ILLINOIS POLLUTION CONTROL BOARD
July 7, 2011

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

Proposed Rule. First Notice.

OPINION AND ORDER OF THE BOARD (by G.T. Girard):

SUMMARY OF TODAY'S ACTION

The Board proposes for first notice a rule establishing an effluent limit of 400 fecal coliforms colony forming units (CFU) per 100 mL from March 1 through November 30 for effluent discharges to Primary Contact Recreation Use water segments of the Chicago Area Waterway System (CAWS). Those segments are 1) Lower North Shore Channel from North Side Water Reclamation Plant to confluence with North Branch of the Chicago River; 2) North Branch of the Chicago River from its confluence with North Shore Channel to its confluence with South Branch of the Chicago River and Chicago River; 3) Chicago River; 4) South Branch of the Chicago River; 5) Little Calumet River from its confluence with Calumet River and Grand Calumet River to its confluence with Calumet-Sag Channel; and 6) Calumet-Sag Channel. The Board finds that the rule proposed is economically reasonable and technically feasible.

The Board declines at this time to establish an effluent limit for other segments of the CAWS and Lower Des Plaines River (LDPR) that are designated as Incidental Contact Recreation Use, Non-contact Recreation Use, and Non-Recreation Use waters. The Board also declines to adopt bacterial water quality standards for the Chicago Area Waterway System and Lower Des Plaines River, but invites participants to comment on whether the Board should adopt the existing General Use fecal coliform water quality standard for Primary Contact Recreation waters of the CAWS. Further, the Board invites participants to file a proposal to address bacterial water quality standards for all waters of CAWS and LDPR after USEPA issues new guidelines in 2012 for establishing such standards.

GUIDE TO THE BOARD'S OPINION

Numerous public hearings have been held, numerous comments received, and exhibits have been filed, all in addition to the Illinois Environmental Protection Agency's (IEPA) original proposal. Thus, for the convenience of the reader, the IEPA's statement of reasons is cited as "SR" and attachments to the proposal are cited as "Attach" while hearing exhibits are cited as

"Exh.". Hearing transcript are cited by date 01/01/01 and A or P if there are separate morning or afternoon transcripts. Public comments are cited as "PC".

The Board's opinion begins by relating the procedural background (page 2). The Board next summarizes the first notice opinion and order in Subdocket A (page 4), followed by the statutory background (page 5). The Board then offers a brief history of the Chicago Area Waterways (CAWS) and Lower Des Plaines River (LDPR) (page 5) followed by the regulatory history (page 7). The Board then describes the Clean Water Act (page 11) and the IEPA's proposal (page 13). The Board next summarizes the testimony provided in the rulemaking (page 13) and then summarizes the public comments received (page 59). Finally, the Board discusses the Board's decision (page 109).

PROCEDURAL BACKGROUND

On October 26, 2007, the IEPA filed a proposal under the general rulemaking provisions of Sections 27 and 28 of the Environmental Protection Act (Act) (415 ILCS 5/27, 28 (2010)). Generally, the proposal amends the Board's rules for Secondary Contact and Indigenous Aquatic Life Uses to update the designated uses and criteria necessary to protect the existing uses of the CAWS and the LDPR. On November 1, 2007, the Board accepted the proposal for hearing. On November 15, 2007, the Board granted a motion to hold hearings in Chicago and Joliet that accompanied the proposal.

On June 12, 2008, the Metropolitan Water Reclamation District of Greater Chicago (District) filed a motion to stay the rulemaking proceeding, which was supported by: 1) Midwest Generation, 2) Chemical Industry Council of Illinois (CICI), and 3) Stepan. On June 25, 2008, the Environmental Law and Policy Center, Friends of the Chicago River, Sierra Club Illinois Chapter, Natural Resources Defense Council and Openlands (Environmental Groups) filed a response in opposition to the motion. Joining in the opposition the motion was Southeast Environmental Task Force (SETF), the People of the State of Illinois (People), and IEPA. On July 21, 2008, the Board denied the motion to stay and directed the parties to proceed with additional hearings already scheduled.

On March 18, 2010, the Board granted a motion filed by Citgo/PDV for an additional hearing on Asian Carp, but delayed that hearing until later in 2010. The Board also granted a motion filed by the Environmental Groups to sever the dockets. The Board severed the dockets as follows: 1) subdocket A deals with the issues related to recreational use designations, 2) subdocket B addresses issues relating to disinfection and whether or not disinfection may or may not be necessary to meet those use designations, 3) subdocket C addresses the issues involving proposed aquatic life uses, and 4) subdocket D addresses the issues dealing with water quality standards and criteria which are necessary to meet the aquatic life use designations.

The Board held 39 days of hearing as of March 18, 2010, when the docket was divided, and additional hearings proceeded in this docket and continue to proceed in the remaining subdockets. Hearings were held in Chicago: January 28, 2008 through February 1, 2008, June 16, 2008, September 8, 2008 through September 10, 2008, September 23, 2008 through September 25, 2008, February 17 and 18, 2009, March 3 and 4, 2009, April 15, 2009, May 5, 6,

and 20, 2009, July 28 and 29, 2009, August 13 and 14, 2009, October 5, 2009, November 9 and 10, 2009, and January 13 and 14, 2010. Hearings were held in Joliet: March 10, 2008 through March 12, 2008, October 27 and 28, 2008 and November 17, 2008. Hearings were held in Des Plaines: April 23 and 24, 2008, and December 2 and 3, 2008.

In the March 18, 2010 order, the Board instructed the Hearing Officer to schedule a hearing in June on the Chicago Health Environmental Exposure and Recreation Study (CHEERS) being prepared by the District. The Board held additional hearings on the CHEERS report in Chicago on June 29 and 30, 2010.

On August 5, 2010, the Board ruled on a motion filed by the District to hold additional hearings in this subdocket concerning the final report on the CHEERS. IEPA, the People and Environmental Groups opposed the request for additional hearings. The Board granted the motion and directed the hearing officer to schedule hearings on the CHEERS final report and to schedule final comments in this matter expeditiously, but in no event to conclude later than December 31, 2010. The Board held additional hearings in Chicago on October 19 and 20, 2010.

On November 4, 2010, the Board denied the People's motion to bar the District from submitting a supplement to CHEERS. The Board noted that the Board would accept all relevant information in Subdocket B submitted by December 31, 2010, including any filings by the District.

On January 3, 2011, in response to a motion by the Environmental Groups and the resulting reply by the District, the Board allowed responses to final comments to be filed by January 31, 2011, and replies to be filed by February 15, 2011.

Not all the testimony received during the 39 days of hearing is relevant to this subdocket. Those whose testimony is relevant are the following:

Rob Sulski of IEPA (Exhibit 1)
Scott Twait of IEPA (Exhibit 2)
Richard Lanyon of the District (Exhibit 60)
Chriso Petropoulou of the District (Exhibit 68)
Charles P. Gerba of the District (Exhibit 69)
Keith Tolson of the District (Exhibit 70)
Earnest R. Blatchley III on behalf of the District (Exhibit 93)
Susan O'Connell of the District
Geeta Rijal of the District (Exhibit 113)
Adrienne D. Nemura on behalf of the District (Exhibit 116)
Stephen F. McGowan behalf of the District (Exhibit 133)
Charles Haas on behalf of the District (Exhibit 144)
David R. Zenz on behalf of the District (Exhibit 146)
Thomas E. Kunetz of the District (Exhibit 153)
John Mastracchio on behalf of the District (Exhibit 159)
Dr. William Van Bonn on behalf of the Environmental Groups (Exhibit 240)
Peter Orris, M.D., M.P.H on behalf of the Environmental Groups (Exhibit 234)

Dr. Marylynn V. Yates on behalf of the Environmental Groups (Exhibit 249)
Margaret Frisbee of the Friends of the Chicago River (Exhibit 259)
Dr. Kevin J. Boyle on behalf of the People (Exhibit 286)
Carl E. Adams Jr. and Robin Garibay on behalf of Stepan Company (Exhibit 318)
Thomas Granato of the District
Sharon Bloyd-Peshkin on behalf of the Environmental Groups (Exhibit 419)
Samuel Dorevitch on behalf of the District (Exhibit 100, 382,398)
Marc H. Gorelick on behalf of the Environmental Groups (Exhibit 233, 390, 415)

In addition to hearing testimony, the Board received over 419 exhibits and over 1000 public comments. Not all comments and exhibits are relevant to a determination of effluent disinfection, and therefore will not be listed. Further, many public comments consist of one page or less comments from numerous individuals. Those comments are: PC 307-483, 485-490, 492-494, 501-504, 506-551, 557-558 573-578, 585 -972, 974-993, 995-1002, 1004-1007, 1012-1054. Those comments all support disinfection of the effluent. The public comments from participants are:

IEPA PC 568, 1003
The People PC 566
The Environmental Groups PC 564, 579, 582, 973
USEPA PC 561, 580, 584, 994
The District PC 300, 300A, 484, 478, 556, 562, 565, 567, 581, 583, 1010

BOARD'S ACTION IN SUBDOCKET A

As explained earlier, on March 18, 2010, the Board designated four subdockets to delineate issues for decision in the R08-9 rulemaking. Subdocket A deals with the issues related to recreational use designations and Subdocket B addresses issues relating to disinfection and whether or not disinfection may or may not be necessary to meet those use designations. On June 16, 2011, the Board adopted a second notice opinion and order proposing recreational use designations for segments of the CAWS and LDPR. *See* Water Quality Standards And Effluent Limitations For The Chicago Area Waterway System And Lower Des Plaines River Proposed Amendments to 35 Ill. Adm. Code 301, 302, 303, and 304, R08-9(A) (June 16, 2011). A summary of the Board's procedural and substantive decisions in Subdocket A is given in the paragraphs that follow.

On August 5, 2010, the Board proposed for first notice recreational use designations for the CAWS and the LDPR which provide for incidental contact recreation, non-contact recreation and non-recreational waters. The Board received additional comment and held an additional hearing on October 19 and 20, 2010 to satisfy the requirements of Section 27(b) of the Act (415 ILCS 5/27(b) (2010)). On June 16, 2011, the Board proceeded to second notice with a rule proposing four categories of recreational use designation for the CAWS and LDPR: Primary Contact Recreation, Incidental Contact Recreation, Non-contact Recreation, and Non Recreation. The Board responded to comments from participants by adding rules defining "Primary Contact Recreation" to identify segments of the CAWS where full body contact recreation is attainable in

the foreseeable future. Primary Contact Recreation is intended to meet the CWA recreational use goal of recreating on and in the water (swimmable).

Segments of the CAWS proposed for Primary Contact Recreation are: 1) Lower North Shore Channel from North Side Water Reclamation Plant to confluence with North Branch of the Chicago River; 2) North Branch of the Chicago River from its confluence with North Shore Channel to its confluence with South Branch of the Chicago River and Chicago River; 3) Chicago River; 4) South Branch of the Chicago River; 5) Little Calumet River from its confluence with Calumet River and Grand Calumet River to its confluence with Calumet-Sag Channel; and 6) Calumet-Sag Channel.

Segments of the CAWS and LDPR proposed for Incidental Contact Recreation are: 1) Upper North Shore Channel from Wilmette Pumping Station to North Side Water Reclamation Plant; 2) South Fork of the South Branch of the Chicago River; 3) Chicago Sanitary and Ship Canal from its confluence with South Branch of the Chicago River to its confluence with Calumet-Sag Channel; 4) Calumet River from Torrence Avenue to its confluence with Grand Calumet River and Little Calumet River; 5) Lake Calumet and Lake Calumet Connecting Channel; 6) Grand Calumet River; and 7) Lower Des Plaines River from the Brandon Road Lock and Dam to the Interstate 55 bridge.

The final three segments of the CAWS and LDPR that were designated for Non-contact Recreation or Non-recreation at first notice remain the same for second notice. The Non-contact Recreation use designation is proposed for Calumet River from Lake Michigan to Torrence Avenue. The Non-recreation use designation is proposed for: 1) Chicago Sanitary and Ship Canal from its confluence with the Calumet-Sag Channel to its confluence with Des Plaines River; and 2) Lower Des Plaines River from its confluence with Chicago Sanitary and Ship Canal to the Brandon Road Lock and Dam.

STATUTORY BACKGROUND

This proposal is filed as a regulatory proposal of general applicability pursuant to Sections 27 and 28 of the Act (415 ILCS 5/27, 28 (2010)) and as a general rulemaking pursuant to Section 5-40 of the Illinois Administrative Procedure Act (5 ILCS 100/5-40 (2010). SR at 2. Pursuant to Section 27(a) of the Act (415 ILCS 5/27(a) (2010)), the Board is required to take into account "the existing physical conditions, the character of the area involved, including the character of surrounding land uses, zoning classifications, the nature of the existing air quality or receiving body of water, as the case may be, and the technical feasibility and economic reasonableness of measuring or reducing the particular type of pollution." 415 ILCS 5/27(a) (2010).

DESCRIPTION AND ENGINEERING HISTORY OF THE WATERWAYS

The Board will begin with a description of the CAWS and then the LDPR. The Board will then discuss the engineering history of the CAWS and LDPR.

CAWS Description

The Chicago area is drained by a series of waterways including many that were manmade to direct water flow away from Lake Michigan to protect drinking water. SR at 18. CAWS consists of 78 miles of manmade channels that allow for commercial navigation, and that provide an outlet for urban stormwater runoff and treated municipal wastewater effluent. *Id*. CAWS also supports recreational boating, fishing, streamside recreation and aquatic life and wildlife. *Id*. Approximately 75 percent of the waterway consists of manmade canals while the other 25 percent is formerly natural stream channels which have been deepened, straightened or widened. *Id*. The flow is artificially controlled by four hydraulic structures managed by the District and the water levels can be lowered in anticipation of a storm event. Wastewater treatment plant effluent makes up approximately 70 percent of the annual flow through the Lockport Powerhouse and Lock and Powerhouse facility. *Id*.

The CAWS drainage area is approximately 740 square miles and comprises the Chicago River and Calumet River drainages. SR at 18. The Chicago River System consists of 55 miles of waterways, includes the Chicago River, Chicago Sanitary and Ship Canal (CSSC), North Branch Chicago River (including the North Branch Canal), North Shore Channel, South Branch Chicago River, and South Fork of South Branch Chicago River. *Id*. The Calumet River System, 23 miles in length, includes Calumet-Sag Channel, portions of Little Calumet River, portions Grand Calumet River, Calumet River, Lake Calumet Connecting Channel and Lake Calumet. *Id*.

LDPR Description

The Des Plaines River originates in Wisconsin and flows into Illinois through Lake and Cook counties. SR at 16. Near Lyons, the Des Plaines River turns southwest and parallels the CSSC and then joins the CSSC. *Id*. The Des Plaines River, without the CSSC, has a drainage area of 13,371 square miles and the CSSC's drainage area is 740 square miles. *Id*. The length of the Des Plaines River from the state border to the confluence with the Kankakee River is 110.7 miles. *Id*.

The LDPR is the section of the Des Plaines River currently designated as Secondary Contact and Indigenous Aquatic Life Uses and extends from the confluence with the CSSC to the Interstate 55 Bridge at River Mile 277.9. *Id*. The LDPR's reach is almost entirely impounded and has two geomorphologically different segments in the Brandon Pool above the Brandon Road Lock and Dam and the portion of the Dresden Island Pool upstream of the Interstate 55 Bridge (Upper Dresden Island Pool). *Id*.

The Brandon Pool is four miles in length and approximately 300 feet wide with depths of 12 to 15 feet. SR at 16. The Brandon Pool is a highly modified stream channel and the CSSC contributes approximately 80 percent of the flow to the Brandon Pool downstream of the confluence. SR at 17.

The entire Dresden Island Pool is 14 miles long and approximately 800 feet wide. SR at 17. Upper Dresden Island Pool is defined as the 8.1 mile reach of the impoundment that is upstream of the Interstate 55 Bridge. *Id*. Upper Dresden Island Pool is more natural than Brandon Pool and has natural shoreline and side channels. *Id*.

The LDPR is a part of the Upper Illinois Waterway which is one of the busiest inland commercial navigation systems in the United States. SR at 17. The Illinois Waterway provides a link between the Great Lakes/St. Lawrence Seaway navigation system and the Mississippi River navigation system. The entire Illinois Waterway is channelized to maintain a minimum depth of nine feet. *Id*.

Engineering History of the CAWS and LDPR

The CAWS and LDPR consist of portions of the Chicago River, Calumet River and LDPR drainages that were altered by human engineering from the mid 1800s into the mid 1900s. SR at 14. These rivers were altered to promote commercial navigation and to eliminate the flow of untreated sewage into Lake Michigan. *Id*. Canals and dams were added during that time to redirect the flow of the CAWS to the Des Plaines River. Four canals were dug where no major waterways existed before and five dams were installed. *Id*. The existing channels were enhanced and stream flow was altered by deepening, widening and channelizing various reaches, and by augmenting existing flow with navigational makeup and "discretionary diversion" from Lake Michigan. *Id*. Upon completion of these alterations, flows in several of the major reaches were in a reverse direction of their original paths. *Id*. With urban development, CAWS and LDPR grew in importance as a storm water management systems. *Id*.

Prior to the human alterations that began in the mid 1800's, the Chicago River flow originated from the north and south branches. SR at 15. The North Branch Chicago River flowed south and converged with north flowing South Branch Chicago River to form the Chicago River. *Id*. The Chicago River then meandered east and emptied into Lake Michigan. *Id*. The North Branch Chicago River received most of the flow from two forks (east and middle), and from a wetland system known as the Skokie Marsh. *Id*. The South Branch Chicago River headwaters included the southern and western forks of the Chicago River. *Id*. The entire drainage for the Chicago River consisted of relatively small, sluggishly flowing prairie streams. *Id*.

The Calumet River System consisted of Little Calumet River, Grand Calumet River and, a network of wetlands. SR at 15. The Little Calumet River began in La Porte County, Indiana, flowed west into Illinois, made a hairpin curve north and then back east. *Id*. The Little Calumet River then joined numerous wetland flows to form the Grand Calumet River, which flowed east and emptied into Lake Michigan in Miller, Indiana. *Id*. During this period, Lake Calumet and the Calumet River had fairly undefined boundaries. *Id*. There existed a complex system of marshes, dunes and swales surrounding an area of open water. Depending on rain events and Lake Michigan levels, the system sometimes flowed into Grand Calumet River and the tributary, Little Calumet River while at other times the system flowed into Lake Michigan or remained stagnant and isolated. *Id*.

Prior to urbanization and the reversal of the Chicago River system, the LDPR had a much smaller amount of water flowing through the system. SR at 15. The LDPR was modified from the original configuration to accommodate shipping traffic and the increased flow from the

CAWS. SR 16. Specifically, the LDPR was deepened and channelized and the Lockport Lock and Power House and the Brandon Road Lock and Dam were added. *Id.*

The LDPR has historically received flows from the CSSC, which was created during the alterations of the CAWS. SR at 17. The flow in the CSSC is predominantly treated and partially treated effluents from the District's wastewater reclamation plants and combined sewer overflows. *Id.* The population equivalent of the effluent carried by the CSSC to the LDPR is about 9.5 million. *Id.* The combined sewer overflows discharges have been reduced with partial completion of the Tunnel and Reservoir Project (TARP) and will be further reduced with the completion of TARP. *Id.*

REGULATORY HISTORY

Prior to adoption of the Act in 1970, the Illinois Sanitary Water Board had jurisdiction over water quality management activities, including establishment of water quality standards. SR at 7. The Sanitary Water Board initially designated the LDPR as an "Industrial Water Supply Sector" with numeric and narrative criteria appropriate to such use category pursuant to the Federal Water Quality Act of 1965 (PL89-235). *Id.*, citing SWB-8 (Adopted December 1, 1966, approved by U.S. Department of Interior January 27, 1968, reapproved by Sanitary Water Board March 5, 1968). Sanitary Water Board Regulation SWB-15 established the uses and numeric and narrative water quality standards applicable to the CAWS. *Id.*, citing SWB-15 (Adopted June 28, 1967, Approved by U.S. Department of Interior January 27, 1968 and reapproved by Sanitary Water Board on March 5, 1968).

The uses specified within Industrial Water Supply Sector and CAWS included "commercial vessel and barge shipping, recreational boating transit, withdrawal and return of industrial cooling and process water, and to receive effluents from industrial and domestic waste treatment facilities." SR at 8. The narrative standards included freedom from unnatural bottom deposits, floating debris and nuisance or toxic conditions. *Id.* Water quality standards for dissolved oxygen, pH, temperature, dissolved solids, and bacteria were also included in Rule 1.07 of SWB-8 and Rule 1.03 of SWB-15. *Id.* In addition, the North Shore Channel and Chicago River were used for recreational activities, and the Calumet Harbor was used as a public water supply and for fish and aquatic life. *Id.*, citing SWB-15, Rule 1.02.

Following adoption of the initial water quality criteria, the Sanitary Water Board submitted a plan for implementation of the standards applicable to the LDPR and the CAWS to the federal government on August 10, 1967. SR at 8. The U.S. Department of Interior approved these plans on January 27, 1968. *Id.*

The Sanitary Water Board was superseded by the creation of the Illinois Pollution Control Board and IEPA upon enactment of the Act in 1970. *Id.* The Board and IEPA almost immediately focused attention on the development of new water quality standards. *Id.* Draft proposed rules were published for public comment on May 12, 1971 (docketed as Water Quality Standards Revisions, R71-14) and public hearings were conducted shortly thereafter. *Id.*

The Secondary Contact and Indigenous Aquatic Life Use designations were developed during the R71-14 proceedings. SR at 8-9. In developing the draft proposed rules, the Board considered classifying the CSSC as "Restricted Use" upstream of the confluence with the Des Plaines River (at Lockport), and considered placing the LDPR downstream from Lockport within the higher General Use designation. *Id.* Restricted Use was later changed to Secondary Contact and Indigenous Aquatic Life Uses as currently understood. SR at 9. During the R71-14 proceedings, the Board spent a great deal of time debating where the Secondary Contact and Indigenous Aquatic Life Use designations should end and the General Use designation should begin. *Id.*

Commonwealth Edison Power Company, the City of Joliet and the United States Steel Corporation of Joliet voiced concerns during the R71-14 proceedings. SR at 9. The Commonwealth Edison Power Company suggested that the Restricted Use designation include the Des Plaines River downstream to the Interstate-55 Bridge. *Id.* The City of Joliet suggested that the point of changeover be made at the confluence of the Des Plaines and Kankakee rivers because being directly downstream of the proposed use change at Lockport would force the City to comply with the General Use standards even though the waters had not come to a point of dilution. *Id.* The US Steel Corporation of Joliet suggested that the Restricted Use designation be extended to the area near Brandon Locks because that area was industrial. *Id.*

Commonwealth Edison made arguments against applying the General Use standards to the LDPR upstream of its confluence with the Kankakee River. SR at 9-10. Commonwealth Edison noted that the costs of imposing the higher water quality standards on the LDPR would outweigh any benefits and that, even if the standards were met, the river would not be suitable for aquatic life due to heavy industrialization, barge traffic, diking of the shoreline and dredging. SR at 10. IEPA states that Commonwealth Edison did not believe that the General Use standards for temperature could be met in the LDPR upstream of its confluence with the Kankakee River, and that meeting the temperature standard was not important due to the small possibility that General Use water quality standards would be met in other respects. *Id.* Because the waterway would be incapable of supporting aquatic life anyway and use of the river for recreation up to the Interstate-55 Bridge was nonexistent due to industrialization, there would be no advantage to adopting the General Use standards. *Id.*

The Board ultimately classified CAWS and the LDPR from Lockport to the Interstate-55 Bridge as Restricted Use waters. *Id.*, citing R71-14 (March 7, 1972). The Board declined to act on amendments proposed by Commonwealth Edison to move the General Use boundary to the confluence with the Kankakee River in Rulemaking R72-4. SR at 10. The Board reasoned that the location of the bridge corresponded to changes in the physical environment characteristics of the area. SR at 10-11, citing R72-4, slip op. at 5 (Nov. 8, 1973). IEPA states that the industrial characteristics described by Commonwealth Edison's witnesses could not be applied to the area below the bridge. SR at 11. The Board also noted that the five-mile stretch downstream of the bridge was capable of providing recreation important to the area and supporting desirable aquatic biota. *Id.*, citing R72-4 at 8.

IEPA notes that few regulatory changes have been made to the use designations or water quality standards applicable to CAWS and the LDPR since 1972. SR at 11. The stretch of the

North Shore Channel from the North Side Sewage Treatment Works to Lake Michigan and the stretch of the Calumet River from the O'Brien Locks and Dam to Lake Michigan were upgraded from Secondary Contact and Indigenous Aquatic Life Use to General Use in Amendments to Water Quality and Effluent Standards Applicable to the Chicago River System and Calumet River System, R87-27 (May 19, 1988). *Id.*, citing R87-27. The main branch of the Chicago River was not included in the Secondary Contact and Indigenous Aquatic Life Use in R71-14 but was included in a list of waters exempt from the Public and Food Processing Water Supply Use designation in Rule 303. *Id.*, citing 35 Ill. Adm. Code 303.

"Secondary Contact" means any recreational or other water use in which contact with the water is incidental or accidental and the probability of ingesting water is minimal. SR at 19. Activities such as fishing, commercial and recreational boating and other shoreline activities where contact is minimal are considered secondary contacts. *Id*. One common characteristic of the waterbodies designated as Secondary Contact in Northeastern Illinois is that the waterbodies were engineered to reverse the flow of the Chicago River. *Id*.

When the Board adopted the Secondary Contact use category in R 71-14, the waters designated as secondary contact had the following characteristics:

1) Routinely dredged and maintained channels, including steep-sided cross-sections designed to accommodate barge traffic and optimize flow.

2) Significant sludge deposition, as a result of combined sewer overflows, industrial waste discharges and urban runoff. Sludge depth in the channel system can reach five feet or more despite dredging.

3) Flow reversal projects, such as this one, place a premium on head differential. The entire system has minimum slope and, consequently, low velocity, stagnant flow conditions. Because of international agreements on the use of Lake Michigan water, diversion to maintain flow in the system is kept as low as possible.

4) Urban stress is significant within the entire drainage area. There was essentially no recreation potential with most adjacent property commercially owned and access limited.

5) Good physical habitat for aquatic communities in the main channel was nonexistent due to the impact of commercial and recreational watercraft use of the system as well as sludge deposition. Watercraft lockage through the Chicago River Control Works averages 25,000 vessels annually; most activity occurs during the summer months.

6) In addition to the above human-made and irretrievable modifications, the CAWS also carries a massive wastewater load including combined sewer overflows during wet weather. During the summer periods, a small "discretionary diversion" of Lake Michigan water is permitted to minimize the combined effects

of waste load from the municipal and industrial discharges to the system and poor assimilative capacity. SR at 19-20

CLEAN WATER ACT AND FEDERAL REGULATIONS

The proposed rulemaking is intended to meet certain obligations of the State of Illinois under the Federal Water Pollution Control Act (Clean Water Act or CWA) (33 U.S.C. § 1313). SR at 3. Section 303 of the CWA requires that a state periodically (at least once each three year period beginning with October 18, 1972) hold public hearings for the purpose of reviewing applicable water quality standards, and to modify the standards as necessary (33 U.S.C. § 1313(c)(1)). *Id*. The national goal of the CWA is to attain "water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for the recreation in and on the water. . .." (33 U.S.C. § 1251(a)(2)). *Id*. This is commonly known as "fishable and swimmable" goal. SR at 3.

Under the federal regulations, the phrase "water quality standards" includes both the establishment of designated uses for intrastate waters and the promulgation of necessary criteria to protect these uses. SR at 3-4. Therefore, IEPA's triennial review includes the designation of uses for specified waters and the establishment of numeric and narrative criteria intended to protect these designated uses. SR at 4. Through the federal regulations, United States Environmental Protection Agency (USEPA) has provided six minimum requirements for State water quality standards under 40 C.F.R. § 131.6. The six requirements are:

(a) Use designations consistent with the provisions of sections 101(a)(2) and 303(c)(2) of the [Clean Water] Act.

(b) Methods used and analyses conducted to support water quality standards revisions.

(c) Water quality criteria sufficient to protect the designated uses.

(d) An antidegradation policy consistent with [40 C.F.R. §131.12

(e) Certification by the State Attorney General . . . that the water quality standards were duly adopted pursuant to State law.

(f) General information which will aid [USEPA] in determining the adequacy of the scientific basis of the standards which do not include the uses specified in section 101(a)(2) of the [Clean Water] Act as well as information on general policies applicable to State standards which may affect their application and implementation. 40 C.F.R. § 131.6

In addition, USEPA has outlined procedures for designating uses and conducting use attainability analyses, permitting states to adopt sub-categories of a use with appropriate criteria as well as seasonal uses. SR at 5, citing 40 C.F.R § 131.10. To remove a designated use or establish a use other than the CWA aquatic life and recreational goals, States must consider six Use Attainability Analysis (UAA) factors to adopt such a use. SR at 5, citing 40 C.F.R § 131.10(g). The six UAA factors are:

1) Naturally occurring pollutant concentrations prevent the attainment of the use; or

2) Natural, ephemeral, intermittent, or low flow conditions or water levels prevent the attainment of the use . . .; or

3) Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place; or

4) Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use; or

5) Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or

6) Controls more stringent than those required by sections 301(b) and 306 of the Act [CWA effluent standards] would result in widespread economic and social impact. 40 C.F.R § 131.10(g).

In addition to the six UAA factors, States are prohibited from removing or downgrading uses that are existing uses (as of November 28, 1975) currently being attained or that could be attained by implementing the CWA effluent limits. SR at 6, citing 40 C.F.R. § 131.10. The IEPA describes the UAA as a federal model for conducting a structured scientific assessment of the factors affecting the attainability of uses by taking into consideration physical, chemical, biological, and economic factors. Exh. 1 at 5-6.

After designating uses, States establish criteria sufficient to protect these uses pursuant to 40 C.F.R. § 131.11. SR at 6. States must establish criteria, for the relevant parameter, that protect the most sensitive use and must address all parameters necessary to protect the use. *Id*., citing 40 C.F.R. § 131.11(a). States must also specifically address toxic pollutants through numeric or narrative criteria as well as adopt a statewide antidegradation policy and methods for implementing that policy. SR at 6, citing 40 C.F.R. § 131.11(b), 131.12. Illinois' statewide antidegradation policy can be found in the Board's regulations at 35 Ill. Adm. Code 302.105

In addition to reviewing the numeric criteria or standards for particular pollutants, states are also obligated to review the designated uses portion of water quality standards every three years where a use has been established that does not meet the CWA aquatic life goal or recreational goal. SR at 7, citing 33 USC § 1251(a)(2).

