decreasing public health risk." 5/5/09A at 52. Notwithstanding the District's strenuous efforts to downplay the advantages of disinfection, their witnesses and submissions likewise acknowledged that disinfection would substantially reduce pathogens in the WWTP effluent – which, as noted above, is virtually 100 percent of the CAWS flow in dry weather. The Risk Assessment concluded that all available types of disinfection technology – chlorination/dechlorination, UV, and ozone – substantially reduce levels of at least some types of pathogens (with some forms of disinfection being more effective against some types of pathogens than others). Ex. 71 at 71-91. Dr. Keith Tolson, a member of the Risk Assessment research team, agreed that "you would, essentially, eliminate, or largely eliminate, the pathogen risk through disinfection." 9/9/08P at 69. Even Dr. Blatchley, the District witness who most directly targeted the issue of disinfection efficacy, ultimately conceded that disinfection would yield "some benefits," and framed the issue as a question of weighing costs against those

benefits. 9/23/08A at 100-101. (*See generally* Section IV, *infra* regarding the CWA standard for assessing costs.) In a published paper, Dr. Blatchley and others documented a very significant reduction in recreational risk associated with conventional disinfection. Ex. 99.[12] *See also* 4/15/08 at 77 (citing Ex. 236).

The District's arguments against the efficacy of disinfection,[13] notwithstanding general acknowledgement that it works, include the following: (a) the proposed 400 cfu/100 ml technology based standard is insufficiently protective; (b) disinfection can lead to pathogen regrowth over a period of days, (c) upstream levels of fecal coliform indicators are at times higher than the proposed technology-based standard; and (d) filtration is sufficiently effective to remove pathogens. These are addressed in turn below.

a. Protectiveness of the proposed 400 cfu/100 ml standard

The District argued, primarily through the testimony of Dr. Blatchley, that the proposed technology-based standard of 400 cfu/100 ml fecal coliform is not sufficiently protective of public health. (We note that the District has not attempted as of yet to reconcile this proposition with its other proposition that current indicator levels in the CAWS that are orders of magnitude higher than this standard are not a risk to public health.) Dr. Blatchley expresses concern that fecal coliform indicators may be more

[12] Ex. 99 is E.R. Blatchley, J.B.Rose, D.E. Huffman, M. Otaki, J.T. Lisle, "Effects of Wastewater Disinfection on Human Health" (presented at hearing with unnumbered pages). The document states (right below Table 7), "The risks associated with swimming in waters receiving municipal wastewater effluents range from 10^{-3} to $x10^{-6}$; risks are 2 to 100 times greater if the water is not disinfected, dependent on the disinfection type, extent of disinfectant exposure, and specific effluent characteristics." Note that while the statistics are provided for swimming, the only variable differentiating the results from limited contact recreational use is degree of exposure, which may reduce but not eliminate the risk differential; and can, in the case of accidental immersion, approximate swimming exposure. 5/5/09A at 31-32, 49-50.

[13] The District's separate argument against the necessity of disinfection, supported by its two risk studies (CHEERS and the Risk Assessment), will be addressed separately in Section III, *infra*.

easily killed by "conventional disinfection" (represented by the proposed technology-based standard) than pathogens, such that systems in compliance with the proposed standard "may still contain viable and/or infective microbial pathogens." Blatchley Testimony (Ex. 93) at 3-4. Dr. Blatchley contrasts the conventional disinfection standard proposed in this rulemaking with the requirements imposed by California's Title 22, which essentially requires disinfection down to the detection limit for waters that will be reused for direct human contact (*e.g.*, irrigation). Blatchley Testimony (Ex. 93) at 6; 9/23/08A at 34.

However, in offering his abstract critique the conventional disinfection standard as being less protective, Dr. Blatchley offers no further detail to guide the Board. He did not attempt to quantify the difference in human health risk to recreational users that would be achieved through use of the Title 22 reuse standard. His discussion centered on reuse of effluent for irrigation purposes, but he did not know what standard is used for effluent treatment at California's swimming beaches. 9/23/08A at 37. He did not point to any sewage treatment discharger, outside those to whom the California re-use standard is applicable, that actually disinfects to that level. He did not know whether he would recommend the Title 22 detection limit standard for the CAWS. 9/23/08A at 38, 47. Nor could he recommend either a proposed technology-based disinfection limit that would be sufficiently protective of CAWS users, or a more effective indicator organism than fecal coliform. *Id*. at 45, 132.

The Environmental Groups are not opposed in principle to application of a more stringent technology-based standard for disinfection. Dr. Blatchley's testimony does not contravene the basic proposition underlying IEPA's proposal that reduction in indicator

organisms will achieve a public health benefit. He is merely arguing, if rather vaguely, that a more stringent standard would achieve a greater public health benefit. However, nothing in Dr. Blatchley's testimony, nor elsewhere in the record, sufficiently supports a finding that IEPA's proposed technology-based standard is inadequate. The discussion of what specific indicator levels are protective of public health should more appropriately be had in the context of any future rulemaking concerning instream standards, rather than the current assessment of whether conventional disinfection technology needs to be installed in the first instance.

The larger problem with Dr. Blatchley's thesis is that it is grounded in a misapprehension of the requirements of the CWA. He states in a published paper that conventional disinfection "may not be as effective in preventing communicable disease transmission as is generally assumed" (Ex. 99), and opines that "disinfection is not the same as sterilization" (9/23/08A at 133) and that use of anything less than the most stringent available disinfection gives a "false reassurance of safety." *Id*. at 31-32. District witness Thomas Granato similarly testified that disinfection technology cannot "offer a 100 percent guarantee of safety." Granato 8/4/08 Testimony at 7 (read into the record at 10/28/08A p. 106 *et seq.*). The CWA, however, nowhere requires water quality control measures to assure "safety" in an absolute sense. The requirement is that the Agency "protect the designated use." 40 C.F.R. § 131.11. The lack of further elaboration leaves a degree of discretion to the agency regarding the means and level of protection. Here, IEPA has proposed a level of disinfection that is in widespread use throughout Illinois for waters with a higher use designation than the CAWS (general use). The District has not, through Dr. Blatchley or otherwise, provided anything close to sufficient

grounds to conclude adoption of the proposed 400 cfu/100 ml fecal coliform standard by the Board would be inconsistent with CWA requirements or otherwise inappropriate.

b. Pathogen regrowth does not significantly diminish the efficacy of disinfection

Dr. Blatchley's arguments were primarily grounded in research he conducted on a grant from the discharger organization Water Environment Research Foundation ("WERF") showing that fecal coliform indicators (as discussed in subsection I.C.1, *supra*), a widely acknowledged indicator of health risk) subjected to disinfection treatments in some instances reflect repair and regrowth over a period of 6 days. See Blatchley Testimony (Ex. 93) at 5 and Attachment 2 (extended testimony). The entire proposition, however, is a red herring: a slight uptick in indicators under some circumstances after nearly a week has no bearing on the benefits of disinfection during the course of that week; and, in any event, the findings only applied to one of several types of disinfection that the District could employ. In any event, the findings are of very limited applicability given that no attempt was made to simulate the temperature or other conditions of the CAWS, which significantly impact pathogen survival.

The following table presented by Dr. Blatchley (Blatchley Testimony (Ex. 93) Ex. 2 at 87) summarizes his findings, and demonstrates their very limited relevance to this proceeding:

Table 3—Summary of bacterial responses to disinfection treatments for samples collected from all four facilities.

Facility	Treatment*	TBC, $t = 0$ (#/100 mL)	TBC, $t = 144$ hours (#/100 mL)	Fecal coliform, $t = 0$ (cfu/100 mL)	Fecal coliform, $t = 144$ hours (cfu/100 mL)
B	UV	6.02×10^8	4.63×10^8	495	300
	Chlorination/dechlorination	5.22×10^8	5.99×10^8	715	1133
	Ori w/	5.34×10^8	5.09×10^8	2.81×10^5	5825
	Ori w/o	5.49×10^8	3.72×10^8	2.16×10^5	7275
D	UV	9.44×10^7	7.90×10^7	640	990
	Chlorination/dechlorination	8.53×10^7	4.09×10^8	61.5	2040
	Ori w/	1.12×10^8	7.00×10^7	2.38×10^5	2718
	Ori w/o	8.54×10^7	4.25×10^7	1.95×10^5	1282
A	UV	5.63×10^7	3.69×10^7	55	0
	Chlorination/dechlorination	6.31×10^7	2.16×10^8	9	500
	Ori w/	7.16×10^7	4.54×10^7	9850	175
	Ori w/o	6.61×10^7	4.77×10^7	9350	475
C	UV	2.02×10^8	1.62×10^8	2	0
	Chlorination/dechlorination	2.28×10^8	3.99×10^8	0.25	0
	Ori w/	2.41×10^8	7.77×10^7	1925	93
	Ori w/o	2.18×10^8	1.21×10^8	2400	9

* "Ori w/" indicates original (control) sample with acetic acid substrate; "Ori w/o" indicates original (control) sample without acetic acid substrate.

The table reflects tests at four different facilities, A B C and D ("facility" column). Both UV and chlorination/dechlorination treatments were applied, while two variants of a control sample were not disinfected ("treatment" column). *All* forms of disinfection radically reduced fecal coliform indicators when first applied, by many orders of magnitude ("fecal coliform, t = 0" column – compare control samples designated "Ori" to "UV" and "Chlorination/dechlorination" samples). It is not until 6 days later ("fecal coliform, t = 144 hours" column) that in two instances, involving chlorination/dechlorination but not UV treatment, the fecal coliform levels were marginally higher (*i.e.*, within the same order of magnitude) – see results for Facilities A and D.

What these results actually show is first, that disinfection when first applied, and for at least several days thereafter (*see* Ex. 95 and 9/23/08A at 67-69), indicator levels are far lower in the disinfected than the non-disinfected effluent. It is during these several

days – and in particular the first day – that the effluent would be present in the CAWS in the areas where extensive recreation has been documented in this proceeding (Dr. Blatchley had no idea how far water in the CAWS travels in 6 days – *see* 9/23/08A at 71). And second, they show that for UV disinfection – one of the options available to the District – the reductions remain even at the end of 6 days.

In any event, Dr. Blatchley conceded that he did not, given the nature of the experiment, attempt to address the significant differences between laboratory conditions and CAWS conditions, which have the potential for significant impact on the applicability of his findings in this context. Specifically, he stated that he did not account for differences in die-off and regrowth levels between his still one-liter laboratory samples and the flowing waters of the CAWS that are impacted by various environmental factors; or between effects at warmer than room temperature (25 degrees C = 77 degrees F) in the dark, which were the laboratory sample conditions, and the much colder waters of the CAWS that are subjected to sunlight (both cold and sunlight UV being factors that can kill or inhibit growth of microorganisms (*see* Yates Testimony (Ex. 249) at 27). 9/23/08A at 76-77. Neither, for that matter, did Dr. Blatchley have any idea the actual cause of the empirical result he observed. 9/23/08A at 72-73. For these reasons alone, Dr. Blatchley's research – while it appears to be scientifically defensible in its own right – would be a woefully insufficient basis to reject or delay a near-universal public health measure.

We note that Dr. Blatchley also presented data concerning the effect of disinfection on total bacterial concentration ("TBC"), but did not study the impact of disinfection on viruses and protozoa, which he acknowledged may be quite different.

c. Upstream levels of fecal coliform are an irrelevant comparison to the proposed technology-based standard

Dr. Geeta Rijal, a District employee, testified that District studies at times show levels of fecal coliform indicators upstream of the District's CAWS WWTPs that are higher than the proposed technology-based limit on the District's effluent of 400 cfu/100 ml. Rijal Testimony (Ex. 113) at 6. According to Dr. Rijal, the significance of this finding is that disinfection to the proposed technology-based level will not be beneficial when upstream levels may be higher. 9/24/08A at 107. Dr. Granato similarly testified that, since upstream levels of fecal coliform are sometimes higher than the 400 cfu/100 ml effluent discharge standard, "the proposed effluent standard could not be attained in the CAWS even if the reclamation plants met the proposed effluent standard." Granato 8/4/08 Testimony at 5 (read into the record at 10/28/08A p. 106 *et seq.*).

This testimony misapprehends both the difference between effluent limits and instream criteria, as well as the difference between loading and concentration. Even leaving aside the question of whether the higher upstream numbers during dry weather are the result of plant backflow, the argument simply makes no sense.

The proposed 400 cfu/100 ml standard is designed for one purpose only: to ensure that the installed disinfection equipment is functioning properly. SR at 92. IEPA did not put forth the proposed standard as instream water quality criteria, but rather as a technology-based effluent standard designed only to ensure that the disinfection equipment is working properly. Thus, the purpose of the standard is not, as Dr. Granato would have it, to "attain" the "proposed effluent standard." It is to ensure that technology is used to reduce the effluent concentration of fecal coliform below current levels.

If the disinfection equipment is functioning, as indicated by compliance with the proposed effluent limit, then regardless of what the levels of fecal coliform may be upstream or downstream, fecal coliform in the plant effluent will be reduced through disinfection from its current levels of 42,000 and 56,000 cfu/100 ml (9/9/08P at 105) to well below 400 cfu/100 ml. 9/08/08A at 65, 70. This means that disinfection will radically reduce the loading of indicator organisms (and associated pathogens) from sewage effluent into the receiving waters -- which are dominated by that sewage effluent. Simply put, whatever the existing instream concentration of fecal coliform indicators, the technology-based effluent limit requiring disinfection will vastly reduce fecal coliform in the sewage effluent and therefore reduce loading to the CAWS.

d. The District has presented no evidence that filtration is sufficient

District witness Thomas Granato suggested during his summary testimony, in response to a question as to whether there existed any method of reducing pathogen discharge from the District's WWTPs other than disinfection, that filtration technology could be used in the alternative. 10/20/10 at 36-7. However, Dr. Granato could provide no data as to the degree to which filtration could reduce fecal coliform levels. *Id*. at 37.

The District has thus provided nothing of substance to support its contention that filtration could reduce fecal coliform levels sufficiently to protect public health. Should such information be provided in the District's comments, then the Environmental Groups should be given the opportunity to respond to it.

D. Disinfection Has No Appreciable Risk Downside

Longtime District consultant Dr. Charles Haas[14] testified that disinfection involves risk downsides, among them toxic disinfection byproducts ("DBPs") and risks associated with chlorine transportation and use. Specifically, Dr. Haas testified first, that chlorination can leave toxic byproducts; and second, that the transfer and storage of chlorine is hazardous. Dr. Haas identified these purported risks in general terms but did not attempt to quantify their severity, and did not opine as to whether these risks should be deemed to outweigh the risks of undisinfected effluent. For a number of reasons, they clearly do not.

As an initial matter, it is important to note that Dr. Haas's testimony concerned the risks of chlorination only, and not UV disinfection. The District's own Risk Assessment recognized that "UV disinfection results in the formation of negligible DBPs." Ex. 71 at 91; *see* 9/10/08A at 110. While vague passing references were made to theoretical DBPs from UV disinfection, all were speculative, and the witnesses concurred with the Risk Assessment's conclusion on the matter. 10/27/08A at 23-24; 9/23/08A at 15-16. Thus, if the District is genuinely concerned about chlorination DBPs, it has the ready option of using UV (or ozone) disinfection instead.

The Environmental Groups do not dispute that chlorination disinfection can create toxic DBPs. That has long been established. However, absolutely no evidence has been provided in this proceeding to suggest that these DBPs are a risk to recreational

[14] *See* 10/27/08A at 14-15 (chronicling Dr. Haas's work over the years for the District).

recreators. Chlorination, as Dr. Haas acknowledged, is frequently to disinfect drinking water. Accordingly, the studies of disinfection byproduct toxicity – and the resulting ingestion standards – are based on chronic long-term ingestion, not incidental ingestion through recreation. The USEPA maximum contaminant level goals ("MCLGs") for trihalomethane DBPs, designed to reflect the level at which no health risk is present – and which, we note, are actually an order of magnitude higher than the risk levels cited by Dr. Haas (10/27/08A at 26) – are based on studies that assume consumption of 2 liters per day by a 150 lb. adult over a period of 70 years. 8/10/08A at 114, 10/27/08 at 25-26. This research scenario is not even remotely relevant to a recreator who swallows a few mouthfuls of water after capsizing. Dr. Haas himself declined to opine as to whether the health impact of trihalomethane DBPs on recreational users would be in any way similar to the health impact of chronic consumption of DBPs. 10/27/08A at 29. Dr. Gerba testified, in response to a question whether these two DBP exposure pathways are comparable, "That would be too much speculation." 9/10/08A at 116.

Sewage pathogens, on the other hand, have the well-documented capability of causing illness to recreators who ingest even a small amount on one occasion. As Dr. Gerba, another District witness, wrote in a textbook chapter,

> For some time, methods have been available to detect the presence of low levels (one organism per 1000 liters) of pathogenic organisms in water, including enteric viruses and protozoan parasites. The trouble is that the risks posed to the community by these low levels of pathogens in a water supply over time are not like those posed by low levels of chemical toxins of carcinogens. For example, it takes just one amoeba in the wrong place at the wrong time to infect one individual, whereas the same individual would have to consume some quantity of a toxic chemical to be comparably harmed.

R.M. Maier, I.L. Pepper, C.P. Gerba, Environmental Microbiology at 564 (Academic Press (Elsvier Science 2004) (Ex 78); 9/10/08A at 117 (Dr. Gerba concedes that "usually risks are greater from the microorganisms" than from DBPs). *See* P. Teunis, C. Moe, P. Liu, S. Miller, L. Lindsmith, R. Baric, J. LePendu, R. Calderon, *Norwalk Virus: How infectious is it?"* Journal of Medical Virology 2008 (Ex. 255) (concluding that a single norovirus, if ingested, will cause illness 50 percent of the time). To put the matter in perspective, even though scientists and regulators are well aware of the risk chronic ingestion of chlorination DBPs, we still chlorinate our swimming pools – which have been shown to harbor levels of DBPs substantially in excess of those referenced by Dr. Haas – out of recognition that the public health consequences of not disinfecting swimming pools would be far worse. *See* H. Chu and M. Niuwenhuijsen, *"Distribution and Determinants of Trihalomethane Concentrations in Indoor Swimming Pools."* Occup. Environ. Med. 2002:59 243-247 (Ex. 145). The City of Chicago and many other cities' public water supply systems employ chlorine disinfection (10/27/08A at 47) based on that same risk calculus.

With respect to the purported risk of chlorine transportation and storage, we note in the first instance that – as Dr. Haas readily admitted (10/27/08A at 35) – any such risk is not exactly novel. Chlorination is the most widespread form of disinfection throughout the nation, including at the District's three suburban plants; not to mention the large amount of chlorine that is used to disinfect swimming pools, and that is transported for other commercial purposes. Any risk that may be associated with chlorine use at the CAWS plants would, at most, be a tiny increment of a larger risk that our society routinely takes. In this regard, it bears noting that the concentration of commercial

bleach, which is a 5.25 percent sodium hyperchlorite solution, is not appreciably weaker than the chlorine used for WWTP disinfection, which is a 12.5 percent solution. *See* 10/27/08A at 34-35.

Finally, while Dr. Haas references risks of gaseous chlorine, he offers no evidence that this form of chlorine, as opposed to liquid chlorine, would be used by the District if it opted to use chlorination rather than UV. The District uses liquid chlorine at its three suburban WWTPs that disinfect, and Dr. Haas acknowledged a nationwide "movement toward" liquid chlorine rather than gaseous. 10/27/08A at 33.

III. The Scientific Studies Presented by the District Do Not Contravene the Demonstrated Need for Disinfection

In the face of all the medical and public health knowledge affirming the risk of sewage pathogens and the importance of disinfection to protect the public, the District opposes disinfection based on two scientific studies: the CHEERS study and the Risk Assessment. While the District has gone out of its way to make the point at various times in this proceeding that it is not offering either study as the "sole" basis for a decision by the Board (*see, e.g.*, 4/15/09 at 21), the fact of the matter is that these two studies are the only real evidence the District is offering for the proposition that the risks to CAWS recreators are insufficient to warrant disinfection.

Neither study achieves that end for the District. The CHEERS study, as all of the Environmental Groups' witnesses have affirmed, was conducted in a reasonably scientifically sound manner. However, as they have also made clear, it would be profoundly *un*scientific to take a single epidemiologic study – with all its inevitable flaws, omissions, and imperfections – and use it as a basis to reject a near-universal

public health measure. That is especially so where, as here, the study results appear to contravene widely recognized scientific understandings concerning pathogen dose-response and heightened risk to children (whom CHEERS was not designed or sufficiently powered to study). The CHEERS researchers and the District have touted the study as "novel," which it is – but that is precisely the reason it would be a terrible basis on which to deny CAWS recreators the benefit of disinfection. The issue is not whether other epidemiologic studies specifically of CAWS recreation exist – they don't – but whether other studies of water recreational risk exist. Those we have in comparative abundance, and we know from them that if people are exposed to pathogens in water, they are going to get sick at higher rates. There is no evidence that the CAWS is so fundamentally different from waterbodies elsewhere that we can throw out decades of medical knowledge about sewage pathogen risks and treat the CAWS as a unique and isolated case.

The Environmental Groups' concerns with the CHEERS study scope, methodology, and applicability were echoed in USEPA's analysis of the study submitted to the Board December 27, 2010. *See* EPA Comments to Illinois Pollution Control Board Docket R2008-09 (Subdocket B) Regarding Chicago Health, Environmental Exposure and Recreation Study (CHEERS) Final Report (PC # 561) ("USEPA CHEERS Comments"). As discussed below, USEPA found little significance in a comparison of illness rates in contaminated GUW versus CAWS waters; and flagged anomalous findings and unaddressed peer review comments.

Perhaps more importantly, the CHEERS study *did* find a risk to CAWS recreators for at least one type of illness. Additionally, as pointed out in the USEPA CHEERS

Comments, the study found a rate of GI illness in both GUW and CAWS waters that was elevated well above USEPA's acceptable risk benchmark for recreational use (8 illnesses per 1,000). The fact that some GUW waterbodies *that are impaired for recreational use* also showed elevated GI risk is not a particularly good reason to reject public health protections for the Chicago River.