According to IEPA, waters in Illinois designated for General Use can attain the CWA goals, and the waters designated for Secondary Contact and Indigenous Aquatic Life Uses are incapable of attaining CWA aquatic life and recreational goals. SR at 7. IEPA notes that this proposal includes rulemaking changes to update the designated uses and criteria necessary to

protect such uses for the waters currently designated as Secondary Contact and Indigenous Aquatic Life Uses in 35 Ill. Adm. Code 303. *Id*. The standards adopted by the Board to protect this use are currently found in 35 Ill. Adm. Code 302, Subpart D. *Id*.

REGULATORY PROPOSAL

IEPA proposes to add a new section to the Board's rules at 34 Ill. Adm. Code 304. SR at 92. The specific proposed language provides that:

> Effluents discharged to the Incidental Contact Recreation waters listed in 35 Ill. Adm. Code 303.220 and the Non-Contact Recreation waters listed in 35 Ill. Adm. Code 303.225 shall not exceed 400 fecal coliforms per 100 ml during the recreational season lasting from March 1 through November 30. All effluents in existence on or before the effective date of this Section shall meet these standards by March 1, 2011. All new discharges shall meet these standards upon the initiation of discharge. *Id*.

The IEPA notes that this language establishes an effluent bacteria standard for discharges to Incidental Contact Recreation waters and Non-contact Recreation waters. *Id*. The standard is 400 fecal coliforms per 100 milliliters (mL)), which mirrors the existing standard in General Use Waters (GUW). *Id*. The standard will require active disinfection as an element of the wastewater treatment process for affected facilities for the months March through November. *Id*.

IEPA states that the recreational value of the waterways to the public is increasing. SR at 93. IEPA notes that there are projects being undertaken to enhance the recreational value of the waterways. *Id*. Establishing enforceable disinfection requirements for wastewater treatment facilities is another major step to enhance the waterways. *Id*.

The IEPA declined to propose a water quality standard for the protection of recreational use designations. SR at 42. The IEPA did so because there is currently no federal recommended bacterial criterion for non-primary contact recreational activities. SR at 43. Further, the IEPA notes that the current federal criteria for primary contact activities has been criticized as being inappropriate for use as a basis for protection of non-immersion recreational activities. *Id*.

IEPA noted that the District was undertaking an epidemiological study and a risk assessment. SR at 44-45. However, at this time, IEPA believes that there is not sufficient sound scientific basis for numeric water quality standard for bacteria. SR at 45. IEPA will address water quality standards in the future; however at this time IEPA proposed a technology-based effluent standard. SR at 45.

SUMMARY OF TESTIMONY

Rob Sulski, IEPA

Mr. Sulski has been employed by IEPA for 24 years and has a Masters Degree in Environmental Engineering from Southern Illinois University. Exh. 1 at 1. Mr. Sulski worked for 19 years in water pollution control regulatory compliance and became IEPA's expert in the

operations of Chicago area industries and wastewater treatment authorities as well as the CAWS. *Id*. Mr. Sulski was the project manager for the CAWS UAA and a member of the technical staff for the LDPR UAA. Exh. 1 at 2. Mr. Sulski grew up and lives in the CAWS area and has recreated in and around the CAWS both personally and professionally numerous times. *Id*.

Mr. Sulski indicated that the CAWS and LDPR have been classified in a distinct category separate from the other surface waters of the State since the inception of the Act. Exh. 1 at 2. In the early part of the twentieth century, public health focus drove public work initiatives to construct sewer systems and treatment facilities. Exh. 1 at 2-3. Mr. Sulski stated that, with CAWS and LDPR, not only were the resources heavily stressed by chemical and biological degradation, but the physical condition was changed with the reversal of flow and addition of major new arteries directing drainage to the Illinois River Basin. Exh. 1 at 3.

Mr. Sulski testified that state and federal laws have driven the establishment of new water quality goals and aggressive water quality standards have been established for virtually all surface waters in Illinois. Exh. 1 at 3. However, CAWS and LDPR have reflected lower expectations due to the historic and ongoing urban and industrial influences. *Id*. The first wave of regulations was adopted in 1970 and while there have been minor changes to those regulations for the CAWS and LDPR; there has been no comprehensive overhaul until this proceeding. Exh. 1 at 3-4. Mr. Sulski notes that the CAWS and LDPR have been transformed over the last 30 years from a "virtual ecological wasteland . . . into an environmental asset to the community." Exh. 1 at 3. Mr. Sulski maintains there is sound reasoning to "custom tailor water quality standards for this system" to coincide with the uniqueness of the system. *Id*.

Mr. Sulski stated that the UAAs found that attainable uses could not be achieved without overcoming dissolved oxygen, temperature and bacteria limitation and to address the bacteria limitations, effluent disinfection is the recommended option. Exh. 1 at 18. Mr. Sulski opined that to reduce bacteria levels, effluent disinfection is required at all wastewater treatment works discharging to waters designated as Incidental Contact and Non-contact Recreation Use. *Id*.

Mr. Sulski contended that effluent disinfection is technically feasible and has been a long-standing requirement and successfully used by domestic wastewater treatment facilities throughout Illinois since the 1970s. Exh. 1 at 19. Mr. Sulski acknowledges that the District has performed several studies on the feasibility of effluent disinfection and that the District has indicated that they would most likely use Ultra violet (UV) treatment for disinfection. *Id*. Mr. Sulski was asked if he was aware of facilities, the size of the District's, that have implemented disinfection. 1/29/08 Tr. at 141. He indicated that the District had disinfected at those facilities in the 1980s, until the bacteria water quality standards were removed. *Id*. at 141-45.

Mr. Sulski testified that the IEPA did not do an economic analysis of the rule change, except generally with the stakeholders groups. 1/28/08 Tr. at 53. Mr. Sulski noted that the District gave the IEPA "substantial documentation" on the costs of disinfection. *Id*. at 57. Mr. Sulski also testified that the IEPA did not determine whether the benefits of effluent disinfection outweigh the costs for disinfection. 3/10/08A Tr. at 38-40.

Mr. Sulski testified that there are approximately 300 combined sewer overflow (CSO) outfalls and on average CSOs discharge 15 times a year. 1/29/08 Tr. at 166-67. Mr. Sulski opined that disinfection will lead to a reduction in bacteria within the system, though the IEPA had not quantified that conclusion. *Id*. at 190. Mr. Sulski agreed that disinfection will lower the levels of fecal coliform at the District's outfalls. *Id*. at 191. Mr. Sulski conceded that the IEPA did not have data to demonstrate that effluent disinfection by the District would reduce levels of pathogens in the water. 3/10/08A Tr. at 43-44.

Mr. Sulski indicated that IEPA knew of no illnesses occurring from recreating on the CAWS. 1/29/08 Tr. at 194-95. However, Mr. Sulski noted that the CAWS is an effluent dominated system and human pathogens cause human illness. *Id*. at 190, 197.

Scott Twait, IEPA

Mr. Twait has held the position of Environmental Protection Engineer in the Water Quality Standards Section of the IEPA since 1996. Exh. 2 at 1. Mr. Twait was the lead technical staffer on the LDPR UAA. *Id*. In particular, Mr. Twait worked on interpretation of information and recommendations concerning thermal standards. Exh. 2 at 1-2.

Mr. Twait testified that the IEPA reviewed the latest available criteria documents to get the most current science on numeric standards necessary for individual parameters to protect the designated uses. Exh. 2 at 2. Mr. Twait stated that in most cases USEPA's national criteria document or information was the latest available documentation; however in two areas material were lacking. *Id*. Those two areas were temperature and bacteria and Mr. Twait's testimony speaks to the IEPA's attempts to address those gaps. *Id*.

Mr. Twait stated that, for bacteria, the IEPA concluded that there were no reliable criteria available on which to base water quality standards to protect the proposed recreational uses. Exh. 2 at 15. Mr. Twait noted that older federal criteria documents "are viewed with skepticism among the scientific community." *Id*. Mr. Twait also noted that USEPA is undertaking a multi-year initiative centered on an epidemiological survey to develop new criteria; although the survey is focused exclusively on primary contact recreation areas. Exh. 2 at 15-16.

Mr. Twait pointed out that the District had commissioned CHEERS and the IEPA agrees that such an approach "is more closely representative of actual exposure conditions likely associated with recreational activity within the various segments of the CAWS." Exh. 2 at 16. Mr. Twait stated that while the IEPA is proposing specific recreational use designations, the IEPA recommends that the Board defer adopting numeric bacterial water quality standards until information is available to support such standards. *Id*. Mr. Twait testified that to protect the recreating public, as a "precautionary measure" the IEPA is proposing that wastewater treatment facilities discharging to any segment of the CAWS or LDPR designated as Incidental Contact Recreation or Non-contact recreation disinfect the discharge. *Id*.

Mr. Twait testified that the IEPA did not perform an economic analysis on the proposal for disinfection, as the IEPA only provides the Board with such analysis when a new technology

is proposed. 1/28/08 Tr. at 53-54. Mr. Twait opined that the rule was economically reasonable and based that opinion on the fact that disinfection is required throughout the state. *Id*. at 54-55.

When asked how the IEPA arrived at effluent limits when no associated water quality criteria had been developed, Mr. Twait stated: "[a]lthough the IEPA doesn't know what level is protective, we believe that disinfection is needed to reduce the bacteria levels of the effluent." 1/29/08 Tr. at 174-75. Mr. Twait explained that the basis for the technology based standard for disinfection is to protect the proposed designated uses. *Id*. at 176-77. In response to questions, Mr. Twait agreed that there were other technology-based controls where no water quality criteria existed. *Id*. at 177.

Mr. Twait conceded that even with the disinfection requirement, attainment of the designated uses in all segments might not occur in either wet weather or dry weather. 1/29/08 Tr. at 179. Mr. Twait acknowledges that CSOs are not addressed by the IEPA's proposal nor is bacteria from municipal separate storm sewer systems. 4/23/08 Tr. at 76-77. Mr. Twait also testified that if all pollutant contributions from CSOs, municipal separate storm sewer systems, and urban runoff were removed, the pathogens levels would be inconsistent with the proposed recreational uses. 4/24/08 Tr. at 42. This would be so because of undisinfected wastewater in the CAWS. *Id*. Mr. Twait noted that CSOs occurred on other waterways in Illinois. *Id*.

In responding to questions, Mr. Twait noted that CSOs occur in the Fox River and other waters of Illinois in which general use water quality criteria apply. 4/24/08 Tr. at 42-43. Mr. Twait acknowledged that this included the Mississippi River and the Illinois River, though he was unsure if any of the waters had 3,000 CSO events in a year. *Id*.

Mr. Twait acknowledged that there were no other facilities the size of the District's in Illinois which disinfect effluent. 1/29/08 Tr. at 141. Mr. Twait testified that Kansas City, Memphis and St. Louis are the only major metropolitan areas he is aware of that do not disinfect effluent. *Id*. at 143-44. In response to a District question regarding the impact on the biological community of the District's ceasing chlorination, Mr. Twait agreed that stopping the chlorination did have a positive impact on the biological community. 1/29/08 Tr. at 155.

Mr. Twait did not know how many illnesses might be prevented if the District was to disinfect effluent. 1/29/08 at 195. Mr. Twait was likewise not aware that the District may need more than three years to construct effluent disinfection. *Id*.

IEPA Responses to Questions

In response to questions regarding whether the IEPA considered any options other than effluent disinfection for bacteria standards, Mr. Sulski indicated that IEPA considered "end of pipe CSO treatment". 4/23/08 Tr. at 13. Mr. Sulski noted that the District examined the option and developed figures, but the IEPA did not do an independent review. *Id*. Mr. Sulski responded that the IEPA also did not look into the feasibility of these options for facilities other than the District's facilities. *Id*. at 13-14. Mr. Twait indicated that the IEPA did consider that there might be industrial facilities that would need to disinfect effluent. *Id*. at 15. Mr. Twait opined that effluent disinfection is economically reasonable and technically feasible for such

sites. *Id*. at 16. Mr. Sulski added that the IEPA knows there are facilities along the CSSC that have sanitary systems to deal with domestic waste. *Id*. Mr. Sulski opined that all of these facilities, discharging into Incidental Contact or Non-contact recreational waters, would be required to disinfect under the proposed rule. *Id*. at 16-17. The IEPA did not receive any cost data regarding disinfection from these facilities. *Id*. at 17.

When asked about bacteria standards, IEPA reiterated that there are no proposed bacteria water quality standards, nor is IEPA dictating what type of disinfection must be performed. 4/23/08 Tr. at 27-28. Mr. Twait stated that when USEPA develops a bacteria water quality standard the IEPA will propose the standard to the Board. 4/23/08 Tr. at 28. Mr. Twait explained that effluent standards will be set for industrial dischargers by looking at the "flow statistics" and the permit engineer will determine whether there is a "reasonable potential to exceed the effluent standard". *Id*. at 28-29.

Mr. Twait clarified that the IEPA is proposing the effluent standard to protect the designated uses instead of waiting for USEPA and the District to complete their studies. 4/23/08 at 72. Mr. Sulski further clarified that though the IEPA has no data on illnesses, the IEPA knows the system is dominated by human organic waste that contains pathogens of human origins. *Id*. Mr. Sulski testified that the IEPA believed it "prudent" to place effluent standards on those dischargers, knowing that those discharges dominate the system. *Id*. Mr. Twait conceded that there is no technology that will eliminate pathogens. *Id*. at 75.

When asked how the IEPA will measure effectiveness of disinfection, the IEPA explained that a comparison of bacteria would be done pre-disinfection and post-disinfection. 4/24/08 Tr. at 159-61. Mr. Sulski stated that the effectiveness of disinfection will be gauged by the effluent as there is no water quality standard. 4/24/08 Tr. at 160.

Sharon Bloyd-Peshkin on behalf the Environmental Groups

Ms. Bloyd-Peshkin is a professional kayak instructor at the Geneva Kayak Center and she testified on behalf of the Environmental Groups. Exh. 419 at 1. Ms. Bloyd-Peshkin previously filed a public comment in support of the IEPA's proposed rule to require effluent disinfection. Her testimony specifically addresses CHEERS attempt to assess how wet participants get during kayaking and other recreational activities. *Id*. Ms. Bloyd-Peshkin expressed a concern with the questionnaire seeking to ascertain how wet participants got during the activity. *Id*. Specifically, Ms. Bloyd-Peshkin opined that the questionnaire is not sufficient to obtain an accurate picture of "how extremely wet kayakers get when they are paddling in perceived cleaner water." Exh. 419 at 2. Ms. Bloyd-Peshkin also believes that the questionnaire is insufficient to establish the "radical difference" in behavior of kayakers on perceived clean waters such as general use waters. *Id*.

Ms. Bloyd-Peshkin testified that because of the bacterial pollution in existence in the Chicago River, there is a "huge difference between the way I paddle there and the way I do in waters I believe to be cleaner." Exh. 419 at 2. Ms. Bloyd-Peshkin almost never teaches on the Chicago River, but when teaching on other area waterways beginners practice hanging upside down and swimming out of overturned boats. *Id*. More experienced paddlers will purposely

capsize to test skills and do not worry about getting wet on other area waterways. *Id*. Conversely on the Chicago River, Ms. Bloyd-Peshkin does her best to stay dry and warns others to not touch the water. *Id*.

Ms. Bloyd-Peshkin commended the researchers for attempting to craft a questionnaire of this nature and their attempt to develop an understanding of recreational risks. Exh. 419 at 3. Ms. Bloyd-Peshkin opines that CHEERS has highlighted both cause for concern and for further study. *Id*. Her concern is the correlation between CAWS and eye symptoms and believes that additional study on the gastrointestinal symptoms should be undertaken. *Id*. In the meantime, Ms. Bloyd-Peshkin does not believe we should wait to require effluent disinfection. *Id*.

Ms. Bloyd-Peshkin concedes that during CSO events, there will be an increase in bacteria, but CSO events are not constant. 10/20/20 Tr. at 140-41. Ms. Bloyd-Peshkin does alter her behavior after a CSO event, and is proportionately more careful even in Lake Michigan. *Id*. at 141-42. Ms. Bloyd-Peshkin does check for recent CSO events at waterways and may be more careful not to get wet after a CSO event. *Id*. at 143.

Kevin J. Boyle on Behalf of the People

Dr. Boyle is a professor and head of the department of Agricultural and Applied Economics at Virginia Polytechnic University. Exh. 286 at 1. His area of expertise is non-market valuation methods that are used to compute monetary values for natural resources and changes in environmental quality. *Id*. Dr. Boyle's research includes applications of these methods to value changes in surface water and groundwater quality. *Id*. Dr. Boyle is the co-editor of a basic reference book in non-market valuation methods and has many years of experience with the valuation method used in his testimony. Exh. 286 at 2. Dr Boyle also has extensive experience leading studies that value water quality improvements and the valuation of natural resources and environmental quality. *Id*.

Dr. Boyle performed an analysis of the economic benefits of water quality improvements based on the proposed recreational use designations for the CAWS. Exh. 286 at 2. Dr. Boyle opined that a conservative estimate of the economic benefit is $1.05 billion or $47 per household per year. *Id*. He stated that this estimate reflects the amount that Cook County households are willing to pay to achieve the water quality improvements associated with the proposed recreation use designations. *Id*.

To perform his analysis, Dr. Boyle followed a general framework consistent with USEPA's 1995 *Interim Economic Guidance for Water Quality Standards* EPA-823-B-95-002, March 1995 (Attach. C). Exh. 286 at 3, citing Attach. C. Dr. Boyle looked at "use" benefits that arise from peoples' direct use of a resource and "intrinsic" or "nonuse" benefits that arise when people value a change in water quality even if they never use the CAWS. Exh. 286 at 3.

Dr. Boyle testified that his approach was also consistent with USEPA's 2000 *Guidelines for Preparing Economic Analyses* noting that the guidelines are general and can be applied to all types of economic improvements. Exh. 286 at 3. Dr. Boyle conducted a "benefit transfer" analysis in which he combined existing economic studies with local, site-specific information.

Id. Dr. Boyle stated that benefit transfer is an established economic procedure that uses existing economic information to develop a specific economic benefit, customized for a new application. *Id*.

Dr. Boyle focused his testimony on the economic benefits of improving the CAWS by disinfection. Exh. 286 at 4. Dr. Boyle testified that water quality is an environmental asset that provides services to society and the economic benefit of improved services can be measured in terms of what a household is willing to pay for the improvement in water quality. *Id*. Dr. Boyle stated that this type of economic benefit analysis is routinely used to support public decision making, environmental rulemaking and to compute monetary damages in natural resource damage cases. *Id*.

Dr. Boyle followed a five step process, consistent with USEPA guidance in performing the benefit-transfer method to analyze economic benefits. Exh. 286 at 5. He describes the first step as the "policy case" which is the proposed change in use designation for the CAWS and the associated water quality improvements from disinfection. Exh. 286 at 5-6.

For the second step, Dr. Boyle identified relevant studies measuring the economic benefit of improved water quality. Exh. 286 at 5-6. Dr. Boyle used *Valuing Water Quality Improvements in the United States Using Meta-analysis: Is the Glass Half-Full or Half-Empty for National Policy Analysis?*, Resource and Energy Economics, 29, 206-227 (2007) by Van Houtven, G., Powers, J. and S. Pattanayak (Van Houtven). Exh. 286 at 5-6, and Exh. 2. The Van Houtven study summarized results from 18 existing studies that measure the economic benefits of water quality improvements. Exh. 286 at 5. The summary is based on water quality index values and several equations. *Id*. The Van Houtven study used a Meta-analysis to statistically summarize results from 18 existing studies valuing changes in water quality. Exh. 286 at 6. Dr. Boyle used an equation from the statistical summary in calculating the economic benefit of improved water quality. *Id*.

In the third step, Dr. Boyle reviewed the Van Houtven study for applicability to the policy case. Exh. 286 at 6. Dr. Boyle testified that the Meta-analysis equation provides the basis for a benefit-function transfer, which is the most accurate type of benefit-transfer analysis. *Id*. Dr. Boyle opined that the Van Houtven study is also applicable to the policy case for three reasons:

1) the 18 studies used in the Meta-analysis all measured the economic benefits for changes in surface water quality.

2) the Meta-analysis equation includes variables that allow measures of the current (baseline) and improved (change) in CAWS water quality to be included in the analysis using a 10-point water quality index.

3) the affected populations are similar. *Id*.

Dr. Boyle also noted that the Meta-analysis equation included variables that reflect population characteristics, household income and a percentage of population using the water resource. *Id*.

The variables allowed Dr. Boyle to customize the economic benefit to Cook County households. *Id*.

The fourth step is to transfer the economic benefit. Exh. 286 at 6. Dr. Boyle stated: "[t]he Meta-analysis equation is used to conduct a benefit-function transfer that computes an economic benefit that is specific to the proposed CAWS water quality change and customized to households in Cook County." Exh. 286 at 6-7.

The fifth step is to address uncertainty, which Dr. Boyle did in two ways. Exh. 286 at 7. Dr. Boyle first computed lower and upper bounds to develop a range of economic benefits. *Id*. Dr. Boyle testified that the range of benefits reflects alternative modeling assumptions that could lead to errors in computing economic benefit. *Id*. Second, Dr. Boyle applied an adjustment to address potential overstatement of the economic benefit. *Id*.

Dr. Boyle used an equation including variables and coefficients to calculate the economic benefit of improved water quality. Exh. 286 at 7. Dr. Boyle testified that key variables measure the changes in water quality on a ten-point index scale, which includes dissolved oxygen, fecal coliform density, pH, biochemical oxygen demand, nitrates, phosphates, temperature, turbidity, and total solids. *Id*. Additional variables included household income and reflected characteristics of economic-benefit study designs and implementation. Exh. 286 at 8.

To develop the water quality index, Dr. Boyle used monitoring data from the District and calculated a value of 6.1. Exh. 286 at 8. Dr. Boyle then calculated the expected improvement based on a reduction of fecal coliform and resulted in an increase to 6.8. For household incomes, Dr. Boyle used data from the 1999 Census and calculated the number of households that use the river based on a 1986 survey of Chicago and surrounding community residents. *Id*. Dr. Boyle found that 10 percent of households use the CAWS. *Id*.

Dr. Boyle concluded that the total economic benefits of water quality improvements associated with disinfection are conservatively $1.05 billion. Exh. 286 at 9. This is the present value of economic benefits to households in Cook County over a 20-year period beginning in 2010. *Id*. Dr. Boyle opined that the annual household economic benefit is approximately $57 in year 2000 dollars. Exh. 286 at 10. Dr. Boyle applied an adjustment for potential over-statement and concluded the annual economic benefit is reduced to $39 per household in 2000 dollars. *Id*. Dr. Boyle further adjusted the economic-benefit measure to 2008 dollars using the Consumer Price Index and arrived at a value of $47 per household per year. Dr. Boyle used alternative specifications of the benefit-transfer function and calculated a lower boundary of $23 per household per year and an upper boundary of $57 per household per year. *Id*. Dr. Boyle's analysis looked at total value and not just recreation. 5/20/09 Tr. at 69-70.

Dr. Boyle opined that many households in Cook County will benefit from improvements to CAWS water quality and he conservatively included only 80 percent of households when calculating the economic benefit. Exh. 286 at 10. Dr. Boyle further opined that his analysis is conservative for the following reasons:

1) the benefits of improved water quality are likely to extend well beyond 20 years;

2) households outside of Cook County may be willing to pay for improved water quality in the CAWS;

3) the use of 10 percent in the benefit-function transfer to reflect the portion of population that are CAWS users is likely understated because recreational activity has increased significantly since 1986.

4) research indicates that a 33 percent adjustment for hypothetical bias may be too large. Dr. Boyle co-authored a 2008 study entitled *Provision Rules and the Incentive Compatibility of Choice Surveys* that found that it is only necessary to reduce economic benefit by 18 percent;

5) some of the households who do not respond to a stated-preference survey will still hold value for the water quality improvements. Exh. 286 at 11-12.

In response to questions Dr. Boyle reiterated that the analysis he performed was a benefit transfer analysis. 5/20/09 Tr. at 10. When asked whether be believed that Cook County residents would be willing to pay $47 per year for cleaner water, Dr. Boyle indicated that his analysis did not look at raising taxes. *Id*. at 11. Dr. Boyle testified that his analysis determines the value households place on good water quality not how much households would pay in taxes for water quality. *Id*.

Dr. Boyle indicated that his analysis based the change in water quality on only the District's discharge and did not account for other discharges. 5/20/09 Tr. at 22-23. However, Dr. Boyle also only considered fecal coliform as one of the variables and looked only at the changes in releases from the treatment plants in the current ambient water quality. *Id*. at 23.

Dr. William Van Bonn on behalf of the Environmental Groups

Dr. Van Bonn is the Senior Director for Animal Health at the John G. Shedd Aquarium and has been in his position since 2005. Exh. 240 at 1, 2. Dr. Van Bonn graduated from the College of Veterinary Medicine at Michigan State University in 1986. Exh. 240 at 2. Dr. Van Bonn testified that one of the most notable influences on the river systems was the effluent from wastewater treatment plants. Exh. 240 at 1. Dr. Van Bonn noted that in addition to the engineering changes to the flow of the Chicago River, stressors were introduced by altering the waters natural cycle and flow and by installing the infrastructure to handle wastewater. *Id*. Dr. Van Bonn opined that the stressors can result in serious health implications for the entire ecosystem. *Id* Dr. Van Bonn further opined that optimal health of an ecosystem is about balance and the discharge of wastewater can affect the balance. Exh. 240 at 2-3.

Dr. Van Bonn noted that there is a potential effect on wildlife, and more specifically river otters, by the introduction of pathogens to the waters. Exh. 240 at 3. Dr. Van Bonn pointed out that a river otter had been sighted on the Chicago River and pathogens in the water may have a detrimental impact on river otters. Exh. 240 at 4-5. Dr. Van Bonn is not aware of a study

concerning river otters on the CAWS and LDPR. Exh. 240 at 5. Dr. Van Bonn opined that pathogens in effluent from wastewater are clearly a threat to public health. *Id*.

Peter Orris on behalf of the Environmental Groups

Dr. Orris is a professor and Chief of Occupational and Environmental Medicine at the University of Chicago (UIC) Medical Center. Exh. 234 at 1. He has been with UIC since 2000 and has over 30 years of experience as a physician. Exh. 234 at Exh. 1 at 1. Dr. Orris supports the Districts emphasis on increasing knowledge of the health effects of recreating on the CAWS and believes that CHEERS will add to the understanding of human health effects of recreating on the CAWS. Exh. 234 at 1. However, Dr. Orris believes that delaying disinfection at the District's plants would be misguided. *Id*. Dr. Orris testified that "[i]t has long been established that waterborne pathogens associated with sewage are hazardous to public health." *Id*. Dr. Orris opined that perhaps no other area of medicine has been so well established for so long. *Id*. Dr. Orris further opined that a single epidemiological study regardless of how well designed and executed and regardless of results is not sufficient to address waterborne pathogens in the CAWS. *Id*.

Dr. Orris testified that an epidemiological study provides the risk of events that may occur to a certain number of people within a population. Exh. 234 at 1. In the circumstances here, the concern is an unexpected event affecting especially vulnerable populations and having potentially dire effects. Exh. 234 at 1-2. Dr. Orris opines that this "scenario is not susceptible to epidemiological conclusions about risk in the establishment of precautionary public policy." Exh. 234 at 2.

Dr. Orris does not believe that a single epidemiologic study should be a sufficient basis to draw policy conclusions on "so well documented, and historically important, a subject as protecting the public from waterborne pathogens." Exh. 234 at 5. Dr. Orris opines that epidemiological studies require repetition and the study of a large population. *Id*. Dr. Orris expresses concern that CHEERS: 1) cannot address particularly vulnerable populations; and 2) is limited because epidemiological studies of waterborne pathogens are dependent on ephemeral variables. *Id*.

Dr. Orris observed that the pathogens associated with human sewage cause serious illness and there are many hundreds of bacteria, viruses, and parasites that are present in water contaminated with undisinfected sewage. Exh. 234 at 2-3. Dr. Orris opines that these pathogens are particularly dangerous to children, the elderly, pregnant women, and individuals with compromised immune systems. Exh. 234 at 3. Dr. Orris noted that in his review of District sampling data, high levels of both fecal coliform and *E. coli* indicator bacteria were included in the data. Exh. 234 at 4. Dr. Orris acknowledged that indicator bacteria are not a perfect reflection of pathogenic bacteria levels; however high levels of indicator bacteria are "strongly associated with the concomitant presence of harmful waterborne pathogens." *Id*. Dr. Orris opined that in the CAWS high levels of indicator bacteria are "very likely correlated" with the presence of waterborne pathogens. *Id*.

Marylynn V. Yates, on Behalf of the Environmental Groups

Dr. Yates has nearly 25 years of experience in the field of microbiology, and her sub-specialties include waterborne-pathogen contamination and review of microbial sampling data, risk studies, and other data relevant to the CAWS. Exh. 249 at 1 (*see also,* Attachment to Exh. 249 (curriculum vitae)). Dr. Yates' experience includes the following: 1) research focusing on water and wastewater microbiology and assessing the potential for contamination of water by human pathogenic microorganisms; 2) work concerning identification of waterborne pathogens, assessing the potential for pathogen contamination of water bodies, and fate and transport of these pathogens in the environment; and 3) the area of microbial risk assessment where she has personally been involved with USEPA's development of methods for indicator microorganisms. *Id*. at 2.

Dr. Yates testified that disinfection of wastewater treatment plant effluent is fundamental to public health where there is appreciable human contact with a receiving waterbody; that disinfection is standard practice in both major cities and many smaller communities in the U.S.; and that continued failure to disinfect effluent discharged to the CAWS may result in a substantial and unnecessary risk to public health. Exh. 249 at 1. Specifically, Dr. Yates testified to the six main findings described below. *See id.* at 1-28.

Dry-weather Pathogen Contamination Comes from Wastewater Treatment Plant

Dr. Yates testified that the CAWS contains measurable human pathogen levels during dry-weather conditions and that these levels largely result from wastewater treatment plant effluent discharge. Exh. 249 at 1. She testified that her research focused on dry weather conditions in the CAWS and whether wastewater treatment plants were putting human disease-causing pathogens into the CAWS. 5/5/09A Tr. at 79, 80. She further explained that disinfection would reduce pathogen loads and the corresponding human health risks associated with exposure to these pathogen loads. Exh. 249 at 1.