The Risk Assessment, meanwhile, is simply bad science. That fact has been documented at length not only by the Environmental Groups' microbiology expert, Dr. Marylynn Yates, but by USEPA, which has heavily and continually criticized the Risk Assessment for fundamental flaws in scope and methodology. The Risk Assessment is too deeply flawed to be given weight in this proceeding.

A. The CHEERS Study in No Way Demonstrates that Disinfection is Unnecessary

The reasons why the CHEERS study cannot be interpreted as a definitive basis for rejection of disinfection are legion. Chief among them is the fact that the CHEERS study did, in fact, identify elevated risks to CAWS recreators. The study found an elevated risk of eye symptoms for CAWS users, as well as an overall high level of risk of GI illness – which, not surprisingly, was matched by equally high levels of illness in GUW that are § 303(d) listed as impaired for recreational use. Second, the CHEERS study contradicts existing scientific knowledge concerning both the dose-response correlation associated with ingestion of sewage contaminated water, and the immune sensitivity of children. Extraordinary caution is required in interpretation of such contradictory results from a "novel" study. And third, the CHEERS study suffers from inherent limitations and flaws that limit its strength and applicability. In addition to the limitations inherent in all

epidemiologic research, it was not sufficiently powered to assess impacts on sensitive populations, and was subject to the common problems of bias, confounding, and unaccounted-for variables.

1. Important Elements of the CHEERS Study Findings Weigh in Favor of Disinfection

Although the District is offering the CHEERS study as a basis for opposing disinfection, key CHEERS findings support disinfection. Given the nature and inherent statistical characteristics of epidemiologic research, these findings should be given significant weight.

a. Eye Symptoms findings

First, the CHEERS study found a positive correlation between risk of "eye symptoms" (eye redness, itching, discharge or crusting) and CAWS recreation. That is, the odds of CAWS recreators developing eye symptoms as a result of CAWS recreation are 37 percent greater for CAWS recreators than for GUW recreators, and 55 percent greater than for non-water recreators. CHEERS Report at xxxviii, IX-43 *et seq*.

This positive correlation should be afforded greater weight in assessing CAWS risk than the negative study findings. Dr. Sam Dorevich, principal investigator for the CHEERS study, acknowledged that in performing the power calculation for the study (*i.e.*, determining the number of participants necessary to yield a statistically meaningful result), the researchers "used typical values of a 1 in 20 chance of a false positive result and a 1 in 5 chance of a false negative result." That is, here as in typical epidemiologic research, the chance of a false positive result – *i.e.* a finding of a risk association where there actually is not one – is much lower than the chance of a false negative result – *i.e.*,

failing to find a risk association where there actually is one. *See* 10/19/10 at 138-39; USEPA CHEERS Comment (PC # 561) (discussing why the 1 in 5 false negative rate minimizes the significance of the failure to find a difference between CAWS and GUW GI illness rates). This is consistent with the testimony of both Drs. Gorelick and Orris, who emphasized that negative epidemiologic results should always be viewed with some skepticism given the inherent bias toward the negative in such research, and need to be reproduced before they can be relied upon (*see* subsections III.A.1.a. and c., *infra*). Positive epidemiologic results are less likely to be false, and therefore "may provide sufficient evidence to justify preliminary action." Gorelick 8/4/08 Testimony (Ex. 233) at 7; *see* subsection II.A1.c., *infra* (regarding epidemiologic "bias toward the null").

b. Level of GI Illness exceeds USEPA's risk benchmark

The CHEERS study found 12.5 additional cases of GI illness per 1,000 CAWS recreators than among the population of non-water recreators, and 13.4 additional cases per 1,000 GUW recreators. *See* CHEERS report at V-1 *et seq*. The USEPA CHEERS Comment found it "noteworthy" that these numbers are substantially higher than the risk benchmark used by USEPA for recreational waters, which is 8 illnesses per 1,000 recreators (PC # 561; *see* Ex. 256 at 21). Thus, the CHEERS report has concluded that more people are getting sick on both the CAWS and the GUW than USEPA considers acceptable from a risk standpoint.

As discussed in the EPA CHEERS Comment (PC # 561), it is of little consequence that the CHEERS study found equally high rates of GI illness among GUW recreators given that *both* the GUW *and* the CAWS are significantly impacted by sewage contamination. While indicator and pathogen levels in the CAWS were overall higher

than in GUWs, the GUWs are not meeting recreational water quality standards. The USEPA CHEERS Comment concluded that, for this reason, the entire comparison between illness rates on these two contaminated sets of waters is "ill advised." It states,

> [F]rom a water quality perspective, the water in the GUW classification were not meeting applicable microbial water quality standards and microbial indicator concentrations, which suggests that the GUW waters are impacted by fecal contamination. As a result, the illness rate in the GUW waters should not be used as a reference population (unexposed to non-disinfected wastewater) upon which to compare CAWS waters….[T]he study was designed to have a 1 in 5 chance of not detecting a difference between study groups when in fact there may have been a difference. Since there was a 20% chance of making such a false negative error, and both the CAWS and GUW sites appear to be polluted with sewage, it is not surprising that the study did not detect a different level of health effect between the CAWS and the GUW groups.

Specifically, the Lake Michigan beaches, the Fox River, the Des Plaines River, and the DuPage River – all part of the CHEERS study GUW category – are listed as impaired for fecal coliform on IEPA's 2010 § 303(d) list of impaired waters.[15] Indeed, Jackson Park Beach and Montrose Beach, two of the beaches included in the CHEERS study GUW (CHEERS Report at II-2) were listed as two of the most bacterially-polluted beaches in Illinois in NRDC's 2010 Testing the Waters report.[16] Jackson Park Beach was ranked the dirtiest beach in the state, exceeding bacterial standards 66 percent of the time, and Montrose Beach was found to exceed those standards 31 percent of the time. The fact that a bacterially-contaminated river reflects similar illness rates to bacterially-impaired beaches – even leaving aside all the methodological problems contributing to that

[15] *Available at* http://www.epa.state.il.us/water/tmdl/303d-list.html (last accessed December 15, 2010).
[16] *Available at* http://www.nrdc.org/water/oceans/ttw/sumill.pdf (last accessed December 15, 2010).

equivalence – is neither surprising nor supportive of a decision to simply ignore the entire problem.

As discussed in further detail below, there are other reasons as well why little stock should be placed in the comparison of CAWS vs. GUW illness rates. First, within the 95 percent confidence bounds of the study, the CAWS rates may well have been significantly higher and the GUW rates significantly lower – we simply do not know unless and until the study is sufficiently replicated (*see* subsection III.A.1.a., *infra*). Second, the CHEERS study suffered from numerous potential biases, including most notably heterogeneity bias – *i.e.* failure to differentiate cleaner portions of the CAWS and GUW from more polluted areas. As with most inherent flaws and shortcomings in epidemiologic research, this type of methodological bias contributes to "bias toward the null" – *i.e.*, negative results that fail to identify differences that may actually exist (*see* subsection III.A.1.c., *infra*). In this regard, the USEPA CHEERS Comment (PC # 561) noted generally that there were important differences between the CAWS and GUW user subgroups that may have influenced the failure to find a difference in GI illness between the two, but that were inadequately addressed in the CHEERS Report. It states,

> There are many differences in the population of users, the types of activities occurring within the study groups, the duration of activities, the precautions taken by the users, the self-reported exposures and potential ingestion of the two groups that limit the usefulness of the comparison between the CAWS and GUW groups. . . . Discussion of the differences among the subgroups was unclear. For example, it was not always clear whether the reported differences among subgroups discussed in the report were corrected for differences among the users that may have affected illness rates. It was unclear how well any such calculations were able to control differences among the groups that could contribute to potential differences in illness rates.

These concerns with failure of the CHEERS study to fully account for biases and confounding factors, identified also by Dr. Gorelick, are discussed in more detail in subsection III.A.5, *infra*.

2. The CHEERS Study Suffers from the Limitations Common to Epidemiologic Studies and All Scientific Research

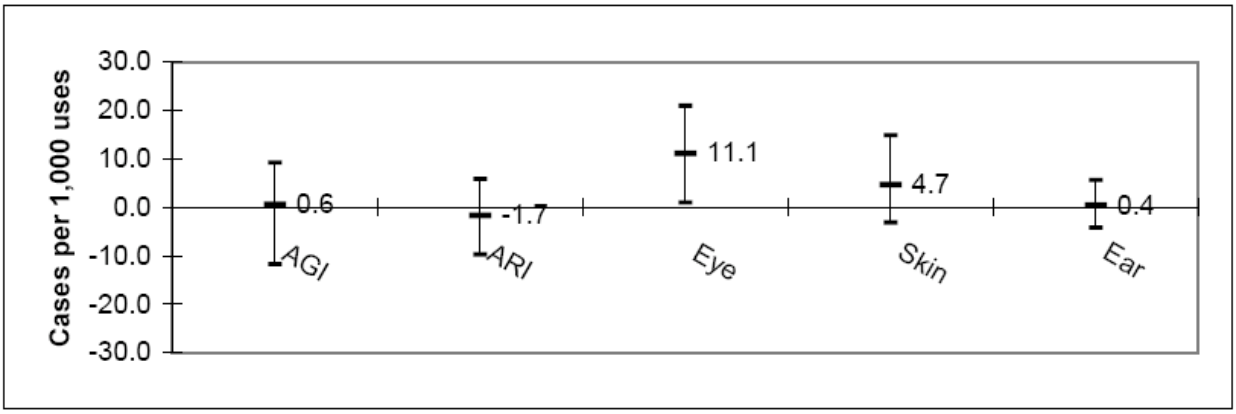
Basic to all science is the tenet that research must be replicated to determine whether the initial results are flawed. Beyond that bedrock scientific caveat, however, is an added layer of uncertainty that attends epidemiologic research, as well as limits to its applicability to certain types of risks. These principles were explained in depth at hearing by Dr. Orris and Gorelick, both of whom have careers devoted to epidemiologic research but comprehend well its inherent limits.

a. Need for replication

A fundamental tenet of scientific research is that scientific results must be replicated in order to be considered valid. Gorelick 8/4/08 Testimony (Ex. 233) at 7. Indeed, a substantial part of scientific inquiry consists of attempts to reproduce others' scientific results in order to determine their legitimacy – particularly when public health is at stake. *Id*. Dr. Gorelick testified that when he was involved in a decision whether to forgo a public health measure (CAT scans for children with certain types of head injuries), the decisionmakers had "8 or 10" studies of the subject, one with 42,000 participants. 6/30/10 at 14-15. Similarly, in the BEACH Act settlement between USEPA and NRDC (Ex. 58), USEPA agreed to develop new recreational water quality criteria based on multiple new epidemiologic studies, as well as a review of the body of existing scientific literature concerning recreational health risks. (Ex. 58 ¶¶ 4, 13)

Replication is not merely a belt-and-suspenders double-check on findings that everyone basically trusts. For one thing, in fields such as epidemiology where bias, confounding, missing data and other problems affecting the quality results are inevitable even in the best studies, it is essential that additional research root out and try to correct for those problems. (*See* subsection III.A.1.a., *infra*). This is particularly the case when a study's findings contradict multiple previous studies and scientific tenets that are considered well established. (*See* subsection III.A.3, *infra*) That is not to say that the new findings are necessarily wrong or suspect, merely that the contradiction renders it doubly important to try to verify and understand them.

For another, epidemiologic research (as with most statistical analysis) produces results only within 95 percent confidence bounds. Thus, rather than being presented as a pinpoint, they are presented as a range of possibilities within these bounds. This is illustrated by the following summary chart from the CHEERS report, comparing risk to CAWS vs. GUW recreators:



CHEERS Report at ii. While the CHEERS study concluded, for example, that CAWS recreators will suffer only 0.6 more cases of GI illness than GUW recreators (far left

vertical bar), the 95 percent confidence range vertically surrounding the 0.6 number indicates that the number could be as high as 10 additional cases within the 95 percent confidence range. Thus, even taking at face value Dr. Dorevich's statement that he would be "surprised" if a replication study reached conclusions inconsistent with the CHEERS study, a finding of 10 additional cases of illness per 1,000 CAWS recreators would, in fact, be statistically consistent with the CHEERS findings. 10/20/10 at 135. We simply do not have a good sense of which end of the 95 percent confidence bar to look at without further study.

The need for replication is further grounded in another problem common to statistical analysis: the occurrence of random statistical flukes. As Dr. Dorevich acknowledged, any time an attempt is made to look at statistical associations, there will be times when the data appear to be significant but in fact are the result of happenstance. 10/19/10 at 144-45. This problem may well, in fact, be reflected in some of the highly anomalous data presented in the Revised CHEERS Report documenting the findings of Study Objective # 2. The data reflect several statistical differences that, as a medical and scientific matter, have no known explanation: that enterococci are correlated with GI illness on GUW waters but not on the CAWS; that females are at a higher risk on the CAWS than males; and that antacid use is correlated with a higher risk on GUW waterways than on CAWS waterways. Revised CHEERS Report (PC # 556) at XI-11, XI-15-17. The CHEERS researchers state simply, in evaluating these findings, "The basis for this difference between the predictive value of enterococci for CAWS vs. GUW recreation is not known." Revised CHEERS Report (PC # 556) at XI-27. Given that the dose-response relationship between pathogen exposure and illness is scientifically well

established; that there is no known reason why that relationship would apply differently in the CAWS; and that in both CAWS and GUW waters illness rates increased with levels of exposure to enterococci (with the only difference being that the increase was not statistically significant for CAWS recreators – *cf.* Tables XI-9 and XI-14), there would be substantial basis to conclude that the difference between the two waterbodies was merely a statistical fluke. The sensible and time-tested scientific response to such data anomalies is to perform further study to determine if the anomalies are genuine or merely data flukes; and, if the former, assess their cause.

b. Inherent limitations of non-laboratory research

The Environmental Groups' witnesses have testified that epidemiology differs from many other types of scientific research in that it is not performed under controlled laboratory conditions, but rather out in the real world where countless variables and happenings may influence the result. 4/15/09A at 8-9, Gorelick 8/04/08 Testimony (Ex. 23) at 6. For instance, Dr. Gorelick compared epidemiologic research concerning illness which has multiple causes – such as GI illness or the other symptoms studied by the CHEERS researches – to "looking for a needle in a haystack." Gorelick 8/4/08 Testimony (Ex. 233) at 10. He stated,

> The types of waterborne pathogens associated with sewage frequently cause diarrhea and stomach upset, and occasionally fever. These types of symptoms are, of course, extremely common. Millions of cases of diarrhea, fever, and vomiting occur every year in this country that having nothing to do with waterborne pathogens. All of these symptoms have dozens of potential causes. Thus, it is an extreme challenge to try to separate out water recreation as a cause of any of them…

Id. Similarly, Dr. Orris – a senior colleague of Dr. Dorevich at UIC -- observed,

> [I]t would be ill advised to draw policy conclusions – particularly conclusions on so well documented, and historically important, a subject as protecting the public from waterborne pathogens – from any negative result in a single epidemiological study. Epidemiological studies are by nature blunt instruments, based in our everyday world with multiple influences. They require repetition and the study of large populations. Illness in recreational users of the CAWS may well be missed even in this excellent first epidemiologic look at this issue.

Orris Testimony (Ex. 234) at 5; 4/15/08A at 8-12. Plainly, epidemiologists themselves have a healthy skepticism concerning the ability of their studies to accurately capture real-world risk. The Board would do well to adopt that skepticism in reviewing the negative CHEERS study results.

The "needle in a haystack" problem inherent in non-laboratory observational research is clearly at issue in the CHEERS study. A fundamental premise of the study – or, at least, of any attempt to use it as a basis for a public policy decision concerning risks to CAWS users – is that the only relevant variable between the CAWS and GUW is disinfection. That is, in order to determine that the CHEERS study supports a conclusion that lack of disinfection is not putting CAWS recreators at greater risk than GUW recreators, one has to make an assumption that the CAWS and GUW waters are fundamentally alike in every respect except the presence of disinfection. That assumption, however, has not been documented, and is in some cases clearly contrary to fact. The CAWS is a flowing waterbody – potentially making it harder to identify pathogen levels encountered by any particular recreators (*see* Revised CHEERS Report at XI-28 concerning the difficulty of correlating samples with recreators) – but the GUW waters on which the majority of CHEERS recreators were found are still lakes. Nothing has been done in the CHEERS study to document other differences between the GUW

and CAWS waters, such as differences in water chemistry or temperature. We simply do not know the impact of these real-world variables on the CHEERS study results. Indeed, the otherwise unexplained anomalies reported with respect to Study Objective # 2 (*see* subsection A.2.a *supra*) might be attributable to these sorts of differences.

c. Bias toward the null

As referenced above, standard statistical analysis used in epidemiologic research assigns a far greater possibility of false negative results – *i.e.*, failure to find an association – than to false positive results. *See* subsections III.A.1.a. and III.A.2.c., *supra*. Compounding this distinction is the "bias toward the null" that results from flaws in epidemiologic methodology. That is, biases, failure to account for differences in environment and study population, failure to account for confounding factors, and the like will most likely have the effect of erasing risk distinctions rather than creating them. 6/30/10 at 43-44, 10/20/10 at 95-96. Dr. Dorevich took the position in hearings that methodological biases affecting one study group would be essentially canceled out by "equal and opposition potential bias" affecting the other study group (6/29/10 at 88-91, 10/19/10 at 69-70), but this view is consistent with neither the science of epidemiology nor the CHEERS study itself.

Indeed, bias toward the null was expressly acknowledged by the CHEERS researchers in the Revised CHEERS report. The researchers acknowledged that, due to limitations on sampling frequency and location, "it is likely that our estimates of microbe concentration do not perfectly reflect the exposure of individuals." They concluded,

> There is no reason that the estimates of water quality we utilized as surrogates for individual exposure systematically over- or underestimated

> microbe concentrations at the time and place of exposure. In general, such imperfect estimation of exposure would bias epidemiologic *results towards the null*. In other words, hypothetical measurements of microbe concentrations to which individuals were actually exposed (or ingested) may have been more strongly associated with the health outcomes we described.

Revised CHEERS Report (PC # 478) at XI-28 (emphasis added). Additional methodological flaws documented in the sections below likely further contributed to bias toward the null in the CHEERS study. Thus, for this reason as well, negative epidemiologic results should be viewed with caution and skepticism.

d. Inapplicability of epidemiologic conclusions to rare but severe events

While all recreators who experience any exposure to pathogen-contaminated water are in principle at some risk, certain types of unusual events risk far greater exposure and potential health consequences. That is, most people who recreate in boats will experience "incidental contact" with water in the general sense, *e.g.*, getting splashed. However, only rarely will a catastrophic risk event occur – for instance, a member of an immune sensitive population such as a child falling out of a kayak in the CAWS and consequently ingesting multiple mouthfuls of water.

Epidemiologic studies are simply not designed to capture and study the risk of these unusual but dangerous events. Their infrequency makes it essentially impossible to obtain a study sample that will yield statistically significant results. In the CHEERS study, only a small fraction of respondents stated that they swallowed a mouthful or more of water (*see* CHEERS Report Section II tables), but those who did suffered a five-fold increase in risk of GI illness. CHEERS Report (PC # 478) at V-16. As. Dr. Gorelick stated, "[t]he risks to users of the CAWS are not uniform for all users. Rather, this is a

situation where there are potentially severe risks to a small but significant subcategory of users." Gorelick 8/04/08 Testimony (Ex. 233) at 11-12.

The problem is that while such types of catastrophic events are rare, regulators should and do consider them in determining whether public health measures should be taken to minimize the risk associated with them, based on the precautionary principle. The fact that children do not often fall out of kayaks in the CAWS, such that this event is not statistically documented as a risk in the CHEERS study, does not mean that the Board should decline to consider the potentially very severe health consequences when it inevitably occurs. Dr. Orris drew the analogy to a community deciding to install a traffic light at a dangerous corner, even where the threat was of a rare catastrophic accident rather than continuous occurrence of low-severity incidents that were more readily subject to statistical analysis:

> An epidemiological study gives us the risk of events that may occur to a certain number of individuals within a population. In this situation, we are concerned in substantial part with unexpected events (falling in the water) affecting especially vulnerable individuals, such as young children, and having potentially dire effects. This scenario is not susceptible to epidemiological conclusions about risk in the establishment of precautionary public policy. This precautionary rationale suggests, for instance, that a community should not hesitate to install a traffic light on a street corner because an epidemiological study indicated that only one child in the neighborhood was likely to die at the corner each decade if everyone obeyed the speed limits.

Orris Testimony (Ex. 234) at 1-2; 4/15/09 at 20-21. Or, to use another analogy raised in this proceeding, an epidemiologic study comparing modes of travel might find no catastrophic airplane crashes during the study period, as compared with automobile accidents. While this finding might substantiate a general conclusion that air travel is safer than automobile travel, it would not substantiate a regulatory decision to conclude

that catastrophic airline accidents are too rare to be worth worrying about, and to forego taking measures to prevent them. 9/24/08A at 75-78.

e. Limits to generalizability

Even an epidemiologic study without obvious methodological flaws may, for any number of reasons, not produce results that are generalizable to the population at large. That is, no matter how carefully an epidemiologist may evaluate data gathered from the study population, that population may not be representative of the larger "target population" concerning which the results are to be applied. Gorelick 9/20/10 Testimony (Ex. 415) at 13.

Problems with generalizability frequently go unidentified. But at least one such problem is clear from the CHEERS study data – that of selection bias. As explained by Dr. Gorelick, the distribution of activities (*i.e.* the proportion of recreators who kayaked, fished, motor boated, *etc.*) among study participants differed markedly from the distribution of activities among CAWS recreators generally. Specifically, the CHEERS study enrolled fewer power boaters and more kayakers than were observed by CHEERS researchers among the general population. *See* CHEERS Report (PC # 478) at II-18, Gorelick 9/20/10 Testimony (Ex. 415) at 5-6; 10/20/10 at 100-101. This difference may well be clinically significant, impacting the generalizability of the study in a concrete way, because the CHEERS study found that motor boating – underrepresented in the study as compared to the general population – was among the activities correlated with the highest risk of illness. CHEERS Report (PC # 478) at V-38, Gorelick 9/20/10 Testimony (Ex. 415) at 6.

3. Extreme Caution is Necessary Where, as Here, Study Results Contradict Established Scientific Knowledge

As discussed in Section I.C, *supra*, there is an overwhelming body of medical and scientific knowledge concerning pathogens and the risks associated with human exposure to them. Many of the CHEERS study findings contravene this body of knowledge, including a number of earlier studies showing a risk of illness to non-primary contact recreators in contaminated water, especially children. That does not mean the CHEERS study is necessarily wrong. But nor does it mean that it is right – either generally or specifically to the CAWS – merely because it is the latest study, or because it was conducted on the CAWS and not somewhere else.

The proper solution to anomalous and contradictory study results is not simply to adopt them and throw out the previous research, but rather to study the problem until the source of the differences is understood. While the Environmental Groups are firmly in favor of ongoing scientific study of risks to recreators, we clearly know enough now about those risks, based on existing medical knowledge and many years' worth of previous scientific studies, to act now.

a. Multiple previous epidemiologic studies showing risk to recreators remain applicable notwithstanding differences in exposure levels

It is well established that there is, generally speaking, a dose-response relationship between illness and pathogens. That is, as exposure to pathogens increases, the likelihood of getting sick from them increases directly (if not always linearly). Gorelick 9/20/10 Testimony (Ex 415) at 12; see 10/20/10 at 103, 168-71. Additionally, there is a substantial body of work supporting the conclusion the levels of bacterial indicators in recreational waters such as *fecal coliform* and *E.Coli* are generally predictive of health

risk. *See* subsection I.C.1, *supra*. *See also* USEPA's December, 2010 Completion Notice of studies concerning the correlation between indicators and GI illness rates, *available at* http://water.epa.gov/scitech/swguidance/waterquality/standards/criteria/health/recreation/upload/CN-P15_FINAL.pdf (last accessed December 29, 2010).

On top of this general knowledge are a number of studies that specifically correlate water recreation in sewage-contaminated water with an increased risk of illness. Many of these studies, listed in Dr. Marylynn Yates' testimony and in most cases acknowledged by the CHEERS researchers, concern specifically non-primary contact recreation. Specifically, Dr. Yates listed the following studies documenting the risk to non-primary contact recreators:

TABLE 2. STUDIES OF RISKS TO RECREATORS

Activity	Number of subjects	Microbial Concentration	Comments	Risks	Reference
windsurfing	79 competitors 41 controls	fecal coliforms: 1000/100 ml (estimated)	competitors and non-competitors were followed for 9 days for occurrence of gastrointestinal, wound, skin, ear, and eye infections	Competitors were 2.9 times more likely to have at least 1 symptom of an adverse health effect, and 6.9 times more likely to experience diarrhea, than non-exposed individuals	DeWailly et al.,1986

white-water canoeing	146 canoeists 173 controls	fecal coliforms:285/100 ml (geometric mean) enteroviruses: 198 pfu/10 L	canoeists and non-canoeists were followed for 28 days for occurrence of gastrointestinal, respiratory, skin, ear, and eye infections	Canoeists were 2.04 times more likely to have at least 1 symptom of an adverse health effect, and 4.25 times more likely to experience gastrointestinal illness, than non-exposed individuals	Fewtrell et al., 1992
white-water canoeing	206 canoeists 173 controls	fecal coliforms:22/100 ml (geometric mean) enteroviruses: 0/10 L	canoeists and non-canoeists were followed for 28 days for occurrence of gastrointestinal, respiratory, skin, ear, and eye infections	Canoeists were 1.28 times more likely to have at least 1 symptom of an adverse health effect, and 1.43 times more likely to experience gastrointestinal illness, than non-exposed individuals	Fewtrell et al., 1992
canoeing	577 canoeists 207 controls	not reported	examined blood samples for evidence of immune response following exposure to waterborne pathogens	Canoeists (≤30 years old) had a 1.58, 1.34, and 7.87 times higher chance of having evidence of being exposed to hepatitis A virus, norovirus, and *Shistosoma*, *respectively*, than non-canoeists.	Taylor et al., 1995

fishing	46 samples	not reported	surfaces of anglers' hands and fish were examined for the presence of *Cryptosporidium*	Based on the concentrations of *Cryptosporidium* detected in the water after washing of the fish or anglers' hands, the mean probabilities of infection were 11% and 81%, respectively.	Roberts et al., 2007

Yates Testimony (Ex. 249) at 16-17. In addition, there is, of course, a significant body of scientific study connecting primary contact recreation in sewage-contaminated waters with increased levels of illness, particularly for children. *See* studies summarized in K. Pond, *Water Recreation and Disease Plausibility of Associated Infections: Acute Effects, Sequelae and Mortality*. World Health Organization 2005 (Ex. 396); and A. Pruss, *Review of Epidemiological Studies on Health Effects From Exposure to Recreational Water*. International Journal of Epidemiology 1998:27 1-9 (Ex. 393) ("Pruss 2008"). These studies are relevant as a general matter to assessing incidental contact risk, as the only variable differentiating the results from limited contact recreational use is degree of exposure, which may reduce but not eliminate the risk differential; and can, in the case of accidental immersion, approximate swimming exposure. *See* 5/5/09A at 31-32, 49-50.

The CHEERS study confirmed the well-established correlation between water recreation and GI illness. Gorelick 9/20/10 Testimony (Ex. 415) at 13. However, while it found pathogen and indicator levels to be elevated in the CAWS as opposed to GUW,

as discussed *supra*, it did not find a statistically significant difference in illness rates between them. CHEERS Report (PC # 478) Section V. Thus, its findings are internally anomalous – *i.e.*, finding an elevated risk of GI illness associated with water recreation generally but not an increased risk associated with increased contamination – and contrary to a large number of previous studies which did specifically find a link between sewage contamination and GI illness. Even the peer reviewers found this result surprising. CHEERS Report (PC # 478) Appendix D-2; Gorelick 9/20/10 Testimony (Ex. 415) at 12. We note, in this regard, that both USEPA and Dr. Gorelick also expressed concern with the study's anomalous finding that motor boaters, while less likely to get wet than kayakers, are at greater risk than kayakers, contrary to the generally-known direct correlation between increased exposure and increased disease risk (although this anomaly could potentially have been due to the study's failure to account for alcohol consumption as a confounder). PC # 561, 10/19/10 at 90, 171, 181. USEPA stated, "It is unclear how both these patterns can exist in this data set." PC # 561.

The District and the CHEERS researchers emphasize that the previous studies concerned potentially different exposure levels than were experienced by CAWS recreators (who arguably may get less wet on calm water as opposed to whitewater); and that the CHEERS study is the first epidemiologic study of limited contact recreation performed on the CAWS, a "novel" endeavor – novel not only for the CAWS but for the entire United States. 6/29/10 at 26-27.

The suggestion that differing exposure levels account for the contradiction between the CHEERS study results and the larger body of epidemiologic research concerning water recreation is pure speculation, not supported by any data presented in

the CHEERS Report. Gorelick 9/20/10 Testimony (Ex. 415). Even more importantly, however, the analysis of exposure levels is a weak link in the CHEERS study, far from sufficient to support distinguishing away the remaining body of water recreation research. The CHEERS survey questions concerning exposure suffered from ambiguities or other deficiencies that may have substantially diminished their ability to gather accurate and relevant data.

While the study questions specifically concerning ingestion of water were validated (through the studies of recreators in swimming pools – *see* 10/19/10 at 54), the questions concerning non-ingestion exposure were not. *Id*. As discussed by Dr. Gorelick, validation of study questions is an important safeguard to ensure the quality of data obtained. Dr. Gorelick has published studies concerning validation of his own study questions. Gorelick 9/20/10 Testimony (Ex. 415) at 4; 10/20/10 at 94; M. Gorelick, D. Wagner, S. McClellan, *Development and Validation of a Self-Administered Questionnaire to Measure Water Exposures in Children."* Ambulatory Pediatrics 2008;8:388–91 (Ex. 416). Here, as Dr. Gorelick explained, there was substantial potential for differing understandings of the terms used, and hence skewed data as a result:

> How well would people agree on the meaning of the terms – "sprinkle" vs. "splash," for example? Is the level of agreement on what these terms mean similar across the entire spectrum? Or are people more or less in agreement when estimating the extremes (none vs. submerged), but less so in the middle of the range? Does the accuracy of the responses differ depending on the type of the activity, the duration of the activity, or the characteristics of the respondent?

Gorelick 9/20/10 Testimony (Ex. 415) at 5. *See* 10/19/10 at 69.

This lack of validation compounds a second problem identified by Dr. Gorelick. The exposure data – which includes both immersion and non-immersion exposure – was compiled into a single "wetness score" using a method devised by the CHEERS researchers but, once again, not validated. Gorelick 9/20/10 Testimony (Ex. 415) at 5, CHEERS Report (PC # 478) Section II and V-17. This method potentially masks important risk distinctions among different types of exposure. As Dr. Gorelick explained the problem,

> While the concept of combining these exposures into a "wetness score" seems at first blush both creative and sensible, clinical scoring systems such as this require validation to determine their properties and ultimate accuracy. For example, is a score of 4 obtained from a sprinkle to four different body parts equivalent, in terms of its contribution to risk, as a score of 4 from having one body part submerged? And how does the scaling work? That is, is the differential between 1 and 2 the same as the difference between 5 and 6, or 15 and 16 from a risk standpoint?

Gorelick 9/20/10 Testimony (Ex. 415) at 5.

Third, as professional kayak instructor and CHEERS study participant Sharon Bloyd-Peshkin explained, even the validated questions concerning ingestion were inherently limited their ability to capture the radical difference in exposure between CAWS and GUW kayakers. Ms. Bloyd-Peshkin articulated the difference as follows:

> When I take kayakers on waterways that are thought to be relatively clean – Lake Michigan, the Fox River, the DuPage – we deliberately get very wet. Beginners practice hanging upside down in their boats while awaiting a rescue, and swimming out of their overturned boats to safety – essential skills for safe paddling. More advanced paddlers purposely capsize as we push the limits of our skills and practice rolls and rescues. In other words, we not only don't worry about getting a little wet on these rivers, we encourage it.
>
> Paddling on the Chicago River is a completely different experience. I am not willing to teach most kayaking skills on the Chicago River because, as noted above, teaching those skills requires getting quite wet. I have only

> led one sightseeing trip on the Chicago River. We did our best to stay dry, and I warned people to avoid touching the water.

Bloyd-Peshkin Testimony (Ex. 419) at 2. The problem with the CHEERS study exposure questions is that the most that recreators could report swallowing was "one mouthful or more"; and furthermore did not allow participants to differentiate between a single quick immersion and a prolonged immersion, as was more likely to occur on GUW *Id*. at 2, CHEERS Report (PC # 478) Section II. Ms. Bloyd-Peshkin observed,

> When we are on the Fox River, Lake Michigan or other place where we are not worried about water quality, we are underwater or in the water for large amounts of time. We certainly get some water in our mouths and noses every time we fall in (intentionally or not). However, the CHEERS study questionnaire did not allow us to differentiate between swallowing many mouthfuls, as we often do, and swallowing only one mouthful.

Bloyd-Peshkin Testimony (Ex. 419) at 2. *See* Gorelick 9/20/10 Testimony (Ex. 415) at 5; 10/20/10 at 143, 149.

This points to a fourth exposure assessment problem identified by Dr. Gorelick and supported by Ms. Bloyd-Peshkin's experience – that of recall bias. As an overall matter, there are inherent recall issues that likely diminished the ability of the CHEERS study to gather accurate data. Dr. Gorelick raised multiple questions concerning the ability of participants to recall accurately their degree of exposure:

> How well do people recognize whether each part of their body got wet? What if someone reaches over and immerses their hand in the water, and at the same time someone splashes their head or torso – would they know it happened? Will they recall each exposure accurately at the end of a several hour trip? And do people recall the extremes – *i.e.*, not getting wet at all or getting totally submerged – better than they remember the events in the middle of the range such as getting splashed?

Gorelick 9/20/10 Testimony (Ex. 415) at 4. Ms. Bloyd-Peshkin described the general difficulty of remembering specifics concerning water exposure after a day of kayaking:

> [A]t the end of a full day of capsizing, rolling, and dunking, it is as a practical matter not really possible to estimate accurately how much water was ingested. The problem is compounded when dealing with beginners. When beginners capsize on a river that is considered clean, they often tend to panic and forget really basic things, like the instructions they were given to hold onto the boat and the paddle. I seriously doubt that when they can't recall such basic safety instructions, that they can realistically remember how much they swallowed with any sort of accuracy.

Bloyd-Peshkin Testimony (Ex. 419) at 2-3. As explained in subsection III.A.2.c, *supra*, errors such as this one are likely to lead to bias toward the null (*i.e.*, failure to find a difference in risk).

Compounding these more basic recall issues, however, is the fact that recreators who perceive the CAWS as being heavily contaminated – as do Ms. Bloyd-Peshkin and according to her many others – are far more likely to recall getting wet in the CAWS. That is, recreators who have been told to keep their hands in the boat, use sanitizer, and avoid getting wet are far more likely to remember if they do get wet than recreators on cleaner water who have no particular reason to pay attention. Dr. Dorevich acknowledged that differences in reported wetness between CAWS and GUW participants probably "does have something to do with perceived risk and efforts to avoid water contact at the CAWS," but that the CHEERS study did not analyze possible reasons for this difference. 10/19/10 at 72, 77. While the CHEERS study asked one survey question regarding how safe participants perceived the CAWS to be for recreation, *see* CHEERS Report (PC # 478) at II-18, it asked *no* questions to ascertain how dangerous they perceived the CAWS to be *relative* to GUW waters. Thus, there is no way to know whether a perception of the CAWS as being more contaminated and

dangerous – which is widespread among recreators, according to Ms. Bloyd-Peshkin – resulted in recall bias.

Finally, as recognized in the USEPA CHEERS Comment (PC # 561), level of exposure in the CAWS is inherently a moving target, such that exposure levels today should not be used as a benchmark for gauging future exposure and associated illness levels. There is no reason to believe that exposure levels – resulting from the mix of participants, activities, and behaviors – will not increase in the future. The Comment states:

> EPA notes that the illness rates reported in CHEERS for the CAWS represent conditions from 2007-2009, when state and local authorities worked on several fronts (including the installation of detailed warning signs at access sites) to inform CAWS users to avoid contact with water. While the 2007-2009 timeframe represents a greater number of recreation users as compared to previous years, there is no information to suggest that the number of users, the intensiveness of the use, and/or the level of water exposure (either intentionally or unintentionally leading to greater contact with the water or less fastidiousness in activities that minimize exposure) will not increase in the future. Because increased levels of exposure were positively correlated with gastrointestinal illness risk, higher gastrointestinal illness rates in CAWS recreators are plausible over time.

In this regard, as the USEPA CHEERS Comment suggests and Ms. Bloyd-Peshkin's testimony confirms, the currently elevated contamination levels in the CAWS may result in recreators intentionally minimizing their exposure. However, the goal of the CWA is not merely to protect existing uses (although such protection is mandatory) but to protect uses deemed attainable as well. 33 USC §1251(a)(2); 40 C.F.R. §§ 131.10, 131.11, 131.20. Since the law is in this manner forward looking, the Board should not constrain itself to evaluating only the risks associated with present exposure levels that reflect fear of existing contamination.

If, therefore – as the District and the CHEERS researchers would have it – exposure levels are the defining difference between the CHEERS study and the larger body of research finding significant risk associated with recreational exposure to sewage-contaminated water, this difference is a rather tenuous thread on which to hang a decision to reject that body of research, and with it CAWS disinfection. Simply put, the fact that the CHEERS study documented a different level of exposure among CAWS recreators using non-validated and somewhat questionable methods is not reason to conclude that the CHEERS study alone among recreational epidemiologic studies is relevant to the Board's decision.

b. CHEERS study findings concerning risks to children and the elderly contravene research finding these populations are more vulnerable

Notwithstanding Dr. Dorevich's uncertainty on the point,[17] it is well established as a medical and epidemiologic matter that children are a "sensitive population" with both more severe symptoms and increased susceptibility to infection. 6/30/10 Transcript at 73; *see* studies cited *id*. at 27, 64-78 (Exs. 391-397). *See also* EPA 2009 workshop presentation, "Discussion Topic 1: Basing Criteria to be Protective of Children." Denise Keehner, Director, Standards and Health Protection Division, USEPA (Ex. 417) ("Keehner Presentation") at slide 6 (citing studies). Drs. Gerba and Haas, both of whom testified in this proceeding for the District, have expressly classified children as part of the estimated 20 to 25 percent of people who are sensitive to infection (a figure that Dr. Dorevich was likewise unaware of – *see* 9/23/08P at 102, 6/29/10 at 109). C. Gerba, J. Rose, C. Haas, *Sensitive Populations: Who is at the Greatest Risk?* International Journal

[17] 6/29/10 at 106.

of Food Microbiology 1996 (Ex. 257, also Ex. 394) ("Sensitive Populations"). *See* 4/15/08 at 110 (Dr. Orris testifies that the immunosentive condition "may tend to be all of us in one way or another.") See *also* 9/9/08 at 62-63. Additionally, the abstract to a 2004 article co-authored by Dr. Gerba concerning children and microbial risk assessment summarizes,

> A growing body of evidence indicates that the greatest risk of infection for enteric pathogens is for persons less than 19 years of age. Children are more likely to become ill from consumption of contaminated drinking water and recreational activities. These increased risks may be because immunological, neurological and digestive systems are still developing. In addition, children are more environmentally exposed to pathogens. For some enteric pathogens children may be the greatest at risk population.

N. Nwachuku and C.P. Gerba, Microbial Risk Assessment: Don't Forget The Children. Current Opinion in Microbiology 2004, 7:206–209 (Ex. 258).[18] There is also substantial research data – some also produced by Dr. Gerba – demonstrating the elderly and pregnant women to be sensitive populations as well. *See* 10/20/10 at 64-78; Sensitive Populations at 116-17 – again, notwithstanding Dr. Dorevich's professed lack of knowledge on the issue. 10/19/10 at 103.

The CHEERS study, however, found no increased risk to either children or the elderly – and expressly noted that its results contradict the Wade *et al* study of recreational risks to children. CHEERS Report (PC # 478) at V-1. Even leaving aside the significant problem that the study was underpowered to study these subpopulations (*see infra* subsection III.A.4), this anomalous finding, once again, cannot be interpreted as automatically overriding previous research findings to the contrary. Nor should the

[18] While the cited studies specifically concerned primary contact recreation, this fact has no bearing on the applicability of the underlying finding concerning the increased sensitivity of children to other types of recreational exposure. As Dr. Gorelick stated at hearing, "If there's Germ X in the water and you're exposed to it, how likely are you to get sick? That shouldn't matter whether it's drinking fishing, swimming, or anything. That's an immunologic phenomenon that shouldn't vary depending on what the source of the waterborne pathogen is." 6/30/10 at 77.

fact that the anomalous findings pertain specifically to the CAWS afford them more weight in decisionmaking concerning the CAWS. While one could perhaps speculate any number of reasons why the risk to children and the elderly might be different on the CAWS, the CHEERS study offers no data to support such speculation. *See* 10/20/10 at 128. Once again, as with many good scientific studies, the CHEERS study raises at least as many questions as it answers, which can only be resolved with further research and attempts to replicate results.

4. The CHEERS Study Was Not Sufficiently Powered to Study Risks to Vulnerable Subpopulations

In order to determine the proper sample size for the CHEERS Study, the researchers performed a "power calculation" to determine how many participants were needed to obtain statistically significant results. The number arrived at was 9,930 participants.

The CHEERS study was designed only to assess risks to the overall recreational population of the CAWS – old and young, healthy and sick, kayakers and motor boaters all lumped together. It was *not* designed to assess the risk specifically to subpopulations of users who may be more vulnerable than others – be they children, the elderly, pregnant women and others known to be more immunologically vulnerable than the general population (*see* subsection 3.b. *supra*; Sensitive Populations at 116-17), or subpopulations with greater exposure to the contaminated water.

Dr. Dorevich expressly acknowledged that in order to study any of these subpopulations with a statistical confidence level to match the CHEERS study, one would need 9,930 participants who were members of that subpopulation – 9,930 children, 9,930 elderly people, 9,930 people who fell into the water, or 9,930 whoever else.

9/24/08A at 52. *See* 6/29/10 at 67-69. By design, the CHEERS study lacked such statistical power for subpopulations among its 9,930+ participants. For example, the study included only 33 children under 4 years old and 148 children between 5 and 9 years old recreating on the CAWS; and only 131 CAWS recreators over 65.[19] The CHEERS study did not even attempt to separately evaluate illness rates for pregnant women, another known sensitive population. 6/29/10 at 102. Dr. Dorevich acknowledged that a study that is underpowered for any particular subgroup will detect only a "very high" elevated risk to that subgroup, not more subtly elevated risk. 6/29/10 at 40, 10/19/10 at 142.

The CHEERS researchers argue first, that the study is a valid basis for risk decisionmaking on the CAWS in this proceeding because it studies risk to the overall population of recreators. However, this approach does not account for the fact that regulators should and often do set standards to protect the most sensitive members of the general population. Indeed, while USEPA's 1986 recreational water quality criteria are not specifically protective of subpopulations, its "current thinking," as described at a 2009 workshop, is to "[d]erive a criteria value protective of children, provided data allow." "Current Thinking On Development of New Criteria." Elizabeth Doyle, OST, OW, USEPA October 6, 2009 (Chicago, IL) (Ex. 418) slide 12. *See* Keehner Presentation at slide 6 (documenting the heightened risk to children that USEPA is attempting to address).

[19] We note, as an additional problem, that the CHEERS study does not fully reflect the relative number of children using CAWS waters, as it studied recreators but not children engaged in educational programs or children wading and sometimes swimming. The record reflects many such activities. *See* 6/16/10 at 9, 16, 37-38, 80-81, 87, 111; 5/6/09 at 50.