Dr. Yates testified that disinfection of wastewater treatment plant effluent would largely reduce CAWS contamination during dry weather conditions. Exh. 249 at 5. She testified that the District's wastewater treatment plants are the largest source of pathogens during dry weather. *Id.* Conversely, Dr. Yates explained that during the few days immediately following a wet weather event, pathogen contamination may linger from CSOs. *Id.*

Dr. Yates testified that the CAWS is heavily effluent dominated and that 70 percent of the flow on dry days originates from wastewater treatment plants. Exh. 249 at 5. Thus, Dr. Yates described that wastewater treatment plant effluent would be the predominant source of pathogens. *Id.* Additionally, Dr. Yates explained that the presence of pathogens is generally assessed by testing for indicator bacteria such as fecal coliforms *E. coli*, and enterococci. *Id.* at 5-6. She further explained that, during dry weather conditions, District sampling data in the CAWS indicates a strong pattern of bacterial contamination at the plant outfall. The bacterial contamination gradually drops as the effluent travels downstream. *Id.* at 6. Dr. Yates reasoned that if the dry-weather contributors of fecal coliforms were animal sources, the concentration

would assumedly be consistent upstream and downstream of the plant, which has not occurred in the CAWS. *Id.* at 7-8.

Dr. Yates further testified that disinfection is specifically designed to decrease pathogen concentrations. Exh. 249 at 8. She described that in the three communities analyzed in USEPA's Urban Rivers analysis, the levels of bacteria in the wastewater treatment plant effluent were lower where the communities practiced disinfection. *Id.* at 9. Moreover, Dr. Yates explained that most major metropolitan areas in the U.S. have adopted disinfection practices and that Chicago is an outlier in implementing this "basic public health precaution that has long been in place elsewhere." *Id.*

Dangerous Human Pathogens Are Very Likely Present in the CAWS

Dr. Yates testified that the levels of indicator bacteria present downstream of the wastewater treatment plant outfalls are very strong evidence of the presence of high levels of human fecal material, and that this material likely contains human pathogens. Exh. 249 at 1-2. She testified that "definitely if you have higher levels of indicators and higher levels of pathogens, you have higher levels of risk." 5/5/09P Tr. at 27.

Dr. Yates testified that wastewater treatment plant effluent can contain more than 100 different waterborne pathogens that can cause illness to humans. Exh. 249 at 9. Dr. Yates testified that although pathogen concentrations can reduce incidentally during primary and secondary sewage treatment, disinfection is specifically designed to decrease these concentrations. *Id.* at 11. Further, Dr. Yates described that non-primary contact users of the waterway can potentially be exposed to waterborne pathogens via four pathways: 1) ingestion of small amounts of water by accidental immersion and involuntary gulping; 2) ingestion of small amounts by eating food with wet hands or by a child's hand-to-mouth contact; 3) inhalation or absorption of water droplets through skin, particularly where an individual has a cut or abrasion; and 4) eye and other infections resulting from exposing mucous membranes to contaminated water. *Id.* at 12.

Dr. Yates testified that high levels of indicator bacteria are generally correlated with higher overall levels of pathogens and that District sampling data demonstrates indicator bacteria that signal the likely presence of human pathogens. Exh. 249 at 13. Dr. Yates described that District sampling data near its outfalls to the CAWS show indicator bacteria levels that are over ten times higher than USEPA standards for recreational waters in which non-primary contact recreation occurs. *Id.*

Next, Dr. Yates argued that reports of illness are not a good measure of risk. Exh. 249 at 15. For instance, she described that the symptoms caused by the types of pathogens in undisinfected sewage are common and can have multiple causes, such as rashes or diarrhea. *Id.* Therefore, Dr. Yates reasoned that infected individuals may not attribute their illness to their water contact, and would likely not seek medical care for these symptoms. *Id.* Further, Dr. Yates explained that exposure to these pathogens does not always result in illness, and individuals suffering from asymptomatic infections may infect others, causing symptomatic secondary infections. *Id.*

Previous Research Shows Risk to Recreational Users

Dr. Yates testified that previous research involving waterbodies with lower concentrations of indicator bacteria than the CAWS have demonstrated risk to recreational users from waterborne pathogens, even absent primary contact. Exh. 249 at 2. In support, Dr. Yates testified that she conducted a search of peer-reviewed scientific literature involving risk assessments related to recreational users of pathogen contaminated waterbodies. Exh. 249 at 15. Additionally, Dr. Yates provided a table listing the higher risks of health effects after limited-contact recreational users were exposed to contaminated waters compared to those who were not exposed. *Id.* at 16.

Current Efforts to Re-evaluate Pathogen Indicator Criteria Have No Bearing on the Question of Effluent Disinfection

Dr. Yates testified that even though current federal criteria are undergoing revision, revisions would likely be more protective of public health, not less protective. Exh. 249 at 2. Dr. Yates testified that this reevaluation is consistent with her conclusions that the levels of indicator bacteria in the CAWS indicate potential human health effects and that disinfection can reduce those risks. Exh. 249 at 18. Dr. Yates described that USEPA is primarily concerned that the absence of indicator bacteria may give false assurances; thus, any standard that results from USEPA's reevaluation will likely result in more stringent controls. *Id.* She further testified that USEPA is concerned with the under prediction of risk, which can result where individuals are getting ill from pathogens even though no coliforms are present. 5/5/09A Tr. at 16.

Additionally, Dr. Yates testified that recently, scientific advances have indicated that currently used indicator bacteria may be insufficiently protective. Exh. 249 at 19. For instance, Dr. Yates described that the presence of many different pathogens is under predicted by indicator bacteria and that this under prediction prompted USEPA's Beaches Environmental Assessment and Coastal Health (BEACH) Act. *Id.* Therefore, Dr. Yates testified that the absence of these coliforms cannot be relied upon to support that certain waters are safe. *Id.* at 20.

Further, Dr. Yates testified that the likelihood is low that the revised BEACH criteria will allow the levels of contamination that are now present in the CAWS. *Id.* at 20. She described that the disinfection process is not susceptible to fine tuning because the impact of disinfection is binary. *Id.* That is, she explained that if wastewater treatment plant s do not disinfect, pathogen levels will be high, while if they do disinfect, pathogen levels will be lower. *Id.* Therefore, Dr. Yates concluded that if we could permanently diminish the risk of people getting sick, we should not avoid diminishing the risk simply because USEPA's criteria provides that 8 of 1,000 people becoming ill is an acceptable risk involving beach closures. *Id.* at 21.

District's Microbial Risk Assessment Has Numerous Flaws

Dr. Yates testified that the Microbial Risk Assessment performed by District's subcontractor, Geosyntec Consultants, contains analytical errors that support its conclusion of no significant risk to CAWS recreators. Exh. 249 at 2.

Dr. Yates explained that the Microbial Risk Assessment concludes that the risk to non-primary contact users of the CAWS is minimal and that disinfection thus would not have a significant impact. Exh. 249 at 21. Dr. Yates described that the Microbial Risk Assessment must be flawed and that it should not be relied upon to support decisions involving disinfection. *Id.*

In support of her statement, Dr. Yates listed the following flaws in the Microbial Risk Assessment's methodology and assumptions:

1) that the Microbial Risk Assessment is based exclusively on gastrointestinal illness without considering other types of illness that could be contracted;

2) that the Microbial Risk Assessment is based on the study of only 8 pathogens where hundreds are associated with untreated sewage effluent, which likely underestimates risk;

3) that the Microbial Risk Assessment fails to consider sensitive populations (e.g. children, pregnant women, the elderly, and immuno-compromised persons);

4) that the Microbial Risk Assessment averages the concentrations upstream and downstream of the wastewater treatment plant s, causing the higher downstream pathogen levels to appear lower;

5) that the Microbial Risk Assessment combines dry and wet weather conditions to assess post-disinfection conditions where, during wet weather, disinfection would have a lesser impact on the pathogens that are present from CSOs rather than the wastewater treatment plant s;

6) that the Microbial Risk Assessment's calculations are based on a limited number of samples during a short period of time;

7) that the Microbial Risk Assessment liberally applies dose-response assumptions to support that a lower risk of infectivity exists;

8) that the Microbial Risk Assessment's sterilization method of rinsing equipment with sterile, distilled water did not follow USEPA protocols;

9) that the Microbial Risk Assessment does not address the volume of the samples actually analyzed for each virus, which allows for extrapolation regarding the concentrations of viruses present;

10) that the Microbial Risk Assessment extrapolates concentrations of viruses by testing small portions of each sample;

11) that the Microbial Risk Assessment includes probability distributions for only 2 input variables (ingestion rate and duration for canoeists) without including every input variable; and

12) that the Microbial Risk Assessment presents its final results as single numbers without showing cumulative probability distribution functions associated with the risk numbers presented. *Id.* at 22-25.

Further, to clarify number 10 above, Dr. Yates explained that the Microbial Risk Assessment is flawed because it analyzes a small sample and applies those results to assume that the whole sample was devoid of noroviruses. 5/5/09P Tr. at 16. Dr. Yates explained that the small fraction of the concentrated sample taken in the Microbial Risk Assessment studies may or may not have been representative of the entire sample where analyzers studied a very small fraction of the original sample, then extrapolated those results to the entire sample. *Id.* at 8. Additionally, she described that, by using these methods, the analyzers could have easily missed viruses in the samples. *Id.* at 16. Moreover, Dr. Yates described that even finding a single norovirus particle has huge public health consequences where the probability of infection from exposure to one norovirus particle is 50 percent. *Id.* at 15.

In addition, Dr. Yates testified that the Microbial Risk Assessment contains gaps in essential information regarding the methods, analysis, and assumptions that should be resolved. Exh. 249 at 26. She then listed specific gaps, including what methods were used to analyze adenovirus sample. *Id.*

District's Epidemiological Study Is Not a Sufficient Tool to Assess the Need for Disinfection

Dr. Yates testified that the epidemiological study that District is currently conducting involving the recreational use of the CAWS will not be a sufficient basis for deciding whether to disinfect. Exh. 249 at 2.

Dr. Yates testified that she did not believe that the methodology of CHEERS conducted by the UIC School of Public Health was inappropriate or otherwise flawed. Exh. 249 at 26. However, Dr. Yates stated that she did not believe that the epidemiological study is an appropriate tool for determining either the magnitude of the risk of pathogens to CAWS recreators, or whether disinfection is appropriate to alleviate the risk. *Id.* at 27.

Further, Dr. Yates listed the following five major reasons why it would be inappropriate to rely on the UIC study:

1) results of epidemiological studies are unreliable unless based on sufficiently large samples;

2) CHEERS's assessment of risk is incomplete where it could not assess the amount of recreators who become infected, yet do not exhibit symptoms;

3) this type of study could not adequately account for varying water conditions during certain periods or in certain locations where pathogen loads are higher;

4) this type of study could not account for the varying levels of use of the CAWS where different recreators engage in activities differently in clean versus contaminated water; and

5) CHEERS should not be relied upon unless its results are reproduced at least once. *Id.* at 27-28.

Dr. Marc Gorelick on Behalf of the Environmental Groups

Dr. Marc Gorelick, Professor of Pediatrics and Population Health and Chief of the Section on Emergency Medicine at the Medical College of Wisconsin, testified on three occasions on behalf of the Environmental Groups. Dr. Gorelick is a medical doctor with extensive expertise in the field of clinical epidemiology. Exh. 233 at 1. His testimony focuses on the limitations of CHEERS as means for evaluating public health risk in the CAWS. On April 15, 2009, Dr. Gorelick presented testimony on the limitations of epidemiologic research. He provided additional testimony on the CHEERS interim technical reports on June 30, 2010. Finally, Dr. Gorelick testified on the CHEERS Final Report on October 20, 2010. A brief summary of Dr. Gorelick's testimony is presented in the following sections.

Dr. Gorelick's Testimony April 15, 2009 (Exh. 233)

As an expert in the field of epidemiologic research, Dr. Gorelick's testimony explained the limitations of epidemiological studies, and urged the Board to be cautious in utilizing epidemiologic study as a means of evaluating public health risk. He stated that while he supports the proposed CHEERS, a single study is simply not a sound basis for going against a vast consensus "that germs in water can make people sick" and allowing a heavy pathogen load into recreational waters. Exh. 233 at 1. Dr. Gorelick asserted that pathogens in sewage can cause illness in humans, and such pathogens cannot be removed from treated sewage effluents without disinfection. *Id.* at 3-4. Further, he stated that the District's indicator pathogen sampling data indicates high levels of pathogens in the District's effluent. *Id.* at 4.

Dr. Gorelick noted that while indicator organisms are not an ideal measure of pathogens, they provide a rough indication of likely levels of pathogens in the sampled water. Exh. 233 at 5. Further, he noted that indicator organism like fecal coliform may not indicate presence of pathogens such as viruses and protozoa. *Id*. Dr. Gorelick stated that even low levels of any pathogen can be dangerous to sensitive populations, *i.e.* children, the elderly, and persons with compromised immune systems. *Id.*

Regarding the limitations of epidemiologic research, Dr. Gorelick stated that "epidemiology cannot provide proof of a cause and effect relationship; it can only provide evidence - sometimes stronger, sometimes weaker - of an association." Exh. 233 at 6. He argued that since the epidemiologic study populations are not isolated from the general

populations, identifying the factor that is causing an observed effect is difficult. Dr. Gorelick emphasized that drawing conclusions from an epidemiologic study is difficult when the results of the study are negative. *Id.* In the case of waterborne pathogens, he notes that numerous variables and factors in an epidemiologic study can render a negative result, even when significant risk is present. Dr. Gorelick contended that given the inherent uncertainty of epidemiologic research, making a policy decision of any kind based upon one negative outcome is not appropriate. *Id.* at 7.

Dr. Gorelick elaborated on the factors that affect the results of an epidemiologic study. For example, Dr. Gorelick stated that sample size is critical to the predictive value of an epidemiologic study. He noted that margin of error is inversely correlated to the sample size. Thus, the more people involved in the study, the lesser would be the margin of error. He notes that studies with small sample size will not provide reliable conclusions about the risks being evaluated. *Id.* at 8. Dr. Gorelick also noted that risk subcategories effectively reduce samples even further. He argued that his concerns regarding the sample size appear to be present in CHEERS. The number of participants enrolled in 2007 season was less than 10 percent of the desired sample size that can result in a significant margin of error. *Id.* Further, he noted that CHEERS participants represent a broad range of recreational uses that does not account for subgroups of recreational activities with higher risk like kayaking and canoeing. *Id.* at 8-9. Also, CHEERS does not address sensitive populations as a risk subgroup.

Dr. Gorelick maintains that CHEERS works well for pathogens that cause symptoms in most or all participants who are infected by them, but does not work well when only a small fraction of infected people get sick. In this regard, he noted that waterborne pathogens can infect a large number of people, but actually result in illness in only small number of the infected people. However, infections with these pathogens can spread asymptomatically to many different people before one of those actually becomes sick. Exh. 233 at 9. Dr. Gorelick observes that CHEERS does not account for asymptomatic infections.

Dr. Gorelick also noted that varying conditions such as sunlight, water temperature and distance from the source affect the pathogen levels. He continues that it will not be possible to know from the results of the epidemiologic study the type of conditions the participants were exposed to during the recreational activity. Dr. Gorelick argued that participants encountering more hazardous conditions may report higher level of illness, while those encountering less hazardous conditions will report lower levels of illness. Thus, the results of two groups effectively cancel each other out. Exh. 233. at 10.

In addition to above factors, Dr. Gorelick states "it is difficult to conduct epidemiological research concerning illnesses that have multiple causes." Exh. 233 at 10. The illnesses caused by waterborne pathogens associated with sewage, such as diarrhea, stomach upset and fever are extremely common and have dozens of potential causes. Dr. Gorelick argued that millions of cases of diarrhea, stomach upset and fever that occur in the U.S. have nothing to do with waterborne pathogens. He contended that separating out illnesses caused by water recreation would be difficult. *Id.* Finally, Dr. Gorelick stated that the risk being studied may be underestimated in an epidemiologic study when participants may conduct themselves more cautiously in hazardous conditions and self-limit their risk. *Id.* at 11.

In sum, Dr. Gorelick concluded that to delay disinfection of the CAWS pending the outcome of CHEERS would be serious mistake. He contended that the results of CHEERS will be inconclusive, "particularly if those results are negative, given the severe limitations in the significance of the negative epidemiological results in a study of this nature." Exh. 233 at 11.

Gorelick testimony June 30, 2010 (Exh. 390)

On June 30, 2010, Dr. Gorelick provided testimony on the preliminary technical reports submitted by the District describing the raw data collected in CHEERS. Exh. 390 at 1. Dr. Gorelick asserts that the raw data presented in the District's technical reports do not represent CHEERS results. He emphasizes that without the critical step of evaluating the data through statistical analysis and mathematical modeling to isolate the specific risk factor being assessed, the data are meaningless. *Id*. Dr. Gorelick urges the Board not to consider the technical reports as a basis for decision making purposes. *Id*.

Dr. Gorelick questions the District's claim that the technical report represents a finding that there is no increased health risk for recreational users in the inland CAWS compared to swimmers in Lake Michigan. He argued that the confounding factors discussed in his previous testimony (Exh. 233) along with several additional factors preclude such sweeping conclusion even when data analysis is complete. Exh. 390 at 4. Dr. Gorelick reiterated his concerns regarding the confounding factors. He noted that in CHEERS, the characteristics of CHEERS participants indicate large and important differences in many factors like year of enrollment, season, gender, age, race, and water activity that may likely affect the risk of acute illness. *Id.* at 5-6. Dr. Gorelick stated that adjusting for confounding factors is possible when analyzing data, such adjustment results in a decrease of the statistical power. *Id.* at 9. He noted that while modern techniques allow for the adjustment for confounding with less loss of power, such techniques increase the margin of error.

In addition to confounding factors, Dr. Gorelick stated that epidemiologic studies such as CHEERS are prone to various sources of bias or systematic errors. Exh. 390 at 6. He also noted that "[t]o the extent that potential biases exist, they call into question the strength of CHEERS's conclusions and generalizability of its results". *Id.* at 7. Finally, Dr. Gorelick continued to express concern regarding diminished statistical power of CHEERS. He noted that despite CHEERS's overall large sample size, CHEERS "lacks sufficient statistical power to identify clinically important differences in risk, in particular risk to the various sub-populations of CAWS users." Id. at 8. In addition to the variable and factors addressed in his previous testimony (Exh. 233), Dr. Gorelick stated that the technical report data reflect two additional limitations, *i.e.* clustering and missing data. *Id.* He noted that whenever participants are clustered in a way that makes them more similar than if they were selected at random, the clustering effect must be accounted for in the statistical analysis. Dr. Gorelick maintains that clustering is an issue with CHEERS since the participants were recruited at least in part in clusters. *Id.* at 10.

Regarding missing data, Dr. Gorelick asserts that inevitably some participants will be missing some information in an epidemiologic study. He stated that while magnitude of missing data is unclear from the technical reports, such data must be addressed in the Final Report. Dr.

Gorelick argued that in a study with many variables missing data can add up, resulting in a corresponding loss of power. *Id.* Dr. Gorelick concludes his testimony by reiterating his position that the technical reports do not provide any basis for drawing meaningful conclusions regarding health risks associated with the CAWS.

Gorelick testimony October 20, 2010 (Exh. 415)

Dr. Gorelick testified on the findings of the CHEERS Final Report on October 20, 2010. He stated that the results of CHEERS do not support the District's sweeping conclusion that steps to disinfect effluent are unnecessary. Exh. 415 at 1-2. He argued that while CHEERS is consistent with fundamental scientific principles, the District's characterization of CHEERS results as the conclusive definition of risk is not. *Id.* at 2. Dr. Gorelick again reiterates his concerns regarding the use of a single epidemiologic study and treat it as definitive conclusion regarding CAWS recreational risk because of a number of reasons.

Sources of Bias. Dr. Gorelick noted that CHEERS includes a number of specific sources of bias that were not acknowledged as biases, even though several were listed by the peer reviewers. Exh. 415 at 3. He stated that the heterogeneity bias, which is one of the most serious potential biases is ignored in CHEERS. Dr. Gorelick maintains that since CHEERS treats the entire CAWS as one group and entire GUW as another, heterogeneity is ignore. He observes that under CHEERS, "both waterways looks more similar to each other than they truly are." *Id.* at 4. Further, he noted that since the largest proportion of participants come from the areas with the lowest rates of illness, the results underestimate the overall risk of illness from the CAWS. *Id.*

Dr. Gorelick asserts that not all questions asked in CHEERS were validated by prior research and may have resulted in flaws in the method of questioning. He observes that standard practice is to validate questions through separate research prior to using the data gathered in an epidemiologic study. Any flaws in the questioning methodology, particularly with respect to water exposure questions may skew CHEERS results. *Id.* at 4. He noted that the answers to the water exposure questions are affected by recall issues involving participant memory recall about exposure, language involving the meaning of terms like "sprinkle" versus "splash", and range of frequency of immersion. While Dr. Gorelick does not contend that water exposure information in CHEERS is incorrect, he argued that CHEERS failed to validate the methodology used to gather the relevant information. *Id.* at 5.

Next, Dr. Gorelick observes that while CHEERS investigators did attempt to evaluate any potential selection bias by comparing the activities occurring in the waterways to those reported by the participants and concluding distribution of CAWS participants was "broadly similar" to all observed uses, CHEERS also noted differences such as fewer kayakers and motor boaters. These differences, Dr. Gorelick argued, are highly significant and may be clinically important. If motor boating is a high risk activity, the estimate of gastrointestinal illness disease in CHEERS population would be lower than the actual risk. Exh. 415 at 6. He also noted that study location introduces a selection bias, since 51 percent of all users observed on the CAWS were recreating on CAWS-North, while 67.9 percent of CHEERS participants in the CAWS group were enrolled

at other locations. Finally, Dr. Gorelick reiterated his concerns regarding self-reporting bias, *i.e.* the participants may not report information accurately for numerous reasons. *Id.* at 6.

Risk to Subgroups. Dr. Gorelick continues to maintain that risks of waterborne illness are unlikely to be uniform for everyone. He argued that CHEERS lacks the statistical power to fully evaluate the risk of illness to potentially vulnerable subgroups and more sensitive populations. While the sample size for statistical analysis was more than the design number of 9,330 participants, far fewer numbers fell into any important subgroups. Exh. 415 at 7. Thus, Dr. Gorelick contended that CHEERS lacks the statistical power to draw meaningful conclusions concerning the subgroups. *Id.* He maintains that even though CHEERS takes steps like performing interaction analysis to focus on the risk to subgroups, such steps do not obviate the fundamental problem of lack of statistical power. *Id.* at 7-8.

Incomplete Adjustment of Confounding Factors. Dr. Gorelick noted that while most of the confounding factors were adjusted by CHEERS investigators, factors such as socioeconomic status, hand washing behavior and duration of activity were not addressed in CHEERS. He also noted that other than the possibility of residual confounding being not considered, the screening method used to exclude some confounders is open to questions. Exh. 415 at 9. In this regard, Dr. Gorelick noted that the bivariate analysis used to examine the association between each of the confounders is "potentially risky as the very nature of confounding means that the association among the variables is skewed." *Id.* He argued that bivariate screening risks missing potential confounders and failing to account for them in the multivariate analysis.

Analytical Problem with Pathogen/Gastrointestinal Illness Correlation. Dr. Gorelick noted that while the primary objective of CHEERS was to determine the rates of acute gastrointestinal illness and non-gastrointestinal illness attributable to CAWS recreation, CHEERS also attempted to identify pathogens responsible for symptoms of gastrointestinal illness among recreators. Dr. Gorelick maintained that the data and analysis of the secondary outcome are problematic for a number of reasons. Exh. 415 at 9. He noted that CHEERS was not powered to assess the secondary objective of identifying pathogens responsible for illness. Next, the rate of return of stool samples is inadequate to draw firm conclusions. Further, he noted that it is very difficult to isolate viral pathogens from stool samples, depending on the pathogen. *Id.* at 9-10.

Unaccounted for Variables. Dr. Gorelick reemphasized his concerns regarding asymptomatic illness, and varying conditions as they relate to CHEERS. He noted that secondary illness passed on to other people by water recreators would not be reflected in the survey data. Exh. 415 at 10. Further, the questions asked in the follow-up survey about illness in certain people in close proximity are of limited use in bridging the information gap regarding asymptomatic illness. Dr. Gorelick also reiterated his concern regarding varying conditions that affect the pathogen levels. He noted that while CHEERS partially addresses this by sampling the water reasonably close in time and place to recreational use, the 6-hour sampling frequency is not sufficient to get the kinds of constantly changing differences in pathogen levels that occur in water bodies. *Id.* at 11.

Overall Insufficiency of Single Study. Dr. Gorelick stressed his position that even if CHEERS is considered as a perfect epidemiologic study, CHEERS could not provide conclusive guidance for a policy decision. Exh. 415 at 12. He stated that epidemiologic research is carried out in the real world where it is subject to knowledge gaps, bias, and confounding. Dr. Gorelick maintains that results of epidemiologic study must be interpreted and understood in the broader context what is already known to science. He noted that the results of the CHEER study, *i.e.* rates of illness were similar among recreators in CAWS and GUW even though indicators of sewage contamination conflicts with existing medical knowledge. Further, CHEERS finding of lower risk of illness in the youngest and oldest subjects is contrary to a prior study of swimming. *Id.* at 12. Although CHEERS failed to identify a relationship specifically between wastewater contaminated water exposure and gastrointestinal illness, CHEERS confirmed the existing medical knowledge regarding the overall relationship between recreational water exposure and gastrointestinal illness. This anomaly, Dr. Gorelick asserts, must be studied further rather than being accepted as an established fact. *Id*. at 13. Finally, he noted that caution should be exercised in generalizing from the results of CHEERS because of the differences between types of water activities of CHEERS participants and the overall population of CAWS users.

Dr. Gorelick concluded that while CHEERS is a well designed and well conducted study, the findings cannot be considered conclusive. For the foregoing reasons, Dr. Gorelick maintained that further research is necessary to explain the differences, as well as establish risks to important subgroups. He stated that any decision concerning public health protection must governed by existing well established biomedical knowledge about risk associated with sewage-related pathogens. *Id.* at 14.

Carl Adams and Robin Garibay on Behalf of Stepan Company

Dr. Adams and Ms. Garibay testified as to the impact of the IEPA's proposal on Stepan's Millsdale plant located in Elwood, Will County. Exh. 318 at 2. More specifically Dr. Adams and Ms. Garibay looked at the methodology and technology that the plant could adopt to meet the proposed standards for temperature, fecal bacteria and dissolved oxygen.[1] *Id*. Dr. Adams has over 35 years of experience in industrial wastewater treatment and Ms. Garibay has over 20 years of experience in wastewater management. Exh. 318 at 1.

The Millsdale plant was constructed in 1954 and employs about 400 people. Exh. 318 at 2. The Millsdale plant operates as a specialty chemical manufacturer and produces 1,200 to 1,500 varying products based on customer specifications. Exh. 318 at 2-3. The Millsdale plant employs a complex wastewater treatment system involving over fifteen tanks and numerous processes, including decantation, equalization, two aeration stages, clarification, two aerobic digestion stages, and activated sludge with dual media filtration. Exh. 318 at 3. The treatment system generates digested sludge that is land applied and the effluent outflow is discharged through a buried pipeline to the Upper Dresdan Island Pool. *Id*. Under the current permit, the plant operation results in an average discharge of 0.88 mgd of treated process wastewater, sanitary wastewater, and stormwater. *Id*. The discharge is monitored for 68 parameters. *Id*.

[1] The Board will summarize only the testimony regarding fecal bacteria in this subdocket and will address the remaining issues in Subdocket C.

Dr. Adams and Ms. Garibay note that the IEPA's proposal would result in the application of a technology-based value designed to assure that disinfection technologies are functioning properly during the months of March through November. Exh. 318 at 9, citing SR at 92. Currently the Millsdale plant outfall does not have a permit limit for fecal coliforms and the current wastewater management does not include a disinfection system. Exh. 318 at 9. Dr. Adams and Ms. Garibay testified that because the standard proposed is not a water quality standard but instead an effluent standard, compliance will be required at the discharge point. *Id*. Dr. Adams and Ms. Garibay opine that installation of a disinfection system will be required to achieve the effluent fecal standard. *Id*. The source of fecal coliform in the wastewater is the overflows from about 15 septic systems which do not use and will not be able to use leach fields. *Id*.

Dr. Adams and Ms. Garibay testified that based on the treated effluent monitoring data, a more than 98 percent reduction of fecal bacteria will be needed to achieve compliance with the proposed standard. Exh. 318 at 9. Sending the wastewater to a municipal treatment facility is not feasible as there are none closer than Stepan's treatment plant. 8/13/09A Tr. at 27. Also the only way to lower the levels of fecal bacteria in the effluent is disinfection as dilution is not available. *Id*. at 28. Dr. Adams and Ms. Garibay testified that treatments commonly used to kill bacteria are:

1) Source Treatment (chlorination) prior to septic system overflows entering process wastewater sewers.

2) End-of-pipe chlorination

3) Other end-of-pipe applications (e.g., UV, ozonation, or peroxide) Exh. 318 at 9-10.

Dr. Adams and Ms. Garibay discussed each of these options.

With Source Treatment, Dr. Adams and Ms. Garibay's concern is assuring that the chlorine concentration is effective to kill bacteria, while not reaching such a level that the residual chlorine could chlorinate organic material present in the untreated process water. Exh. 318 at 10. Also, not having the chlorine in a concentration that the residual chlorine could inhibit sludge is a concern. *Id*. In addition, the nature of Stepan's septic system with multiple septic fields, and thus multiple sources spread throughout the facility is problematic with this type of treatment. 8/13/09A Tr. at 25, 72. All of the septic fields converge at the one treatment facility. *Id*. Dr. Adams and Ms. Garibay do not consider this option technically feasible as there is not sufficient information and data on the effectiveness or reliability Source Treatment. *Id*.

As to end-of-pipe chlorination, Dr. Adams and Ms. Garibay testified that this type of treatment is known to be effective and has proven to work well on a variety of treated wastewaters. Exh. 318 at 10. Dr. Adams and Ms. Garibay opined that dechlorination would also be required to meet the proposed standards for total residual chlorine proposed in this

rulemaking. *Id*. Dr. Adams and Ms. Garibay further opined that chlorination and dechlorination are considered technically feasible.

Dr. Adams and Ms. Garibay note that other end-of-pipe systems such as UV light, ozonation (facilitated with UV), hydrogen peroxide (facilitated with UV), have been shown to be effective in destroying fecal bacteria. Exh. 318 at 10. However, Dr. Adams and Ms. Garibay question the effectiveness of these systems as applied to Stepan's treated effluent due to the type of total suspended solids present, the tendency for the effluent to contain materials that "foam", the level of biological oxygen demand, and the "color" of the treated effluent. *Id*. Dr. Adams testified that UV lights do not penetrate the wastewater very well, so UV light is not an effective catalytic. 8/13/09A Tr. at 72-73. Dr. Adams noted that another catalyst, ferric iron will result in a tremendous amount of sludge. *Id*. Thus, leaving peroxide and ozone as catalysts both of which are expensive. *Id*. Dr. Adams and Ms. Garibay opine that these systems are not technically feasible. *Id*.

Dr. Adams and Ms. Garibay next examined the economic and environmental impact of chlorination and dechlorination. Exh. 318 at 10. The financial impact includes $1,771,000 in capital cost and $650,000 annually in operation and maintenance. Exh. 318 at 11. Dr. Adams and Ms. Garibay opine that the environmental impact includes an increase in effluent concentrations of chloride by 19 percent, of sulfate by 31 percent, and the potential formation of chlorinated organics. *Id*; 8/13/09A Tr. at 43-44. Further land use will be approximately 5,700 square feet with a significant generation of solid waste and an increase in electrical use of 0.784 million kilowatt hours per year. *Id*. Dr. Adams clarified that the increased land use is the amount of additional area the plant will need for the additional treatment options. 8/13/09A Tr. at 76.

In conclusion, Dr. Adams and Ms. Garibay argue that the proposed effluent limitations and water quality standards will result in significant financial and cross-media environmental impacts. Exh. 318 at 14. Dr. Adams and Ms. Garibay testify that these impacts cannot be understood without considering the actual engineering steps that Stepan and other discharges will need to undertake to comply with the proposed standards. *Id*.

Thomas Granato on Behalf of the District

Dr. Granato is the Deputy Director of Research and Development, managing the Environmental Monitoring and Research Division of the District. 10/19/10 Tr. at 215. Dr. Granato has been employed by the District for over 22 years and for the last five years, he has been directly involved in the planning, development, management and administration of the District's research studies. *Id*. at 216. In prior testimony, Dr. Granato stated that the District believes that the IEPA should have waited for the completion of CHEERS before proposing this rulemaking. *Id*. at 217-18; *see also* 10/28/08 Tr. at 104-11.

Dr. Granato opined that the IEPA "relied upon incorrect assumptions and incomplete information to reach faulty conclusion" on the proposed recreational use designations. 10/19/10 Tr. at 217. Dr. Granato reiterates that the District does not believe there is a significant risk of gastrointestinal illnesses with Incidental and Non-contact recreation on the CAWS in either dry

or wet weather. *Id*. at 218. Dr. Granato stated that as a result, disinfection of the effluent from the water treatment plants will have a minimal effect on illness rates. *Id*.

Dr. Granato was the overall manager for the District for CHEERS, which included being a liaison with CHEERS staff and coordination of support functions for CHEERS. 10/19/10 Tr. at 227. The support functions included providing District staff, with experience in microbiology, public health and environmental biology, to the CHEERS team. *Id*. at 228. Additionally, the District assisted CHEERS team members with access to various sites. *Id*. The District also provided comments on the Quality Assurance Project Plan (QAPP) and the study design. *Id*. at 230-31. Dr. Granato testified that the CHEERS team did not take all of the District's suggestions. *Id*. at 231-32.

Dr. Granato explained that CHEERS is the first epidemiological study of the health risks of fishing, boating, rowing and paddling in the CAWS. 10/19/10 Tr. at 218. CHEERS was developed by a multi-disciplinary team of experienced researchers, with backgrounds in infectious disease medicine, environmental medicine, epidemiology, biostatistics, industrial hygiene and environmental science. *Id*. at 219. CHEERS was reviewed by experts from the U.S. Center for Disease Control and Prevention, USEPA, and several universities. *Id*. In addition these experts monitored the quality of the data collected and the analysis and interpretation of the data. *Id*.

Dr. Granato testified that CHEERS was designed to investigate the occurrence of illness associated with secondary contact recreation on the CAWS. 10/19/10 Tr. at 219. CHEERS had three objectives: 1) to determine the rates of acute gastrointestinal and non-gastrointestinal illness attributable to CAWS recreation; 2) to identify pathogens responsible for acute infections among recreators, and to explore sources of those pathogens on the CAWS; 3) to characterize the relationship between concentrations of microbes in the CAWS and rates of illness among recreators. *Id*. at 219-220.

Dr. Granato stated that with respect to the first objective, CHEERS concluded that rates of gastrointestinal illness are not higher among CAWS recreators as compared to recreators doing the same activities on general use waters that do not receive undisinfected wastewater treatment plant effluent. 10/19/10 Tr. at 220. As to the second objective, Dr. Granato testified that the "vast majority of pathogens identified from stool samples from study participants in all of CHEERS groups with gastrointestinal symptoms were viruses." *Id*. at 221-22. Further, Dr. Granato stated that pathogens that often result in severe waterborne disease were not identified in stool samples. Thus, Dr. Granato opined that "there was no suggestion that water recreation, CAWS use, or water ingestion was associated with gastrointestinal illness." *Id*. at 222.

Dr. Granato asserts that CHEERS makes clear that disinfection of the District's wastewater treatment plant effluent discharged into the CAWS is not necessary as the risk to recreators in the CAWS are no greater than the risks to recreators in other nearby waters where effluents are disinfected or where no effluent is discharged. 10/19/10 Tr. at 222-23. Further, Dr. Granato maintains that the total costs associated with disinfection are extraordinary, particularly considering the lack of benefit. *Id*. at 223. And finally, Dr. Granato opines that effluent disinfection would result in substantial environmental impacts in the form of energy usage, air

emissions from power generation and transportation of raw and waste materials, and land usage. *Id*. at 223-24.

Dr. Granato opines that the information in the record is now "complete" with regard to the IEPA "reevaluating their technology-based effluent limitation proposal." 10/19/10 Tr. at 239. Dr. Granato believes that the risk Assessment study,[2] CHEERS and other studies in the record establish that there really is no benefit to be derived by the imposition of an effluent limit. *Id*.

Richard Lanyon on Behalf of the District

Richard Lanyon began his career at the District in 1963, serving in various engineering, maintenance and operations departments following his bachelor and master of civil engineering degrees at the University of Illinois at Urbana-Champaign. 9/8/08A Tr. at 14. He worked as Director of Research and Development for seven years before he became General Superintendent, the position he held at the time of the hearing. *Id.* Mr. Lanyon provided a historical overview of the development of the CAWS, the current uses and prospective capital improvements. Exh. 60 at 2, 9/8/08A Tr. at 13-14. He believed that the IEPA has not clearly demonstrated that improving wastewater treatment is feasible, beneficial or economically reasonable, and that the rulemaking will be premature if the rule proceeds before all the District's studies have been completed. *Id.* at 10-11.

The History, Structure and Operation of the CAWS

Mr. Lanyon explained that the CAWS is a system of altered natural rivers and artificial channels that allowed the city to reverse the flow of the Chicago and Calumet Rivers away from Lake Michigan in the early 1900s in order to prevent illness due to drinking water contamination. Exh. 60 at 2. The North Shore Channel and Wilmette Pumping station were built in 1910 to divert lake water into the North Branch of the Chicago River, to flush it of wastes and eliminate odors. *Id.* The CAWS consists of 78 miles of canals, about 57 of which are man-made; the other 21 have been altered to the extent that, according to Mr. Lanyon, they no longer resemble a natural river channel. *Id.* at 3. One artificial channel, the Calumet-Sag, contains the O'Brien Lock and Dam, which the U.S. Army Corps of Engineers (Corps) built in 1960 to control the water diverted from Lake Michigan into the channel. *Id.* at 4. All flows are controlled by hydraulic structures operated by the District with oversight from the Corps and the U.S. Coast Guard. *Id.* at 3.

Flow Regulation. Mr. Lanyon explained that various inflows into the CAWS include discretionary diversion from Lake Michigan, leakage through control walls, tributary streams, storm runoff CSOs and treated effluent from water reclamation plants. Exh. 60 at 5. Treated effluent comprises over 70 percent of the annual flow, and during dry winter months it makes up nearly 100 percent of the flow. *Id.* The District fluctuates the flow volume in the channels in order to provide for required navigation depth, high water quality (as shown by dissolved oxygen

[2] The Geosyntec Microbial Risk Assessment is found in prefiled testimony discussed below. *See* Exh. 68 Attach. 3; Exh. 69 Attach. 2; Exh. 70 Attach. 3.

levels), urban drainage and flood prevention. *Id.* at 4, 9/8/08A Tr. at 50-51. Flows are not regulated based on temperature. 9/8/08A Tr. at 51. Mr. Lanyon explained that to maintain water quality primarily through warm weather months, the discretionary diversion of Lake Michigan water is allowed at a rate of about ten percent of the annual flow in the CAWS, or an average of 270 cubic feet per second (CFS). *Id.* at 49-51. The allotment must be used gradually over time because: 1) the design capacity of the Sanitary and Ship Canal can divert only a limited CFS, 2) the force of gravity is limited and 3) too much flow may cause velocities that would violate Corps navigation rules. *Id.* at 52. The diversion is mainly accomplished by gravity, which pulls water through sluice gates at the O'Brien Lock and Dam and the Chicago River Controlling Works. *Id.* at 55. Pumping is an option at the Wilmette Pumping Station, but the pumps on site are too old to work efficiently, requiring the District to use portable pumping equipment or to rely on gravity. *Id*.

The District's discretionary allotment is scheduled to be reduced to 101 CFS in 2015 because following TARP and other water quality improvements in Illinois, a 1996 Illinois Supreme Court Decree and memorandum of understanding with other Great Lakes stated prohibited Illinois from continuing to use its discretionary diversion for water quality maintenance. 9/8/08A Tr. at 53-54. Mr. Lanyon stated that the 2015 reduction will force the District to work harder to meet the dissolved oxygen indicators for high-quality water. *Id.*

Past improvements to water quality. Mr. Lanyon stated that the improvements in CAWS water quality since the turn of the century have largely resulted from reductions in industrial use of land adjacent to the CAWS. 9/8/08P Tr. at 24. This led to reductions in cyanide and other metals, as well as ammonia and sodium hypochlorite concentrations. *Id.* The hypochlorite was toxic to fish and was released prior to the 1980s at the Calumet and Stickney treatment plants as part of their disinfection program, which did not involve dechlorinating the water before replacing it in the CAWS. *Id.* at 25.

Disinfection. The District runs seven water reclamation plants, which were built during the 1920s, 30s and 40s. The plants provide primary (settleable and floatable solids removal) and secondary (activated sludge and clarification) treatment to meet the Districts NPDES permit limits. Exh. 60 at 8. Mr. Lanyon stated that the treated wastewater has "relatively low" levels of pathogenic microorganisms. *Id*. He clarified at hearing that levels of fecal coliform, or indicator bacteria, are low in water treated by the District and discharged into the CAWS (10-100,000 colonies per 100 mL) as compared to the bacterial levels in raw, untreated sewage (1-10 million colonies per 10 mL). *Id.* at 64. By contrast, Mr. Lanyon stated that disinfected effluent from plants such as those operating at Kirie, Egan and Hanover Park have levels that are close to zero. *Id.* at 65. He explained that those three plants in the northwest of Cook County are required by permit to disinfect their discharges because they discharge into the general use waters of Willow Creek, Salt Creek and the west branch of the DuPage River, respectively. *Id.* at 67-69. He noted that they treat smaller amounts of wastewater (12-50 million gallons/day) than the plants along the Calumet, North Side and Stickney (250-800 million gallons/day). *Id.* at 68-69. However, he acknowledged that the reason the District disinfects at the northwest plants is because of water quality standards imposed by the Pollution Control Board, not because the northwest plants are smaller than their counterparts nearer the lakefront. *Id.*

Mr. Lanyon stated that the northwest plants use chlorination/dechlorination treatment technology, which utilizes sodium hypochlorite as an inactivation agent and sodium bisulfite to remove the chlorine. Exh. 60 at 71. He stated that this is a common but decreasingly popular approach to disinfection in U.S. publically-owned treatment plants. *Id.* Mr. Lanyon stated at hearing that he believed chlorination/dechlorination, as well as ultraviolet disinfection technologies, would be technically feasible at the CAWS plants, although he stated that it has never been done before for such large plants (which process 250-800 million gallons per day). *Id.* at 82-83. He stated further that the District has not considered recommencing use of the equipment it used in the 1970s at the Stickney, Calumet and North Side plants to disinfect water using chlorination. 9/8/08P Tr. at 25. The District has not considered this because the equipment is old and may have been scrapped, because dechlorination equipment would still need to be installed (since dechlorination has become mandatory for treatment plants that disinfect), and because the contact basin used in the 70s and 80s at the Calumet plant is too small to treat the volume of wastewater that the plant now processes. *Id.* at 26-28. Mr. Lanyon explained that chlorination requires that the wastewater be in contact with the chlorinating agent for a lengthy time before the dechlorinating agent is added, and that the District dealt with this in the past by simply leaving the chlorinating agent in the water and counting part of the "kill time" as the time the water took to flow back to the CAWS. *Id.* at 27.

Mr. Lanyon stated that the District has built 109 miles of tunnels as part of the Tunnel and Reservoir Plan (TARP), which have reduced CSOs by about half, leading to a current average of 43 annual events. Exh. 60 at 9, 9/8/08A Tr. at 74. He hoped that by completion of TARP's final reservoir at McCook in 2024, CSOs will be down to one or two per year. Exh. 60 at 8-9, 9/8/08A Tr. at 76. Mr. Lanyon described a CSO as a day on which an overflow occurs at one or more outfalls, which may include multiple outflows at once; and he stated that the effects of a CSO discharge can last several days beyond the overflow event. *Id.* at 75-76.

Mr. Lanyon stated that the District has not discharged flow from the CAWS into Lake Michigan since August 23, 2007, and prior to that, since August of 2002, both times during extreme wet weather. 9/8/08A Tr. at 57. He stated that the northwest treatment plants, however, never have CSOs, and that hypothetically, during a seven-month season where disinfection would be required in the CAWS (May-October), CSOs would still not be the only source of pathogens. *Id.* at 74. However, he did not know the proportion of pathogen loading of the treatment plants as compared to those other sources. *Id.* at 75.

Potential Uses and Capital Improvement Costs

Mr. Lanyon stated that capital improvements already planned for the District's three largest wastewater treatment plants, which are about 80 years old, will cost billions of dollars to implement. Exh. 60 at 9. They must be implemented in the next twenty years to maintain the quality of treated wastewater and protect drinking water. *Id.* Mr. Lanyon spoke for the District in saying that the IEPA has not provided sound scientific or engineering evidence that IEPA's proposals for heightening use attainment will be feasible, significantly beneficial or economically reasonable. *Id*. at 10.

On the other hand, Mr. Lanyon stated that neither the District nor any authority he knows of has studied the potential effect on barge traffic of shutting down the Midwest Generation plants at Fisk, Crawford, or Will County, or the value of recreational boating as it currently operates. 9/8/08P Tr. at 22. He also stated that disinfection is technically possible, and that the District is prepared to take on new challenges if there would be a "significant benefit," which he viewed as achieving or maintaining a recreational use. 9/8/08A Tr. at 88. He acknowledged that other municipalities disinfect their wastewater even though CSO events occur in the receiving water bodies, and questioned whether that disinfection benefits those water bodies, but was unable to say whether disinfection would be beneficial in the CAWS case while CSO events continue. *Id.* at 90-91. Further, he stated that the District does not have a specific methodology for determining economic reasonableness. He stated that the District has undertaken numerous studies that should inform the IEPA's proposals, and believed that the rulemaking would be premature until they are completed, which may take up to two years in some cases. Exh. 60 at 10-11.

Thomas E. Kunetz, on Behalf of the District

Mr. Kunetz is the assistant chief engineer in the engineering department of the District. Exh. 153 at 1. He is in charge of the process facilities division, and also the production of contract documents for the upgrade, rehabilitation, and expansion of the District's seven water reclamation plants and outlying facilities. *Id.* Mr. Kunetz has experience in wastewater engineering, and testifies in order to explain the programs, and the costs, that the District plans to undertake on water reclamation plants. *Id.* He testified to explain the District's program for identifying, planning, and allocating funds for the capital improvement projects for repairing, rehabilitating, replacing, and expanding the District's water reclamation plants. *Id.*

Mr. Kunetz's calculations pertain to the costs for capital projects only; they do not include operation and maintenance fees such as engineering design fees, outlying District facilities, intercepting sewer projects, or TARP projects. Exh. 153 at 2. This is called the Capital Improvement Program (CIP). *Id.* Its purpose is to identify and implement projects necessary to ensure that each water reclamation plant meets the NPDES permitting requirements. *Id.*

Mr. Kunetz explains that Part of the CIP is the Infrastructure and Process Needs Feasibility Study process, initiated in 2000. Exh. 153 at 2. The purpose of the study is to "identify, evaluate and prioritize capital improvements projects necessary to update processes to current technology, to improvement treatment efficiency, reduce maintenance and operation costs, and reduce energy consumption at each water reclamation plant [and] . . . continue to produce exceptional quality effluent." *Id.* The studies end at 2040. *Id*. Part of the studies is a Master Plan, which is a "road map" to the future. *Id.* at 3. It identifies and prioritizes major projects in order to achieve the plant's established goals through 2040. *Id.*

The need for the studies stems from the fact that three of the largest treatment facilities in the District are also the oldest. Exh. 153 at 3. The main objectives of the study are to assess future flows and pollutant loadings, maintain treatment capacity through 2040, replace or upgrade undersized or underperforming unit processes, evaluate opportunities for process

changes, prepare to respond to potential changes in regulations, and standardization between plants where it is practical. *Id.*

The studies are commenced by assessing areas of concern and process objectives based on anticipated future flows to the treatment plants. Exh. 153 at 3. Next, a computer model is generated to evaluate current process efficiencies and potential future modifications. *Id.* at 4. A Master Plan is then generated based on the computer models' predictions of necessary projects and repairs for the water reclamation plants to continue to produce exceptional quality effluent through 2040. *Id.* The Master Plan takes into account various types of technology and cost comparisons for the different projects. 10/28/08Tr. at 89. Mr. Kunetz also creates non-master plans that take into account less urgent projects. *Id.* at 101.

Master Plans have been created for Stickney, Calumet, and North Side. The Stickney Master Plan outlines four projects at a total cost of $890,700,000. Exh. 153 at 4. The projects include construction of new sludge thickening tanks, elimination and replacement of the existing inefficient skimming tanks, demolition and replacement of outdated Imhoff tanks, and construction of new circular primary settling tanks to replace aging rectangular preliminary settling tanks. *Id.* The Calumet Master Plan requires three projects at a total cost of $530,490,000. *Id.* at 5. The projects are installing a new influent pumping station, replacing overloaded aging rectangular tanks, replacing undersized grit tanks, and installing a new Aeration Battery D. *Id.* The North Side Master Plan lists three projects at a total cost of $990,480,000. Those projects are installing a new battery of settling tanks, aeration tanks, and final settling tanks, a new aeration battery, and demolition existing undersized final settling tanks. *Id.* The calculations that result in the actual figures are based on the median regulatory information from around the country. 10/28/08Tr. at 11. They address the need to keep healthy levels of phosphorus, nitrogen, and other nutrients in the water. *Id.* at 13.

Mr. Kunetz's testimony concludes with his assertion that the projects that the studies reveal to be necessary are of the utmost necessity. Exh. 153 at 6. The projects represent the baseline financial responsibilities necessary to keep the water reclamation plants functioning under the current regulatory framework until the year 2040. *Id.* Failure to complete the projects will:

> jeopardize the District's water reclamation plants' ability to continue to produce exceptional quality wastewater, will potentially impede the water reclamation plants' ability to meet the existing NPDES permit effluent discharge limitations as flows and loads increase, and will allow aging infrastructure to further degrade to the point that it is beyond reasonable repair or use. *Id.* at 7.

John Mastracchio, on Behalf of the District

Mr. Mastracchio is a senior associate with Malcolm Pirnie, which is an environmental consulting firm. Exh. 159 at 1. Mr. Mastracchio opposes the IEPA's proposed water quality standards and disinfection. *Id.* at 4. His purpose is to explain the economic effects of the proposed improvements and disinfection process. *Id.* at 1. As a senior associate at an

environmental consulting firm, Mr. Mastracchio has considerable experience in calculating economic effects and has training in engineering.

Mr. Mastracchio based his economic calculations on the IEPA's proposal exactly; that is, Mr. Mastracchio considered the disinfection process be implemented at all three facilities. 10/28/08Tr. at 18. Mr. Mastracchio made his calculations based on the costs listed in Attachment 1 to his testimony; the numbers come from the Chlorination/Dechlorination Cost Study, the Ultraviolet Disinfection Cost Study reports, and David R. Zenz's testimony (*see* Exh. 146). Exh. 159 at 2. Mr. Mastracchio testified that he lacked regulatory information and tried to choose the mean for regulations around the country. 10/28/08Tr. at 11. He did not include customer affordability or median household incomes. *Id.* at 29. Mr. Mastracchio uses those numbers in combination with two other points to draw his ultimate conclusion, which is that the proposed changes are financially infeasible. Exh. 159 at 4.

First, Mr. Mastracchio explained that the District generates revenue through *ad valorem* property taxes, personal property replacement taxes, user charges, interest income, and other miscellaneous fees. Exh. 159 at 3. Second, Mr. Mastracchio points out that there are limitations on the District to use those funds for new projects. *Id*. Specifically, the Property Tax Extension Limitation Law of 1995 limits the District's ability to increase the aggregate tax levy, the District's initial Tax Cap legislation restricts non-referendum bond authority from applying to projects initiated after October 1, 1991, and the non-referendum bonds that the District is permitted to issue under Public Act 93-279 will not raise enough revenue to fund new projects. *Id.* at 3-4.

Based on those numbers, Mr. Mastracchio concluded that "the District does not have sufficient financial resources to fund the capital expenditures and operation and maintenance costs necessary to disinfect the District's discharges to meet the IEPA proposed bacterial effluent standard, either through chlorination and dechlorination or through ultraviolet disinfection." Exh. 159 at 4. Specifically, if the District cannot generate sufficient capital because of the Property Tax Extension Limitation Act's restrictions, and obtaining the remaining funds elsewhere would still exceed the District's Tax Cap and the non-referendum bonding authority. *Id.* at 4-5.

Mr. Mastracchio stated that he believes an act of the state Legislature to amend the Property Tax Extension Limitation Act, or a voter referendum, or drastic reductions in funding for other District programs are the only ways to achieve the IEPA's proposed rule. Exh. 159 at 5.

Dr. David Zenz on Behalf of the District

Dr. David R. Zenz, P.E. is a Senior Associate with Consoer Townsend Envirodyne Engineers, Inc. (CTE). Exh. 146 at 1. Dr. Zenz was part of the CTE team that conducted effluent disinfection studies for District regarding potential technologies and costs at the District's three largest plants discharging to the CAWS: North Side, Stickney, and Calumet. Exh. 146 at 1-2. CTE was commissioned by the District as a result of a request from the IEPA to provide information for the CAWS UAA on the potential technologies and costs of effluent

disinfection for the District's North Side, Stickney, and Calumet plants. Exh. 146 at 2. CTE assembled a team which included Dr. Charles Haas. Exh. 146 at 2.

Selection of Disinfection Technology

Based on experience of the team, CTE, the District, and scientific literature, the team selected the following eight alternatives for initial evaluation:

1) Chlorination (alone) 4 variations
2) Ozone 2 variations
3) Ultraviolet (UV) Radiation 2 variations
4) Chlorination – Dechlorination 8 variations
5) Chlorine Dioxide
6) Bromine Compounds
7) Sequential Disinfection Processes
8) Membrane Process. Exh. 146 at 2-3.

After consultation with the District the field of alternatives for further evaluation was narrowed to: Ozone, UV Disinfection, and Chlorination / Dechlorination. Chlorination alone was not considered for further evaluation because the chlorine residual would not meet forecasted chlorine water quality standards in the CAWS. Gas chlorination/gas dechlorination was not considered for further evaluation in light of the District's concerns for the potential hazards to humans and the environment due to accidents or terrorism. The options of chlorine dioxide, bromine compounds, sequential disinfection processes, and membrane process were not considered for further evaluation based on the lack of experience using these processes on a large scale since the District's three plants are among the largest in the United Stated. Exh. 146 at 3.

For the remaining alternatives, an evaluation matrix was developed to weigh and score the alternatives in order to select which alternative to pursue for a detailed cost estimate. Exh. 146 at 5, Attach. 2. Total scores under the evaluation matrix were lowest for the chlorination alternatives, mainly due to safety concerns, energy consumption, and toxic disinfection byproducts. Exh. 146 at 5. UV disinfection yielded the highest scores with no known toxic byproducts and relative safety. Exh. 146 at 5. Dr. Zenz stated: "[t]he evaluation matrix scores mirror the current trend in the wastewater treatment industry away from chlorine-based disinfection towards alternatives such as UV that have lower environmental and health impacts." Exh. 146 at 5. Both UV and ozone disinfection were pursued for a detailed cost estimate. Exh. 146 at 5.

UV Disinfection Costs

Dr. Zenz testified that the District selected UV disinfection over ozone for further evaluation based on the lower capital and operating costs, wide use for effluent disinfection throughout the US, and absence of known disinfection byproducts. Ozone, on the other hand, is not widely used and does form some byproducts, many of which have not yet been identified. The District directed CTE to prepare cost estimates for UV disinfection at the North Side, Calumet, and Stickney plants, adjusted for the effluent bacterial standard of 400 fecal coliforms

per 100 mL as proposed by IEPA to the Board. Exh. 146 at 7. CTE prepared Level 3 cost estimates, with an accuracy of plus or minus 30 percent and a 10-15 percent complete design, for UV disinfection without tertiary filtration as indicated below. Exh. 146 at 7-9; Exh. 149, Exh. 150. Only seasonal, not year round, disinfection was assumed for the annual operation and maintenance costs. 10/27/08 Tr. at 102-103.

The total present worth [3]costs for UV Disinfection without filtration was estimated to be $206.8 million for the North Side water reclamation plant, $201.6 million for Calumet water reclamation plant, and $511.2 million for Stickney water reclamation plant. In response to questions from the People of the State regarding different estimates calculated by Science Applications International Corporation (SAIC)[4], Dr. Zenz clarified that the SAIC estimate represents an estimate that includes less information than the estimates provided in the 2008 CTE cost studies. 10/27/08 Tr. at 144, 148-149, Exh. 12, 148, 412.

Beyond the cost estimates, the team recommended the District undertake a laboratory and/or pilot plant testing program before making a final decision. Such studies would be needed due to the large size of the District facilities and high capital and operating costs associated with a final decision. Exh. 146 at 6. The pilot plant testing program would also help to determine if tertiary filtration is needed in conjunction with the UV disinfection system. 10/27/08Tr. at 82-83. Dr. Zenz testified that a UV disinfection system for the Stickney plant "could be one of the largest ever constructed in North America, and probably one of the largest constructed in the entire world." 10/27/08Tr. at 60. Dr. Zenz estimated that the pilot plant facilities might be on the order of 1 million gallons per day (MGD). 10/27/08Tr. at 168.

CTE also estimated the time needed for full implementation of UV disinfection facilities at the three District plants; the longest time was projected for the Stickney plant due to its larger size and more extensive civil / site work. Exh. 146 at 9-10. Dr. Zenz testified that the schedule does not contain any cushion. 10/27/08 Tr. at 59. More specifically Dr. Zenz indicated that for North Side and Calumet, the time to implement UV disinfection would be a total of eight years, and for Stickney, the total would be ten years.

Dr. Chriso Petropoulou, on Behalf of the District

Dr. Chriso Petropoulou is employed with Geosyntec Consultants, Inc. and has been the project manager for the District's Microbial Risk Assessment, entitled "Dry and Wet Weather Microbial Risk Assessment of Human Health Impacts of Disinfection vs. No Disinfection of the Chicago Area Waterways System", April 2008 (Microbial Risk Assessment) (Exh. 71). Exh. 68 at 1. The District commissioned a team of research scientists and water quality experts to review USEPA's 1986 criteria and 2003 guidance. The expert review panel

[3] Total present worth is based on a 20-year life, a three percent interest rate and a three percent inflation rate.

[4] SAIC performed and independent analysis for USEPA of the costs for disinfection. *See* Exh. 148.

found that the these USEPA documents would not provide a scientific basis for developing protective bacteria standards based on the use designations identified in the CAWS UAA. The expert review panel recommended more science would be needed before bacteria criteria could be established for effluent dominated urban waterways. To address this recommendation, the District undertook a microbial risk assessment study to determine the health impacts of recreational use in the CAWS. Exh. 71 at xiii – xiv.

The District commissioned a Microbial Risk Assessment to evaluate the human health impacts of recreational use in the CAWS with and without disinfection of effluent from the District's North Side, Stickney, and Calumet water reclamation plants. Exh. 68 at 1-2. The goal of the Microbial Risk Assessment was to determine the expected number of gastrointestinal illnesses associated with recreational use with and without disinfection of effluent from District's three water reclamation plants. Exh. 70 at 3. The risk assessment was developed by a team of nationally recognized experts in risk assessments and human health effects from bacteria, lead by Geosyntec. The results of the Microbial Risk Assessment predate the results of CHEERS.

Dr. Petropoulou testified regarding microbial sampling and results. The Microbial Risk Assessment drew from samples taken in the CAWS surface water and the wastewater reclamation plant outfalls during both dry and wet weather. Exh. 68 at 2. Dry and wet weather sampling took place over a period of two years: 2005 for dry weather samples and 2006 for wet weather samples. Exh. 68 at 2. Samples were collected upstream, downstream, and within the outfalls of the North Side, Stickney, and Calumet wastewater reclamation plant s. Exh. 68 at 3.

The Microbial Risk Assessment analyzed samples for microorganisms typically present in the feces of humans and other warm-blooded animals. Exh. 68 at 4. Microorganisms analyzed included indicator organisms approved by the USEPA: *E. coli*, enterococci, and fecal coliform. Dr. Petropoulou explained that the presence of these indicator microorganisms may be indicative of the presence of microbial pathogens which cause disease, but these indicator organisms themselves are not pathogenic. In addition, the Microbial Risk Assessment also examined pathogens that were representative of those present in the wastewater and were a public health concern. The pathogens selected were associated with documented outbreaks of disease, including gastrointestinal and respiratory diseases and infections. Exh. 68 at 4.