Moreover, capturing a snapshot of current recreational patterns tells the Board nothing about the mix of users and their recreational activities that *would* take place if the CAWS were decontaminated. Ms. Bloyd-Peshkin testified that she and her colleagues avoid the CAWS as a kayak instruction venue due to fear of illness (Bloyd-Peshkin Testimony (Ex. 419) at 2); and many members of the public have testified to the Board that they would engage in more and different recreation on the CAWS if it were decontaminated. 6/16/08 at 29, 75, 115. As discussed *supra*, since the goal of the CWA is to protect not only existing uses but uses deemed attainable, the Board should not constrain itself to evaluating only the risks associated with present uses.

The CHEERS researchers did attempt to evaluate risk to certain subgroups, notwithstanding the small samples of those subgroups who participated, using a process called interaction analysis. CHEERS Report (PC # 478) Chapter IV; *see* Gorelick 9/20/10 Testimony (Ex. 415) at 8. While the interaction analysis did not identify any statistically significant risk associated with the various factors it evaluated, the peer reviewers pointed out that the interaction was not sufficiently powered to reliably identify such risk. CHEERS Report (PC # 478) Appendix D at D-10. One peer reviewer noted that there appeared to be elevated risk for CAWS users among some groups, but that these differences were ignored because they did not rise to the level of statistical significance. *Id*.

Clearly, the only way to actually determine the risk of illness to any sensitive subpopulation of users is to conduct a study expressly powered and designed to address that subpopulation. That is precisely what previous researchers have done with respect to immunologically sensitive populations, particularly children (*see* Keehner Presentation at

slide 6), and the CHEERS study has not. The Board should rely on the substantial body of existing research to conclude that immunologically sensitive subpopulations are at risk from contamination of CAWS waters.

5. The CHEERS Study Suffered From Multiple Methodological Flaws and Limitations

As all of the Environmental Groups' experts have testified, the CHEERS study represents fundamentally sound science. However, even sound science is not flawless, and the CHEERS study is no exception. As discussed above, the CHEERS study suffers from all of the inherent limitations of epidemiologic research, stemming from the fact that it is performed in the real world surrounded by multiple unknown and uncontrollable variables rather than in laboratory conditions.

In addition to these more general limitations, the CHEERS study reflected a number of specific methodological shortcomings – none of which render it bad science, but all of which detract from the reliability of its results. These shortcomings, to the extent not previously addressed herein, are detailed below.

a. Methodological bias

Epidemiologic studies are subject to numerous sources of bias, a technical term referring to errors in the way data are collected or recorded that can lead to misestimates of the association between exposures and risk outcomes. To the extent possible, researchers minimize bias. But since it is generally not possible to completely eliminate it, researchers also generally include an acknowledgement of potential bias in their write-ups of study results. Gorelick 9/20/10 Testimony (Ex. 415) at 3; 6/30/10 at 50.

The CHEERS study reflects multiple potential biases, most of which are not acknowledged in the final CHEERS Report. Several of these are discussed above,

including recall bias (including the possibility that memories of exposure may differ between CAWS and GUW recreators), bias from non-validated survey questions, and selection bias (in particular the lack of congruity between the distribution of activities observed on the CAWS and the distribution of activities among the study participants). Dr. Dorevich also acknowledged that the CHEERS study did not fully account for clustering bias. 6/29/10 at 85; *see* 6/30/10 at 89, 10/20/10 at 97-98.

Of particular note, however, is the problem of heterogeneity bias – the contrary-to-fact assumption that risk is uniform throughout the entire CAWS and the entire GUW respectively. In fact, CHEERS Report (PC # 478) Table V-9, which shows illness rates for various specific locations within the CAWS and GUW, reflects large differences – heterogeneity – in illness rates within the CAWS and GUW depending on location. That is, some CAWS waters are more risky than other CAWS waters, and the same holds for GUW. Within the CAWS, the illness rate ranges from 38.9 illnesses per 1000 recreators at CAWS-North to 61.7 per 1000 at Main Stem – a 59% relative difference. Similarly, the rates range from 39.9 to 59.4 per 1000 in the GUW depending on location. Yet despite these internal risk differences in CAWS and GUW waters, the analysis treats the entire CAWS as one group, and the entire GUW as another. *See* 10/19/10 at 48, 97-100. When heterogeneity is ignored in this manner, both waterways look more similar to each other in terms of risk than they truly are – *i.e.*, a bias toward the null. This bias may be particularly significant given that the largest proportion of participants comes from the areas with the lowest rates of illness, suggesting that the overall risk of illness from the CAWS (compared with the unexposed group) is an underestimate. *See* Gorelick 9/20/10 Testimony (Ex. 415) at 4.

The problem of heterogeneity bias is further compounded by selection bias pertaining to location: the percent of recreators observed at various locations does not match up with the percent of recreators in the CHEERS study from those locations. This bias may be clinically significant given that CHEERS participants recreating in the less risky portions of the CAWS are not only more numerous in an absolute comparison (as noted above) but are over-represented as compared with the target population. According to Table III-1, approximately 51% of all users observed on the CAWS were recreating on CAWS-North, while 67.9% of study participants in the CAWS group were enrolled at those locations (Table V-9). This over-representation of users of the less risky portion of the CAWS may bias the CHEERS study toward an underestimation of CAWS risk.

b. Incomplete adjustment for confounding factors

All observational epidemiologic studies are subject to confounding factors. That is, when study subjects go about the business of their everyday life during the course of the study, they will be affected both by the specific factor being studied (here, contamination in recreational water) and by other unrelated factors – *e.g.*, influences connected with their age, health, eating habits, gender, ethnicity, the season in which they choose to recreate, and the like. All epidemiologic studies go to great lengths to try to account for the influence of confounders such as these. *See* Gorelick 5/28/10 Testimony (Ex.390) at 5.

The CHEERS study did so as well, in a sophisticated and sound manner overall. Gorelick 9/20/10 Testimony (Ex. 415) at 9. However, as is often the case in epidemiologic studies, residual flaws in the analysis have the potential to skew the data.

In his testimony concerning the interim technical report submitted by the District in May, 2010 (PC # 300), Dr. Gorelick pointed out several confounding factors that were not included in the interim report analysis but which he believed should be: year, season, handwashing behavior, socioeconomic status, and duration of activity. While Dr. Dorevich took Dr. Gorelick's advice with respect to three of these factors – year, season, and handwashing behavior (although the latter analysis has yet to be submitted to the Board) – the CHEERS report still does not account for socioeconomic status and duration of activity. Gorelick 9/20/10 Testimony (Ex. 415) at 9. Additionally, Dr. Dorevich acknowledged another confounding factor, alcohol consumption, that the CHEERS study did not address. 10/19/10 at 183-84.

All of these omitted factors could potentially skew the study results, which would most likely contribute to bias toward the null (*see* subsection III.A.2.c., *supra*). Dr. Gorelick testified that "it's very clear from the literature, including some of the studies I've done, that socioeconomic status is related to your risk of gastrointestinal illness. It may or may not be related to where you choose to go recreate on the water, but it's certainly plausible that people from different neighborhoods,[20] who may have a different socioeconomic status, may choose to recreate on the CAWS versus general use waterways." 10/20/10 at 119. Unaccounted-for wide differences duration of exposure – for instance, as Ms. Bloyd Peshkin testified concerning tendency of recreators to say out on GUW for the whole day (Bloyd-Peshkin Testimony (Ex. 419) at 2) – could skew the results in multiple ways. For example, the distinction could contribute to recall bias given that recreators returning from a longer trip may have a more difficult time recalling exactly how many times they got wet and where than would recreators returning from a

[20] The word is in the transcript as "neighbors," presumably due to a transcription error.

brief trip. *See id.* at 2-3. And Dr. Dorevich acknowledged that alcohol consumption could have impacted the otherwise inexplicably high rate of GI among motor boaters. 10/19/10 at 183-84. *See* 10/20/10 at 104.

Additionally, the CHEERS researchers used a somewhat questionable and controversial methodology in determining which potential confounders to consider and which to ignore. This screening method involves examining the association between each of the confounders and the outcome on a one-by-one (bivariate) basis. Gorelick 9/20/10 Testimony (Ex. 415) at 9. Dr. Gorelick described this method as "potentially risky," because "multiple confounders may act in concert," such that "an association between one variable and another may not appear significant unless you account for the other confounders." *Id.* Dr. Gorelick stated that a more sound method would be to include in confounding analysis "any variable for which there is a strong biological reason to consider confounding should be included in the final analysis regardless of the results of the one-by-one screening."

c. Inability to account for asymptomatic illness

The CHEERS study is based on self-reported symptoms of illness, from recreators who reported in response to survey questions whether they felt sick. This method works reasonably well (leaving aside potential recall and study question bias) for assessing the types of pathogens that cause almost all of the people who contract them to get sick. However, many types of pathogens associated with sewage are asymptomatic for a large percentage of people infected with them. That is, these people will not feel sick, but are contagious, and may secondarily pass along the infection to others who then will get sick. An asymptomatic illness passed along secondarily to non-water recreators would be quite

difficult to trace back to water recreation as its original cause. *See* Gorelick 8/4/08 Testimony (Ex. 233) at 9-10.

The CHEERS study makes no real attempt to evaluate the impact of secondary transmission of illness. Although the survey includes questions regarding illness contracted by household members, those members are not study subjects; and the CHEERS study does not ask about non-household members who may have been secondarily infected by the recreator-participants – *e.g.*, coworkers or schoolchildren. *See* Gorelick 9/20/10 Testimony (Ex. 415) at 10. The Environmental Groups' point is not so much that the CHEERS study should have done this – clearly, it would be a complicated exercise – but merely to emphasize that a single observational epidemiologic study is at best, as Dr. Orris put it, a "blunt instrument," which should never be treated as definitive in a public health determination. Orris Testimony (Ex. 234) at 5.

d. Inability to account for variability in water conditions

All three of the Environmental Groups' experts – Drs. Gorelick, Orris, and Yates – pointed out in their 2008 testimony that the CHEERS study would have a difficult time accounting for ever-changing variables in the water that affect pathogen levels, such as water temperature, sunlight, and distance from the source. See Gorelick 8/4/08 Testimony (Ex. 233) at 10; Orris Testimony (Ex. 234) at 5; Yates Testimony (Ex. 249) at 17. Sampling at a particular point and time of day on the CAWS, where a recreator entered or left the water, would not provide accurate information concerning the level of pathogens in the water encountered by the recreator during the course of the trip, assuming most recreators do not choose to paddle in circles around their put-in point. 10/20/10 at 89-91. This problem would be compounded in trips of greater duration – as

noted above, a variable that was not considered in the CHEERS study confounding analysis. *See* subsection III.A.4. *supra*.

As it turns out, the three Environmental Groups' experts were correct. The CHEERS study researchers, although they sampled with reasonable frequency, expressly acknowledged in the Revised CHEERS Report the limitations in their ability to assess the exposure of particular individuals given the different water conditions those individuals likely encounter:

> Limitations of this study include the fact that in limited contact recreational activities, water exposure in general, and water ingestion in particular, occurs sporadically, and at different locations throughout an individual's recreation on the water. In this study water was sampled every two hours for indicators and every 6 hours for pathogens, and at points where recreation began and ended. Thus, it is likely that our estimates of microbe concentration do not perfectly reflect the exposure of individuals.

Revised CHEERS Report (PC # 556) at XI-28. The researchers further acknowledged that "[i]n general, such imperfect estimation of exposure would bias epidemiologic results towards the null." *Id*. *See* subsection III.A.2.c., *supra*.

Once again, the Environmental Groups' argument is not that the CHEERS study should have perfectly accounted for these variations in water quality – that would be as a practical matter impossible (although the CHEERS study could have improved the data analysis by including duration as a confounding factor). The point is simply that the CHEERS study is subject to substantial data gaps and limitations, and hence should not be treated as a definitive assessment of CAWS recreational risk.

6. CHEERS Study Objective # 2 Does Not Present Sufficient Data To Allow the Board to Develop Instream Recreational Water Quality Criteria

The District has taken the position that the Board should establish instream water quality standards before determining a technology-based standard, and asserted at the October 2010 hearings that CHEERS Study Objective # 2 -- the results of which were submitted December 6, 2010 in the Revised CHEERS Report – would provide a basis for the Board to do so. 10/20/10 at 35-36. The Study Objective # 2 results do not, however, provide that basis.

The Objective # 2 findings, set forth in section XI of the study report, set forth the CHEERS researchers' conclusions regarding the association between particular sewage pathogens and risks to recreators. As an initial matter, we note that this section reflects the unexplained anomalous results -- potential statistical flukes -- described in subsection III.A.1.a, *supra*, such as the correlation between enterococci and illness, and antacid use and illness, on the CAWS but not on the GUW. It also contains the acknowledgement described in subsection III.A.5.d., *supra*, that the CHEERS study was limited in its ability to assess the pathogen exposure of individual recreators who traveled to waters other than their entry and take-out point. Revised CHEERS Report (PC # 556) at XI-28.

These data gaps and anomalies aside, Section XI sets forth two conclusions pertinent in principle to establishing instream water quality criteria. First, it determined that only enterococci, and not *E.Coli*, constitute a valid indicator of health risk (fecal coliform was not studied). Revised CHEERS Report (PC # 556) at XI-26-27. Second, it calculated the expected number of illnesses per 1,000 at two different levels of instream

enterococci – 250 cfu/100 ml (10.73 additional illnesses per 1,000 recreators) and 500 cfu/100 ml (13.1 additional illnesses per 1,000 recreators). Revised CHEERS Report (PC # 556) at XI-23-24.

With respect to the choice of indicators, the fact that the CHEERS researchers did not find a correlation between *E.Coli* and health risk must be understood in the context of significant previous research that found otherwise – as is the case with any scientific finding that contradicts previous studies. *See* subsection III.A.3, *supra*. Numerous previous studies have identified a correlation between *E.Coli* and health risk. *See* Pruss 2008. Indeed, Dr. Gerba, the District's witness, testified to the existence of that correlation. 9/9/08A at 127. The fact that the CHEERS study failed to find such a correlation is merely one more data point on which to base additional analysis and research.

With respect to the calculation of health risk associated with the two different levels of enterococci, the numbers are an interesting addition to the discussion, particularly since illness rates at both the high and the low levels of enterococci indicators analyzed in the study exceed EPA's risk benchmark of 8 illnesses per 1,000. However, the problem for standard-setting purposes is that the CHEERS study provides no real guidance as to the level of exposure that should be assumed. For purposes of the report, the researchers used a spread of wetness scores reflecting the array of levels of exposure reported by GUW recreators (not CAWS recreators, as the study inexplicably found no correlation at all between enterococci indicators and health risk on the CAWS, *see* Revised CHEERS Report (PC # 556) at XI-18).

But there is no good reason why the statistical spread of exposure levels actually reported by recreators should define the exposure level that the Board chooses to protect. Should the Board merely protect the average level of exposure, or should it protect more sensitive exposures – *e.g.*, those who accidentally ingest significant amounts of water? Should the Board protect the current pattern of exposure, or should it – in view of the forward-looking nature of the CWA, which protects not just existing but attainable uses – protect a pattern of exposure that would occur following the abatement of contamination levels? Additionally, the Study Objective # 2 data is based on observed health risk to the overall population of recreators, not specifically to sensitive populations such as children (for whom the study was underpowered – *see* subsection III.A.4 *supra*). Should the Board set standards to protect these immunologically vulnerable subpopulations, or merely to protect the general population? As discussed above, USEPA has come down on the side of setting water quality criteria that protect children. *See* subsection III.A.4., *supra*.

Thus, while the Revised CHEERS Report provides interesting and useful data to contribute to the ongoing discussion of how to establish recreational water criteria, it does not provide basis to deviate from IEPA's original plan to set a technology based standard now, to be followed by instream criteria later after USEPA completes its study process in 2012 as required by the NRDC BEACH Act Settlement (Ex. 58). The well-known public health risk from recreation in sewage-contaminated water demands that we act now to require that the District take the near-universal public health measure of installing disinfection, with the 400 cfu/100 ml fecal coliform standard in place for the sole purpose of ensuring that it is functioning properly. *See* subsection I.A, *supra*; SR at 98.

B. The Risk Assessment Was Both Inherently Limited and Poorly Conducted, and Should Not be Considered in the Board's Evaluation of CAWS Risk

Unlike the CHEERS Study, the District's Risk Assessment conducted by Geosyntec Consultants was a "paper" study, based not on data gathered from actual recreators but on modeling of variables that would impact recreators generally. The District relies in its opposition to disinfection on the finding in the Risk Assessment that health risks in the CAWS are so low that recreational activities are safe even in the immediate aftermath of a CSO discharge. Risk Assessment (Ex. 71) Table 5-9; Granato 8/4/08 Testimony (read into the record at 10/28/08A p. 106 *et seq.*). (It remains to be seen how the District will reconcile this contention with its other argument that the presence of CSOs renders the CAWS too contaminated and risky to warrant disinfection – *see* Granato 8/4/08 Testimony at 5.) The GI illness rates identified in the Risk Assessment were so much lower than the rate of 12-13 illnesses per 1,000 recreators identified in the CHEERS study that the District's witness Dr. Thomas Granato (who is neither an epidemiologist nor a microbiologist) felt compelled to speculate that the difference must be attributable to unidentified and un-studied "toxic chemicals" in the water, since he had no other explanation for it. 10/19/10 at 260.

The likely explanation is simpler than that. The Risk Assessment, unlike the CHEERS study, is just bad science. It was conceived and designed with too limited a scope, conducted with serious methodological flaws, and presented in a manner that is both unclear and reflective of bias. This is not simply the opinion of the Environmental Groups and their witnesses, but the opinion of USEPA, which has criticized the Risk Assessment heavily and repeatedly for most of the same flaws identified by the

Environmental Groups' microbiology witness Dr. Marylynn Yates. In its most recent communication with the District, the director of USEPA Region 5's Water Division concluded in summary, "Overall, it is EPA's view that the dry and wet weather risk assessments were deficient and do not adequately describe potential risks from exposure to undisinfected sewage effluent to persons engaged in limited contact recreational activities on the CAWS" -- quite thoroughly contradicting the Geosyntec researchers' rather optimistic belief, expressed repeatedly, that USEPA's concerns "have been resolved." July 21 2010 letter to Louis Kolias from Tinka Hyde (PC # 304) ("July 21 Comment"); 9/9/08A at 69, 9/10/08A at 54, 62, 79-80.

These flaws persist because the Risk Assessment has not been peer reviewed – a fundamental quality control measure in science (4/15/08 at 101) – thus allowing the researchers to deflect USEPA's criticisms with vague defenses and non-answers. EPA stated in the July 21 Comment, "We appreciate your responses, but, as explained in the enclosures, we have identified numerous comments that have not been adequately addressed." July 21 Comment (cover letter).[21]

Specifically, USEPA summarized the problems with the Risk Assessment into the following four categories in its July 21 Comment: (1) overall -- the methodology was "unconventional" in the field of risk assessment; (2) regarding analytical quality -- the study lacks a "coherent problem formulation," "appropriate assessment of input parameters," "appropriate statistical analyses, presentation of confidence intervals," or "formal peer review"; (3) regarding sampling methodology and results – the risk

[21] The District claims to be "pursuing" publication of the Risk Assessment data in a peer reviewed journal, but as of yet, more than two years after completion of the study, we have been presented with no information that it has been accepted. *See* July 21 Comment Letter Enclosure 1 at 3. USEPA found the District's response concerning peer review to be "overstated and imprecise." *Id.*

conclusions are based on "deficient sampling," "inappropriate merging of wet and dry datasets," and "poor interpretation of a limited number of data points"; and (4) regarding disinfection – "no meaningful attempt was made to estimate the possible improvement by disinfecting the wastewater." July 21 Comment (cover letter). Most of these issues, and several more, were identified by Dr. Yates in her 2008 testimony.

The specific deficiencies identified by USEPA and/or Dr. Yates include the following:

- *Outdated risk assessment model*. USEPA's concern that the Risk Assessment is grounded in "an outdated risk assessment model" that "further hampers transparency and confidence in this report's conclusions" remains unanswered. July 21 Comment Enclosure 1 at 6. USEPA observed in particular that the secondary attack rates used in the report were "misinterpreted and incorrect," and that the risk characterization methodology is "unconventional and with limited precedent in the field of QMRA, and unjustified in the report." USEPA characterizes Geosyntec's response to this concern as "incorrect, inadequate, and confuses several important factors." *Id*.
- *Unjustified conflation of data*. Although the Risk Assessment acknowledges that the source of pathogens differs substantially between wet and dry weather – the WWTPs being the primary source in dry weather but CSOs contributing more significantly in wet weather – the Assessment inexplicably conflates the wet and dry weather data in assessing the impact of disinfection on pathogen levels. This problem was identified by both Dr. Yates (Yates Testimony (Ex. 249) at 24) and by USEPA (July 21 Comment Enclosure 1 at 9), and has not

been resolved to USEPA's satisfaction (*Id.*). This conflation could potentially bias the impact of disinfection downward, as disinfection at the WWTPs will obviously achieve a lower reduction in pathogen levels on days when CSOs are also contributing significantly to pathogen loads. Yates Testimony (Ex. 249) at 23-24. Dr. Yates further observed that the Risk Assessment unjustifiably conflates upstream and downstream sampling data. Yates Testimony (Ex. 249) at 23.

- *Insufficient number of samples*. Both Dr. Yates and USEPA expressed concern with the insufficient number of samples taken in connection with the study, resulting in potentially unrepresentative data given changing water conditions that affect pathogen concentrations (a problem identified by the CHEERS researchers in their study as well, although their sampling was much more thorough). Yates Testimony (Ex. 249) at 24; July 21 Comment (Enclosure 1 at 8, 12); 9/9/08P at 116.
- *Unexplained very low pathogen numbers*. USEPA expressed concern that, for reasons Geosytec does not attempt to explain, "[t]he pathogen concentrations reported in this study are typically at the lower end of those reported in the literature for secondary contact effluent." July 21 Comment Enclosure 1 at 10, 16. It states, "[c]learly this is an important issue and the disparity should be discussed and explained in the report and contrasted to the peer reviewed data that are available," but this has not been done to date. *Id*. Both USEPA and Dr. Yates noted, in particular, that where calcivirus was reported in one

outfall sample at a relatively high concentration, it was discarded by the researchers as an outlier. *Id*. at 13, Yates Testimony (Ex. 249) at 25.

- *Flawed sample analysis*. Both USEPA and Dr. Yates expressed concern that only fractions of the samples were analyzed for any given pathogen, leaving the possibility that the pathogen of interest is present in the remaining unanalyzed portion. July 21 Comment Enclosure 1 at 17; Yates Testimony (Ex. 249) at 25. *See* 5/5/08P at 7-19; 7/28/09 at 18-44; 9/9/08P at 135-37. Dr. Yates further observed that, on occasions where analysis of a part of the sample for one type of pathogen (adenovirus) revealed the likely presence of another type of pathogen (enterovirus), the researchers failed to test the sample for enterovirus -- even where analysis of the other portion of the sample was negative for enterovirus, such that the first analysis may have missed them. Yates Testimony (Ex. 249) at 25; *see* 5/5/08P at 33, 9/9/08P at 145-47. USEPA called Geosyntec's response to its concern regarding this issue "inadequate" and "illogical."
- *Inadequate data presentation.* Both Dr. Yates and USEPA expressed concern and frustration with the poor presentation of data and results in the Risk Assessment, limiting its usefulness as an assessment tool. Some of the identified problems went only to clarity and transparency, while others concerned more substantive flaws in the data presentation. Specifically, they flagged such problems as (1) lack of sampling schematics (July 21 Comment, Enclosure 1 at 2), (2) failure to lay out assumptions for each pathogen assessed (*Id*. at 9), (3) lack of information on the duration of wet weather

discharges (*Id.*), (4) lack of information regarding analysis of pathogen samples (*Id*. at 14-15), (5) lack of PDFs to describe pathogen concentration variations (*Id.* at 20). Dr. Yates also flagged numerous additional presentation inadequacies, including, among other things, the lack of probability distribution results. Yates Testimony (Ex. 249) at 25 - 26.

- *Limited scope*. The Risk Assessment evaluated only GI illness and a subset of the pathogens that may cause it, not the many other potential illness risks associated with recreation in sewage-contaminated water that were evaluated in the CHEERS study. Yates Testimony (Ex. 249) at 22. And in fact, it was for a non-GI illness impact – eye symptoms – that the CHEERS study found a significant risk to CAWS recreators. Dr. Yates noted also that the Risk Assessment studied only a small universe of the many sewage-related pathogens that can cause illness to recreators, for reasons that were inconsistent and made no sense. *Id.* at 23. Dr. Tolson testified that he "had no clue" as to how the limited scope of the study would quantitatively impact the magnitude of the study's risk estimation. 9/10/08A at 69.
- *Failure to assess risks to sensitive populations*. The risk assessment, like the CHEERS study, assessed only illness rates among healthy adults, not sensitive populations such as children.

These severe and unaddressed inadequacies preclude the use of the Risk Assessment as part of the Board's determination. It should be given no significant weight in determining the necessity or benefits of disinfection.

IV. Disinfection is an Economically Reasonable Means of Attaining the Designated Recreational Uses on the CAWS

The Board's evaluation of the cost of disinfection is constrained by two separate but related standards. First, to the extent economics can be considered at all when designating uses under the CWA, Factor 6 of the Use Attainability Analysis ("UAA") factors listed in 40 C.F.R. §131.11(g) provides the only standard by which economic information can be assessed. Factor 6 considers whether a requirement of disinfection technology, in addition to secondary treatment, to protect an attainable use "would result in widespread economic and social impact." Note that Factor 6 may be considered only with respect to protection of an *attainable* use – existing uses *must* be protected and may not be removed. C.F.R. §131.11(a). Second, Illinois law requires that the Board make an "economic reasonableness" determination. Specifically, pursuant to 415 ILCS 5/27, the Board must "make a determination, based upon the evidence in the public hearing record, including but not limited to the economic impact study, as to whether the proposed rule has any adverse economic impact on the people of the State of Illinois."

The Illinois economic reasonableness determination should be construed in light of, and consistently with, UAA Factor 6. The cooperative federal structure of the Clean Water Act, and the obligations it imposes on delegated states, do not allow rejection of designated uses on economic grounds that fall short of the stringent Factor 6 test. *See* 33 U.S.C. 1342(c)(2). However, regardless of how 415 ILCS 5/27 is interpreted, disinfection is clearly an economically reasonable alternative for the CAWS.

Dr. Granato conceded at hearing that the District has performed no analysis to determine whether the cost of disinfection would meet the UAA Factor 6 test. 10/20/10 at 55-56. Indeed, District Superintendent Lanyon conceded at a study session concerning

disinfection that the District could not meet that test. *See* Transcript of MWRD Committee on Industrial Waste and Water Pollution Study Session ("MWRD Tr.") (Oct. 31, 2007 at 10:03 a.m.), p. 214:8, Attachment A to Environmental Groups' Subdocket A comments dated April 15, 2010 (Subdocket A PC # 294).

Superintendent Lanyon was clearly correct in that assessment. The Factor 6 test, which has been defined extensively in USEPA guidance, is stringent. *See* Interim Economic Guidance for Water Quality Standards, Workbook, Appendix M to the *Water Quality Standards Handbook - Second Ed.* (*EPA-823-B-94-005a),* EPA-823-B-95-002 (Mar. 1995), IEPA SR, Att. C ("USEPA Factor 6 Guidance"), p. 1-5. The guidance states that "[d]emonstration of substantial financial impacts is not sufficient reason to modify a use …. Rather, the applicant must also demonstrate that compliance would create widespread socioeconomic impacts on the affected community." USEPA Factor 6 Guidance, p. 1-5. The document provides a five-step test that evaluates the scope and type of impacts to the median household income in a rulemaking area. *See* USEPA Factor 6 Guidance, p. 1-7. It furthermore requires that not only costs but benefits of disinfection – of the kind laid out in detail by the People's witness Dr. Kevin J. Boyle – be considered in the evaluation. *See* Boyle Testimony (Ex. 286). That said, USEPA has been clear that the Factor 6 test is *not* a cost-benefit analysis test and cannot be applied as such, notwithstanding any cost-benefit elements that may factor in to the general state "economic reasonableness" analysis in other contexts. MWRD Tr. at 214:8.

This stringent Factor 6 test has not been met here. USEPA's independent analysis of the cost of disinfection performed by Science Applications International Corporation ("SAIC") (Ex. 148) determined that the cost per household per month of the most

plausible method of disinfection at the three MWRD CAWS treatment plants (UV without filtration) would be $1.94. Ex. 148 at 15. The cost of some other types of disinfection was somewhat higher, but not appreciably. *Id*. While the District has criticized the analysis in some respects (*see* 10/20/10 at 26-30), it has not to date offered any analysis of its own showing that the cost to individual households would be significantly higher than that documented in the SAIC report.

Neither is it of any consequence that the District does not currently have the taxing or bonding authority to pay for disinfection. Leaving aside that the CWA does not create an exemption to its water quality requirements for dischargers who failed to budget for pollution control measures, the District has admitted that it will have to go to the legislature to obtain additional levy authority regardless of whether it needs to disinfect sometime before 2016. 10/28/10 at 86-87. The only consequence of an order to disinfect would be that the District would have to do so a few years sooner.

Finally, even if the 415 ILCS 5/27 economic reasonableness test is considered separately, IEPA has clearly met it, particularly in view of the SAIC data. The fact that disinfection is near-universal in the United States, even for large municipal wastewater treatment authorities, belies the District's assertion that requiring it to join the rest of the country in disinfecting its effluent would be an unreasonable economic burden.[22] Indeed, it borders on the absurd for MWRD to claim it is economically unreasonable for it to provide wastewater treatment for discharges flowing past urban neighbors and numerous

[22] MWRDGC is disinfecting at three of its plants that discharge into water bodies located in the suburbs pursuant to existing Board regulations.

parks when such treatment is provided by POTWs in large numbers of diverse communities across Illinois.

V. The Presence of CSOs Does Not Diminish the Need to Disinfect the District's Effluent

In this proceeding, MWRD has made the curious argument that it should not be required to control its sewage pollution from its WWTPs because CSOs are an additional source of pollution in the CAWS. This argument makes no sense on at least three levels. First, the CWA requires that the CSOs be cleaned up as well – which the District claims it is in the process of doing, albeit exceedingly slowly. Second, the presence of one source of pollution to a receiving waterbody is not an excuse, under the CWA, for refusing to address another source of pollution that inhibits attainment of designated uses. And third, disinfection will clearly be beneficial on a substantial number of dry-weather days, notwithstanding the District's efforts to artificially minimize the annual number of such days.

A. The District is Obligated Under the CWA to Remediate Its CSOs, and Delay in Meeting That Obligation is Not Grounds to Avoid Disinfection

There are two principal sources of waterborne pathogen contamination of the CAWS and LDPR: first, undisinfected effluent from MWRD's North Side, Calumet and Stickney WWTPs, and second, the CSOs that are controlled by the District, the City of Chicago and local municipalities. SR at 93; Yates Testimony (Ex. 249) at 7; O'Connell Testimony (Ex. 112) at 2. CSOs result from rainfall events that overwhelm the capacity of existing infrastructure. See Lanyon Testimony (Ex. 60), Attachment 4 at 18. According to MWRD 2004-2006 data, CSOs occur somewhere in the system around 33 to 65 days per year, O'Connell Testimony (Ex. 112) at 2l.

CSOs are considered point sources, and are already subject to Clean Water Act NPDES permitting requirements and a number of specific regulatory requirements within that program. 33 U.S.C. § 1342 (q) (1). *See also* O'Connell Prefiled Testimony Ex. 112. The 1994 National CSO Policy ("CSO Policy") sets forth specific requirements for controlling CSOs in order to meet health and environmental objectives. USEPA, "Combined Sewer Overflow (CSO) Control Policy," 59 FR 18688 (Apr. 19, 1994). The CSO Policy requires that permittees implement minimum technological requirements (the "nine minimum controls") and a Long-Term CSO Control Plan. *Id*. *See also* Nemura Testimony 9/25/08A at 38. IEPA has ostensibly included the requirements of the nine minimum controls as permit conditions in the currently effective NPDES permits (NPDES Permit Nos. IL0028088, IL0028053, and IL0028061) as well as in the draft permit renewals put on public notice on November 9th, 11th , and 12th, 2009. (Public Notice Nos. ALD:07061901.bah, FRB:07031401.bah, and AAH:06122002.dlk). *See* Exs. 409 and 410 (Calumet WWTP 2002 NPDES permit and 2009 draft NPDES permit).

The District has long identified the Tunnel and Reservoir Project ("TARP") as its Long Term Control Plan for CSOs, (Special Condition 19 in all three presently-effective permits). In this proceeding, it has repeatedly stated that TARP is expected to greatly reduce the number of CSOs in the system. See, e.g. Lanyon Testimony (Ex. 60) at 9; 9/8/08A at 75-76 and 9/23/08A at 97. There is no reason the TARP remediation of CSOs cannot occur concurrently with effluent disinfection, so as to address the two sources of sewage contamination to the CAWS expeditiously.

Delays in completion of TARP, which reflect the choices and priorities of MWRD, are certainly no reason to postpone disinfection. In the 2002 NPDES permits,

the projected completion date for TARP was 2015. Adrienne Nemura stated that TARP would be completed in 2016. Nemura Testimony (Ex. 116) at 7. However, Superintendant Lanyon testified that the District will not complete TARP until 2024. 9/8/08A at 56. The draft NPDES renewal permits also predict completion in 2024. Special Condition 17 in Public Notice Nos. ALD:07061901.bah and FRB:07031401.bah. And in the IEPA public hearing on the draft renewal NPDES permits, Mr. Lanyon pushed the completion date back still further to 2029.[23] Clearly, if the District is concerned that CSO contamination is a threat to recreational use, the proper solution is to more promptly complete TARP as required under the CWA. Failure to complete TARP cannot sensibly be used as an excuse to fail to disinfect.

B. Disinfection is Necessary to Attain the Board's Designated Recreational Uses During Dry Weather Regardless of the Presence of CSOs

While the CSOs contribute to CAWS contamination during and for a limited time after certain rainfall events (*see* subsection C., *infra*), the North Side, Stickney and Calumet Water Reclamation Plants discharge undisinfected sewage effluent 365 days a year, whether the CSOs are discharging or not. *See* subsection I.C.2, *supra*. On dry weather days, undisinfected sewage from the North Side, Calumet and Stickney WWTPs constitutes virtually 100% of the flow in the waterways subject to this rulemaking during dry weather. Lanyon Testimony (Ex. 60) at 5.

Thus, while minimizing the incidence of CSOs to protect use during wet weather is an important water quality priority, failing to require disinfection of 24 hour/7 day a week WWTP discharges of undisinfected sewage effluent would be an obvious failure to

[23] In our public comments on those draft permits last year, several of our groups emphasized the need for IEPA to include an enforceable schedule for completion of TARP to ensure that CSO reductions are achieved as swiftly as possible.

protect the proposed designated recreational uses during dry weather. The fact remains that even if all CSOs were to disappear tomorrow, the waterways would still not support the existing and expanding recreational uses no matter what the weather. Looking at the District's own data, the dry weather geometric mean of fecal coliform downstream of the North Side WRP has been calculated to range from 1600 cfu/100 mL to 7400 cfu/100 mL, up to a maximum of 25,000 cfu/100 mL (Ex. 113, Attachment IV, p 4 and Table 1). At Foster Avenue, where much recreation occurs, it is 1301 cfu/100 mL to 8304 cfu/100 mL up to a maximum of 31,000 cfu/100 mL (Ex. 113, Attachment V, Table 3). Downstream of the Calumet WRP, the geometric mean of fecal coliform was calculated to range from 100 cfu/100 mL to 1200 cfu/100 mL up to a maximum of 15,000 cfu/100 mL (Attachment IV to Ex. 113, p. 4 and Table 1), and 43 cfu/100 mL to 1979 cfu/100 mL up to a maximum of 6000 at Halsted Street (Ex. 113, Attachment V, Table 3). For purposes of general comparison, nearly every one of these averages exceeds not only the Board's general use standard 200 cfu/100mL, Rijal Testimony (Ex. 113), Attachment IV at 10, but also USEPA's informal benchmark secondary contact standard, used occasionally in its past evaluations of proposed standards, of 5 to 10 times the primary contact standard, *see* 9/24/08P at 108, which would be 1000-2000 cfu/100 mL. As discussed extensively in Section I, *supra*, it is well established that high levels of indicators are associated with health risk to recreators.

The Board should take steps to protect its designated uses (assuming the proposed Subdocket A uses are finalized) by reducing these levels of contamination using available means, regardless of whether those means affect a complete solution. At the very least, the recreational uses proposed in Subdocket A are attainable during dry weather -- which

as discussed in subsection C. below is a substantial portion of the year – through the adoption of basic disinfection technology.[24] Failure to require disinfection of the District's WWTPs to lower the dry-weather risk associated with the recreational uses proposed by the Board in Subdocket A would not meet the CWA requirements to which the Board is subject. *See* 33 USC § 1311 (c) (state water quality standards submitted to USEPA for review must be protective of designated uses and "protect the public health and welfare, enhance the quality of water and serve the purposes of [the CWA]."); 40 CFR §§ 131.10 (states must identify attainable uses to be achieved and protected); and 131.11 (states must adopt criteria to protect designated uses, whether numeric or narrative). Indeed, it is somewhat ironic that in this proceeding the MWRD has suggested that the Board should adopt special standards for wet weather conditions while resisting steps that would allow the CAWS to meet standards during dry weather.

This basic CWA principle that the presence of one pollution source does not excuse the unchecked contribution of another source is recognized by other CSO communities. These communities disinfect the wastewater from its sewage treatment plants regardless of CSO discharges and their plans to remediate them. *See*, *e.g*. 9/25/08 at 84 (other states cited for wet weather standards disinfect at wastewater treatment plants); 9/25/08A at 65-67 (Indianapolis disinfects); 9/25/08A at 79 (Boston disinfects); 9/25/08P at 12 (disinfected effluent in Santa Ana River).

[24] The wet weather impacts can be addressed through other means, including perhaps criteria establishing an enforceable compliance schedule for completion of TARP, and eventually through adoption of instream numeric water quality criteria when sufficient evidence has been developed to support such criteria.

C. The District's Analysis of Data Concerning the Frequency of Dry Weather Days is Substantially Flawed

The District's has repeatedly attempted to downplay the importance of disinfection at its WWTPs by minimizing its characterization of the number of "dry weather days" in a given year – that is, days where the waterways are not influenced by CSOs or the lingering effects of CSOs. However, the District's testimony on this subject has been inconsistent and even contradictory at times, and at any rate does not paint an accurate picture of the true impact of the District's failure to disinfect. This section discusses the incorrect assumptions concerning calculation of CSO-impacted days in both the Risk Assessment (Ex. 71) and the MWRD 07-79 Report, "Fecal Coliform Densities in the Chicago Waterway System During Dry and Wet Weather 2004-2006," (Rijal Testimony (Ex. 113) Attachment 5), and offers our own analysis of rainfall data as a counterpoint.

As discussed in Section 3.B, *supra*, the District's Risk Assessment analysis was severely flawed for many reasons, and the estimates of wet weather influence presented within that study were no exception. The Risk Assessment states that only 15% of the recreation season was "dry weather," classifying the remaining 85% of the recreation season as "wet weather." Ex.71, Table 5-8. *See also*, 9/9/08P at 73. However, the Risk Assessment provided no basis for this calculation in its report, stating only that the "[d]ata used to construct proportions [was] based on MWRDGC CSO and rain gauge records for the 2006 recreational year." 9/9/08P at 73. *See also*, Ex. 71 at 125. The Geosyntec researchers stated that they counted dry weather days as any on which there was no precipitation the preceding two days (9/9/08P at 110-111), but provided no basis for this assumption that every rain event results in three days of "wet weather."

The unsupported 15 percent dry weather number in the Risk Assessment is directly contradicted by the testimony of District witness Dr. Geeta Rijal – who came up with a higher percentage of dry weather days, but still with flaws and internal contradictions in her analysis. Dr Rijal testified that, based on District rainfall gauge data, measurable rainfall occurred at an average of about 145 days or about 40% of days per year. 9/24/08A at 99. She also suggested that, to account for the lingering impacts of wet weather, one should multiply the 145 days by two to arrive at 290 days of wet weather influence (or 79% of days). *Id.* At turns, Dr. Rijal went on to testify that wet weather days constituted 50-60% of days in a year, 9/24/08A at100, or 60-70% of days, 9/24/08A at 99, and then stated that the Risk Assessment estimated only 15% wet weather days. 9/24/08A at 100.

The one consistency of the District's estimates of the potential influence of wet weather conditions is that they all are based on faulty assumptions.

The first faulty assumption is that all precipitation has a uniform effect on water quality – or any effect on water quality at all if there was not sufficient precipitation to cause a CSO. Dr. Nemura testified that the term "wet weather impacts" refers to impacts caused by CSOs, and admitted that not every rainfall event is sufficient to cause a CSO. 9/24/08P at 104. She further testified that large storm events generally cause the worst CSO impacts. 9/25/08A at 108-09. On several occasions, evidence was presented that supports an approximate threshold of 0.5 inches of precipitation before CSOs are likely. See, Lanyon Testimony (Ex. 60), Attachment 4 at 18 (most CSOs captured if rainfall is less than 0.67 inches; generally no effect if rainfall is less than 0.33 inches); 9/25/08A at 22 (light rain is usually between 0.1 and 0.4 inches); Rijal Testimony (Ex. 113),

Attachment 5 at 4 (average heavy rainfall in North Area is 0.5 inches; 0.7 inches in South Area); 9/25/08 at 113 (0.5 inches is the threshold for suspension of recreational uses on account of wet weather in Ballona Creek). Re-examining the rainfall data for 2005-2006 submitted by the District, the vast majority (83%) of measured precipitation events are below 0.5 inches and would not be expected to cause CSOs. Ex. 91, Ex. 92, and Ex.139[25]. Of these light rainfall days, 57% measured precipitation less than 0.1 inches. *Id*. Viewed from this angle, it appears that true "wet weather" events occur much less frequently than the District has portrayed.

The second faulty assumption, related to the first, is that lingering effects of several days should be considered for every day of measurable rainfall. If precipitation is minimal such that there is no CSO and therefore no "wet weather" influence, as discussed above, it would be absurd to count the lingering influence of an event that never occurred. Further, even when there is a CSO event in some part of the CAWS, it does not necessarily affect every portion of the CAWS in which someone might recreate.

The third faulty assumption is the failure to account for the fact that days of lingering influence cannot simply be added onto every rainfall day, because where several rainfall days happen consecutively the lingering influence – that is, the influence from previous CSOs on days it is not actually raining – will occur only after the *last* of the consecutive rainfall days. That is, if one assumes one day of lingering influence after a rainfall event, and there are 7 consecutive days of rainfall, the proper calculation would be 7 + 1 = 8, not 7 X 2 = 14. Simply adding one additional lingering influence day for

[25] Percentages calculated by examining precipitation events measured at the North Side and North Branch Pumping Station for years 2005-2006. Data used from Ex. 139 consisted of readings taken at midnight each day, to be consistent with the data in Ex. 91 and Ex. 92.

every day of rainfall – as Dr. Rijal did when she added 145 + 145 in her testimony (9/24/08A at 99) – would double-count lingering influence for consecutive days.

A fourth faulty assumption is the failure even to put forth a consistent estimate of the number of lingering influence days in the calculations of dry weather days. While Dr. Rijal posited one additional day for purposes of her 2 X 145 estimate (9/24/08A at 99), elsewhere she posited 2 additional days of wet weather influence, for a total of 3 days. *See* 9/24/08A at 103. The absurd endpoint of these faulty assumptions is best illustrated by combining the third and fourth of them described above. Since the District found an average of about 145 days a year of precipitation, using Dr. Rijal's calculation method and her assumption of three days for wet weather influence, one would get a result of 145 X 3 = 435 wet weather days per year – a full 70 days more than there are in a year.