The three major groups of indicator and pathogenic microorganisms selected for the Microbial Risk Assessment were: bacteria, protozoa, and viruses. Bacteria included: fecal coliform, *E. coli*, enterococci, *Salmonella* spp., and *Pseudomonas aeruginosa*. Protozoa included: *Cryptosporidium parvum* and *Giardia lamblia*. Enteric viruses included: total culturable viruses, adenovirus, and norovirus. Exh. 68 at 4-5.

Risk was evaluated during wet and dry weather to capture the variability of exposure to people recreating under a range of dry and wet weather conditions. 9/9/08A Tr. at 118-119. Dry weather sampling was preceded by at least 3 days of dry weather. 9/9/08A Tr. at 116-117. Wet weather sampling was performed after three days of dry weather and a forecast of 0.5 inches of rain with the high possibility of pumping stations discharging into the waterways. "All the wet

days that we conducted during the study took place when there was actual rain in the waterway." 9/9/08A Tr. at 117.

Wet weather/CSO events and post wet weather conditions were estimated to impact 85 percent of the recreational year (from April through November) in the CAWS: wet weather/CSO events were estimated to impact 40 percent, with post wet weather conditions (less than 48 hours following an event) accounting for another 45 percent. Dry weather (defined as more than 48 hours after a wet weather event) accounted for only 15 percent of the recreational year. Exh. 71 at Table 5-8, Figure 5-4, 9/9/08P Tr. at 73.

For bacteria samples, dry weather results indicated bacteria concentrations varied significantly between wastewater reclamation plant sites at North Side, Stickney and Calumet and by location upstream or downstream. During wet weather, however, Geosyntec found no statistical difference between bacteria concentrations upstream or downstream of the three wastewater reclamation plant s. Exh. 68 at 5-6. In addition, Geosyntec found the wet weather bacteria concentrations in the outfalls of North Side and Stickney wastewater reclamation plant were less than the corresponding upstream and downstream concentrations. In particular, the Microbial Risk Assessment suggests "the major inputs for [the bacteria] *Pseudomonas aeruginosa* in the waterways are sources other than the reclamation plant effluents." Exh. 68 at 6, Exh. 71 at xx, 35-40.

To assess the effectiveness of using fecal coliform as proposed by IEPA as an indicator for disease-causing pathogens, Geosyntec ran correlation statistics for the bacteria sampled. Results indicated that no significant correlation exists between the dry weather samples of fecal coliform indicator bacteria and pathogenic bacteria. Exh. 68 at 6, Exh. 71, Att. A. However, Dr. Petropoulou indicated a better correlation exists between the wet weather samples for fecal coliform indicator bacteria and pathogenic bacteria. Exh. 68 at 6, Exh. 71, Att. A, 9/10/08A Tr. at 15-17.

For protozoa samples, dry weather results in the outfalls and waterways up and downstream showed no infectious *Cryptosporidium* oocysts, and most *Giardia* cysts detected were non-viable (10-26 percent viable). Exh. 68 at 7, Exh. 71 at xxii. During wet weather, infectious *Cryptosporidium* oocysts were detected only in one sample downstream of the Calumet water reclamation plant, and the average percentage of viable *Giardia* cysts increased to 10-49 percent in the outfalls as well as the waterways up and downstream. Exh. 68 at 7, Exh. 71 at xxiii, 44. Overall, the concentrations of *Cryptosporidium* oocysts (infectious and non-infectious) and *Giardia* cysts (viable and non-viable) were greater during wet weather compared to dry weather sampling. Exh. 68 at 7, Exh. 71 at 43-47.

For virus samples, the percentage of samples with detectable concentrations were generally greater during wet weather than dry weather. During dry and wet weather, viruses were detected in the outfalls and waterways both up and downstream of the District's three wastewater reclamation plant s. Exh. 68 at 7-9, Exh. 71 at xxiv-xxviii, 47-55.

Dr. Petropoulou found, "[t]he analytical results also indicate that despite elevated levels of fecal coliform indicator bacteria, the concentrations of actual pathogenic microorganisms in

the waterway are low and many are often not detectable." Exh. 68 at 6, 9. Dr. Petropoulou concluded that during wet weather, pathogen concentrations in the waterways are largely from sources other than the District's three wastewater reclamation plant s. Exh. 68 at 9.

Dr. Charles Gerba, on Behalf of the District

Dr. Charles Gerba is Professor of Environmental Microbiology at the University of Arizona in Tucson, and has been a member of the Geosyntec Team Senior Advisory Committee for the Microbial Risk Assessment. Exh. 69 at 1. Dr. Gerba elaborated on Dr. Petropoulou's testimony regarding the selection of indicator and pathogenic microorganisms for the Microbial Risk Assessment. While the USEPA-approved indicator bacteria were assessed, so too were pathogenic enteric viruses and protozoan parasites. Dr. Gerba explained that the enteric viruses and protozoan parasites have a much lower infectious dose and survive longer in surface waters than enteric bacteria. Exh. 69 at 2-3. Dr. Gerba and Dr. Tolson explained that the Microbial Risk Assessment quantitatively estimated only gastrointestinal illness consistent with USEPA's method for setting establishing criteria for recreational waters. 9/9/08P Tr. at 27, 30, 9/10/08P Tr. at 103. The understanding is that standards based on gastrointestinal illness sill also address non-gastrointestinal illnesses. 9/9/08P Tr. at 31.

Of the bacteria selected, Dr. Gerba stated that *Salmonella* is "one of the more hardy enteric bacterial pathogens and can always be found in wastewater and would be expected to be representative of the risks from other enteric bacterial pathogens." Exh. 69 at 2. *Pseudomonas aeruginosa* was selected because it causes recreationally associated eye, skin and ear infections. Exh. 69 at 2. Fecal coliforms, *E. coli*, and enterococci were selected because of the use as indicator of recreational water quality. Dr. Gerba noted that the Microbial Risk Assessment did not detect any pathogenic *E. coli*. Exh. 69 at 3.

Of the protozoans, Dr. Gerba stated that *Cryptosporidium* is the pathogenic protozoan most commonly associated with recreational waterborne disease outbreaks in the United States today. Exh. 69 at 3. *Giardia* was selected because is also associated with waterborne disease outbreaks. Exh. 69 at 3.

Of the viruses, norovirus and adenovirus are the viruses most commonly associated with recreational waterborne diseases. Adenovirus is a cause of ear, nose, throat, and respiratory infection associated with recreational waters, and adenovirus and norovirus are both causes of viral diarrhea. Exh. 69 at 3.

Dr. Keith Tolson, on Behalf of the District

Dr. Keith Tolson has worked with Geosyntec as the Microbial Risk Assessment Leader for the Microbial Risk Assessment and serves on the faculty at the Center for Environmental and Human Toxicology. Exh. 70 at 1. Dr. Tolson's responsibility in the Microbial Risk Assessment included calculation and interpretations of the risks. Exh. 70 at 1-2. Dr. Tolson testified regarding the mathematical relationship between levels of pathogens in a waterway, type of recreational activity, and the probability of an individual developing illness. Exh. 70 at 2.

Dr. Tolson and Dr. Gerba explained that the Microbial Risk Assessment quantitatively estimated only gastrointestinal illness consistent with USEPA's method for setting establishing criteria for recreational waters. 9/9/08P Tr. at 27, 30, 9/10/08P Tr. at 103. The understanding is that standards based on gastrointestinal illness will also address non-gastrointestinal illnesses. 9/9/08P Tr. at 31.

Dr. Tolson explained that based on histories of illness outbreaks and research using controlled studies, predications are made as to the dose-response relationship between the amount of exposure to pathogens and the incidence of illness. Exh. 70 at 2. By measuring the levels of pathogens in the waterways and estimating a dose for exposure based on the type of recreational activity, Dr. Tolson illustrated how the probability is calculated for an individual to develop a gastrointestinal illness. Exh. 70 at 2. Dr. Tolson noted that this type of microbial risk assessment is similar to techniques USEPA and other public entities use to support decision making. Exh. 70 at 4.

The types of recreational activity influencing the amount of exposure to pathogens in the waterways was based on the CAWS UAA. Exh. 70 at 3. Recreational use was divided into three levels of exposure: high (canoeing), medium (fishing), and low (pleasure boating). Dr. Tolson noted that the high exposure category for canoeing utilized calculations that accounted for a range of incidental ingestion, including that from capsizing. Information from surveys conducted for the CAWS UAA was used to estimate the proportion of recreational users and types of recreation in each of the three main waterway segments. Exh. 70 at 3, Exh. 71 at xxx, 9/10/08P Tr. at 119-120. The amount of exposure determining a dose was based on parameters such as the length of time spent on the waterway and the amount of water incidentally ingested per unit of time. Exh. 70 at 3.

The goal of the Microbial Risk Assessment was to determine the expected number of gastrointestinal illnesses associated with recreational use with and without disinfection of effluent from District's three wastewater reclamation plants. Exh. 70 at 3. Dr. Petropoulou, Dr. Gerba, and Dr. Tolson explained that the microbial risk assessment assumed no one had immunity, so essentially the risk assessment actually estimated the number of infections, thereby conservatively overestimating the number of illnesses. 9/9/08A Tr. at 129-132, 9/9/08P Tr. at 27, 60-62, 9/10/08A Tr. at 42.

Based on the proportion of wet and dry weather days, the Microbial Risk Assessment compared the expected gastrointestinal illnesses without disinfection for the three main recreational categories evaluated. With no disinfection, the number of gastrointestinal illnesses per 1,000 exposures was: 1) for canoeing at North Side 2.45, Stickney 3.19, Calumet 0.52; 2) for fishing at North Side 1.42, Stickney 1.90, Calumet 0.31, and 3) pleasure boating at North Side 0.66. Stickney 1.05, Calumet 0.14. Exh. 71, Table 5-12.

Based on the proportion of recreational user types contributing to the expected gastrointestinal illnesses and the proportion of wet and dry weather days, Dr. Tolson and the Microbial Risk Assessment compared predicted illness rates with and without disinfection per 1000 secondary contact exposures. With no disinfection the number of gastrointestinal illnesses was 1.53 at North Side, 1.74 at Stickney, and 1.20 at Calumet. With disinfection the number of

illnesses was 1.32 at North Side, 1.48 at Stickney, and 0.17 at Calumet. Exh. 1 (Att. 1) of Exh. 70, Exh. 71, Tables 5-8, 5-9, 5-11, 5-14, 9/9/01P Tr. at 64-65, 99-100.

To put these results into perspective, Dr. Tolson noted that USEPA does not have current guidance on a secondary contact water quality criteria. Exh. 70 at 5. However, USEPA has proposed a range of water quality criteria for primary contact and acceptable risk thresholds. Currently, USEPA's most conservative of acceptable risk threshold is 8 illnesses per 1000 exposures for primary contact in heavily used swimming areas and 14 illnesses per 1000 for freshwater recreational use including immersion/swimming activities. Exh. 70 at 5, Exh. 71 at xxxi, 125-126, Table 5-10.

Dr. Tolson found, "For the designated recreational uses evaluated, the risks of developing illness were less than U.S. EPA's illness rate of 8 illnesses/1000 swimmers in primary contact recreational waters." Exh. 70 at 7, 9/10/08A Tr. at 38. Dr. Tolson concluded "that the risks of gastrointestinal illness associated with recreational use of the CAWS are low and mainly due to secondary loading of the waterway under wet weather conditions from CSOs and other discharges, which would not be improved by disinfection of effluent from the District's water reclamation plants." Exh. 70 at 2, PC# 567 at 8-9.

With regard to a review of the Microbial Risk Assessment conducted for USEPA, Dr. Tolson indicated that any concerns that were outlined in the Review were resolved for the most part. Exh. 72, 9/9/08A Tr. at 65. 9/9/08A Tr. at 68, 93-94, 9/10/08A Tr. at 46-47, 54, 58.

Dr. Geeta Rijal on Behalf of the District

Dr. Geeta K. Rijal is the Section Head of the Analytical Microbiology and Biomonitoring Section at the District. Dr. Rijal testified regarding the effectiveness of disinfection in the CAWS in light of other sources of fecal coliform besides the District's Stickney, North Side, and Calumet water reclamation plants. Dr. Rijal testified that during the UAA process, the IEPA and District "recognized that a microbiological understanding of the CAWS is required before scientifically sound recommendations concerning the recreational use potential and protective standards can be established for the man-made waterways." Exh. 113 at 2. IEPA requested the District undertake a microbial assessment, and to this end, the District conducted special studies on fecal coliform bacteria distribution in the CAWS and the relationship between water quality and point and non-point source contributions during dry and wet weather conditions. Exh. 113 at 1. Dr. Rijal presented research on reports addressing: 1) non-point sources of bacterial pollution in the CAWS, 2) fecal coliform concentrations and trends in the CSSC and Des Plaines River, and 3) fecal coliform densities in the CAWS during dry and wet weather. Exh. 113, Attach. 2, 3, 4, 5.

Dr. Rijal began by explaining that the microbiological quality of the CAWS depends on numerous interacting factors other than the effluent from the District's water reclamation plants. These factors include contribution from upstream sources and non-point sources. Exh. 113, Attach. 2 at 1. Non-point sources are caused by runoff from rainfall, snowmelt or irrigation across surfaces and through soil into a receiving stream. Non-point sources of fecal coliform are generally not regulated and may include "urban runoff, agricultural farm waste runoff, discarded

trash, domestic pets fecal droppings, birds fecal droppings, animal feedlots, wildlife, land application of manure, landfills, improperly maintained sanitary systems on boats, erosions from impervious land cover, construction sites, and unprotected exposed areas, impoundments, and removal of stream side vegetation." Exh. 113, Attach. 2 at 1. Forty-two percent of Cook County is covered by impervious surfaces, and Dr. Rijal connected runoff as contributing to non-point sources of fecal coliform with the microbiological quality of the CAWS. Exh. 113, Attach. 2 at 1.

Beyond non-point sources, Dr. Rijal examined the role of fecal coliform contributions from upstream sources. In cooperation with USEPA Region V, the District compared fecal coliform concentrations in two urban waterways: the upper Des Plaines River (which receives *disinfected* wastewater effluent from upstream suburban communities) and the CSSC (which receives *undisinfected* wastewater effluent from the Stickney, North Side, and Calumet water reclamation plants). Exh. 113 at 2. Samples were taken from the upper Des Plaines River Station 91, which is upstream of Lockport and the junction with the CSSC where it is designated as General Use. Comparison samples were taken from the CSSC Station 92, which is located at Lockport where CSSC is designated as secondary contact. Exh. 113 at 2. Results indicated that the fecal coliform concentrations at the Des Plaines River Station 91 exceeded the IEPA's proposed effluent standard of 400 CFU/100 mL more frequently than at the CSSC Station 92, 9/24/08P Tr. at 5-6. Although 400 CFU/100 mL does not represent an ambient water quality standard, Dr. Rijal used the proposed effluent limit as a means to compare ambient levels of microbial quality in the waterways. 9/24/08P Tr. at 43. Dr. Rijal found the study provided good evidence that the microbial quality of the CSSC at Station 92 classified as Secondary Contact is comparable to that of the Des Plaines River Station 91 classified as General Use. Exh. 113 at 3.

Following studies regarding non-point and upstream sources, Dr. Rijal evaluated the additional contribution of fecal coliforms from wet weather sources. The District undertook a three-year study to evaluate fecal coliform concentrations and trends during wet and dry weather in two main areas: North (the North Shore Channel, North Branch Chicago River) and South (Little Calumet River, and the Calumet-Sag Channel). Exh. 113 at 3. The study illustrated the lingering effects of wet weather on fecal coliform concentrations in the CAWS, showing wet weather fecal coliform densities remaining above dry weather levels for at least 48-72 hours after the conclusion of a wet weather event. Exh. 113, Attach. 5 at 25-32, 9/24/08P Tr. at 59. Wet weather events were defined as days with any measurable rainfall that occurred on the same day or one or two days prior to sampling. Exh. 113 at 4. Dr. Rijal found that measurable rainfall occurs approximately 145 days (about 40 percent) of the year, and the wet weather effects linger well after the rainfall ends. Exh. 113 at 6. Wet weather fecal coliform densities remained above dry weather levels for at least 72 hours. Exh. 113, Attach. 5 at 25-32. Dr. Rijal emphasized that these other sources of fecal coliform would not be reduced if the IEPA's proposed fecal coliform effluent limit is adopted. Exh. 113 at 4.

Dr. Rijal then simulated the impact of complete disinfection (effluent concentration = 0 fecal coliform / mL) at the District's North Side and Calumet water reclamation plants. Wet weather with complete disinfection was simulated by assuming 100 percent of the dry weather fecal coliform concentration is attributable to the District and then by subtracting the entirety of

this contribution from the wet weather fecal coliform concentrations. Exh. 113 at 5; Attach 4 at 8-9; Exh. 115; 9/24/08P Tr. at 56-58.

Dr. Rijal found that, "[e]stimated wet weather FC [fecal coliform] density, with or without disinfection, would not meet the proposed effluent standards [400 CFU/100 mL] for at least 19 miles downstream from the North Side water reclamation plant in the North area or 8 miles downstream from the Calumet water reclamation plant in the South area. The FC densities, with or without disinfection, would be equivalent at these distances downstream of the respective water reclamation plants." Exh. 113 at 5. Although 400 CFU/100 mL does not represent an ambient water quality standard, Dr. Rijal used the proposed effluent limit as a means to compare ambient levels of microbial quality in the waterways. 9/24/08P Tr. at 43.

Dr. Rijal concluded that the North Side and Calumet water reclamation plants are not the only significant sources of fecal coliform to the CAWS. Other sources from wet weather, non-point, and tributary load sources contribute to elevation of fecal coliform concentrations to levels much higher than during dry weather. Exh. 113 at 6. Dr. Rijal emphasized that these other sources of fecal coliform would not be reduced if the IEPA's proposed fecal coliform effluent limit is adopted. Exh. 113 at 4. Dr. Rijal continued that even during dry weather periods, the lingering effects of wet weather and tributary loads maintain elevated levels of fecal coliform in the CAWS for 72 hours or more after the conclusion of a wet weather event. Exh. 113, Attach. 5 at 25-32. With measurable rainfall occurring about 40 percent of the year and wet weather effects lingering for at least two to three days after the rainfall ends, Dr. Rijal concluded that the IEPA's proposed effluent standard would be "ineffective at significantly reducing CAWS bacteria concentrations for a substantial portion of the year." Exh. 113 at 6, Attach. 5 at 25-32, 9/24/08P Tr. at 59.

Adrienne Nemura on Behalf of The District

Ms. Nemura is a licensed Civil Engineer and the Vice President and Owner of LimnoTech, an environmental consulting firm. Exh. 116 at 1. Ms. Nemura has worked for several municipalities on CSO plans by assessing CSO impacts, evaluating CSO control alternatives, preparing long term control plans, and revising water quality standards. *Id.* at 1-2.

Ms. Nemura testified that in her professional opinion, IEPA improperly established standards for aquatic life and recreational uses in the CAWS because the IEPA did not demonstrate that the uses are attainable when wet weather discharges affect the CAWS. Exh. 116 at 2. She recommended that if IEPA proposes water quality standards for the CAWS consisting of both uses and criteria, IEPA should consider the difference between dry and wet weather conditions and whether those uses and criteria are attainable under all conditions. 9/24/08P Tr. at 87. Ms. Nemura opined that the proposed standards are premature and should include a provision for exemptions to the standards due to wet weather conditions. Exh. 116 at 2. She also stated that a provision is needed to inform the public that the waterways should not be used for recreation when impacted by wet weather discharges. *Id.* Ms. Nemura stated that the standards for the waterways should reflect the highest attainable use of the waterways, and that IEPA should determine in consultation with impacted parties the highest attainable use of the waterways. 9/24/08P Tr. at 127, 129. Ms. Nemura stated that if information about the highest

attainable use of the CAWS was not included in the UAA, then IEPA should wait until that information is available to make a determination about the highest attainable use of the CAWS. *Id.* at 130.

With regard to IEPA's proposed technology-based effluent disinfection requirements, Ms. Nemura testified that IEPA failed to define "dry weather" and what recreational activity can be attained at different locations at different times along the CAWS. Exh. 116 at 3. Ms. Nemura further testified that the IEPA failed to demonstrate that IEPA assessed how wet weather discharges such as CSOs prevent attainment of the designated uses along the waterways during or after a wet weather event. *Id*. Ms. Nemura stated that the magnitude, frequency, and duration of CSO impacts on bacteria levels vary from location to location and storm to storm. *Id.* at 4. She also stated that decisions about appropriate levels of control for sources other than wastewater treatment facilities will be arbitrary if no regulatory target is provided to address wet weather conditions. *Id.* Ms. Nemura contended that IEPA's own statements indicate that the proposed uses for the CAWS are not attainable during wet weather. 9/24/08P Tr. at 100. Ms. Nemura opined that IEPA failed to consider the nature of the waterways and the impact of wet weather on the waterways. *Id.* at 105. Ms. Nemura does not believe that the proposed uses of the waterways are attainable under all conditions. *Id.* She said that under wet weather conditions, bacteria levels in the waterways are sufficiently high enough to increase the risk of illness to humans from incidental contact with the waterways. *Id.* at 115.

Ms. Nemura also testified regarding CSO permitting. She stated that permitted CSO discharges are currently allowed into the waterways, but these discharges would not be allowed under IEPA's proposed use of the waterways because the CSO discharges would contribute to a violation of the water quality standards for the waterways. 9/24/08P Tr. at 120-121. Ms. Nemura said that recreational use standards for the waterways will not be met during and after CSO discharges. *Id.* at 123. She said that existing use standards can be comprised of both the activities taking place on the waterway and the water quality conditions of the waterway. *Id.* at 124.

Ms. Nemura testified that generally there is more fecal coliform in CSO than in undisinfected effluent. 9/25/08P Tr. at 4. She stated that the level of fecal coliform in CSO varies depending on a variety of factors including the nature of the storm event. *Id.* at 4-5.

Susan O'Connell on Behalf of the District

Susan O'Connell is the Supervising Civil Engineer in the Maintenance and Operations Department at the District. Ms. O'Connell manages the District's NPDES permits for the water reclamation plants, and she testified regarding the known CSOs within the District's jurisdiction. Exh. 112 at 1.

Ms. O'Connell explained the role of CSOs as "relief points when storm water runoff overwhelms the combined sewer system. During and after precipitation, CSOs to the waterway occur when the quantity of combined flow of rainwater and sewage exceed the capacity of the treatment plants, the [TARP] and the local sewer systems." Exh. 112 at 2. Ms. O'Connell added that CSOs allow excess flows to be transported away from homes and businesses. Exh. 112 at 2.

The District's NPDES permits include requirements for monitoring, notification, and reporting for CSOs. To comply with the permit requirements, the District maintains a website to provide information to the public on CSOs and when they occur. Exh. 112 at 1. The District also provides a quarterly monitoring report to the IEPA documenting the frequency and occurrence of CSOs throughout the District's jurisdiction. The reporting covers permitted CSOs owned separately by local municipalities as well as the District.

The total number of CSOs within the District's jurisdiction is 406. Within the CAWS, Ms. O'Connell testified that there are 255 CSO points. Of these, 178 are owned by the City of Chicago, 52 by local municipalities, and 25 by the District. Exh. 112 at 2.

From 2005 to 2007, Ms. O'Connell documented the number of CSO events: 33 days in 2005, 65 days in 2006, and 42 days in 2007. Of these, the CSO events occurring during the recreation season were: 22 days in 2005, 55 days in 2006, and 37 days in 2007. The volume discharged by CSO pump stations alone ranged from 2.4 billion gallons in 2005 to 7.4 billion gallons in 2007. Exh. 112 at 2-3, 9/24/08A Tr. at 82.

Dr. Ernest Blatchley III on Behalf of the District

Dr. Ernest Blatchley III is a Professor of Civil (Environmental) Engineering at Purdue University and provided testimony on behalf of the District regarding the effectiveness of disinfection. Exh. 93 at 1. Dr. Blatchley identified three key limitations to the IEPA's proposed effluent bacteria standard, which is based on the measurement of viable fecal coliform bacteria as an "indicator organism." Exh. 93 at 3.

First, Dr. Blatchley explained that measuring indicator organisms is common from a practical perspective since to measure the concentrations of pathogens present in the water is impossible. Exh. 93 at 3. Although coliform bacteria are commonly used, Dr. Blatchley presented a body of evidence indicating that coliforms can be misleading indicators of the performance of disinfection systems. Exh. 93 at 3, Attach. 2, 3. When compared with many microbial pathogens, coliform bacteria are more easily inactivated by wastewater disinfection techniques such as chlorine, ozone, and UV. Exh. 93 at 3-4. As a result, disinfection geared toward compliance with a standard based on coliform bacteria will not guarantee a low concentration of microbial pathogens. Exh. 93 at 4. Dr. Blatchley stated that other commonly used indicator microorganisms used are *E. coli* and enterococci. Exh. 93, Attach. 2 at 3.

Second, Dr. Blatchley explained that "disinfection does not imply sterilization". Exh. 93 at 4. Even conventionally disinfected wastewaters with viable coliform concentration limits of 400 CFU/100 mL will contain viable and/or infectious microorganisms, some of which might be pathogenic. Dr. Blatchley followed by stating, "the risk of disease transmission associated with exposure to municipal wastewater will always be non-zero, regardless of the form of disinfection." Exh. 93 at 4. To put this in perspective, Dr. Blatchley looked to Western Europe as an example where wastewater disinfection is practiced typically only at facilities discharging to public swimming areas or breeding grounds for shellfish meant for consumption. Exh. 93 at 6, Attach. 2 at 6-7, 9/10/08P Tr. at 8-9. Despite the fact that disinfection is uncommon in

Europe, the incidence of waterborne disease does not appear substantially different than in the United States. Exh. 93 at 6.

Third, Dr. Blatchley examined the inputs from other sources affecting microbial water quality in the CAWS besides the District's facilities, including non-point sources and CSOs. Exh. 93 at 7. For CSOs, Dr. Blatchley noted that TARP has yielded substantial improvements in water quality and will bring additional improvements when completed. However, Dr. Blatchley stated that even when completed, TARP will not completely capture all CSO events. Exh. 93 at 7. For non-point sources, Dr. Blatchley stated these will be largely unaffected by TARP, such that non-point sources of pathogens to the CAWS will remain. Exh. 93 at 7.

Dr. Blatchley concluded, "[c]ollectively, these issues dictate that wastewater disinfection, as required to comply with the proposed effluent bacterial limit, will yield little or no decrease in the risk of disease transmission associated with use of the CAWS." Exh. 93 at 10. Dr. Blatchley found that IEPA's proposed effluent standard based on fecal coliform bacteria would do "very little" to achieve pathogen reductions in the CAWS. 9/23/08A Tr. at 101-102.

Stephen McGowan on Behalf of the District

Stephen McGowan, PE, is the Vice President of Malcolm Pirnie, Inc. and Project Manager for the study commissioned by the District, entitled "Environmental Assessment of Plant Effluent Disinfection at the North Side, Calumet, and Stickney Water Reclamation Plants, and Increasing dissolved oxygen (DO) in the CAWS" (Environmental Assessment), July 2008. Exh. 133 at 1, Attach. 2. The study evaluated the environmental and energy impacts of two disinfection scenarios, UV and chlorination/dechlorination. These two technologies were evaluated because UV was the highest ranked alternative in the CTE's evaluation matrix, and chlorination/dechlorination is a commonly used method for wastewater applications. Exh. 133 at 2.

The study focused on the potential adverse environmental impacts of construction and operation of disinfection facilities at the District's three water reclamation plants. Each impact category was quantified and related to the District's overall service area, consisting of 7 water reclamation plants, 883 square miles, and 5.2 million customers. Exh. 133 at 2. Mr. McGowan found that, with the addition of disinfection, energy use would increase by 33 percent for UV and 25 percent for chlorination/dechlorination. Exh. 133 at 6-9, Attach. 2-11. Mr. McGowan indicated that an increase in emissions for CO_2, NO_x, SO_2, and mercury would also occur with disinfection. Water usages and land mass needed for the plants would also increase. *Id*.

Mr. McGowan compared these increases to energy use at a typical household as well as greenhouse gas emissions to cars on the road and trees for CO_2 absorption. The increased use of energy would be equivalent to 10,600 households for UV or 8,000 households for chlorination/dechlorination. The increase in greenhouse gas emissions is equivalent to 14,200 cars for UV or 10,800 cars for chlorination/dechlorination. Further, to absorb CO_2 emissions from UV disinfection and chlorination/dechlorination would take 13.1 million trees and 9.9 million trees, respectively. Exh. 215, Exh. 133 at 7-9, Attach. 8-9. Mr. McGowan concluded by stating, "[i]mplementing disinfection technologies will utilize critical District resources (air,

land, water, and financial) that will then become unavailable for future treatment options and alternatives." Exh. 133 at 9.

Dr. Charles Haas on Behalf of the District

Dr. Charles Haas is the Head of the Department of Civil, Architectural and Environmental Engineering at Drexel University and co-author of USEPA's Municipal Wastewater Disinfection design manual, among 160 other peer-reviewed papers and books. Dr. Haas testified on behalf of the District regarding the risks associated with the use of chlorine for wastewater disinfection. Exh. 144 at 1-2. He identified the following risks associated with the use of chlorine for wastewater disinfection: 1) formation of disinfection byproducts, 2) relative insensitivity of some pathogens, and 3) security and safety issues. Exh. 144 at 2-5.

When chlorine reacts with organic materials in the wastewater during the disinfection process, the reaction can produce chlorinated disinfection byproducts. The human health concern surrounding chlorinated disinfection byproducts is that some are classified as probable or possible carcinogens. Disinfection byproducts include trihalomethanes, haloacetic acids, and other dissolved organo-halogen compounds. Dr. Haas emphasized that one such byproduct, N-Nitrosodimethylamine, is a potent carcinogen. Exh. 144 at 2. USEPA has set water quality criteria for disinfection by products based on the 1 in 1million cancer risk level. Exh. 144 at 2-3. Dr. Haas found, ". . . the chlorination of District effluents would present a high likelihood of exceeding these recommended water quality guidelines." Exh. 144 at 3. Although the chlorination process may be followed by dechlorination, studies are not encouraging of the ability to reduce the occurrence of disinfection byproducts. Dr. Haas knew of no wastewater utilities deliberately using dechlorination to control disinfection byproducts. Exh. 144 at 3.

As to the relative insensitivity of some pathogens to chlorine, Dr. Haas pointed to viruses and protozoan pathogens that are more resistant to chlorine than coliform indicator organisms. Dr. Haas cautioned that achieving satisfactory levels of indicator organisms in disinfected wastewater does not assure a low level of risk from viruses and protozoan pathogens. Exh. 144 at 3-4.