Finally, the assumption of counting a minimum three-day influence of wet weather effects has not been supported with anything but anecdotal evidence. When asked why the District sampled for 3 days, and not some other number, Dr. Rijal responded, "to avoid overtime" for the sampling crew. 9/24/08A at 103. In fact, the graphs showing geometric means of fecal coliform levels in the days following a heavy rain event show that by the third day measured (i.e. the second day after rainfall) geometric mean fecal coliform levels had returned to around the levels of dry weather geometric means. Ex. 114. *See also* 9/24/08A at 122. Notwithstanding the fact that the methodology for classifying the data used to create these graphs was severely flawed,[26] it still shows that the third-day influence is minimal, and calls into question the practice of counting three days of wet-weather influence for each day of rainfall.

[26] See 9/24/08P at 20-37.

Using the same data as the District, Ex. 91, Ex. 92, and Ex.139, and correcting the District's faulty assumptions – *i.e.*, counting only rainfall measurements over 0.5 inches as wet weather events likely to result in CSOs, eliminating double-counting of consecutive rainfall days, and adding only one day of lingering effects – results in a radically different estimate than the District's.[27] Using this corrected method, true wet weather impacts occurred on average 12.2% of the time. In other words, disinfection would reduce the dominant pathogen loading source around 87.8% of the time. While this method of estimation may be an oversimplification of the factors that contribute to CSO overflows, it certainly gives a more realistic estimate of the number of true "wet weather" days. The point here is not to quibble about precisely how many days are wet weather or dry weather, but rather to underscore the fact that disinfection is necessary at the WWTPs regardless of whether an additional pathogen source is present for a portion of the year – a much smaller portion than the District would have the Board believe.

VI. The Additional Energy Use Required for Disinfection Does Not Diminish the Need to Disinfect the District's Effluent

The District devoted a substantial amount of the Board's time to the issue of the additional energy use that would be required to implement disinfection. In a nutshell, the District is asserting that disinfection would do more harm than good because the energy use would cause increased air emissions. *See* McGowan Testimony (Ex. 133); 9/25/08P; 3/3/09P.[28]

[27] If rainfall over 0.5 inches occurred on consecutive days, lingering effects were only added to the last day. Wet weather days for the North Area and their corresponding lingering effects were counted if the rainfall measurements at either North Side or North Branch Pumping Station qualified.

[28] No estimate was made of potential energy savings from such factors as people deciding to recreate near their homes rather than driving miles out to the suburbs or further where sewage discharges are disinfected.

Viewed even superficially, this argument fundamentally makes no sense. Arguing that energy use causes environmental impacts simply begs the question whether that energy use is required to protect designated uses – which is the point of the rest of this proceeding. It is a given that many public health and safety measures in our society require energy, but our decisions to take those measures are based on our evaluation of their necessity and benefits. Hospitals use energy but they help care for sick people; streetlights use energy, but they make our urban streets safer. We may work to make these safety measures more efficient and minimize their adverse effects, but ultimately they are a worthwhile use of our valuable resources. The same goes for disinfection as part of sewage treatment facilities. Nearly every major city in the country disinfects wastewater to help prevent human exposure to harmful pathogens. The energy use from the disinfection process should not stand in the way of implementing such a rudimentary public health measure.

Viewed non-superficially, the District's argument makes even less sense. Under the UAA regulations governing this proceeding, 40 CFR 131.10(g), only the third factor allows consideration of unintended negative environmental impacts: "Human caused conditions or sources of pollution prevent attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place." The District has far from established facts sufficient to meet the burden. At best, the District has put forth highly questionable data as to the secondary (and fairly attenuated) air pollution it predicts will result from a requirement to disinfect its wastewater effluent, but it has not established that the claimed air pollution impacts from energy use outweigh the

public health and environmental benefits of disinfecting wastewater effluent in a major urban area.

A. Clean Air Impacts are Evaluated Separately Under Other Regulatory Schemes

Through its testimony regarding the consequences of using electricity to disinfect its wastewater, the District is trying to force a false choice between protecting clean water and clean air. Federal law and sound public policy requires both clean water and clean air. As even McGowan's testimony acknowledges, the federal Clean Air Act regulates pollution from electricity generation through Title V and Prevention of Significant Deterioration permits. *See* 42 U.S.C. §§ 7470 *et seq.* and 7501 *et seq*. The bulk of McGowan's testimony focused on the potential negative effect of as-yet-unregulated GHGs, and their potential to contribute to global warming. However, since that time, USEPA has promulgated rules regulating GHGs, which went into effect on January 2, 2011. *See* Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 75 Fed. Reg. 31,514 (June 3, 2010).

Air pollution is also being addressed at the state level. The state of Illinois has a Renewable Portfolio Standard requiring 25% of utilities' electricity generation to come from renewable sources, *see* Ex. 136, and there is a general trend toward a cleaner mix of energy. Further, a new USEPA rule requires states to revise their state implementation plans under the Clean Air Act in order to implement the new GHG rules. See, Action to Ensure Authority to Issue Permits Under the Prevention of Significant Deterioration Program to Sources of Greenhouse Gas Emissions: Finding of Substantial Inadequacy and SIP Call, 75 Fed. Reg. 77,698 (Dec. 13, 2010).

B. The District's Analysis of Greenhouse Gas Impacts of Disinfection Was Profoundly Flawed

In furtherance of its argument that disinfection should not be implemented because it uses energy, the District offered pre-filed testimony that was meant to show the GHG impacts of the disinfection requirement applied to the Calumet, North Side and Stickney plants. McGowan Testimony (Ex. 133). For the reasons described below, the GHG impacts put forth were dramatically overstated. The District did ultimately submit amended emissions estimates based on appropriate data sources. However, the District's position that the environmental harm from the carbon impacts of incremental energy consumption outweigh the disinfection's environmental benefits is undermined both by the profound inaccuracies in the initial estimate, and the District's equally profound lack of effort to curb its energy consumption in existing operations through available means.

The District's initial analysis of the greenhouse gas impacts of the energy required to disinfect was based on emission factors from an unrepresentative mix of energy sources that was heavily biased toward coal-based electricity production. The greenhouse gas and air pollution impacts cited in Mr. McGowan's testimony were calculated using the 2004 RFC West Subregion Resource Mix from the U.S. Environmental Protection Agency's eGrid database. McGowan Testimony (Ex. 133) at 4; 9/25/08P at 28-31. The RFC West Subregion includes northern Illinois, all of Indiana, Ohio and West Virginia, western Pennsylvania, Maryland and Virginia. 9/25/08P at 29; Ex. 135. This methodology is misleading because these regional emission factors do not accurately represent the generation profile of the electricity mix that actually powers MWRD's facilities. The exact path that an electron will take after it is delivered to the grid is governed only by the laws of physics. In other words, it is impossible to say

which generating unit or units produced the electricity consumed by any particular end user. In fact, the fuel source profile of the District's energy supplier and that of its distribution company provide more accurate emissions factors than Subregion Resource Mix referenced in the District's pre-filed testimony. In cross examination, Ms. Susan Hedman from the Attorney General's Office asked the District's energy expert, Mr. Stephen F. McGowan, whether he was even aware that all utilities must disclose their fuel source mix, and he admitted he was not:

> Ms. HEDMAN: Can I infer from your answers to the earlier questions – may I conclude that you're not aware that state law requires all utilities to disclose the mix of fuel sources for the electricity delivered to customers?
>
> Mr. McGOWAN: I am unaware of that.

9/25/08P at 42. *See also* Ex. 137.

In response to this rather devastating line of questioning, the District subsequently presented supplemental testimony with substantially revised GHG and other pollutant estimates calculated using the fuel mix and emission factors for its own electricity supplier, Integrys Energy Services, Inc. 3/3/09A at 8-21; Ex. 143. However, the flaws in the District's initial methodology reveal a lack of familiarity with basic data sources and standard methodologies for calculating the environmental impacts, including the carbon footprint, of company operations. Further, the District's estimates fail to consider whether the District could take steps to minimize GHG emissions from disinfection and environmental impacts associated with their existing operations (*see* subsection C., *infra*).

C. The District Could Improve the Energy Efficiency of its Operations and Generate More Clean and Renewable Energy at its Plants to Offset GHG Impacts of Disinfection

In his prefiled testimony, Mr. McGowan compared the annual energy that would be required to operate the UV equipment and pumping station to that used by the Sears Tower (now Willis Tower). McGowan Testimony (Ex. 133) at 8. Since the Willis Tower is the largest building in Chicago and one of the largest in the world, the comparison was intended to put in perspective how much energy disinfection requires. However, if the Willis Tower is to be a point of reference, there is another, better comparison that ought to be made. The Tower is currently undergoing a complete energy retrofit that will reduce its electricity use by 80%. The building's rehabilitation includes window replacements, mechanical system modernizations, lighting system upgrades, extensive use of highly-efficient co-generation (combined heat and power) technologies, wind and solar power installations. See http://www.usatoday.com/news/nation/2009-06-24-sears-tower_N.htm and http://www.trulia.com/blog/williamstrauss/2010/06/sears_tower_willis_tower_undergoes_sustainable_modernization_project. Thus, the Tower is an excellent example of a large energy consumer that is taking an aggressive approach to reducing its energy consumption and cleaning the sources of its energy supply.

If reducing GHG and other pollutant emissions is truly the priority that MWRD claims, we would expect to see it, too, investing in state-of-the-art energy efficiency and renewable energy systems. Mr. McGowan's prefiled testimony goes into detail about how disinfection would increase electricity use, but is completely silent about efforts to reduce electricity use from its existing operations. The District argues that by increasing electricity use by 33%, UV disinfection would cause unacceptable environmental harms.

It fails to demonstrate, however, why the incremental harms associated with disinfection are somehow more significant, and thus less acceptable, than the harms produced by the existing operations, unmodified by aggressive efficiency and renewable energy measures.

Indeed, other POTWs around the country with equipment and operations very similar to MWRD's have dramatically reduced energy consumption, reducing GHG emissions and energy costs – costs that ultimately get passed on to their customers. Energy efficiency improvements made to motors, pumping equipment, and lighting systems can significantly reduce energy consumption. On-site power generation opportunities using microturbines or fuel cells with recovered biogas are plentiful. Wind and solar power installations at sewage treatment facilities are becoming more common as operators are seeking to meet environmental objectives and gain control over future energy costs.[29] As one of the largest water treatment districts in the world, the MWRD, like the Willis Tower, should be a pioneer in optimizing its energy systems, reducing consumption and capitalizing on clean and renewable resources as much as possible (the District owns an enormous amount of industrial property that could be covered with solar panels, for example).

The District is right that energy consumption *should* be a primary concern for it. But it should be working on how to minimize energy consumption while protecting clean water and public health. The District should analyze its existing energy use through a comprehensive, investment grade audit. It should assess options for reducing energy

[29] For a few select examples of sewage treatment districts that have made substantial investments in energy optimization, see: http://www.energy.ca.gov/process/pubs/ebmud.pdf, http://www.nypa.gov/services/ESforWaterandWastewaterFacilities.htm, http://www.interstatepower.us/Case-Study/CA%20CAP381_Sheboygan.pdf, http://www.cincinnati-oh.gov/water/pages/-36456-/

consumption through energy efficiency, for cleaning its power supply through the installation of on-site energy generation through biogas, solar and wind power production. It should make the results of this assessment available to the public and should publish a timeline for completing all cost-effective investments.

Conclusion

The Board should adopt the proposal of the Illinois Environmental Protection Agency that an effluent standard of 400 cfu/100 ml be applied to the discharges into the CAWS.

Dated: January 3, 2011

Respectfully submitted,

NATURAL RESOURCES DEFENSE COUNCIL

ENVIRONMENTAL LAW AND POLICY CENTER

OPENLANDS

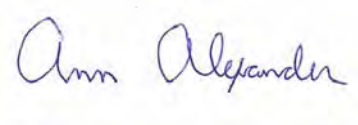
SIERRA CLUB—ILLIOIS CHAPTER

PRAIRIE RIVERS NETWORK

FRIENDS OF THE CHICAGO RIVER

ALLIANCE FOR THE GREAT LAKES

By:



NRDC Senior Attorney and authorized to represent all of the above parties with regard to this objection

APPENDIX 1

ILLINOIS POLLUTION CONTROL BOARD
September 15, 2005

IN THE MATTER OF:	)	
	)	
PROPOSED 35 ILL. ADM. CODE	)	R04-26
304.123(g), 304.123(h), 304.123(i), 304.123(j),	)	(Rulemaking - Water)
and 304.123(k)	)	

Proposed Rule. Second Notice.

OPINION AND ORDER OF THE BOARD (by T.E. Johnson):

Today the Board adopts this proposed rule for second notice pursuant to the Illinois Administrative Procedure Act. 5 ILCS 100/1-1 (2004). The following opinion will explain the proposal background, summarize the second-notice proposal, and discuss the economic reasonableness and technical feasibility of the rule.

BACKGROUND

On May 14, 2004, the Board received a rulemaking proposal from the Illinois Environmental Protection Agency (Agency). The Agency seeks to set an interim phosphorus effluent standard by adding five new subsections (g-k) to existing 35 Ill. Adm. Code 304.123. A motion for acceptance accompanied the proposal.

In its statement of reasons, the Agency asserts that it is in the process of developing the State numeric nutrient standards pursuant to its triennial water quality standards review. Pet. at 7. The Agency expects to file a nutrient standards petition with the Board in early 2007. Pet. at 8. In the interim, the Agency is proposing this effluent standard for phosphorus to limit higher concentrations of phosphorus that may result in detrimental levels of plant and algae growth. *Id*. The Agency requests that the interim effluent standard apply until the Board adopts a numeric water quality standard for phosphorus.

Two hearings were held before Board Hearing Officer John Knittle. The first hearing was held on August 30, 2004 (Tr.1), in Chicago. The second hearing was held on October 25, 2004, in Springfield (Tr.2). During those hearings the Board heard testimony from a number of witnesses. The Board received 17 public comments prior to proceeding to first notice.

On April 7, 2005, the Board found that the proposal was technically feasible and economically reasonable. The Board proceeded to first notice, and noted that additional comments on the proposal would be accepted.

The proposed amendments were published in the *Illinois Register* on May 6, 2005. *See* Ill. Reg. Vol. 29 Issue 19, p. 6200. The Illinois Association of Wastewater Agencies (IAWA) filed a public comment on June 20, 2005. On July 1, 2005, the Environmental Law & Policy

Center, Prairie Rivers Network and Sierra Club (collectively ELPC) filed a response to the comments of IAWA. The Agency filed a comment on July 26, 2005.

PUBLIC COMMENTS AND RESPONSE

Three public comments and a response were filed in this rulemaking after the Board proceeded to first notice. Both the Agency (PC 22) and ELPC (docketed as a response, hereinafter ELPC Resp.) were supportive of the proposal the Board sent to first notice. The IAWA (PC 21) filed a comment against the proposal on June 20, 2005. On August 31, 2005, the IAWA filed additional comments, accompanied by a motion for leave to file *instanter*.

In the motion for leave to file, the IAWA asserts that through a combination of factors including vacation schedule and workload, it has not been able to file the comments in a timely fashion. Mot. at 1. The IAWA contends that the purpose of the additional comments is not to prejudice the other parties, but to provide the Board with the IAWA's unique insight into what it believes is a mistake by the Board in its previous order. *Id.*

Hearing Officer John Knittle directed the parties to indicate on or before September 9, 2005, whether any response to the motion and comments would be forthcoming. ELPC indicated that they would not be filing any response to the motion or comment. To date, no other responses have been received by the Board. The motion for leave to file is granted, and the Board accepts the IAWA's additional comments, and dockets the comments as Public Comment 23 (PC 23). The pleadings are summarized below.

IAWA

The IAWA continues to oppose the proposal as insufficiently supported. PC 21 at 1. IAWA asserts that the record does not contain evidence that phosphorus is causing widespread pollution problems in the state of Illinois, or that promulgation of the proposed standard will have a measurable impact on eutrophication. *Id.* The IAWA contends that eutrophic conditions may or may not be an environmental problem depending on the presence or absence of conditions other than phosphorus, such as low reaeration rates. *Id.* The IAWA notes that the Illinois Eater Quality Report prepared by the Agency does list many streams segments as impaired due to phosphorus, but that the listing is not based on onsite determination of cause and effect, but on statistical guidelines. *Id.* The IAWA contends that this should not be considered evidence that these elevated levels of phosphorus are causing environmental problems. PC 21 at 1-2.

The IAWA states that the Agency, along with the Illinois Nutrient Work Group, is in the midst of a multi-year undertaking to develop science-based water quality standards, and that IAWA does not believe the record in this matter documents an urgent need to shortcut the science-based approach. PC 21 at 2. The IAWA contends the proposed rule will have very limited impact on the total amount of phosphorus entering the aquatic environment because agricultural sources are also major dischargers of phosphorus. *Id.*

The IAWA asserts that if a phosphorus effluent standard is adopted, the Board should exempt the standard from the Averaging Rule at 35 Ill. Adm. Code 304.104 (a)(2) and (3). PC 21 at 2. The IAWA asserts that the rule would require the Agency to place a daily maximum limit of 2.0 mg/L in NPDES permits, and that a daily maximum limit is both unnecessary and undesirable. *Id.* The IAWA contends that a daily maximum limit is not needed since phosphorus is not a toxic parameter. The IAWA argues that daily maximum effluent limits are typically related to acute toxicity levels of pollutants, and are designed to prevent short-term discharges of high levels of pollutants that would lead to acute toxicity levels. *Id.*

The IAWA asserts that a daily maximum limit is undesirable as it will discourage the use of biological phosphorus removal technology (BPR), and that the Board should encourage the use of BPR over chemical phosphorus removal (CPR) because CPR is more resource intensive. PC 21 at 2-3. CPR requires the manufacture of a chemical and transportation of the chemical to the treatment facilities. PC 21 at 3. The IAWA notes that the state of Wisconsin has allowed an exemption even to the monthly average limit for plants using BPR. *Id.* The IAWA suggests the following addition to the rule:

> g) (4) Monthly average permit limits established under this subsection (g) are not subject to the averaging rules under subsections (a)(2) and (a)(3) of Section 304.104. PC 21 at 3.

The IAWA believes that the economic impact of the proposed rule has been seriously underestimated. PC 21 at 3. The IAWA asserts that the Village of Beecher is expanding its plant to 1.2 MGD and that the cost of chemical phosphorus removal including a chemical feed building, equipment, electrical, and controls amounts to $288,000. *Id.* The IAWA contends the cost for the phosphorus portion of the sludge handling is $178,600, equating to a total capital cost for phosphorus removal of $466,600 for a 1.2 MGD plant. *Id.* The IAWA asserts that the City of McHenry's South plant is expanding to 1.5 MGD, and that the cost of the chemical feed equipment and building, including electrical and controls, was $350,000. *Id.*

The IAWA argues that these costs are dramatically different from those referenced by the Board and that the Board's decision in the first-notice opinion and order was erroneously based upon an estimate of the capital cost for phosphorus removal of $35,000 per MGD capacity. PC 21 at 4-5. The IAWA asserts that the actual costs of complying with the proposed rule will be 4 or 10 times higher than the costs cited in the Board's first-notice opinion and order. *Id.* The IAWA asserts that costs will be ten times higher than $35,000 for plants in the 1 to 5 MGD range and four times $35,000 for plants above 30 MGD. *Id.* The IAWA assert that for plants with a capacity of 1 to 2 MGD using CPR, it appears that the 20-year present worth including sludge processing and disposal will be $600,000 to $1,000,000. *Id.*

In its additional comments, the IAWA asserts that to the extent the Board relied on costs estimates submitted in the record by the City of Elgin in a facility plan amendment request, the Board is relying on incorrect information. PC 23 at 1. The IAWA submits a letter from Mr. Greg Hergenroeder, the director of the Fox Water Reclamation District in support of this assertion. The IAWA asserts that, as set forth in the letter, the costs contained in the IAWA's

first public comment are more accurate, and that the cost for chemical phosphorus control would be approximately $3,000,000. PC 23 at 1-2.

The IAWA contends that the information it provided regarding the actual costs for twenty facilities that constructed phosphorus removal in Wisconsin are probably much more accurate than cost estimates contained in the Agency comments. PC 23 at 2. The IAWA asserts that the best evidence is provided by the IAWA and that it is mere speculation that chemical feed facilities can be fit into existing buildings at a reasonable cost. *Id*.

The IAWA asserts that the costs using whatever numbers the Board uses are unreasonable when compared to environmental need or benefit. PC 23 at 2.

Environmental Law and Policy Center, Prairie Rivers Network and Sierra Club

The ELPC asserts that it is true, but irrelevant, that agriculture is a major source of phosphorus, and that the Board has found that phosphorus from point sources is likely more damaging to the environment because it is more biologically available to algae. ELPC Resp. at 1-2, citing Site-Specific Phosphorus Limitation for the City of Shelbyville, R83-12 (Dec. 20, 1984). The ELPC does not object to amending the rules to make it more clear that daily maximum limits are not intended. ELPC Resp. at 2. The ELPC proposes the following language to effectuate that intention:

> k) The averaging rules under subsections (a)(2) and (a)(3) of Section 304.104 do not apply to permit limits established pursuant to Section 304.123(g) or (h). ELPC Resp. at 2.

The ELPC asserts that without a daily maximum it should be possible for most Illinois dischargers to use BPR methods that generate less sludge than CPR methods. ELPC Resp. at 2.

The ELPC contends that if the proposal costs dischargers anything, the costs will be very modest. ELPC Resp. at 2. The ELPC assert that the IAWA comments regarding potential economic costs to Illinois dischargers basically confirm that the costs are modest. *Id.* The ELPC argues that the economic costs of the proposal were probably overstated and certainly were not significantly understated as suggested by the IAWA. ELPC Resp. at 3. The ELPC notes that a limit of 1 mg/L is already required for new or increased discharges by a provision of Illinois' antidegradation regulations. *Id.* The ELPC asserts that under this provision, new or increased pollution may only be allowed to the extent it is necessary and it certainly is not necessary to allow more than 1 mg/L phosphorus to be discharged given that a 1 mg/L phosphorus limit was found economically reasonable by the Board using technology in existence two decades ago. ELPC Resp. at 3, citing Village of Wauconda v. IEPA, PCB 81-017 (May 1, 1981); Amendments to the Water Pollution Regulations, R76-1 (Feb. 15, 1979).

The ELPC asserts that the figures provided by the IAWA are for the present value of the total costs of 20 years of construction and operation of the phosphorus removal equipment. ELPC Resp. at 3. The ELPC contends that no party to this proceeding has denied that phosphorus removal is likely to required well within the 20 year period, and thus even if

phosphorus removal were not already required by the antidegradation rules, the effect of the proposal at issue would be to advance the installation of phosphorus removal equipment at a few plants by a few years and to encourage some municipalities to explore land treatment or other non-discharge methods. ELPC Resp. at 3-4. The ELPC calculates that ignoring antidegradation, the virtual certainty that phosphorus treatment will be required in much less than 20 years, and assuming $1,000,000 for a 1 MGD will result in a cost of $5.00 per person per year. ELPC Resp. at 4. The ELPC asserts that the Wisconsin study cited by the IAWA makes clear that costs per person vary greatly and fall rapidly with increased scale. *Id.*

The ELPC asserts that even ignoring the antidegradation requirements, total costs would not be large, and that it is unclear how many new or increased discharges there will be before numeric phosphorus standards are adopted, and what, if any, increased costs will be incurred by new or expanding discharges as a result of having a 1 mg/L phosphorus limit. ELPC Resp. at 4. Further, argues the ELPC, the savings from not having to retrofit plants after numeric standards are adopted and the savings for drinking water plants and other waste users from reduced phosphorus pollution must be set against any increased costs. *Id.* The ELPC asserts that the evidence shows that the net economic effects of reducing phosphorus loadings are strongly positive. ELPC Resp. at 5.

The ELPC concludes that the adoption of the proposal will save money for the state of Illinois by establishing a bright line rule for new or increased discharges during the period in which phosphorus standards are developed. ELPC Resp. at 5. The ELPC posits that the net effect of the adoption of the proposal will be to reduce the number of permit disputes and potential hearings and appeals resulting from such disputes. *Id.*

Agency

The Agency fully supports the Board's decision to proceed to first notice and agrees that the Board's proposed language provides clarity to the proposal without sacrificing the intent or changing the scope of the original proposal. PC 22 at 2. The Agency asserts that, contrary to the assertion of the IAWA, the record contains abundant discussion on issues related to need to control phosphorus loading in Illinois streams, and the availability of technically feasible and economically reasonable phosphorus controls. *Id.*

The Agency, in general, supports the IAWA's concept that a daily maximum limit is not necessary, and believes that the exemption of the proposed phosphorus standard from the Board's averaging rule does not interfere with the original intended purpose of the proposal. PC 22 at 2-3. The Agency asserts that the primary objective of its proposal is to reduce net loading of phosphorus from certain major sources into waters of the state, and as long as there are no changes to the proposed monthly average limit of 1 mg/L, the primary objective will be met. PC 22 at 3. The Agency proposes the following language to meet the IAWA's intended objective:

> k) The averaging rules under subsections (a)(2) and (a)(3) of Section 304.104 do not apply to permit limits established pursuant to Section 304.104(g) or (h). PC 22 at 3.

The Agency argues that its proposed language ensures that the averaging rule exemption is available to permits issued under Section 304.104(g) as well as 304.104(b). PC 22 at 3.

The Agency contends that the costs provided by the IAWA may be applicable to the Village of Beecher and the City of McHenry, but appear to above the expected average costs in general. PC 22 at 3-4. The Agency asserts that when specific high costs are extrapolated on a statewide basis, they would give an unrealistic high estimate of the costs because (1) the costs are based on a strictly CPR or BPR method and the general trend in the industry is to remove most of the phosphorus with BPR methods and any remaining phosphorus with CPR at a minimum costs; (2) The 20% increase in sludge production is excessive, and generally 5 to 10 percent is considered a good number, especially with BPR and CPR are used in combination; (3) the cost of $288,000 for a chemical feed building may be reasonable for the Village of Beecher, but in most cases the chemical feed may fit into an existing building or a proposed building may be expanded for a more reasonable cost; and (4) many plants built or modified in the last few years considered the possibility of phosphorus removal in the planning phase of the treatment plant and removal at such plants can be accomplished with minimal additional facilities at a modest cost. PC 22 at 4.

DISCUSSION

The Board has held two days of hearings and received substantial testimony and comments on this proposal. The comments and the recent additional language changes suggested by IAWA, the ELPC, and the Agency and the participants have been evaluated, and the second-notice proposal adopted by the Board today reflects the Board's consideration of all the comments and testimony the Board has received. The Board will discuss below the issues raised in the first-notice comments.

Justification for the Proposed Phosphorus Standard

IAWA has reiterated its opposition to this rulemaking as not based on sound science, noting that the Illinois Nutrient Work Group is in the midst of a multi-year undertaking to develop science-based water quality standards. As discussed in the first notice opinion and order, the Illinois Nutrient Work Group has been formed to develop nutrient standards. The Agency expects that a nutrient standards petition will be filed with the Board in early 2007. While the Board recognizes that water quality data is still being gathered for the State's rivers and streams to develop comprehensive nutrient standards, the Board finds nothing in the comments of the IAWA to alter its decision that there is sufficient information in the record to justify reduction of phosphorus loading on the State waters.

While the findings of the nutrient control work group will help the Agency in developing scientifically justifiable nutrient water quality standards, the Board believes that an effluent standard would reduce the phosphorus loading on the State waters. The Board continues to agree with ELPC and the Agency that an effluent standard is mainly intended to reduce significant loading of a pollutant giving consideration to availability of appropriate treatment technology, and associated costs.

The IAWA argues that the proposed rule will have very limited impact on the total amount of phosphorus entering the aquatic environment because agricultural sources are also major dischargers of phosphorus. As before, the Board believes it is prudent to control phosphorus discharge from larger treatment plants given the impact of such discharges on receiving streams. While non-point source contribution (agricultural drainage and runoff) is also a significant source of phosphorus loadings, the Board believes that control of phosphorus from non-point sources is not appropriate in this rulemaking.

Economic Reasonableness

The IAWA believes that the economic impact of the proposed rule has been seriously underestimated, and presents information in its comments to support this contention. The Agency notes that although the costs provided by the IAWA may be applicable to the Village of Beecher and the City of McHenry, they appear to above the expected average costs in general; while the ELPC argues that the economic costs contained in the proposal were probably overstated and certainly were not significantly understated as suggested by the IAWA.

The Board finds nothing in the information provided by IAWA to alter its decision that the implementation of the proposed phosphorus effluent standard is economically reasonable. In the first-notice opinion, the Board stated that the cost of phosphorus removal varies on a site-specific basis depending upon the plant capacity, type of phosphorus removal process and existing treatment processes. If anything, the information supplied by the IAWA taken in context with the comments of the Agency and the ELPC bolster that statement.

As stated in the first-notice opinion and order, BPR and CPR are generally used for phosphorus removal. CPR treatment involves the use of aluminum salts, iron salts or lime to precipitate phosphorus from wastewater. The BPR processes involve the application of a combination of anaerobic, anoxic, and aerobic zones in suspended growth biological systems to remove reduce both phosphorus and nitrogen. Chemical addition is also used to augment the biological treatment processes.

The Board continues to believe that, based on the cost information in the record coupled with the fact that the proposed rule applies to only larger facilities, affected facilities can incorporate the additional cost of phosphorus control in their overall expansion plans with minimal impact. Thus, the Board finds that the implementation of the proposed phosphorus effluent standard to be economically reasonable.

Daily Maximum Limits

Each commenting party agrees that if a phosphorus effluent standard is adopted, the Board should exempt the standard from the averaging rule at 35 Ill. Adm. Code 304.104 (a)(2) and (3). The Board agrees. The exemption of the proposed phosphorus standard from the Board's averaging rule will not interfere with the stated objective of the proposal to reduce net loading of phosphorus from certain major sources into waters of the state. Exempting the phosphorus effluent standard from the averaging rule will in no way change the proposed monthly average limit of 1 mg/L.

Further, as argued by both the IAWA and the ELPC, exempting the phosphorus effluent standard from the averaging rule should encourage the use of BPR methods that may have more beneficial results, including the generation of less sludge.

The Board will use the following language in its second-notice proposal:

k) The averaging rules under subsections (a)(2) and (a)(3) of Section 304.104 do not apply to permit limits established pursuant to Section 304.123(g) or (h).

This language ensures that the exemption from the averaging rule applies to permit limits established pursuant to both subsections 304.123(g) or (h), instead of limiting the exemption to only subsection 304.123(g).

SUMMARY OF SECOND-NOTICE PROPOSAL

The proposal sets forth a phosphorus effluent limit of 1.0 milligram per liter (mg/L) as a monthly average that would apply to new or expanded discharges from treatment works with a design average flow (DAF) over 1.0 million gallons per day receiving municipal or domestic wastewater, or a total phosphorus effluent load of 25 lbs/day or more for treatment works other than those treating municipal or domestic wastewater. However, if the source can demonstrate that phosphorus is not limiting nutrient in the receiving water or that alternative phosphorus effluent limits are warranted by the aquatic environment in the receiving water, the 1.0 mg/L limit would not apply.

Today's proposal differs in only one substantive manner than the proposal as set forth in its entirety in the Board's first notice opinion and order – the addition of proposed language to ensure that the averaging rule exemption is available to permits issued under Section 304.104(g) as well as 304.104(b). This change was supported by IAWA, the ELPC and the Agency in post first-notice filings, and is set forth above.

In response to testimony and questions at hearing, the Agency offered several changes to the original proposal in its post-hearing comments prior to first notice. In the first notice opinion and order, the Board found that the changes to the proposal did not change the scope of the originally proposed language. The proposal that was published in the *Illinois Register* accepted the Agency's changes along with some clarifying changes drafted by Board.

Changes of note that were made in the Board's first-notice opinion and order include: (1) the addition of language in subsections (g)(1) and (g)(2) to clarify that treatment works receiving primarily municipal or domestic wastewater are not covered by subsections (b) through (f) of the proposal; (2) language in subsection (h) that provides that dischargers otherwise subject to the requirement in (g) may choose to demonstrate that the treatment works in question is not causing the phosphorus issues in the receiving waters, and therefore should not be subject to a monthly average permit limit for total phosphorus of 1.0 mg/L; (3) a sentence allowing the Agency to consider site-specific information in deciding whether alternative phosphorus effluent limits are appropriate is also included in the proposal; (4) a change in the renumbered subsection (i) that

provides that dischargers that comply with the requirements of (g) or (h) are not subject to additional phosphorus limitations that may be otherwise required by 35 Ill. Adm. Code 304.105 and 302.203; and (5) a new clause in the renumbered subsection (j) that the new water quality standards are not effective until approved by the United States Environmental Protection Agency (USEPA). Interim Phosphorus Effluent Standard, Proposed 35 Ill. Adm. Code 304.123(g-k), R04-26 (Apr. 7, 2005), slip op. at 20.

In addition, the Board defined what constitutes as a "new" or "expanded" discharge from treatment works at subsections (g)(3), defined a "new" discharge as a discharge from treatment works constructed after the effective date of the proposed regulations, an "expanded" discharge as a discharge from an existing treatment works that would be greater than the flow rates permitted prior to the effective date of the proposed amendments, and deleted subsection (i) of the Agency's proposal. Interim Phosphorus Effluent Standard, Proposed 35 Ill. Adm. Code 304.123(g-k), R04-26 (Apr. 7, 2005), slip op. at 20.

The Board has made additional non-substantive changes to the rule, but will not summarize or delineate the entirety of the rule or the changes made by the Board. The Board's order reflects the Board's changes.

CONCLUSION

Based on the record developed to date in this matter, the Board finds that adoption of the Agency's proposal is warranted. The Board proposes this rulemaking for second-notice review by Joint Committee on Administrative Rules (JCAR).

ORDER

The Board directs the Clerk to cause the filing of the following rule with the Joint Committee on Administrative Rules for its second-notice review.

TITLE 35: ENVIRONMENTAL PROTECTION
SUBTITLE C: WATER POLLUTION
CHAPTER I: POLLUTION CONTROL BOARD

PART 304
EFFLUENT STANDARDS

SUBPART A: GENERAL EFFLUENT STANDARDS

Section
304.101 Preamble
304.102 Dilution
304.103 Background Concentrations
304.104 Averaging
304.105 Violation of Water Quality Standards

SUBPART B: SITE SPECIFIC RULES AND EXCEPTIONS NOT OF GENERAL APPLICABILITY

SUBPART C: TEMPORARY EFFLUENT STANDARDS

Appendix A References to Previous Rules

AUTHORITY: Implementing Section 13 and authorized by Section 27 of the Environmental Protection Act [415 ILCS 5/13 and 27].

SOURCE: Filed with the Secretary of State January 1, 1978; amended at 2 Ill. Reg. 30, p. 343, effective July 27, 1978; amended at 2 Ill. Reg. 44, p. 151, effective November 2, 1978; amended at 3 Ill. Reg. 20, p. 95, effective May 17, 1979; amended at 3 Ill. Reg. 25, p. 190, effective June 21, 1979; amended at 4 Ill. Reg. 20, p. 53 effective May 7, 1980; amended at 6 Ill. Reg. 563, effective December 24, 1981; codified at 6 Ill. Reg. 7818: amended at 6 Ill. Reg. 11161, effective September 7, 1982; amended at 6 Ill. Reg. 13750, effective October 26, 1982; amended at 7 Ill. Reg. 3020, effective March 4, 1983; amended at 7 Ill. Reg. 8111, effective June 23, 1983; amended at 7 Ill. Reg. 14515, effective October 14, 1983; amended at 7 Ill. Reg. 14910, effective November 14, 1983; amended at 8 Ill. Reg. 1600, effective January 18, 1984; amended at 8 Ill. Reg. 3687, effective March 14, 1984; amended at 8 Ill. Reg. 8237, effective June 8, 1984; amended at 9 Ill. Reg. 1379, effective January 21, 1985; amended at 9 Ill. Reg. 4510, effective March 22, 1985; peremptory amendment at 10 Ill. Reg. 456, effective December 23, 1985; amended at 11 Ill. Reg. 3117, effective January 28, 1987; amended in R84-13 at 11 Ill. Reg. 7291 effective April 3, 1987; amended in R86-17(A) at 11 Ill. Reg. 14748, effective August 24, 1987; amended in R84-16 at 12 Ill. Reg. 2445, effective January 15, 1988; amended in R83-23 at 12 Ill. Reg. 8658, effective May 10, 1988; amended in R87-27 at 12 Ill. Reg. 9905, effective May 27, 1988; amended in R82-7 at 12 Ill. Reg. 10712, effective June 9, 1988; amended in R85-29 at 12 Ill. Reg. 12064, effective July 12, 1988; amended in R87-22 at 12 Ill. Reg. 13966, effective August 23, 1988; amended in R86-3 at 12 Ill. Reg. 20126, effective November 16, 1988; amended in R84-20 at 13 Ill. Reg. 851, effective January 9, 1989; amended in R85-11 at 13 Ill. Reg. 2060, effective February 6, 1989; amended in R88-1 at 13 Ill. Reg. 5976, effective April 18, 1989; amended in R86-17(B) at 13 Ill. Reg. 7754, effective May 4, 1989; amended in R88-22 at 13 Ill. Reg. 8880, effective May 26, 1989; amended in R87-6 at 14 Ill. Reg. 6777, effective April 24, 1990; amended in R87-36 at 14 Ill. Reg. 9437, effective May 31, 1990; amended in R88-21(B) at 14 Ill. Reg. 12538, effective July 18, 1990; amended in R84-44 at 14 Ill. Reg. 20719, effective December 11, 1990; amended in R86-14 at 15 Ill. Reg. 241, effective December 18, 1990; amended in R93-8 at 18 Ill. Reg. 267, effective December 23, 1993; amended in R87-33 at 18 Ill. Reg. 11574, effective July 7, 1994; amended in R95-14 at 20 Ill. Reg. 3528, effective February 8, 1996; amended in R94-1(B) at 21 Ill. Reg. 364, effective December 23, 1996; expedited correction in R94-1(B) at 21 Ill. Reg. 6269, effective December 23, 1996; amended in R97-25 at 22 Ill. Reg. 1351, effective December 24, 1997; amended in R97-28 at 23 Ill. Reg. 3512, effective February 3, 1998; amended in R98-14 at 23 Ill. Reg.687, effective December 31, 1998; amended in R02-19 at 26 Ill. Reg. 16948, effective November 8, 2002; amended in R02-11 at 27 Ill. Reg. 194, effective December 20, 2002; amended in R04-26 at 29 Ill. Reg. _____, effective _____.

SUBPART A: GENERAL EFFLUENT STANDARDS

Section 304.123 Phosphorus (STORET number 00665)

a) No effluent discharge within the Lake Michigan Basin shall contain more than 1.0 mg/L of phosphorus as P.

b) No effluent from any source which discharges to a lake or reservoir with a surface area of 8.1 hectares (20 acres) or more, or to any tributary of such a lake or reservoir whose untreated waste load is 2500 or more population equivalents, and which does not utilize a third-stage lagoon treatment system as specified in subsections 304.120(a) and (c), shall exceed 1.0 mg/L of phosphorus as P; however, this subsection shall not apply where the lake or reservoir, including any side channel reservoir or other portion thereof, on an annual basis exhibits a mean hydraulic retention time of 0.05 years (18 days) or less.

c) Pursuant to Section 28.1 of the Environmental Protection Act (Act) [415 ILCS 5/28.1], the owner or operator of any source subject to subsection (b) of this Section may apply for an adjusted standard. In addition to the proofs specified in Section 28.1(c) of the Act 415 ILCS 5/28.1(c), such application shall, at a minimum, contain adequate proof that the effluent resulting from grant of the adjusted standard will not contribute to cultural eutrophication, unnatural plant or algal growth or dissolved oxygen deficiencies in the receiving lake or reservoir. For purposes of this subsection (c), such effluent shall be deemed to contribute to such conditions if phosphorus is the limiting nutrient for biological growth in the lake or reservoir, taking into account the lake or reservoir limnology, morphological, physical and chemical characteristics, and sediment transport. However, if the effluent discharge enters a tributary at least 40.25 kilometers (25 miles) upstream of the point at which the tributary enters the lake or reservoir at normal pool level, such effluent shall not be deemed to contribute to such conditions if the receiving lake or reservoir is eutrophic and phosphorus from internal regeneration is not a limiting nutrient.

d) For the purposes of this Section the term "lake or reservoir" shall not include low level pools constructed in free flowing streams or any body of water which is an integral part of an operation which includes the application of sludge on land.

e) Compliance with the limitations of subsection (b) of this Section will be achieved by the following dates:

    1) Sources with the present capability to comply will do so on the effective date of this Section;

    2) All other sources will comply as required by NPDES permit.

f) For purposes of this Section, the following terms will have the meanings specified:

    1) "Dissolved oxygen deficiencies" means the occurrence of a violation of the dissolved oxygen standard applicable to a lake or reservoir.

(BOARD NOTE: Dissolved Oxygen standards for general use waters are set forth at 35 Ill. Adm. Code 302.206; Dissolved Oxygen standards for secondary contact or indigenous aquatic life waters are set forth at 35 Ill. Adm. Code 302.405.)

2) "Euphotic zone" means that region of a lake or reservoir extending from the water surface to a depth at which 99% of the surface light has disappeared or such lesser depth below which photosynthesis does not occur.

3) "Eutrophic" means a condition of a lake or reservoir in which there is an abundant supply of nutrients, including phosphorus, accounting for a high concentration of biomass.

4) "Eutrophication" means the process of increasing or accumulating plant nutrients in the water of a lake or reservoir. Cultural eutrophication is eutrophication attributable to human activities.

5) "Internal regeneration" means the process of conversion of phosphorus or other nutrients in sediments of a lake or reservoir from the particulate to the dissolved form and the subsequent return of such dissolved forms to the euphotic zone.

6) "Limiting nutrient" means a substance which is limiting to biological growth in a lake or reservoir due to its short supply or unavailability with respect to other substances necessary for the growth of organisms.

7) "Unnatural plant or algal growth" means the occurrence of a violation of the unnatural sludge standard applicable to a lake or reservoir with respect to such growth.

(BOARD NOTE: Unnatural sludge standards for general use waters are set forth at 35 Ill. Adm. Code 302.203; unnatural sludge standards for secondary and indigenous aquatic life waters are set forth at 35 Ill. Adm. Code 302.403.)

g) Except as provided in subsection (h) of this Section, any new or expanded discharges into General Use waters from the following treatment works not covered by subsections (b) through (f) of this Section, are subject to monthly average permit limits for total phosphorus of 1 mg/L:

1) Treatment works with a Design Average Flow of 1.0 million gallons per day or more receiving primarily municipal or domestic wastewater; or

2) Any treatment works, other than those treating primarily municipal or domestic wastewater, with a total phosphorus effluent load of 25 pounds per day or more.

3) For purposes of this subsection:

i) A new discharge means a discharge from a treatment works constructed after the effective date of this Section.

ii) An expanded discharge means a discharge from any existing treatment works that would be greater than the flowrates permitted prior to the effective date of this Section.

h) Discharges qualifying under subsections (g)(1) and (g)(2) of this Section may not be subject to the requirements of subsection (g) of this Section provided the discharger demonstrate that phosphorus from treatment works is not the limiting nutrient in the receiving water. The Agency may impose alternative phosphorus effluent limits where the supporting information shows that alternative limits are warranted by the aquatic environment in the receiving stream.

i) No additional phosphorus limitations are required pursuant to Sections 304.105 and 302.203 for the discharges that comply with the requirements of (g) or (h) of this Section.

j) The provisions of subsections (g), (h), and (i) of this Section apply until such time as the Board adopts a numeric water quality standard for phosphorus and the adopted standard is approved by the U.S. EPA.

k) The averaging rules under subsections (a)(2) and (a)(3) of Section 304.104 do not apply to permit limits established pursuant to subsection (g) or (h) of this Section.

(Source: Amended in _____ at _____ Ill. Reg. _____, effective _____, 2005.

IT IS SO ORDERED.

I, Dorothy M. Gunn, Clerk of the Illinois Pollution Control Board, certify that the Board adopted the above opinion and order on September 1, 2005, by a vote of 5-0.