Among the environmental impacts of chlorine disinfection, Dr. Haas also discussed security and safety issues. If chlorine were used for disinfection at the District's facilities, Dr. Haas advised that storing large amounts of chlorine gas "could present a potential target for malicious activity such as by terrorists…" Exh. 144 at 4. Particularly since 2001, many water utilities have switched from chlorine gas to sodium hypochlorite. Still, sodium hypochlorite presents its own risks, from worker safety to environmental hazards, where tank breaches and spills could pose hazards to offsite populations and ecosystems. Exh. 144 at 4-5.

Dr. Samuel Dorevitch on Behalf of the District

Dr. Samuel Dorevitch, an environmental health researcher at the University of Illinois at Chicago School of Public Health, testified on three occasions in this rulemaking concerning CHEERS. Dr. Dorevitch is a medical doctor, with training and board certification in Emergency Medicine and in Preventive Medicine. He has a specialization in Occupational Medicine. Exh.

100 at 1. Dr. Dorevitch is currently employed by the University of Illinois at Chicago as a Research Assistant Professor in the Division of Environmental and Occupational Health Sciences. He also serves as a Research Assistant Professor in the University's School of Public Health in the Division of Epidemiology and Biostatistics. Exh. 100, Attach. 1 at 2. CHEERS was conducted under Dr. Dorevitch's direction.

On September 23, 2008, Dr. Dorevitch presented testimony on characterization public health risks associated with recreating on CAWS and provided an overview of CHEERS. He presented additional testimony on June 29, 2010 in support of a report entitled "CHEERS Research Update: An Interim Technical Report Prepared for the Submission to the Illinois Pollution Control Board." PC 300. More recently, Dr. Dorevitch testified in support of the CHEERS Final Report (PC 478) on October 19, 2010. In the following sections, the Board will provide a summary of Dr. Dorevitch's testimony.

Dr. Dorevitch Testimony September 23, 2008 (Exh. 100)

Dr. Dorevitch testified that he conducts research on local environmental health issues, and also advocates for reducing pollution and improving the environment. Exh. 100 at 1. He noted that while scientific basis for improving air quality and drinking water quality are well established and based on thousands of studies, the scientific data to support regulatory measures for protecting water recreation is beginning to be developed by the research community. Specifically, Dr. Dorevitch noted that there are less than 20 observational epidemiologic studies of primary contact recreation that have been published in the United States. He maintains that no studies have been done to evaluate the health effects of limited contact recreation in the U.S., and less than 5 studies have been done in Europe. *Id.* at 2.

Dr. Dorevitch opined that since there is a lack of scientific guidance for establishing health based standards for CAWS recreation, information needs to be developed to address the protection of recreation on the CAWS. Additionally, he stated that lack of known outbreak of disease linked to CAWS recreation provides an "opportunity to define scope and specifics of the problem before developing a potential solution." Exh. 100 at 4. To this end, Dr. Dorevitch noted that an epidemiologic study to evaluate the health effects of limited contact recreation in the CAWS known as CHEERS was developed. Dr. Dorevitch asserts that since "epidemiologic studies involve direct measurement, rather than the statistical modeling of risk, they are of great importance in developing plans to protect the health of the public." *Id.* CHEERS, Dr. Dorevitch stated, uses the "gold standard" of observational epidemiologic and prospective cohort design. Further, Dr. Dorevitch asserts that CHEERS protocols were developed by a multi-disciplinary team of experienced researchers with background in infectious disease medicine, environmental medicine, epidemiology, biostatistics, industrial hygiene and environmental science. Exh. 100 at 4-5. The design protocols of CHEERS have been reviewed and endorsed by a panel of recognized leaders in the fields of water microbiology and health from the U.S. Centers for Disease Control and Prevention, the USEPA, and other universities.

Dr. Dorevitch provided a brief overview of the CHEERS research. He stated that people are recruited into one of three groups: (i) the CAWS group consisting of people who row, paddle, fish or go boating on the CAWS; (ii) the General Use Group composed of people who recreate in

similar manner on nearby General Use streams and lakes; and (iii) the Unexposed Group who do outdoor activities like jogging and biking that do not involve water about the same time and place as the recruitment of participants to other groups. Exh. 100 at 5. Individuals in all three groups are interviewed on the day of recreation regarding current health and the extent of their contact with water if they engaged in water recreation. The participants are later interviewed 3 times over telephone during the following three weeks regarding any changes in health status and additional water exposure. CHEERS included collection and analysis of water samples for bacteria, viruses and parasites along with clinical specimens (stool samples) if a participant developed illness to identify pathogens responsible for illness. Exh. 100 at 5-6.

Dr. Dorevitch testified that CHEERS also includes an exposure study to assess the different routes (ingestion, inhalation and skin contact) through which rowers, paddlers, boaters and fishers may be exposed to water microbes. Exh. 100 at 6. Dr. Dorevitch asserted that the exposure study would describe for the first time how much water exposure occurs by each route for specific recreational activities. *Id.* He noted that the result from the exposure study will also be helpful in evaluating the assumptions of the risk assessment regarding exposure, dose, and risk. Dr. Dorevitch stated that there is national interest in applying the final results of CHEERS to develop water quality regulations because CHEERS allows a rare opportunity to evaluate the strengths and limitations of risk assessment methods. *Id.*

Dr. Dorevitch stated that USEPA places significant weight on epidemiologic studies because such studies seek to minimize the possibility of: 1) not identifying a real risk that may exist (false negative result); and 2) identifying a risk when none exist (false positive result). Exh. 100 at 6-7. He noted that the total number of study participants enrolled in the three recreational groups in CHEERS was calculated to be 9,330 on the basis of 1 in 20 chance of false positive result, and 1 in 5 chance of a false negative result. *Id.* at 7. Dr. Dorevitch briefly summarized the findings of CAWS recreational use survey in 2007. He noted that the dominant uses on the North Shore Channel and North Branch of Chicago River are rowing and paddling, while motor boating is the dominant use on Calumet-Sag Channel. Further, he noted that while fishing from shore and jet skiing is uncommon, swimming and water skiing were never observed. *Id.* Also, he noted that participant interviews suggest that a small number of users account for a large proportion of uses. Exh. 100 at 8. These results, Dr. Dorevitch observed, provide clarity to the recreational use information reported in the UAA.

Further, Dr. Dorevitch testified that over 5,000 water samples have been analyzed and more than 150 stool samples have been collected for analysis. He asserted that the results of the analyses will answer to critical questions concerning risk, the determinants of risk, exposure, sources of microbes, and causes of illness and serve as the basis for establishing standards for the protection of limited contact recreational uses. Exh. 100 at 8.

Dr. Dorevitch Testimony June 29, 2010 (Exh. 382)

Dr. Dorevitch testified in support of an update on CHEERS entitled "CHEERS Research Update: An Interim Technical Report Prepared for Submission to the Illinois Pollution Control Board" (Interim Report). He noted that the participants' recruitment and health follow-up have been completed, and statistical analysis is ongoing. Exh. 382 at 3. Dr. Dorevitch cautioned that

while the Interim Report summarizes preliminary results of water quality and recreational uses, such results should not be viewed as answers to primary study questions. He stated that the results of health risk analyses, which are yet to be completed, need to be considered to describe relationships between key variables and health outcomes. *Id.*

Dr. Dorevitch also addressed the ongoing interaction between the CHEERS research team and the CHEERS peer review group. He noted that based on a discussion with the peer review group, the research team agreed that a subset of the water quality data did not meet CHEERS project quality criteria. In this regard, Dr. Dorevitch observed that a data set for *E. coli* and *enterococcus* summarized in Table II-6 and Figure II-1(a-b) in the Interim Report should be excluded since the data set had implausibly low levels of indicator bacteria. Exh. 382 at 4. He noted that the exclusion of the data set would result in higher mean values of indicator bacteria in 2008 season, but the impact on median values would be minimal.

Dr. Dorevitch concluded his testimony by noting that the final CHEERS report will be completed and filed with the Board. He noted that the Final Report would address occurrence of illness among study participants and rates of illness attributable to CAWS recreation adjusted for demographic differences among study participants, and microbes responsible for gastrointestinal symptoms among study participants. The reports would also include information necessary for the development of scientifically-based bacterial water quality standards for CAWS. Exh. 382 at 4-5.

Dr. Dorevitch Testimony October 19, 2010 (Exh. 398)

Dr. Dorevitch testified in support of the CHEERS Final Report (PC 478), which was submitted to the Board on August 31, 2010. He noted that the Final Report addresses two of the three study objectives: the determination of the rates of acute gastrointestinal and non-gastrointestinal illness attributable to CAWS recreation; and identification of pathogens responsible for acute infections and their potential sources. However, Dr. Dorevitch stated that the third objective of CHEERS regarding the characterization of the relationship between concentrations of microbes in the CAWS and rates of illness among CAWS recreators would be addressed in a supplement to be submitted to the Board (PC 556). Exh. 398 at 3.

Dr. Dorevitch stated that a total of 11,733 people completed field interviews and 11,297 (96.4 percent) participated in a telephone follow-up. As noted in his 2008 testimony (Exh. 100), Dr. Dorevitch observed that the dominant uses on the North Shore Channel and North Branch of Chicago River are rowing and paddling, while motor boating is the dominant use on Calumet-Sag Channel. Further, he noted that while fishing from shore and jet skiing are uncommon, swimming and water skiing were never observed. Exh. 398 at 4-5. Further, a small number of users accounted for a relatively large proportion of uses.

Regarding evaluation of risk of recreational activities, Dr. Dorevitch explained that a conceptual model was first developed linking water recreation and illness. Next, the time periods of interests were defined for evaluating the occurrence of each type of illness. This step was followed by statistical analyses to identify association between CHEERS group and the risk of illness. The final step involved the estimation of the frequency of illness attributable to

CAWS recreation. Additionally, Dr. Dorevitch noted that the research team re-analyzed the data using a variety of approaches to ensure that the results were reliable and not a result of specific choices of statistical methods or definitions used in the evaluation. Exh. 398 at 5.

Dr. Dorevitch testified that with respect to the first specific objective, CHEERS concluded that rates of gastrointestinal illness are not higher among CAWS recreators as compared to recreators doing the same activities on waters that do not receive undisinfected wastewater treatment plant effluent. Exh. 398 at 6. CHEERS found that about 12-13 cases of gastrointestinal illness per 1,000 uses can be attributed to limited contact recreation on the CAWS. Dr. Dorevitch maintains that illness rate is indistinguishable from the rate of gastrointestinal illness attributable to limited contact recreation on General Use waters. CHEERS found the rate of eye symptoms on the CAWS, which was 15-16 cases per 1,000 uses, to be higher than the rate of eye symptoms among limited contact recreators on General Use waters. However, Dr. Dorevitch noted that the eye symptoms were relatively mild with less than 20 percent of cases using over-the-counter medication. *Id.*

Regarding the third objective, Dr. Dorevitch noted that CHEERS found that majority of pathogens identified from the stool samples of study participants with gastrointestinal illness were viruses. The common viruses in the stool samples included rotavirus, norovirus, and other enteric viruses. Exh. 398 at 6. Dr. Dorevitch stated that the detection of pathogens in stool samples of participants with gastrointestinal symptoms was just as common for all the three study groups, and pathogen presence was not associated with self-reported water ingestion. These findings, Dr. Dorevitch stated, are not consistent with the assumption that CAWS use would be associated with the presence of waterborne pathogens in stool samples of participants with gastrointestinal symptoms. *Id.* at 7. Finally, Dr. Dorevitch noted that the supplemental report addressing the analysis of the water quality-illness relationship would be submitted to the Board (PC 556).

SUMMARY OF PUBLIC COMMENTS

CHEERS (PC 478)

On April 19, 2007, the District's Board of Commissioners voted to contract the University of Illinois at Chicago (UIC) to conduct an epidemiologic study of recreational use of the CAWS. The UIC study conducted under the direction of Dr. Dorevitch is known as CHEERS or Chicago Health, Environmental Exposure, and Recreation Study. The final report of CHEERS was submitted to the Board on August 31, 2010 (report). PC 478. The main objectives of study were as follows:

1) To determine rates of acute gastrointestinal and non-gastrointestinal illness attributable to CAWS recreation.

2) To characterize the relationship between concentrations of microbes in the CAWS and rates of illness among recreators.

3) To identify pathogens responsible for acute infections among recreators and to explore sources of those pathogens on the CAWS. PC 478 at 1-6.

The final report notes that while objectives number one and number three have been met, CHEERS objective number two will be addressed in a supplement to the final report that will be submitted in the fall of 2010.

The report states that gastrointestinal illness attributable to motor boating, canoeing, fishing, kayaking, and rowing on the CAWS occurred at a rate of about 12-13 cases per 1,000 uses. The report notes the rate of gastrointestinal illness on CAWS is comparable to that observed among those who do the same activities on general use waters. The report indicates that the eye symptoms occurrence rate of 5.5 cases per 1,000 uses due to CAWS recreation was higher than the rate of eye symptoms among limited contact recreators on General Use waters. However, the report notes that the eye symptoms were mild. Finally, the report maintains that respiratory, skin, and ear infections are not attributable to limited contact recreation at CAWS or General Use waters locations. PC 478 at xli.

Regarding pathogens responsible for infections, the report states that the vast majority of pathogens identified in the stool samples from CHEERS participants were viruses. The report notes that the pathogens that often cause severe disease were not identified in the stool samples. Further, the report states that there was no indication that water recreation, CAWS use, or water ingestion were associated with gastrointestinal illness even though such a possibility cannot be ruled out. PC 478 at xli.

CHEERS components included participant activities, water sampling and analyses, clinical specimen analyses, estimation of number of cases of illness attributable to CAWS recreation, and determining the pathogens responsible for gastrointestinal illness. In the following sections the Board will provide a brief summary of CHEERS.

General Background

As noted above, the objective of CHEERS was to determine rates of acute gastrointestinal illness and non-gastrointestinal illness attributable to CAWS recreation, characterize the relationship between microbe levels and rates of illness, and identify pathogens responsible for acute gastrointestinal illness and their sources. However, the report clarifies that the purpose of CHEERS was not to develop regulatory standards. PC 478 at xxv. CHEERS utilized the prospective cohort design, which was also used by the USEPA to conduct epidemiologic studies of swimming at beaches. The report notes that the study design, progress, data quality, data analyses and the development of the final report has been reviewed by an external peer review committee of nationally recognized experts in the field. *Id.*

CHEERS Participants and Field Activities

CHEERS evaluated the health risks of limited contact water recreational activities on the CAWS over three recreational seasons from 2007 through 2009. PC 478 at 11-1. The participating recreators were enrolled into three study groups: people recreating on the CAWS

(CAWS group); people recreating on area inland lakes, rivers and Lake Michigan GUW group); and people recreating near CAWS or GUW without water exposure, *i.e.* jogging, walking or cycling (unexposed group). CHEERS locations on the CAWS were located on the North Shore Channel, the Chicago River North Branch, South Branch, and the Main Stem, and the Calumet-Sag Channel. The GUW locations included the Des Plaines, DuPage, and Fox Rivers; and inland lakes/lagoons including Busse Lake, Tampier Lake, and the Skokie Lagoons. *Id.* at v. The report notes that a total of 11,733 people completed the field interviews out of which 11,297 (96.4 percent) participated in a follow-up telephone interview. PC 478 at xxviii. The breakdown of participants between the three groups was 4,090 in the CAWS group, 3,860 in the GUW group and 3,783 in the unexposed group. PC 478 at 11-7.

In the field, the participants were administered two interviews. The first interview prior to recreational activity dealt with basic demographic information, while the second, administered after recreation to the water-exposed groups, inquired about water contact. PC 478 at I-6. The recreational activity in the two groups of water recreators included motor boating, canoeing, fishing, kayaking and rowing. *Id.* at II-10. Post recreation, the participants were asked questions about water contact with their body, *i.e.* face, arms, hands, torso, or feet. They were asked to respond by categorizing water exposure as none, sprinkle, splash, drenched or submerged. *Id.* at II-11. A wetness score was calculated to evaluate water for different recreational activities, and also compare water exposure between the CAWS group and the GUW group. CHEERS participants were also asked to estimate how much water they swallowed with the response options of none, a drop or two, a teaspoon, or at least a mouthful. *Id.* at xxx.

Subsequent to recreation/enrollment, CHEERS participants were contacted by telephone on approximately days two, five, and 21 to follow up on development of any health symptoms. PC 478 at V-1. The participants were asked if they had developed any one of a variety of gastrointestinal and other symptoms. The report notes that day two phone call addresses development of any symptoms during 48 hours after completion of recreational activity, and the later phone calls address development of symptoms during subsequent time periods, *i.e.* days two to five and days five to 21. CHEERS kept track of the date of symptom onset and the duration of symptoms. The report relied on the definition of acute gastro intestinal illness set forth in the USEPA's National Environmental and Epidemiological Assessment of Recreational Water (NEEAR) study. Acute gastrointestinal illness means any vomiting, three or more diarrheal stools in a 24-hour period, nausea with stomach ache, nausea that interferes with daily activities, or stomach ache that interferes with daily activities. PC 478 at V-1. CHEERS participants who developed any new gastrointestinal symptoms (not limited to acute gastrointestinal illness) were asked to provide up to three stool samples collected 48 hours apart for microbial analyses to identify pathogens responsible for acute infections among recreators and explore sources of those pathogens. PC 478 at X-1.

The report notes that there were many differences in demographic, dietary, and other characteristics among the three groups. There were also differences in frequency of water recreation activities in the two water exposed groups (CAWS and GUW). PC 478 at II-18. CHEERS found that the predominant water recreation activities of CAWS CHEERS participants were kayaking (34.2 percent), canoeing (22.3 percent), motor boating (16.7 percent), rowing (16.1 percent), and fishing (10.7 percent). *Id.* The report notes that rowing and motor boating

were more common among CAWS participants, while canoeing and fishing were more common among GUW participants. Kayaking was equally popular among CAWS and GUW CHEERS participants. When it came to amount of water exposure, the GUW recreators reported submersion of all body parts more frequently than CAWS recreators. *Id.* The final report notes that the differences between the groups emphasized the need for data analysis methods to account for such differences. *Id.* at II-19.

Water Quality Measurements

The report states that the water quality of CAWS and GUW was characterized to estimate the microbial quality of the waters to which CHEERS participants may have been exposed to during water recreational activities. PC 478 at II-1. The report notes that water quality samples were obtained at the approximate times and locations of water recreation in order to identify water quality measures for predicting the risk of illness among people engaged in secondary contact water recreational activities. CHEERS relied on a peer reviewed water sampling strategy to characterize the microbial quality of the affected waters. *Id.*

During the field study period of 2007-2009, water quality was measured at 39 locations within the CAWS and other General Use waters covered under CHEERS. The sampling points on the CAWS were located on the North Branch, South Branch, Calumet-Sag Channel, Main Stem and the CSSC. The GUW locations included Lake Michigan Harbors (Montrose, Belmont, Diversy, Burnham, Kackson Park, & Calumet), Lake Michigan Beaches (Leone, Montrose, & Jackson Park), Inland Lakes (Busse Woods, Crystal, Arlington, Lovelace Park, Maple, Mastodan, Tampier & Skokie Lagoons), Rivers (Fox, Des Plaines, & DuPage), and North Branch Dam and Lincoln Park lagoon. PC 478 at II-2 and II-3. The water samples were analyzed for indicator bacteria (*E. coli* and enterococci), indicator viruses (somatic and Male specific coliphages), and protozoan pathogens (*cryptosporidium* and *Giardia*). The report notes that samples were taken once every two hours for indicator analyses and every six hours for pathogen analyses. The report also notes that viral pathogens (adenovirus, norovirus, and entero virus) were measured in selected samples. *Id.* at xxvi

The report observes that the microbes concentrations were found more frequently and at higher concentrations in the CAWS compared to GUW. In the CAWS locations, microbe levels were higher on the North system (North Branch and lower North Shore Channel) compared to the Calumet-Sag Channel. PC 478 at xxvii. The microbe concentrations were generally higher downstream of the water reclamation plants compared to upstream of the plants, except for *Cryptosporidium*. Finally, the report notes that while water entering the CAWS at the Main Stem of the Chicago River was similar to Lake Michigan water, water entering the CAWS at the North Branch Dam had relatively high concentrations of protozoan pathogens. *Id.*

Estimating the Number of Illness Attributable to CAWS Recreation

The report notes that a multi-step process was utilized to evaluate the health risks of canoeing, kayaking, motor boating and rowing. These steps included:

1) developing a conceptual model that linked water recreation to illness, defining time periods of interest for evaluating the occurrence of each type of illness,

2) conducting statistical analyses to identify associations between study group and the risk of illness, after taking into account other differences between study groups,

3) estimating the frequency of illness attributable to CAWS recreation, and

4) checking if the results of the analyses were simply a result of the specific statistical methods and definitions used. PC 478 at xxix.

Further, the report notes that severity of illness was assessed by considering whether the participant's symptoms resulted in using over-the-counter medication, evaluation of healthcare provider, interference with daily activities, or hospitalization. *Id.*

Acute Gastrointestinal Illness in Relation to CHEERS group

The rate of illness attributable to CAWS recreation was determined by analyzing the development of gastrointestinal illness and other types of illnesses in relation to CHEERS group. The report notes that the participants who developed diarrhea, vomiting, or disability from either nausea or stomach ache were considered to have acute gastrointestinal illness. PC 478 at xxix. During the immediate three-day period after recreation, CHEERS found four percent of CHEERS participants had developed acute gastrointestinal illness. When compared to the unexposed group, the report found that the odds of developing acute gastrointestinal illness were 26 percent higher in the CAWS group and 25 percent higher in the GUW group. *Id.* The report notes that the observed differences between the study groups were not statistically significant because of many differences between the groups, such as demographic characteristics and baseline health status, which could influence associations between study group and occurrence of acute gastrointestinal illness. *Id.*

When the differences among the groups were taken into account, the odds of developing acute gastrointestinal illness were 41 percent higher in the CAWS group and 44 percent higher in the GUW, respectively, compared to the unexposed group. These associations were statistically significant. PC 478 at xxx. The report also compared the odds of illness among CAWS and GUW groups directly to one another. The report notes that the comparison between the CAWS and GUW groups also took into account two additional differences between groups. These differences included water exposure, and participant's water recreation activity. The report found that the odds of developing acute gastrointestinal illness were the same in the CAWS and GUW group. *Id.*

The report, however, states that the water exposure did influence the occurrence of acute gastrointestinal illness in both study groups. Based on the responses of CHEERS participants as to how much water they swallowed (none, a drop or two, a teaspoon, or mouthful) during recreational activity, the report found the odds of developing acute gastrointestinal illness were five-fold higher among those who swallowed a mouthful or more of water compared to those

who did not. PC 478 at xxx. The report also found that fishing and motor boating, compared to other limited contact recreation activities, are associated with higher odds of developing acute gastrointestinal illness even though only 1-2 percent of motor boaters and fishers reported swallowing water. The report contends that the higher rate of gastrointestinal illness infection among fishers may be due to additional water exposure through contact with bait and with fish. *Id.*

The report relied on "G-computation" statistical approach to estimate how many cases of illness could be attributed to CAWS recreation. PC 478 at xxxi. After taking into account 20 potential differences between CHEERS groups, the report found that for every 1,000 CAWS uses, about 12.5 recreators will develop acute gastrointestinal illness attributable to their limited contact water recreation activity. In the case of GUW, the report found for every 1,000 uses about 13.4 recreators will develop acute gastrointestinal illness attributable to their limited contact water recreation activity. The report found no statistically significant difference in the number of case of gastrointestinal illness between the two groups. *Id.* at xxxi – xxxii.

Acute Respiratory Illness in Relation to CHEERS group

CHEERS considered participants who developed fever with nasal congestion, or fever with sore throat, or cough with phlegm as having acute respiratory illness. PC 478 at xxxiii. The report found 2.1 percent of CHEERS participants developed acute respiratory illness during the first week of follow-up after recreation activity. The report notes that acute respiratory illness was no more common among those in the CAWS or general use waters groups, than in the unexposed group. *Id.* Similar to evaluation of acute gastrointestinal illness, direct comparisons of the CAWS and GUW groups took into account water exposure, and each participant's specific water recreation activity. The report found that the odds of developing acute respiratory illness remained the same in the CAWS and general use waters group. However, report found that the water exposure did influence the occurrence of acute respiratory illness. Based on the responses of CHEERS participants as to how much water they swallowed (none, a drop or two, a teaspoon, or mouthful) during recreational activity, CHEERS found that for each step up in the level of self-reported water ingestion the odds of developing acute respiratory illness doubled. *Id.*

Acute Ear Symptoms in Relation to CHEERS group

CHEERS considered participants who developed ear pain or ear infection during the first week of the follow-up of recreation activity to have acute ear symptoms. PC 478 at xxxiv. The report found 1.2 percent of CHEERS participants developed acute ear symptoms. Compared to participants in the unexposed group, acute ear symptoms were no more likely to occur in the CAWS group or the general use waters group in the seven days following recreation. Directly comparing the CAWS and general use waters groups after taking into account water exposure and each participant's specific recreational activity, the report found the odds of developing acute ear symptoms were the same in the CAWS and general use waters groups. *Id.* However, the report found water exposure did influence the occurrence of acute ear symptoms. Based on the responses of CHEERS participants as to how much water they swallowed (none, a drop or two, a teaspoon, or mouthful) during recreational activity, the report found that for each step up

in the level of self-reported water ingestion the odds of developing acute respiratory illness increased by 48 percent. *Id.*

Skin Rash in Relation to CHEERS group

CHEERS found that new skin rash was reported by four percent of CHEERS participants. The report notes that skin rash was no more likely to occur in the CAWS group than in the unexposed group in the three days following recreation. PC 478 at xxxvi. Further, the report notes that after taking into consideration demographic, medical, and exposure variables, the odds of developing skin rash were the same for the CAWS and unexposed groups. With regard to direct comparison of the CAWS and GUW waters groups, after taking into account additional differences relating to water exposure and each participant's specific water recreation activity (motor boating, fishing, rowing, canoeing, or kayaking), the report found that the odds of developing skin rash were the same in the CAWS and general use waters groups. Finally the report found that for every 1,000 limited contact uses there were essentially no excess skin rash cases attributable to CAWS or general use waters recreation. *Id.*

Eye Symptoms in Relation to CHEERS group

CHEERS states that eye symptoms, which include eye redness, itching, discharge or crusting, were reported by 3.6 percent of participants within three days following recreation. PC 478 at xxxviii. The report notes that symptoms were not counted as a new case, if a participant considered their eye symptom to be related to usual allergies. The report determined the odds of developing new eye symptoms were 55 percent higher in the CAWS group compared to the unexposed group. Further, the odds of reporting new eye symptoms were 37 percent higher in the CAWS group than in the GUW group. *Id.*

Based on a comparison CAWS users and non-water recreators, after taking into account potential differences between groups, CHEERS found that for every 1,000 uses of the CAWS about 15.5 developed acute eye symptoms attributable to their limited contact water recreation activity. When CAWS users were compared to general use recreators, for every 1,000 uses the CAWS group would be expected to have 11 additional cases of eye symptoms. This estimate takes into account water exposure, demographics, and other differences between the groups. *Id.* at xxxviii. Based on the participants' reported of use of over the counter medication or visit to a health care provider, the report states that eye symptoms were relatively low in severity.

Pathogens Responsible for Gastrointestinal Illness

The report notes that one of the primary objectives of CHEERS was to characterize pathogens responsible for illness among CAWS recreators. The stool samples of participants with gastrointestinal illness symptoms were analyzed to identify the pathogens responsible for the gastrointestinal illness. PC 478 at xl. The report notes that 2,467 (22.4 percent) participants developed new gastrointestinal illness symptoms (not necessarily acute gastrointestinal illness). Further, the report notes that 745 of the 2,467 symptomatic participants provided a stool sample. The stool samples analyses identified a pathogen in 79 samples from 76 participants (10.2 percent of those who provided samples). *Id.*

The report notes that most commonly identified pathogens were viruses, which were identified in 70 (92 percent) of the 76 stool samples. The report notes that among the viral infections 53 were due to rotavirus (76 percent), 14 were due to norovirus (20 percent), and three (4 percent) were due to other enteric viruses (echovirus and adenovirus). Protozoan and bacterial pathogens were identified in samples from 5 (7 percent) and 4 (5 percent) CHEERS participants, respectively. Pathogens that are often associated with severe disease, such as *Shigella, Salmonella*, or *E. coli* O157:H7, were not identified in any stool samples. The report states that while rotavirus has previously been detected in stream water elsewhere in other settings, rotavirus infection has not been linked to outbreaks of recreational waterborne illness in the US. *Id.*

Finally, The report notes that the detection of pathogens in stool samples of participants with gastrointestinal illness symptoms was just as common for all three CHEERS groups and pathogens presence was not associated with self reported water ingestion. These findings, the report observes, are not consistent with the assumption that CAWS use would be associated with the presence of waterborne pathogens in stool samples of CHEERS participants with gastrointestinal illness symptoms. *Id.*

CHEERS Supplement (PC 556)

On December 6, 2010, the District filed a supplement to CHEERS final report. PC 556. The CHEERS supplement addresses the second of the three main objectives of CHEERS, *i.e.* the relationship between water quality and health risks. Exh. 398 at 7. The supplement notes that six microbes (*E. coli*, enterococci, somatic coliphage, F+ coliphage, *Giardia, and Cryptosporidium)* were evaluated as predictors of each of five health outcomes (acute gastrointestinal illness, acute respiratory infection, ear symptoms, eye symptoms, and skin rash). While the supplement found concentrations of enterococci were predictors of acute gastrointestinal illness occurrence among recreators on GUW, none of the microbes were predictors of acute gastrointestinal illness among CAWS recreators. PC 556 at ES-18. The supplement observes that for a given level of enterococci, the estimates of the risk of acute gastrointestinal illness were dependent on the degree to which GUW participants were exposed to water, which is consistent with expectations that those who have no exposure to water would be expected to remain free of illness attributable to water recreation. *Id.*

CHEERS estimated health risk for GUW as a function of water quality for specific scenarios of population exposure, with exposure defined by the "wetness score," described in the final report. *Id.* Initially, the concentration of enterococci expected to result in specific numbers of excess cases of acute gastrointestinal illness attributable to limited contact recreation on GUW was estimated for heavy exposure (a wetness score of 10) scenario. Next an integrated approach was used to estimate overall cases of illness to represent different levels of water exposure. This approach took into account the risk at each exposure level, and the distribution of exposure levels among recreators. The supplement estimated a rate of acute gastrointestinal illness attributable to limited contact recreation on GUW to be about 11 cases per 1,000 when the enterococci concentration is 250 CFU per 100 mL. Further, the rate is estimated to be about 13 cases per 1,000 when the concentration is 500 CFU per 100 mL. Finally, the supplement also found that

exposure and, on the CAWS, recent CSO events were associated with the development of acute gastrointestinal illness. The supplement notes that a CSO in the 24 hours prior to recreation was associated with a four-fold increase in the odds of illness among heavily exposed recreators. *Id.*

Final Conclusions of CHEERS

CHEERS supplement summarized final conclusions on the three main objectives of CHEERS as follows:

Objective #1: Rates of illness attributable to CAWS recreation. CHEERS found about 12-13 cases of gastrointestinal illness per 1,000 uses can be attributed to limited contact recreation on the CAWS. This rate is statistically indistinguishable from the rate of gastrointestinal illness attributable to limited contact recreation on GUW. CHEERS also found about 15-16 cases of eye symptoms per 1,000 uses can be attributed to limited contact recreation on the CAWS that is higher than the rate of eye symptoms among limited contact users of GUW. Further, respiratory, skin, and ear symptoms were not attributable to limited contact recreation at CAWS or GUW locations.

Objective #2: Relationship between microbe concentration and health risk. Among the six microbes studied, only enterococci was associated with the development of acute gastrointestinal illness, and only among recreators on GUW. While microbial measures of water quality were not useful in predicting the development of acute gastrointestinal illness among CAWS recreators, the association between enterococci and acute gastrointestinal illness was only apparent among GUW recreators with heavy water exposure. On the CAWS, recent combined sewer overflows were associated with a four-fold increase in the risk of developing illness among recreators with heavy water exposure.

Objective #3: Pathogen responsible for illness. CHEERS found that the vast majority of pathogens identified in stool samples from CHEERS participants with gastrointestinal illness symptoms were viruses. Further, pathogens that often result in severe disease were not identified in stool samples. Finally CHEERS notes that while there was no indication that water recreation, CAWS use, or water ingestion were associated with gastrointestinal illness, such a possibility cannot be ruled out. PC 556 at ES-20

Other CHEERS Related Information (PC 300, 300A, 484 & 562)

In addition to CHEERS Final Report and the Supplement, the District submitted an Interim Report, revised Tables to the Interim Report, an Errata Sheet to the Final Report, and the District's response to USEPA's comments on CHEERS. See PC 300, 300A, 484, and 562. Given that the Board has summarized CHEERS Final Report and Supplement, the Board will not provide a summary of the Interim Report or the revised tables. Particularly, since the Interim Report states that the summaries in the report should not be viewed as answers to primary study questions. PC 300 at 6.

On September 20, 2010, the District submitted an Errata Sheet to revise the report that was filed on August 31, 2010. The District noted that the electronic file of a more complete

version of the report became corrupted just prior to the filing deadline, and an earlier version of the report was submitted instead. PC 484 at 1. The Errata Sheet changes complete the portions of the report, generally at locations that, in the earlier version, had been left blank or contained notes indicating text or other information would be added. Additionally, the Errata sheet reflects several corrections in spelling, wording, or document compilation. The District asserts that none of the revisions in the Errata Sheet alter the substance of the report, but they provide further details about the research methods and results in the report.

On January 3, 2011, the District filed clarifications regarding CHEERS in Response to the USEPA's December 27, 2010 filing with the Board. PC 562. The District provides Dr. Dorevitch's response to USEPA concerns regarding CHEERS. Regarding USEPA's concern that the observed risk levels in CHEERS do not appear to represent the full or future level of health risk to recreators in the CAWS, Dr. Dorevitch states that the focus of CHEERS was limited to ("secondary") contact recreation, where water ingestion is expected to be "incidental" or "accidental" during such activities. Since water ingestion was expected to occur during water skiing, tubing, or jet skiing, individuals who engage in these activities were not eligible for enrollment. Further, Dr. Dorevitch stated that speculating about future risk levels was not an objective of CHEERS. A primary objective of CHEERS was to characterize risk attributable to CAWS recreation under current conditions. PC 562, Attach. 1 at 2.

Next, Dr. Dorevitch addressed USEPA's contention that the illness rate in the GUW should not be used as a reference group (unexposed to nondisinfected wastewater) upon which to compare CAWS waters because the GUW were not meeting applicable water quality standards and microbial indicator concentrations, *i.e.* the GUW waters are impacted by fecal contamination. *Id.* at 3. Dr. Dorevitch states that a consistent body of evidence has made clear that elevated levels of fecal indicator bacteria do not necessarily imply human fecal contamination, and in some settings, may not imply fecal contamination at all. Since the recreational activities of CHEERS participants in CAWS and GUW waters are the same, he argued that comparing rates of illness in the two settings (point-source dominated vs. not), regardless of concentrations (densities) of *E. coli* and/or enterococci is reasonable. *Id.*

Regarding USEPA's concern about minimal reporting of what the relative fecal source attributions were for each day of the study, Dr. Dorevitch states that CHEERS protocols were developed by adapting the NEEAR study. He contends that neither that study nor, to the best of the research team's knowledge, any other epidemiologic studies, have attributed fecal pollution each day to different sources. PC 562, Attach. 1 at 3.

Dr. Dorevitch next addressed USEPA's contention that it is not surprising that CHEERS did not detect a different level of health effect between the CAWS and GUW groups, since there was a 20 percent chance of making such a false-negative error, and both the CAWS and GUW appear to be polluted with sewage. *Id.* at 4. He noted that CHEERS detected numerous differences between groups in health risk. For example, females had a higher risk of acute gastrointestinal illness than males. Those with higher levels of perceived risk of CAWS recreation had higher rates of illness than those with lower perceived risk. Dr. Dorevitch argued that CHEERS clearly had enough statistical power to identify these differences in risk. He notes

that while the possibility cannot be ruled out that one group actually has a higher risk than the other, the point estimates do not suggest that this is the case.

Regarding USEPA's contention that numerous differences between the population of CAWS and GUW users limit the usefulness of the comparisons between the CAWS and GUW groups, Dr. Dorevitch states that the comparisons of the illness rates between the CAWS and GUW groups were adjusted for 22 potential differences to account for the confounders. PC 562, Attach.1 at 5. He argued that CHEERS peer review panel, which was familiar with the details for adjusting for potential confounders, was comfortable with the analyses and findings. *Id.*

Dr. Dorevitch also addressed USEPA's assertion that stool sample design chosen for CHEERS was very likely not to identify an etiologic agent. He notes that the infectious disease physicians, microbiologists, infectious disease epidemiologists, and other members of the research team were in agreement regarding the methods for obtaining stool samples, testing them, and the battery of specific analyses that the samples underwent. PC 562 at 6. Further he notes that of the two studies cited by USEPA, one involved the detection of a pathogen (*E. coli* O157:H7) and the other involved norovirus. Dr. Dorevitch states that stool samples from CHEERS participants were tested for Shigatoxin, which is elaborated by *E. coli* O157:H7 and norovirus testing is standard for all CHEERS stool specimens. *Id.*

Finally regarding USEPA's concern as to the high gastrointestinal illness rate for fishers and boaters, Dr. Dorevitch states that the research team shares USEPA's concern. In the case of fishers, he observes that the higher rate of illness may be due to pathogens being transferred from fish (and/or bait) to the hands and then ingested by fishers. PC 562, Attach.1 at 6. However in the case of boaters, Dr. Dorevitch notes while the cause of symptoms is less clear, the higher rates of illness may be due to food borne illness or alcohol-related gastrointestinal illness symptoms. He admits that these explanations may not be the causes of the elevated rates of illness. *Id.*

IEPA (PC 568)

IEPA has consistently held the position that there is insufficient science to establish a water quality standard. PC 568 at 3-4. As a result IEPA proposed a technology-based effluent limit of 400 fecal coliform/100 mL. PC 568 at 4, citing 35 Ill. Adm. Code 304.121(a). This effluent limit mirrors the existing standard for GUW. *Id.*

IEPA states that a disinfection requirement was not proposed to protect the proposed recreational use designations for the CAWS and Lower Des Plaines River; as only ambient water quality standards can be adopted to protect designated uses. PC 568 at 4. IEPA opines that "[i]f the Board accepts the conclusion that inadequate science exists to establish ambient water quality standards at this time, the only remaining question for the Board to answer in subdocket B is whether the IEPA's proposal of a technology-based disinfection requirement is technically feasible and economically reasonable." *Id.*

IEPA has been "consistent and clear about the weakness of" IEPA's proposal: scientific information necessary to develop a numeric water quality standard is lacking. PC 568 at 5.

Although a narrative standard may be possible, IEPA comments that the suggestion that the Board is faced with a decision on what requirements are necessary to meet the recreational use designations is not accurate. *Id*. IEPA asserts that the decision on requiring disinfection "cannot and should not be equated with a decision on what level of ambient bacterial contamination is safe." *Id*.

The IEPA points out that Section 13(a) of the Act (415 ILCS 5/13(a) (2010)) grants to the Board the authority to adopt regulations to promote the purposes of the Act including effluent standards. PC 568 at 5, quoting 415 ILCS 5/13(a) (2010). In adopting such regulations, the Board must consider technical feasibility and economic reasonableness of the proposed regulations. PC 568 at 5. IEPA comments that there has been a technology-based disinfection requirement in the Board's rules since 1972 for dischargers to GUW. *Id*. The IEPA opines that applying the requirement to two of the three of the use designations for the CAWS and LDPR is the Board's focus. *Id*.

IEPA's Proposal

IEPA proposed a new subsection, which contains four key elements. Those elements are: 1) a numeric effluent limitation, 2) applicability to two of the three recreational use categories, 3) a seasonal exemption, and 4) an effective date for existing and new dischargers. PC 568 at 6. This language parallels the requirements applicable to GUW at 35 Ill. Adm. Code 121(a). *Id*.

IEPA states that the proposal sets a technology-based effluent limit of 400 CFU per 100 mL and is identical to the requirements for GUW. PC 568 at 7. The proposal requires disinfection for dischargers into Incidental Contact Recreation and Non-contact Recreation waters, but not Non-Recreational waters. PC 568 at 8. The proposal requires disinfection from March through November due to evidence of sculling teams using waters in March and November. *Id*. An effective date was included in the proposal, the date having passed, IEPA asks for a date three years from the effective date of the regulations. *Id*.

Evidence in the Record

The IEPA summarizes the record and notes that no evidence has been presented to allow for a scientifically defensible water quality standard to be proposed. PC 568 at 9. The IEPA opines that the District attempted with CHEERS not to support water quality standards, but instead to oppose a technology-based effluent standard. *Id*. The IEPA asserts that the District has used CHEERS to "justify" the District's conclusion that effluent disinfection is not necessary. PC 568 at 10. The IEPA opines that no matter what conclusions the Board may draw from CHEERS, for CHEERS to be relevant in this proceeding, CHEERS needed to conclude what water quality standard would be appropriate. CHEERS did not do that, so, IEPA argues that CHEERS and the testimony regarding are not relevant. *Id*. Likewise, IEPA did not include many of the exhibits relating to the Microbial Risk Assessment. *Id*. IEPA urges the Board to "set aside the additional information" for future rulemaking setting water quality standards. PC 568 at 10-11.

Technical Feasibility and Economic Reasonableness

IEPA offers that under Section 27(a) of the Act (415 ILCS 5/27(a) (2010)) the Board is required to consider technical feasibility and economic reasonableness of a proposal. PC 568 at 15. IEPA refers the Board to Interim Phosphorus Effluent Standard, Proposed 35 Ill. Adm. Code 304.123(g-k), R04-26 (Jan. 19, 2006) for guidance on approaching a decision in Subdocket B. *Id*. The IEPA points out that the Board recognized the differences between water quality standards and an effluent standards. *Id*. Specifically, the Board stated:

> 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. PC 568 at 15, quoting R04-26, slip op. at 3-4.

The IEPA argues that in this proceeding the IEPA is asking that the Board limit a pollutant to the waters of the State by adopting a technology-based effluent standard. PC 568 at 15.

IEPA "believes strongly" that the proposed effluent disinfection is technically feasible and that a long history of the use of disinfection technologies supports such a conclusion. PC 568 at 17. IEPA stated that in the past, disinfection through chlorination resulted in toxic effects to aquatic life, which lead to discontinuation of chlorination at the District's North Side, Calumet, and Stickney water reclamation plants. Today, new technologies for disinfection involving de-chlorination, ozonation, and UV radiation have overcome these effects. IEPA argues that during the recreation season "disinfection technology is now ubiquitous" at publicly owned treatment works. PC 568 at 17.

IEPA notes that the District did not include the most common and inexpensive method of disinfection when examining technical feasibility and economic reasonableness. PC 568 at 18. Further, IEPA argues that the fact that the District previously disinfected the effluent at the three plants at issue in this proceeding is also significant. *Id*.

IEPA comments that the SAIC costs are a useful guide but the costs are not reflective of the actual cost to consumers because the District charges customers based on assessed property values. PC 568 at 22. The IEPA used SAIC's disinfection cost estimates and the District's explanation of fees to calculate a projected cost. *Id*. IEPA calculated that for a home with an assessed value of $100,000 the increased tax cost would be between $9 and $12 per year. *Id*. The IEPA opines that even the "very high total costs of disinfection at all three" District plants is economically reasonable. *Id*.

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IEPA explained that in developing the proposal, IEPA assumed that industrial dischargers to the CAWS and LDPR would not need to provide disinfection. IEPA figured that any domestic/bacteria-containing waste stream from industrial dischargers would be heavily diluted by process water. PC 568 at 23. However, one industrial user, Stepan, came forward to explain that Stepan would need to disinfect under the IEPA's proposal. PC 568 at 22. IEPA offered to work with Stepan Company on this issue to address the minor source of fecal coliform and consider alternatives to disinfecting the entire waste stream. PC 568 at 22.

IEPA PC 1003

On June 9, 2011, IEPA filed a comment in response to the Board's proposed second notice opinion and order in Subdocket A (Water Quality Standards and Effluent Limitations for the Chicago Area Waterway System and Lower Des Plaines River: Proposed Amendments To 35 ILL. Adm. Code 301, 302, 303, and 304, R08-9 (A) (June 2, 2011). The Board docketed the comment in Subdocket B as well because IEPA specifically addressed water quality standards. *See* PC 1003. The IEPA "recommends" that the Board "clarify" in this opinion and order that the existing fecal coliform criteria at 35 Ill. Adm. Code 302.209 apply to the primary contact recreation waters of the CAWS and LDPR. PC 1003 at 3.

The People of the State of Illinois (PC 566)

The People request that the Board to adopt the technology-based effluent disinfection requirement proposed by the IEPA because the waterways are currently being used for incidental contact recreation. PC 566 at 1. The People state that disinfection measures to protect the public are long overdue. *Id.*

The People testify that the CWA requires the Board to adopt all water quality criteria necessary to protect existing recreational uses of the CAWS and LDPR pursuant to 33 U.S.C. § 1313(c)(2)(A). PC 566 at 2. Further, the People state that for waters with multiple use designations, "the selected criteria must support the most sensitive use." PC 566 at 2, *citing* 40 C.F.R. § 131.11(a)(1).

The People state that the parties have presented compelling evidence that the disinfection of sewage wastewater effluent is necessary to protect public health and welfare. PC 566 at 3. First, there is a large body of evidence that pathogens associated with non-disinfected sewage wastewater effluent cause illness in exposed individuals. PC 566 at 3-4, *citing* Exh. 249 at 9; Exh. 234 at 1; 10/19/10 Tr. at 171. The People state that this risk of illness has been apparent for much time and that there are now newer and better disinfection methods available, such as ultraviolet and ozonation. PC 566 at 4. These available methods justify disinfection. PC 566 at 5.

The People support their argument by pointing out that the USEPA recommends water quality criteria to protect individuals from illness-causing organisms and pathogens in recreational waters. PC 566 at 5. The USEPA recommends that, for waters used for "infrequently used full body contact recreation," a single sample maximum allowable density of

151 CFU/100 mL. PC 566 at 6, *citing* PC 561 at 1-2. Currently, the river level exceeds these recommended parameters. PC 566 at 6.

The People point out that disinfection of sewage wastewater effluent is widely practiced in metropolitan areas across the United States. PC 566 at 6. Those cities that do not are being pressured to do so by USEPA. *Id.*; PC 566 Exh. A. Based on the USEPA's recommendations and the near-universal practice of disinfection across the U.S., the People find the lack of disinfection in CAWS disturbing. PC 566 at 7.

Next, the People argue that the District wastewater treatment plants contribute to the high levels of pathogens in the CAWS. PC 566 at 7. The People point out that the pathogenic pollution occurs in both dry weather and wet weather. *Id.* The People cite Dr. Yates and her prefiled testimony, and report that the District's discharge points increase the bacterial load of waterways by more than 1000 percent. *Id.*, *citing* Exh. 249. at 6-7. The District's discharge points also greatly increase the viral contamination in the waterways. PC 566 at 8. CHEERS demonstrates that pathogenic contamination is also prominent during wet weather events that cause sewer overflows. *Id.*, *citing* PC 478. The daily mean concentrations of both *E. coli* and enterococci are far higher than the concentrations upriver from the District. PC 566 at 8.

The People next argue that the pathogenic levels in the CAWS are always unacceptably high, and that recreators in the CAWS are unable to avoid them. PC 566 at 9. Therefore, not only is the risk of illness always present, but it is unavoidable. *Id.* Combined with the fact that individuals are definitely using the CAWS to recreate, this risk is unacceptable. *Id.* Even individuals who do not swim but only kayak in the water have contact with the water; almost 97 percent of kayakers in the CAWS reported contact. PC 566 at 10, *citing Water Quality Standards for Coastal and Great Lakes Recreation Waters*, 69 Fed. Reg. 67218, 67220 (Nov. 16, 2004). The People believe that the IEPA's technology-based effluent disinfection requirement is necessary to protect public health and welfare based on the above facts, and therefore, the Board should require the District to disinfect the effluent from its treatment plants before it goes out into the CAWS. PC 566 at 10-11.

The People comment that CHEERS does not support the absence of disinfection requirement for the sewage wastewater effluent that the District discharges into Illinois waterways. PC 566 at 11. The People claim that CHEERS had unexpected results, but those are not justification to reject other long-accepted scientific knowledge and practice, such as the need for disinfection. PC 566 at 12. The People reason that CHEERS is an anomaly and those results have not been replicated in other studies, which makes them an unreliable basis on which to base policy. *Id.* The People urge the Board to reject District's argument and adopt the disinfection criteria proposed by the IEPA. *Id.* The People point out that even the authors of CHEERS acknowledge and recognize the inconsistent findings of CHEERS, implying that CHEERS should be discarded as reliable scientific evidence. PC 566 at 13.

The People also reject the testimony of Dr. Granato regarding CHEERS and CHEERS findings as being an untested and unproven hypothesis. PC 566 at 13. Dr. Granato testified that CHEERS indicates that illness among CAWS recreators is not caused by pathogens but by some as yet unidentified chemicals in the CAWS. *Id*. The People point out that Dr. Granato has no

epidemiological support for this theory and so reject this argument as a basis for policy-making. *Id.*

The People do note that even though CHEERS cannot prove the cause of illness, CHEERS definitely demonstrates that CAWS recreators are becoming ill in significant numbers. PC 566 at 14. CHEERS concluded that approximately 12.5 recreators for every 1,000 will suffer an acute case of gastrointestinal illness, and 15.5 recreators for every 1,000 will suffer eye symptoms. *Id.* The People point out that these rates are above the 8 to 10 illnesses per 1,000 recreators rate that the USEPA recommends, thereby demonstrating the need for more protective criteria for CAWS. *Id.* The People believe that more protective criteria will lead to fewer illnesses for recreators on Illinois waterways. *Id.*

Further, the People state that the proposed effluent disinfection criterion is both technically feasible and economically reasonable. PC 566 at 15. The People state that the District's estimate (between $963 million and $2,702 million) is misleading because it does not take into account the economic impact that rejection of the water quality standards would have on public health and welfare. *Id.* The People opine that the cost to public health and welfare would justify the investment in the disinfection criterion. *Id.* Further, the CWA calculates the cost of pollution control technology as a minor factor in setting water quality standards. PC 566 at 16. The USEPA specifies that the existing uses may not be removed from such an analysis. *Id., citing* 40 C.F.R. § 131.10(h)(1). The People argue that incidental contact recreation is an existing use of the CAWS, and so it must be considered in the cost analysis. PC 566 at 17.

Also, the People use the *Water Quality Standards Handbook* to argue that the only way the disinfection criterion should not be implemented is if District can demonstrate that there would be widespread adverse impacts to the community if disinfection is enforced. PC 566 at 17, *citing* Appendix M to the *Water Quality Standards Handbook-Second Edition* at 4-7 (Mar. 1995). Because the District has made no such showing, the People argue that the disinfection is justifiable and should be implemented. *Id.* Though the costs of the disinfection are significant, the People argue that there is no evidence that they would place an undue burden on taxpayers or increase regional unemployment rates. *Id.* Further, the District's total budget for 2008 was over $1.4 billion, making the cost of disinfection negligible. *Id.*

The People cite to Granite City Div. of Nat'l Steel Co. v. Illinois Pollution Control Bd., 155 Ill. 2d 149 (1993), arguing that Granite City controls the technical feasibility and economic reasonableness aspects of the Board's analysis. PC 566 at 19. The People maintain that under Granite City, the Board is required only to consider or carefully weigh the technical feasibility and economic reasonableness of compliance with proposed regulations in the rulemaking process. *Id.* The People urge the Board to give little weight to the District's economic arguments. *Id.*

The People comment further that the technical feasibility and economic reasonableness of disinfection is long-established. PC 566 at 19. The technical feasibility is evidenced by the "near-universal" practice of disinfection in American metropolitan areas. PC 566 at 19-20. The People argue that disinfection is the industry standard. PC 566 at 20. The People state that disinfection should be implemented even if it requires more electricity because there is no

statutory basis for such an exception. *Id.* The economic reasonableness is evidenced by the fact that nearly all other major metropolitan areas in the U.S. use disinfection. PC 566 at 20-21. The People argue that economic reasonableness must be considered in relation to the entirety of District's budget. PC 566 at 21. Dr. Boyle's testimony further supports economic reasonableness; his cost-benefit analysis estimated that the proposed disinfection measures would have a present value of $1.05 billion over twenty years, or $47 per household per year. *Id., citing* Exh. 286 at 1-4.

For the above reasons, the People conclude that the disinfection of sewage wastewater is necessary to protect recreators in the CAWS and current uses of the CAWS. PC 566 at 22. The People request that the Board adopt the technology-based effluent disinfection requirement proposed by the IEPA. *Id.*

Environmental Groups (PC 564)

The Environmental Groups urge the Board to find in support of the technology based effluent standard proposed by the IEPA. PC 564 at 1. In sum, the Environmental Groups maintain that the following five reasons support their position:

1) The proposed technology-based standard is appropriate and necessary and disinfection will reduce risks for CAWS and LDPR recreators.

2) The District's CHEERS and Microbial Risk Assessment studies fail to demonstrate that disinfection is unnecessary.

3) Disinfection is an economically reasonable means of attaining the designated uses.

4) The presences of CSOs does not diminish the need for disinfection.

5) Energy used is not grounds to reject disinfection. PC 564 at 1-2.

The Environmental Groups comment on each of the reasons is summarized below.

Proposed Technology-Based Standard is Appropriate and Necessary And Will Reduce Risks For CAWS and LDPR Recreators

The Environmental Groups opine that IEPA's decision to propose a technology-based standard was reasonable, consistent with applicable law, and consistent with prior Board decisions. PC 564 at 4.

The Environmental Groups note that IEPA indicated that a technology -based effluent standard is technically feasible and that technology-based effluent disinfection has been a long standing requirement in the Board's rules. PC 564 at 5, citing SR at 98. The Environmental Groups argue that this determination by the IEPA was reasonable for several reasons. PC 564 at 5. First, the Environmental Groups comment that the technology-based standard does not

require any assumptions regarding numeric criteria to be established in the future, but only the assumption that disinfection will be required to achieve the numeric criteria adopted in the future. PC 564 at 5. Second the IEPA correctly noted that scientific data necessary to developing instream criteria are still a work in progress. *Id*. Third, USEPA has not objected to the IEPA's proposal. PC 564 at 6.

The Environmental Groups assert that a technology-based effluent limit is consistent with applicable law and Board precedent. PC 564 at 6. The Environmental Groups cite to 40 C. F.R. §131.11 for support, noting that the IEPA is treating use designations effectively as temporary narrative criteria. PC 564 at 7. The Environmental Groups also point to the Board's decision in Proposed 35 Ill. Adm. Code 304.123(g), 304.123(h), 304.123(i), and 304.123(k), R04-26 (Sept. 15, 2005) and (Jan. 19, 2006). The Environmental Groups note that the Board adopted a technology-based phosphorus limit when the IEPA informed the Board that developing numeric nutrient criteria was a multi-year process. PC 564 at 7.

The Environmental Groups argue that disinfection is necessary to public health and three "facts remain indisputably clear". PC 564 at 8. The Environmental Groups first argue that exposure to waterborne sewage pathogens can cause illness to recreators. *Id*. Second, both indicator and pathogen levels in the CAWS are substantially elevated during dry weather as a result of the District's undisinfected wastewater treatment plant effluent. *Id*. Third, disinfection technology will significantly reduce the indicator and pathogen levels, without an appreciable downside risk. *Id*.

The Environmental Groups point to testimony by Dr. Orris that the association between disease and the ingestion of undisinfected wastewater is one of the oldest in history. PC 564 at 8, citing 4/15/09 Tr. at 12. The Environmental Groups assert that a "couple 'novel' studies" presented by the District "do not negate the established fact that sewage pathogens and illness are one of the best established correlation in medical literature." PC 564 at 8. The Environmental Groups argue that the lack of documented disease outbreaks on the CAWS "has no bearing on an assessment of the risk for purposes of this proceeding." PC 564 at 9. The Environmental Groups point out that the USEPA expressly criticized the Microbial Risk Assessment study and agrees that the lack of documented outbreaks is not definitive. *Id*.

The Environmental Groups point to testimony from multiple witnesses that recreational exposure to sewage related waterborne pathogens causes illness. PC 564 at 9. Further, the Environmental Groups argue that extensive scientific research, including to some extent CHEERS supports the correlation between recreational exposure to sewage related pathogens and illness. PC 564 at 10. The scientific literature also supports a connection between pathogen indicator organisms and risk of illness to recreators. *Id*.

The Environmental Groups argue that pathogen and indicator levels are elevated in the CAWS during dry weather as a result of the Districts undisinfected effluent. PC 564 at 11. The Environmental Groups note that Dr. Yates included charts from USEPA that show high indicator levels from the wastewater treatment plants. *Id*. The Environmental Groups note that the District presented three studies concerning fecal coliform indicator levels in the CAWS, but none

of these studies contradict the USEPA sampling results presented by Dr. Yates, demonstrating the source and level of dry weather fecal coliform indicators. PC 564 at 14.

The Environmental Groups argue that disinfection would significantly reduce indicator levels and pathogen loading in the CAWS. PC 564 at 16. The Environmental Groups opine that disinfection of wastewater at least seasonally is nearly universal in US cities with Chicago being the only exception. *Id*. The Environmental Groups note that the District disinfects at three suburban wastewater treatment facilities that discharge to other waters of the state. *Id*. The Environmental Groups argue nothing the District has presented "comes close to overcoming the overwhelming evidence that disinfection as currently practiced throughout the nation is beneficial to public health." *Id*. The Environmental Groups argue that the District's witnesses and submissions acknowledge that disinfection would reduce pathogens substantially in the wastewater treatment plant effluent. PC 564 at 17.

The Environmental Groups take issue with the testimony of several District witnesses. As to Dr. Blatchley's testimony, the Environmental Group argue that the proposed standard of 400 CFU/100 mL is protective of public health. PC 564 at 18. Further, the Environmental Groups argue that pathogen regrowth does not significantly diminish the efficacy of disinfection. PC 564 at 21. The Environmental Groups also take issue with Dr. Rijal's testimony that fecal coliform indicators are found upstream of the District's CAWS wastewater treatment plants and assert that the testimony is irrelevant to the proposed effluent standard. PC 564 at 24. The Environmental Groups disagree with Mr. Granato that filtration would be sufficient to reduce fecal coliform. PC 564 at 25.

The Environmental Groups argue that disinfection has no appreciable downside risk. PC 564 at 26. The Environmental Groups concede that chlorination disinfection can create disinfection byproducts; however, no evidence has been provided that disinfection by products are a risk to recreators. *Id*. By contrast, the Environmental Groups opine that sewage pathogens have well documented capabilities of causing illness. PC 564 at 27.

District's CHEERS and Microbial Risk Assessment Studies Fail to Demonstrate that Disinfection is Unnecessary

The Environmental Groups opine that the District's opposition to disinfection is based on the CHEERS and Microbial Risk Assessment; however, neither of these studies support the District's position that risks to recreators are insufficient to warrant disinfection. PC 564 at 29. The Environmental Groups concede that CHEERS was conducted in a reasonably scientific sound manner; however, CHEERS is only one epidemiological study. *Id*. The Environmental Groups maintain that a single epidemiological study should not form the basis to reject a public health measure. PC 564 at 29-30. The Environmental Groups note that USEPA shares the Environmental Groups concerns regarding the study scope, methodology and applicability of CHEERS. PC 564 at 30, citing PC 561. The Environmental Groups argue that the Microbial Risk Assessment is bad science with numerous flaws. PC 564 at 31.

CHEERS in No Way Demonstrates that Disinfection is Unnecessary. The Environmental Groups argue that the reasons CHEERS cannot be interpreted as a definitive basis

for rejection of disinfection are numerous. PC 564 at 31. A main reason, according to the Environmental Groups, is that CHEERS did find elevated risks of eye symptoms for CAWS users. *Id*. Second, the Environmental Groups argue that CHEERS contradicts existing scientific knowledge concerning "both the dose-response correlation associated with ingestion of sewage contaminated water, and the immune sensitivity of children." *Id*. A third problem the Environmental Groups point to is that CHEERS suffers from inherent limitations and flaws that limit CHEERS strength and applicability. *Id*.