Dorothy M. Gunn, Clerk
Illinois Pollution Control Board

ILLINOIS POLLUTION CONTROL BOARD
January 19, 2006

IN THE MATTER OF:	)	
	)	
PROPOSED 35 ILL. ADM. CODE	)	R04-26
304.123(g), 304.123(h), 304.123(i), 304.123(j),	)	(Rulemaking - Water)
and 304.123(k)	)	

Adopted Rule. Final Notice.

OPINION AND ORDER OF THE BOARD (by T.E. Johnson):

Today the Board adopts proposed phosphorus effluent standard regulations. These regulations set forth a phosphorus effluent limit of 1.0 milligram per liter (mg/L) as a monthly average that would apply to new or expanded discharges from treatment works with a design average flow (DAF) over 1.0 million gallons per day receiving municipal or domestic wastewater, or a total phosphorus effluent load of 25 lbs/day or more for treatment works other than those treating municipal or domestic wastewater.

The rules adopted here are substantively unchanged from those adopted in the Board's first-notice and second-notice opinion and orders. On September 15, 2005, the Board adopted the rule for second notice. The Board directed that the rule be submitted to the Joint Committee on Administrative Rules (JCAR) for second-notice review. JCAR considered the rule on November 15, 2005, and again on December 13, 2005. JCAR issued a certification and statement of objection to the rule on December 13, 2005. The following opinion will explain the proposal background, summarize the procedural history, discuss the economic reasonableness and technical feasibility of the rule, and respond to JCAR's objection.

BACKGROUND

On May 14, 2004, the Board received a rulemaking proposal from the Illinois Environmental Protection Agency (Agency). The Agency seeks to set an interim phosphorus effluent standard by adding five new subsections (g-k) to existing 35 Ill. Adm. Code 304.123. A motion for acceptance accompanied the proposal.

In its statement of reasons, the Agency asserts that it is in the process of developing the State numeric nutrient standards pursuant to its triennial water quality standards review. Pet. at 7. The Agency expects to file a nutrient standards petition with the Board in early 2007. Pet. at 8. In the interim, the Agency is proposing this effluent standard for phosphorus to limit higher concentrations of phosphorus that may result in detrimental levels of plant and algae growth. *Id*. The Agency requests that the interim effluent standard apply until the Board adopts a numeric water quality standard for phosphorus.

Two hearings were held before Board Hearing Officer John Knittle. The first hearing was held on August 30, 2004 (Tr.1), in Chicago. The second hearing was held on October 25,

2004, in Springfield (Tr.2). During those hearings the Board heard testimony from a number of witnesses. The Board received 17 public comments prior to proceeding to first notice.

On April 7, 2005, the Board found that the proposal was technically feasible and economically reasonable. The Board proceeded to first notice, and noted that additional comments on the proposal would be accepted.

The proposed amendments were published in the *Illinois Register* on May 6, 2005. *See* Ill. Reg. Vol. 29 Issue 19, p. 6200. The Illinois Association of Wastewater Agencies (IAWA) filed a public comment on June 20, 2005. On July 1, 2005, the Environmental Law & Policy Center, Prairie Rivers Network and Sierra Club (collectively ELPC) filed a response to the comments of IAWA. The Agency filed a comment on July 26, 2005.

In its second-notice opinion and order issued on September 15, 2005, the Board found that adoption of the Agency's proposed rule was warranted, and proposed the rulemaking for second-notice review by the JCAR.

JCAR REVIEW

JCAR considered the second-notice proposal at its November 15, 2005 meeting and voted to extend the second-notice period for an additional 45 days. JCAR considered the second-notice proposal again at its December 13, 2005 meeting and issued a formal certification and statement of objection to the proposed rulemaking. The complete text of the objection follows:

> At its meeting on December 13, 2005, the Joint Committee on Administrative Rules objected to the Pollution Control Board's rulemaking titled Effluent Standards (35 Ill. Adm. Code 304; 25 Ill. Reg. 6200) because the rulemaking imposes an undue economic and regulatory burden on the affected wastewater treatment facilities by requiring those facilities to meet interim standards for phosphorus discharges. The EPA has committed to the USEPA to have numeric standards in place for nutrients, but not until in 2008. This additional time should allow affected entities more time to prepare for any costs associated with these standards.
>
> Failure of the agency to respond within 90 days after receipt of the State of Objection shall constitute withdrawal of this proposed rulemaking. The agency's response will be place on the JCAR agenda for further consideration. *See* Statement of Objection to Proposed Rulemaking, December 13, 2005.

The second-notice period commenced on October 7, 2005, and ended on December 17, 2005, when the Board received notification from JCAR that an objection was issued. *See* 5 ILCS 100/5-40(c) (2004); 35 Ill. Adm. Code 102.606. Other than the non-substantive comments suggested by JCAR, the Board received no comments during the second-notice period.

DISCUSSION

At second notice, the Board found that adoption of the proposal is warranted, and that the proposal was economically reasonable and technically feasible. JCAR stated that they objected to the proposal because the rulemaking imposes an undue economic and regulatory burden on the affected wastewater treatment facilities by requiring those facilities to meet interim standards for phosphorus discharges.

JCAR is a legislative oversight committee that may examine any proposed rule to determine whether the proposed rule is within the statutory authority upon which it is based; whether the rule is in proper form; and whether the notice that was given before its adoption was sufficient to give adequate notice of the purpose and effect of the rule. In addition, JCAR may consider whether the agency has considered alternatives to the rule that are consistent with the stated objects of both the applicable statutes and regulations and whether the rule is designed to minimize economic impact on small businesses. 5 ILCS 100/5-110(a) (2004).

If JCAR certifies its objections to the issuing agency within the second-notice period, that agency must either modify the proposed rule to meet JCAR's objections, withdraw the proposed rule in its entirety, or refuse to modify or withdraw the proposed rule. 5 ILCS 100/5-110(c) (2004).

If an agency refuses to modify or withdraw a proposed rule to remedy an objection by JCAR, that agency most notify JCAR in writing of its refusal and submit a notice of refusal to the Secretary of State. The notice must be published in the next available issue of the *Illinois Register*. If JCAR decides to recommend legislative action in response to an agency refusal, the JCAR "shall have drafted and introduced into either house of the General Assembly appropriate legislation to implement the recommendations of the Joint Committee." 5 ILCS 100/5-110(g) (2004).

The Board respectfully disagrees with JCAR's conclusions. The Board continues to believe that, based on the cost information in the record coupled with the fact that the proposed rule applies to only new or expanding larger facilities, affected facilities can incorporate the additional cost of phosphorus control in their overall expansion plans with an economically reasonable impact. Once again, it should be stressed that the proposed limit would apply to only new or expanded discharges from wastewater treatment plants with either a design average flow over 1.0 million gallons per day receiving municipal or domestic waste water, or a total phosphorus effluent load of 25 pounds per day or more for treatment works other than those treating municipal or domestic wastewater. Further, the 1.0 mg/L limit would not apply to a source that can demonstrate that phosphorus is not the limiting nutrient in the receiving water or that alternative phosphorus effluent limits are warranted by the aquatic environment in the receiving water. Thus, the Board finds that the implementation of the proposed phosphorus effluent standard will not impose an undue economic or regulatory burden.

Further, as the Board explained at second notice, while the findings of the nutrient control work group referenced by JCAR will help the Agency in developing scientifically justifiable

water quality standards for nutrients, effluent standards are somewhat different. An effluent standard is mainly intended to limit significant loading of a pollutant to a receiving stream giving consideration to availability of appropriate treatment technology and associated costs. While there is currently a water quality standard for phosphorous that applies to some waters of the State, the impact of the new effluent standard for phosphorus is designed to limit the phosphorus loading on the State waters.

As stated in the second-notice order, the Board believes it is prudent to control phosphorus discharge from larger treatment plants given the impact of such discharges on receiving streams. While non-point source contribution (agricultural drainage and runoff) is also a significant source of phosphorus loadings, the Board believes that control of phosphorus from non-point sources is not appropriate in this rulemaking.

The Board finds nothing in JCAR's objection or in a review of the record to alter its decision that the implementation of the proposed phosphorus effluent standard is economically reasonable and technically feasible. As noted, the Board did receive six non-substantive comments from JCAR. The Board has incorporated the suggested changes into the adopted proposal.

SUMMARY OF THE ADOPTED PROPOSAL

The adopted proposal sets forth a phosphorus effluent limit of 1.0 milligram per liter (mg/L) as a monthly average that would apply to new or expanded discharges from treatment works with a design average flow (DAF) over 1.0 million gallons per day receiving municipal or domestic wastewater, or a total phosphorus effluent load of 25 lbs/day or more for treatment works other than those treating municipal or domestic wastewater. However, if the source can demonstrate that phosphorus is not limiting nutrient in the receiving water or that alternative phosphorus effluent limits are warranted by the aquatic environment in the receiving water, the 1.0 mg/L limit would not apply.

Today's proposal differs in only one substantive manner than the proposal as set forth in its entirety in the Board's first-notice opinion and order – the addition of proposed language to ensure that the averaging rule exemption is available to permits issued under Section 304.104(g) as well as 304.104(b). This change was supported by IAWA, the EPLC and the Agency in post first-notice filings.

In response to testimony and questions at hearing, the Agency offered several changes to the original proposal in its post-hearing comments prior to first notice. In the first-notice opinion and order, the Board found that the changes to the proposal did not change the scope of the originally proposed language. The proposal that was published in the *Illinois Register* accepted the Agency's changes along with some clarifying changes drafted by Board.

Changes of note that were made in the Board's first-notice opinion and order include: (1) the addition of language in subsections (g)(1) and (g)(2) to clarify that treatment works receiving primarily municipal or domestic wastewater are not covered by subsections (b) through (f) of the proposal; (2) language in subsection (h) that provides that dischargers otherwise subject to the

requirement in (g) may choose to demonstrate that the treatment works in question is not causing the phosphorus issues in the receiving waters, and therefore should not be subject to a monthly average permit limit for total phosphorus of 1.0 mg/L; (3) a sentence allowing the Agency to consider site-specific information in deciding whether alternative phosphorus effluent limits are appropriate; (4) a change in the renumbered subsection (i) that provides that dischargers that comply with the requirements of (g) or (h) are not subject to additional phosphorus limitations that may be otherwise required by 35 Ill. Adm. Code 304.105 and 302.203; and (5) a new clause in the renumbered subsection (j) that the new water quality standards are not effective until approved by the United States Environmental Protection Agency (USEPA). Interim Phosphorus Effluent Standard, Proposed 35 Ill. Adm. Code 304.123(g-k), R04-26 slip op. at 20 (Apr. 7, 2005).

In addition, the Board defined what constitutes as a "new" or "expanded" discharge from treatment works at subsection (g)(3). A "new" discharge is defined as a discharge from treatment works constructed after the effective date of the proposed regulations, and an "expanded" discharge is defined as a discharge from an existing treatment works that would be greater than the flow rates permitted prior to the effective date of the proposed amendments. The Board deleted subsection (i) of the Agency's proposal. Interim Phosphorus Effluent Standard, Proposed 35 Ill. Adm. Code 304.123(g-k), R04-26 slip op. at 20. (Apr. 7, 2005).

The Board has made additional non-substantive changes to the rule as suggested by JCAR, but will not summarize or delineate the entirety of the rule or the changes made by the Board. The Board's order reflects the Board's changes.

CONCLUSION

Based on the record before it, the Board finds that adoption of the Agency's proposal is warranted.

ORDER

The Board directs the Clerk to file the following adopted rule with the Secretary of State for publication in the *Illinois Register* for final notice and adoption in the *Illinois Administrative Code*.

TITLE 35: ENVIRONMENTAL PROTECTION
SUBTITLE C: WATER POLLUTION
CHAPTER I: POLLUTION CONTROL BOARD

PART 304
EFFLUENT STANDARDS

SUBPART A: GENERAL EFFLUENT STANDARDS

Section
304.101 Preamble

SUBPART B: SITE SPECIFIC RULES AND EXCEPTIONS NOT OF GENERAL APPLICABILITY

Section

SUBPART C: TEMPORARY EFFLUENT STANDARDS

Section

304.301 Exception for Ammonia Nitrogen Water Quality Violations (Repealed)
304.302 City of Joliet East Side Wastewater Treatment Plant
304.303 Amerock Corporation, Rockford Facility

Appendix A References to Previous Rules

AUTHORITY: Implementing Section 13 and authorized by Section 27 of the Environmental Protection Act [415 ILCS 5/13 and 27].

SOURCE: Filed with the Secretary of State January 1, 1978; amended at 2 Ill. Reg. 30, p. 343, effective July 27, 1978; amended at 2 Ill. Reg. 44, p. 151, effective November 2, 1978; amended at 3 Ill. Reg. 20, p. 95, effective May 17, 1979; amended at 3 Ill. Reg. 25, p. 190, effective June 21, 1979; amended at 4 Ill. Reg. 20, p. 53, effective May 7, 1980; amended at 6 Ill. Reg. 563, effective December 24, 1981; codified at 6 Ill. Reg. 7818; amended at 6 Ill. Reg. 11161, effective September 7, 1982; amended at 6 Ill. Reg. 13750, effective October 26, 1982; amended at 7 Ill. Reg. 3020, effective March 4, 1983; amended at 7 Ill. Reg. 8111, effective June 23, 1983; amended at 7 Ill. Reg. 14515, effective October 14, 1983; amended at 7 Ill. Reg. 14910, effective November 14, 1983; amended at 8 Ill. Reg. 1600, effective January 18, 1984; amended at 8 Ill. Reg. 3687, effective March 14, 1984; amended at 8 Ill. Reg. 8237, effective June 8, 1984; amended at 9 Ill. Reg. 1379, effective January 21, 1985; amended at 9 Ill. Reg. 4510, effective March 22, 1985; peremptory amendment at 10 Ill. Reg. 456, effective December 23, 1985; amended at 11 Ill. Reg. 3117, effective January 28, 1987; amended in R84-13 at 11 Ill. Reg. 7291, effective April 3, 1987; amended in R86-17(A) at 11 Ill. Reg. 14748, effective August 24, 1987; amended in R84-16 at 12 Ill. Reg. 2445, effective January 15, 1988; amended in R83-23 at 12 Ill. Reg. 8658, effective May 10, 1988; amended in R87-27 at 12 Ill. Reg. 9905, effective May 27, 1988; amended in R82-7 at 12 Ill. Reg. 10712, effective June 9, 1988; amended in R85-29 at 12 Ill. Reg. 12064, effective July 12, 1988; amended in R87-22 at 12 Ill. Reg. 13966, effective August 23, 1988; amended in R86-3 at 12 Ill. Reg. 20126, effective November 16, 1988; amended in R84-20 at 13 Ill. Reg. 851, effective January 9, 1989; amended in R85-11 at 13 Ill. Reg. 2060, effective February 6, 1989; amended in R88-1 at 13 Ill. Reg. 5976, effective April 18, 1989; amended in R86-17(B) at 13 Ill. Reg. 7754, effective May 4, 1989; amended in R88-22 at 13 Ill. Reg. 8880, effective May 26, 1989; amended in R87-6 at 14 Ill. Reg. 6777, effective April 24, 1990; amended in R87-36 at 14 Ill. Reg. 9437, effective May 31, 1990; amended in R88-21(B) at 14 Ill. Reg. 12538, effective July 18, 1990; amended in R84-44 at 14 Ill. Reg. 20719, effective December 11, 1990; amended in R86-14 at 15 Ill. Reg. 241, effective December 18, 1990; amended in R93-8 at 18 Ill. Reg. 267, effective December 23, 1993; amended in R87-33 at 18 Ill. Reg. 11574, effective July 7, 1994; amended in R95-14 at 20 Ill. Reg. 3528, effective February 8, 1996; amended in R94-1(B) at 21 Ill. Reg. 364, effective December 23, 1996; expedited correction in R94-1(B) at 21 Ill. Reg. 6269, effective December 23, 1996; amended in R97-25 at 22 Ill. Reg. 1351, effective December 24, 1997; amended in R97-28 at 23 Ill. Reg. 3512, effective February 3, 1998; amended in R98-14 at 23 Ill. Reg.687, effective December 31, 1998; amended in R02-19 at 26 Ill. Reg. 16948, effective November 8, 2002; amended in R02-11 at 27 Ill. Reg. 194, effective December 20, 2002; amended in R04-26 at 30 Ill. Reg. _____, effective _____.

SUBPART A: GENERAL EFFLUENT STANDARDS

Section 304.123 Phosphorus (STORET number 00665)

a) No effluent discharge within the Lake Michigan Basin shall contain more than 1.0 mg/*l* of phosphorus as P.

b) No effluent from any source which discharges to a lake or reservoir with a surface area of 8.1 hectares (20 acres) or more, or to any tributary of such a lake or reservoir whose untreated waste load is 2500 or more population equivalents, and which does not utilize a third-stage lagoon treatment system as specified in subsections 304.120(a) and (c), shall exceed 1.0 mg/*l* of phosphorus as P; however, this subsection shall not apply where the lake or reservoir, including any side channel reservoir or other portion thereof, on an annual basis exhibits a mean hydraulic retention time of 0.05 years (18 days) or less.

c) Pursuant to Section 28.1 of the Environmental Protection Act (Act) [415 ILCS 5/28.1], the owner or operator of any source subject to subsection (b) of this Section may apply for an adjusted standard. In addition to the proofs specified in Section 28.1(c) of the Act 415 ILCS 5/28.1(c), such application shall, at a minimum, contain adequate proof that the effluent resulting from grant of the adjusted standard will not contribute to cultural eutrophication, unnatural plant or algal growth or dissolved oxygen deficiencies in the receiving lake or reservoir. For purposes of this subsection (c), such effluent shall be deemed to contribute to such conditions if phosphorus is the limiting nutrient for biological growth in the lake or reservoir, taking into account the lake or reservoir limnology, morphological, physical and chemical characteristics, and sediment transport. However, if the effluent discharge enters a tributary at least 40.25 kilometers (25 miles) upstream of the point at which the tributary enters the lake or reservoir at normal pool level, such effluent shall not be deemed to contribute to such conditions if the receiving lake or reservoir is eutrophic and phosphorus from internal regeneration is not a limiting nutrient.

d) For the purposes of this Section the term "lake or reservoir" shall not include low level pools constructed in free flowing streams or any body of water which is an integral part of an operation which includes the application of sludge on land.

e) Compliance with the limitations of subsection (b) of this Section shall be achieved by the following dates:

1) Sources with the present capability to comply shall do so on the effective date of this Section;

2) All other sources shall comply as required by NPDES permit.

f) For purposes of this Section, the following terms shall have the meanings specified:

1) "Dissolved oxygen deficiencies" means the occurrence of a violation of the dissolved oxygen standard applicable to a lake or reservoir.

(BOARD NOTE: Dissolved Oxygen standards for general use waters are set forth at 35 Ill. Adm. Code 302.206; Dissolved Oxygen standards for secondary contact or indigenous aquatic life waters are set forth at 35 Ill. Adm. Code 302.405.)

2) "Euphotic zone" means that region of a lake or reservoir extending from the water surface to a depth at which 99% of the surface light has disappeared or such lesser depth below which photosynthesis does not occur.

3) "Eutrophic" means a condition of a lake or reservoir in which there is an abundant supply of nutrients, including phosphorus, accounting for a high concentration of biomass.

4) "Eutrophication" means the process of increasing or accumulating plant nutrients in the water of a lake or reservoir. Cultural eutrophication is eutrophication attributable to human activities.

5) "Internal regeneration" means the process of conversion of phosphorus or other nutrients in sediments of a lake or reservoir from the particulate to the dissolved form and the subsequent return of such dissolved forms to the euphotic zone.

6) "Limiting nutrient" means a substance which is limiting to biological growth in a lake or reservoir due to its short supply or unavailability with respect to other substances necessary for the growth of organisms.

7) "Unnatural plant or algal growth" means the occurrence of a violation of the unnatural sludge standard applicable to a lake or reservoir with respect to such growth.

(BOARD NOTE: Unnatural sludge standards for general use waters are set forth at 35 Ill. Adm. Code 302.203; unnatural sludge standards for secondary and indigenous aquatic life waters are set forth at 35 Ill. Adm. Code 302.403.)

g) Except as provided in subsection (h) of this Section, any new or expanded discharges into General Use waters from the following treatment works not covered by subsections (b) through (f) of this Section, are subject to monthly average permit limits for total phosphorus of 1 mg/ *l*:

1) Treatment works with a Design Average Flow of 1.0 million gallons per day or more receiving primarily municipal or domestic wastewater; or

2) Any treatment works, other than those treating primarily municipal or domestic wastewater, with a total phosphorus effluent load of 25 pounds per day or more.

3) For purposes of this subsection:

A) A new discharge means a discharge from a treatment works constructed after December 15, 2005.

B) An expanded discharge means a discharge from any existing treatment works that would be greater than the flowrates permitted prior to December 15, 2005.

h) Discharges qualifying under subsections (g)(1) and (g)(2) of this Section may not be subject to the requirements of subsection (g) of this Section provided the discharger demonstrate that phosphorus from treatment works is not the limiting nutrient in the receiving water. The Agency may impose alternative phosphorus effluent limits where the supporting information shows that alternative limits are warranted by the aquatic environment in the receiving stream.

i) No additional phosphorus limitations are required pursuant to Sections 304.105 and 35 Ill. Adm. Code 302.203 for the discharges that comply with the requirements of subsection (g) or (h) of this Section.

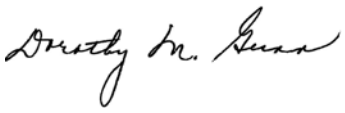
j) The provisions of subsections (g), (h), and (i) of this Section apply until such time as the Board adopts a numeric water quality standard for phosphorus and the adopted standard is approved by the U.S. EPA.

k) The averaging rules under subsections (a)(2) and (a)(3) of Section 304.104 do not apply to permit limits established pursuant to subsection (g) or (h) of this Section.

(Source: Amended at 30 Ill. Reg. _____, effective _____)

IT IS SO ORDERED.

I, Dorothy M. Gunn, Clerk of the Illinois Pollution Control Board, certify that the Board adopted the above opinion and order on January 19, 2006, by a vote of 4-0.



Dorothy M. Gunn, Clerk
Illinois Pollution Control Board