CHEERS Findings that Weigh in Favor of Disinfection. The Environmental Groups argue that the findings of CHEERS actually support disinfection. PC 564 at 32. The Environmental Groups note that CHEERS found a positive correlation between the risk of eye symptoms and recreating in the CAWS. *Id*. The Environmental Groups argue that this positive correlation should be given greater weight than the negative findings of CHEERS. *Id*. The Environmental Groups opine that this is so because Dr. Dorevitch indicated that the chance of a false positive was a 1 in 20 chance, while a false negative was a 1 in 5 chance. *Id*.

The Environmental Groups also argue that the level of gastrointestinal illnesses are higher than the USEPA's risk benchmark for recreational waters. PC 564 at 33. The Environmental Groups note that the rate of gastrointestinal illnesses is above USEPA's benchmark in both the general use waters and CAWS included in CHEERS. *Id*. The Environmental Groups further note that many of the general use waters included in CHEERS are listed as impaired for fecal coliform in the CAWS Section 303(d) list prepared by IEPA in 2010. PC 564 at 34. The Environmental Groups opine that "[t]he fact that a bacterially-contaminated river reflects similar illness rates to bacterially-impaired beaches . . . is neither surprising nor supportive of a decision to simply ignore the whole problem." PC 564 at 34-35.

CHEERS Suffers From Limitations Common to Epidemiologic Studies and All Scientific Research. The Environmental Groups claim that a basic tenet of all science is that research must be replicated to determine if the results of the initial study are flawed. PC 564 at 36. Furthermore, the Environmental Groups offer that there is another layer of uncertainty with epidemiological research as well as the applicability to certain risks. *Id*.

The Environmental Groups argue that the USEPA has agreed to develop new recreational water quality criteria based on "multiple new epidemiologic studies" and current science. PC 564 at 36. Further, a substantial part of scientific inquiry consists of attempts to reproduce scientific results to determine legitimacy. *Id*. The Environmental Groups assert that in a field such as epidemiology where bias, confounding, missing data and other problems affect the quality of a study, replication is essential to correct those problems. PC 564 at 37. The Environmental Groups maintain that replication is particularly important when a study produces findings that contradict multiple previous studies that are considered well established. *Id*.

The Environmental Groups note that epidemiological research produces results within the 95 percent confidence bounds and are thus presented as a range of possibilities. PC 564 at 37. Also, the occurrence of random statistical flukes is another problem PC 564 at 38.

The Environmental Groups point out another problem with CHEERS are the inherent limitations of non-laboratory work. PC 564 at 39. The Environmental Groups argue that the impact of real-world variables is simply unknown with CHEERS. PC 564 at 41.

An additional limitation of epidemiologic studies and CHEERS is that standard statistical analysis assigns a greater possibility of a false negative than a false positive result. PC 564 at 41. The Environmental Groups argue that biases fail to account for differences in environment and study population and confounding factors. *Id*. This can have the effect of erasing risk distinction rather than creating them. *Id*.

The Environmental Groups argue that another limitation is the inapplicability of epidemiologic conclusions to rare but severe events. PC 564 at 42. Specifically, the Environmental Groups point out that epidemiological studies are not designed to study the risk of unusual events such as a child falling out of a kayak. *Id*.

The Environmental Groups claim that a limitation to epidemiologic research is that the study may not produce results which can be generalized to the population at large. PC 564 at 44. One problem of generalization that is evident to CHEERS, according to the Environmental Groups is that there was selection bias. *Id*. Specifically, fewer power boaters and more kayakers were enrolled in CHEERS than were observed by CHEERS researchers in the general population. *Id*.

Extreme Caution is Necessary Because CHEERS Contradicts Established Scientific Knowledge. The Environmental Groups note that multiple previous epidemiological studies established a dose-response between illness and pathogens. PC 564 at 45. There are also a number of studies that correlate water recreation in sewage-contaminated water with increased risk of illness. PC 564 at 46. The Environmental Groups claim that CHEERS confirmed the well-established correlation between water recreation and gastrointestinal illnesses. *Id*. The Environmental Groups take issue with CHEERS findings concerning risks to children and the elderly. PC 564 at 55. The Environmental Groups argue that CHEERS found no increased risk for children or the elderly and this is contrary to existing studies. PC 564 at 56.

The Environmental Groups argue that CHEERS was designed only to assess risks to the overall recreational population of the CAWS. PC 564 at 57. The Environmental Groups claim CHEERS was not designed to study the risk to subpopulations that may be more vulnerable. *Id*. The Environmental Groups argue that regulators can and often do set standards protective of sensitive populations. PC 564 at 58.

CHEERS Suffered from Multiple Methodological Flaws and Limitations. The Environmental Groups challenge the CHEERS results while acknowledging that CHEERS represents fundamentally sound science. PC 564 at 60. The Environmental Groups argue that CHEERS reflects multiple potential biases, many not acknowledged by the final report. *Id*. The Environmental Groups note particularly the problem of heterogeneity bias, that assumption that risk is uniform throughout the entire CAWS. PC 564 at 61.

Also, the Environmental Groups argue that CHEERS did not sufficiently adjust for confounding factors. PC 564 at 62. Those factors include socioeconomic status or the duration of the activity. PC 564 at 63. And the Environmental Groups note that there was no accounting for asymptomatic illnesses. PC 564 at 64.

CHEERS Does not Present Sufficient Data to Allow the Board to Develop Water Quality Standards. The Environmental Groups claim that the District is seeking to have the Board develop water quality standards before determining a technology-based effluent standard. PC 564 at 67. The Environmental Groups assert that CHEERS contains anomalies and data gaps and thus do not provide a basis for establishing a water quality standard. PC 564 at 67-69. The Environmental Groups opine that the IEPA's original plan of setting technology-based effluent standard should not be deviated from. PC 564 at 69.

Microbial Risk Assessment Was Inherently Limited and Poorly Conducted. The Environmental Groups argue that the Microbial Risk Assessment was based on modeling of variables rather than actual data gathered from recreators. PC 564 at 70. The Environmental Groups opine that the District relies on a finding in the Microbial Risk Assessment that health risks in the CAWS are low even in the immediate aftermath of a CSO event. *Id*. Further, the Environmental Groups note that the risk of gastrointestinal illnesses estimated by the Microbial Risk Assessment were substantially lower than the illnesses found by CHEERS; and Dr. Granato explained this discrepancy as possibly being attributable to unidentified toxic chemicals. *Id*., citing 10/19/10Tr. at 260. However, the Environmental Groups believe that a more likely explanation is that the Microbial Risk Assessment is bad science. PC 564 at 70.

The Environmental Groups maintain that flaws in the Microbial Risk Assessment persist because the Microbial Risk Assessment has not been peer reviewed. PC 564 at 72. The Environmental Groups point to flaws that either USEPA and/or Dr. Yates set forth regarding the Microbial Risk Assessment: 1) outdated risk assessment model, 2) unjustified conflation of data, 3) insufficient number of samples, 4) unexplained very low pathogen numbers, 5) flawed sample analysis, 6) inadequate data presentation, 7) limited scope, and 8) failure to assess risks to sensitive populations. PC 564 at 72-75.

Disinfection is an Economically Reasonable Means of Attaining the Designated Uses

The Environmental Groups opine that the Board's evaluation of economic reasonableness is bound by Section 27 of the Act (415 ILCS 5/27 (2010)) and Factor Six of the UAA (40 C.F.R. §131.11(a)). PC 564 at 76. The Environmental Groups argue that the only standard by which economic information may be assessed when designating uses in under the provisions of Factor Six of the UAA. *Id*. The Environmental Groups offer that the Board should construe economic reasonableness in light of UAA Factor Six. *Id*. The Environmental Groups assert that under any interpretation, disinfection is economically reasonable. *Id*.

The Environmental Groups argue that the UAA Factor Six is a stringent standard and has not been met for disinfection. PC 564 at 77. The Environmental Groups note that the USEPA's analysis of the cost of certain types of disinfection determined that the cost per household per month could be $1.94. The analysis showed that , while other types of disinfection might have

higher costs, the increase would not be great. PC 564 at 77-78, citing Exh. 148 at 15. The Environmental Groups argue that while the District has criticized the analysis, the District has not offered a cost analysis demonstrating that the costs would be significantly higher. PC 564 at 78.

The Environmental Groups are undeterred by the District's arguments that the District does not currently have taxing or bonding authority for disinfection. PC 564 at 78. The Environmental Groups note that the District indicated that by 2016, the District will need to approach the legislature for additional levy authority. *Id*. Thus, the Environmental Groups opine that the only consequence of a disinfection requirement is that the District will need to approach the legislature sooner. *Id*.

The Environmental Groups assert that economic reasonableness under Section 27 of the Act (415 ILCS 5/27 (2010)) has been established particularly in view of the USEPA's analysis of costs. PC 564 at 78. The Environmental Groups note that disinfection is "near-universal in the United States" and this fact belies the District's argument that disinfection is economically unreasonable. *Id*.

The Presences of CSOs Does Not Diminish the Need for Disinfection

The Environmental Groups acknowledge that CSOs are one of two sources of waterborne pathogen contamination in the CAWS and LDPR. PC 564 at 79. The Environmental Groups explain that CSOs occur when rainfall events overwhelm the system and occur somewhere in the system around 33 to 65 days per year. *Id*. CSOs are considered point sources and are subject to the CWA. PC 564 at 80. The District has identified the Tunnel and Reservoir Project (TARP) as the long term control plan for CSOs and TARP is expected to reduce the number of CSOs. *Id*. The Environmental Groups opine that TARP and disinfection can occur concurrently to address the two sources of waterborne pathogens. *Id*. The Environmental Groups argue that delays in completion of TARP reflect choices made by the District and are no reason to delay disinfection. *Id*.

The Environmental Groups argue that while CSOs contribute to the contamination of CAWS on some days, undisinfected sewage impacts the CAWS 365 days a year. PC 564 at 81. Thus, the Environmental Groups opine that failure to require disinfection would be a failure to protect designated recreational uses during dry weather. PC 564 at 80-81. The Environmental Groups maintain that the basic principle of the CWA that presence of one pollution source does not excuse the unchecked contribution of another source is recognized by other communities with CSO events. PC 564 at 83. The Environmental Groups offer that these other communities disinfect wastewater regardless of the CSO remediation plans. *Id*.

The Environmental Groups take issue with the Districts characterization and number of days that CAWS is impacted by CSOs. PC 564 at 84. The Environmental Groups note that the District's Microbial Risk Assessment indicated that during the recreation season only 15 percent was "dry weather" while 85 percent was "wet weather". *Id*. The Environmental Groups point out that the District researchers assumed every rain event resulted in three days of "wet weather" but offered no justification for this assumption. *Id*. The Environmental Groups assert that Dr.

Rijal's testimony directly contradicts the findings of the Microbial Risk Assessment as Dr. Rijal testified that based on the District rainfall gauge data, measurable rainfall occurred on about 40 percent of the days. PC 564 at 85. The Environmental Groups acknowledge that Dr. Rijal also testified that "wet weather" days constituted as much as 70 percent of the days. *Id.*

The Environmental Groups argue that the District's estimates of wet weather days are based on faulty assumptions. PC 564 at 85. The first assumption the Environmental Groups take issue with is an assumption that all precipitation has a uniform effect on water quality. *Id.* The Environmental Groups note that Dr. Nemura testified that not every rainfall event is sufficient to cause CSOs. *Id.* The Environmental Groups argue that the threshold amount of rain necessary for a CSO event is 0.5 inches and an examination of the record establishes that the vast majority of measured precipitation events in 2005-2006 were less the 0.5 inches. PC 564 at 85-86. Based on this data, the Environmental Groups opine that "true 'wet weather' events occur much less frequently than the District" has claimed. PC 564 at 86.

A second faulty assumption according to the Environmental Groups is the time that lingering effects of wet weather events should be considered. PC 564 at 86. Specifically, the Environmental Groups opine that several days of lingering effects for each wet weather event is unwarranted. *Id.* The Environmental Groups also offer that a wet weather impact on one portion of the CAWS does not mean that recreation cannot occur on other portion s of the CAWS. *Id.*

A third faulty assumption is the calculation of the impact on a day for day basis. PC 564 at 86. The Environmental Groups argue that simply adding a day to each day that there is precipitation does not account for those periods where there is rain for several days in a row. *Id.* For example, if there is rain for seven consecutive days, only one day should be added for calculating the impact of wet weather. *Id.*

The Environmental Groups argue that the District fails to put forth a consistent estimate of the number of days that wet weather events influence the system in calculating dry weather days as another faulty assumption. PC 564 at 87. The Environmental Groups assert that the "absurd endpoint of these faulty assumptions" is that in one instance, there could be more wet weather days calculated then there are days in the year. *Id.* The Environmental Groups also argue that an assumption of a minimum three-day wet weather effect is not supported by the record. *Id.* The Environmental Groups assert that the information in the record establishes that by the third day measured the geometric mean fecal coliform levels returned to "around" the levels of dry weather geometric means. *Id.*

Energy Used is Not Grounds to Reject Disinfection

The Environmental Groups summarize the District's arguments saying "[i]n a nutshell, the District is asserting that disinfection would do more harm than good because the energy use would cause increased air emissions." PC 564 at 88, citing Exh. 133. The Environmental Groups maintain that this argument makes no sense. PC 564 at 89. The Environmental Groups note that clean air impacts are evaluated under other regulatory provisions and sound policy requires both clean air and clean water. PC 564 at 90. Also, the Environmental Groups opine

that the District's analysis of Greenhouse Gas impacts was flawed and energy efficiency could be improved by the District. PC 564 at 91-94.

Environmental Groups (PC 579)

On January 31, 2011, the Environmental Groups submitted a response to the comments submitted by the District on January 3, 2011 (PC 567). PC 579 at 1. In the response to the District's comments, the Environmental Groups claim that: 1) the District has misinterpreted the health benefits associated with disinfection; 2) the District has erroneously cited federal law, USEPA policy, and Illinois law; and 3) the District has erroneously stated the costs of disinfection.

Health Benefits of Disinfection

The Environmental Groups first claim that the District has misinterpreted the Dr. Gorelick's January 10, 2010 testimony regarding the CHEERS replication. PC 579 at 2. Specifically, the Environmental Groups stress that Dr. Gorelick's statement was that a "similar result" would be any result within the 95 percent confidence bounds. *Id.* Included in these bounds, the Environmental Groups claim is the inclusion of 10 additional illnesses among CAWS recreators versus general use waters recreators. *Id.*

Next the Environmental Groups claim that the District has misinterpreted Dr. Dorevitch's findings regarding handwashing. The Environmental Groups quote the District's Final Comment by stating "The increased incidence of eye symptoms . . . was likely due to lower rates of hand washing among CAWS recreators who ate or drank." The Environmental Groups believe that this assertion contradicts Dr. Dorevitch's supplemental analysis that found that CHEERS participants washed their hands more than general use waters participants. *Id.* at 2. The Environmental Groups believe that this may have led CHEERS to illogically conclude higher level of CAWS eye symptoms were attributable to CAWS users' higher frequency of hand washing. *Id.* at 3.

The Environmental Groups then reiterate that, according to the District's studies, "filtration is largely ineffective as a substitute for disinfection." PC 579 at 3. The Environmental Groups base their claim on the District's study that found that less than 50 percent of fecal coliform is removed by filtration. *Id.*

The Environmental Groups then claim that the District has failed to address the criticisms from the USEPA of the technical studies presented by the District. PC 579 at 4. The Environmental Groups do not evaluate the District's response to the Microbial Risk Assessment. *Id.*

The Environmental Groups further claims that "wet weather" impacts exist for only 24 hours after a CSO event instead of 72 hours. PC 579 at 5. The Environmental Groups claim that the District has confirmed the adjusted assumptions of the Environmental Groups by stating that "a starting point for defining wet conditions may be rainfall greater than 0.1 inches or 0.25

inches in the previous 24 hrs. and CSO event for more than 1 hr. in the previous 24 hrs. [sic]." *Id.* (citing PC 565 Item 1 at 37).

Federal Law, USEPA Policy and Illinois Law

The Environmental Groups claim that the District has ignored the requirements of UAA Factor Six, which dictate the relevant standard when treatment costs may be considered in determining designated uses. PC 579 at 5. In addition, the Environmental Groups argue that, in accordance with UAA Factor Six, water quality standards must protect the "most sensitive uses." *Id.* The Environmental Groups claim that in this case the most sensitive users are children, pregnant women, and wildlife. *Id.*

The Environmental Groups additionally point out that the USEPA's CHEERS comments indicate that there should not be any "flexibility" on the USEPA's 8 illness per 1,000 risk benchmark. PC 579 at 6 (citing PC 561).

The Environmental Groups also believe that the District has misstated Illinois' law regarding "sensitive waters" under 35 Ill. Adm. Code 302.209. PC 570 at 6. The Environmental Groups characterize the test for determining "sensitive waters" as a two-part test. *Id.* According to the Environmental Groups, the test requires "natural characteristics, aesthetic value or significance . . . deserving of protection from pathogenic organisms" and requires that CAWS have physical characteristics to support primary contact or flow through or are adjacent to parks. *Id.* The Environmental Groups conclude that "all waters that support primary contact or flow adjacent to parks or recreational areas have 'natural characteristics, aesthetic value or significance' deserving of protection." *Id.*

Costs of Disinfection

The Environmental Groups opine that the PC 567 contains no meaningful refutation of SAIC's conclusions regarding the costs of disinfection. PC 579 at 7. The Environmental Groups claim that the District has presented no new data to contravene the SAIC report but instead relies upon Dr. Zenz's prefiled testimony. *Id.* The Environmental Groups further claim that the Dr. Zenz's report was submitted to the USEPA prior to the USEPA issuing its final SAIC report, and the conclusions of Dr. Zenz's report supported the conclusions of the SAIC report. *Id.* The Environmental Groups conclude that the Dr. Zenz's testimony confirms the SAIC report's conclusion that filtration "does not appear to be necessary." *Id.* (quoting PC 567 at 24).

The Environmental Groups next claim that the District's estimations for the cost of UV disinfection are slightly inflated. PC 579 at 7. Relying on the conclusions of the SAIC report, the Environmental Groups claim that the costs for UV disinfection would increase the monthly rate by $0.92 per household per month. *Id.* The Environmental Groups acknowledge that this increase in cost would result in a 15 percent increase in the District's fees. *Id.*

The Environmental Groups then claim that the District's calculations for the "present value" costs associated with disinfection conflict with "basic financial principles." PC 579 at 8. According to the Environmental Groups, the District has calculated the "present value costs over

20 years on 3.0 percent interest rate and a 3.0 percent interest rate." *Id.* (citing (Ex. 159)). The Environmental Groups argue that this calculation does not account for the time value of money. *Id., citing* USEPA, *Guidelines for Preparing Economic Analysis*, 6-1 and 6-12 (*available at* http://yosemite.epa.gov/ee/epa/eed.nsf/pages/Guidelines.html). The Environmental Groups instead argue that a real discount rate, one accounting for inflation, should be assumed. *Id.* Additionally, the Environmental Groups suggest that the Office of Management and Budget's suggested 2.7 percent inflation rate for a ten year planning horizon could be used in analyzing the "present value costs" for disinfection. *Id*

Environmental Groups (PC 582)

On February 15, 2011, the Environmental Groups submitted a reply to the District's responses to Comments on the Proposed Effluent Bacteria Standards, filed on January 31, 2011. PC 582 at 1. The Environmental Groups' reply addresses their concerns with the District's argument that the UAA Factor 6 for determining whether control measures required to meet the proposed use designations are too costly and states that UAA Factor 6 should be a part of Subdocket B. *Id.* at 2. The Environmental Groups claim that since the economical feasibility as part of assigning designated use according to 40 C.F.R. § 131.10(g) was excluded in Subdocket A, economical feasibility cannot be excluded in Subdocket B. *Id.* The Environmental Groups also opine that the District has failed to address the issue of economic feasibility in Subdocket A and cannot claim that this issue does not belong in Subdocket B. *Id.* at 3.

The Environmental Groups also opine that the District incorrectly disregards the previous research concerning recreational risk that involves greater exposure levels than the CHEERS study. PC 582 at 4-5. The Environmental Groups further state that there is "an overwhelming scientific consensus both that pathogen indicators, both primary and secondary, are exposure pathways to that risk." *Id.* at 4. The Environmental Groups acknowledge that the District is correct by stating that CAWS users may in some cases have lower exposure levels than recreators studied elsewhere, because CHEERS recreators are cautious about getting wet. *Id.* The Environmental Groups further state that the CHEERS study should not be the sole study that the District relies on for assessing the risks associated with recreating on the CAWS. *Id.*

The Environmental Groups next claim that the District's complaints regarding the Taylor study used by the Environmental Groups' witness, Marylynn Yates, have no merit. PC 582 at 4. The Environmental Groups rely on the Taylor study's inclusion of the risks associated with the norovirus and the heightened risk to anglers to support the Taylor study in favor of the CHEERS research. *Id.* at 5.

The Environmental Groups additionally reiterate that the "validity" of the CHEERS study is not at issue, but rather that CHEERS study may be misused. PC 582 at 5. In response to the District's comments, the Environmental Groups claim that the CHEERS study would not support a Board's decision in favor of not requiring disinfection because of CHEERS's flaws and limitations. *Id.* The Environmental Groups acknowledge that some of the flaws in the CHEERS study are inherent in all epidemiological studies. *Id.* Yet, the Environmental Groups argue that the District should not be able to cite to the general limitations of epidemiological studies as support for disregarding CHEERS's flaws and limitations. *Id.*

The Environmental Groups then acknowledge that USEPA expressly affirmed the applicability of the benchmark dose of 8 illnesses per 1,000 for in the context of the CAWS. PC 582 at 5-6.

The Environmental Groups further claim that the District has glossed over the most significant shortcomings of the CHEERS study, which compared sewage-contaminated waters of the CAWS with sewage-contaminated general use waters. PC 582 at 6. The Environmental Groups claim that this comparison led to the faulty assumption that gastrointestinal illness rates were similar for the CAWS and the general use waters. *Id.* Specifically, the Environmental Groups claim that there are four factors that were not accounted for in the CHEERS study, besides the non-disinfected waste-water treatment plant effluent, which include:

1) the listing of many general use waters on IEPA's 303(d) list as impaired for recreational use,

2) the failure to account for the potential influence of CSOs, wastewater treatment plant s, and CAWS backflows on general use waters sewage contamination levels,

3) the known heavy bacterial contamination at many Lake Michigan beaches, and

4) the failure of CHEERS to address sharp differences in contamination and risk levels within the CAWS and general use waters. *Id.*

According to the Environmental Groups, no significance can be attached to the similar gastrointestinal illness rates found in the CAWS and the general use waters without addressing the presence of "significant sewage contamination" in the general use waters. PC 582 at 7.

The Environmental Groups also opine that since the District has not defended its Microbial Risk Assessment, then the Microbial Risk Assessment should be "accepted at face value." PC 582 at 7. In addition, the Environmental Groups believe that the District has misinterpreted two portions of CHEERS: 1) how the increased hand washing by CAWS users contributes to lower rates of eye infections and 2) the statistical confidence levels and study replication as testified to by Dr. Gorelick. *Id.* at 7-8.

The Environmental Groups also claim that the District effectively acknowledges the possibility of heightened sensitivity of children to infection. PC 582 at 8. The Environmental Groups argue that, although the District asserts that science regarding the sensitivity to children to infection from water recreation is not settled, the District has acknowledged that the USEPA has found children to be more sensitive to infection than the general population. *Id.* The Environmental Groups additionally criticize the District for specifically relying on studies directed towards water recreation while disregarding larger bodies of "settled research" that show that children are more sensitive to infections.

Id. By relying on these data gaps, the Environmental Groups claim that the District should not disregard what is currently known about the heightened sensitivity to infection for 20-25 percent of the population. *Id.*

The Environmental Groups also opine that the District has not addressed multiple flaws in the calculation of the wet weather days. PC 582 at 8. Specifically, the Environmental Groups claim that the District arbitrarily assumes that the wet weather days have a two day influence by CSO discharges. *Id.* The Environmental Groups state that this conclusion contradicts Dr. Dorevitch and others "that the lingering influence of CSOs is generally about 24 hours." *Id.* at 9.

The Environmental Groups also caution against the District from relying on a potential development of instream recreational water quality standards. PC 582 at 9. The Environmental Groups claim that no timeline exists for achieving these standards based upon the USEPA not setting a deadline for completing its research. *Id.* Additionally, the Environmental Groups ask the District to include in its rationale the additional time needed for the IEPA to conduct a rulemaking based upon the research. *Id.*

The Environmental Groups also acknowledge that the District will need to go to the legislature by 2016 to obtain "additional levy authority," so increased funding will be needed with or without disinfection. PC 582 at 9. The Environmental Groups finally claim that the estimated costs associated with the nutrient removal are badly inflated. According to the Environmental Groups, the nutrient removal costs are not supported by the USEPA's *Municipal Nutrient Removal Technologies Reference Document. Id.* at 10.

Environmental Groups (PC 973)

On June 6, 2011, the Environmental Groups filed a comment in response to the Board's proposed second notice opinion and order in Subdocket A (Water Quality Standards and Effluent Limitations for the Chicago Area Waterway System and Lower Des Plaines River: Proposed Amendments To 35 ILL. Adm. Code 301, 302, 303, and 304, R08-9 (A) (June 2, 2011). The Board docketed the comment in Subdocket B as well because the Environmental Groups specifically addressed water quality standards. *See* PC 973. The Environmental Groups note that in Subdocket B, questions regarding the impact of the Primary Contact use designations will need to be addressed. PC 973 at 1-2. Those questions include:

1) whether disinfection at the Stickney wastewater treatment plant should occur on a different timetable from disinfection at the North Side and Calumet plants, and

2) whether the incidental contact waters require different ambient criteria than the primary contact waters, and, if so, how and when those incidental contact criteria should be derived. PC 973 at 2.

USEPA (PC 561)

USEPA highlights two key findings and offers four concerns related to CHEERS. The key findings identified by USEPA include: 1) that the estimated gastrointestinal illness rate for CAWS users (13 illnesses per 1000 users) is greater than USEPA's recommendation for users in fresh waters (8-10 illness per 1000 users); and 2) that increased rates of self-reported water exposure correlated with higher gastrointestinal illness rates. PC 561 at 1.

USEPA states that concerns about CHEERS previously raised by peer reviewers but not sufficiently addressed in the final CHEERS report, include: 1) flawed comparison of CAWS to general use waters; and 2) use of an inadequate stool sample design. PC 561 at 2-3. In addition, USEPA says that the authors of CHEERS failed to provide a clear discussion of the differences among the different subgroups. PC 561 at 3. USEPA expresses concern that the observed risk levels identified by CHEERS do not "represent the full or future level of health risk to recreators in the CAWS." PC 561 at 2.

USEPA states that CHEERS failed to address peer reviewers' concerns about the usefulness of comparing the illness rates between users of CAWS and general use waters. PC 561 at 2. According to USEPA, this comparison had four primary flaws. The first flaw is the fact that the water in the general use waters classifications may be impacted by fecal contamination, rendering these waters unfit to serve as a reference population with CAWS. *Id.* In addition, the USEPA claims that CHEERS failed to adequately report what the "relative fecal source attributions were for each day of the epidemiological study." This, in turn, compromised CHEERS's ability to compare the level of human-infectious pathogen differences between the two sites. *Id*. Third, CHEERS had a 20 percent chance of making a false-negative error, which, combined with the fact that both sites were polluted by sewage, may have led to a false conclusion that there was no difference in health effect between the two groups. *Id*. Finally, the comparison between the two groups was also limited by several differences between the populations, including the duration and type of activities, the users' self-reporting habits, and precautions taken by recreators. *Id*.

USEPA also states that CHEERS failed to answer peer reviewers' concerns about CHEERS's use of an inadequate stool sample design. PC 561 at 3. Specifically, the USEPA claims that the stool sample design used in CHEERS was "very likely not to identify an etiological agent." *Id*. While CHEERS's analysis of pathogens found in stool samples of users of both waterways revealed that recreational use of CAWS was not associated with gastrointestinal illness, the USEPA believes that this is an "overstatement of the stool sample results" because of "concerns about this portion of CHEERS's design and methods." *Id*.

USEPA asks for a more extensive discussion of the differences among the subgroups in CHEERS. *Id.* USEPA says the report includes contradictory results, including its finding that fishers and boaters, who would seem to have the lowest rates of water exposure, have the highest rates of gastrointestinal illnesses, which seems to contradict the reality that water exposure clearly links to illness. *Id*. As a result of such findings, USEPA requests a more clear discussion of how the weaknesses of the analyses affect the interpretation of their results, and also requests

a supplemental report describing analyses that were completed after the USEPA received the initial report. *Id*.

Finally, USEPA expresses concern that the observed risk levels in CHEERS do not "represent the full or future level of health risk to recreators in the CAWS." PC 561 at 2. USEPA says that several factors may have led to an understatement of the CAWS risk levels. *Id*. For example, the illness rates were reported from 2007-2009, when authorities aggressively warned CAWS users to avoid contact with the water. *Id*. In addition, USEPA says that the number of users, the intensity of their use, and the level of precautions they take could rise dramatically in the future. *Id*. Further, CHEERS did not include activities that occur in CAWS like swimming, jet skiing, and waterskiing. *Id*.

USEPA (PC 580)

USEPA expressed concerns about the methodology used in CHEERS. *See* PC 561. Members of the CHEERS research team and representatives from the District responded to USEPA's comments. *See* PC 562 and PC 565. Specifically, in response to comments by Dr. Dorevitch that CHEERS was not intended to speculate about future risks, USEPA reiterates concerns that CHEERS did not study the effects of activities that sometimes occur in the CAWS. PC 580 at 1, *citing* PC 562. Those activities include swimming, wading, and jet skiing. *Id*. USEPA did, however, concede that CHEERS had a limited scope. *Id*.

Next, USEPA responds to Dr. Dorevitch's statement that "elevated levels of fecal bacteria do not . . . imply human fecal contamination," and thus USEPA's concerns about fecal contamination in general use waters were unfounded. PC 580 at 1, *citing* PC 562. USEPA notes that several indicators seen in CHEERS results, including concentrations of fecal bacteria, human enteric viruses, and protozoa pathogens, suggest that general use waters "suffer from fecal contamination." PC 580 at 1. In addition, USEPA observes that existing point source discharges, CSOs, and annual backflows of water from CAWS are all "potential sources of human fecal contamination to general use waters." PC 580 at 2. Thus, USEPA believes "comparing rates" between CAWS and general use waters users is not "entirely reasonable". PC 580 at 2, *citing* PC 562.

USEPA then answers Dr Dorevitch's claim that no epidemiological studies have attributed fecal pollution each day to different sources, which was a response to USEPA's suggestion that the absence of this data was a weakness of CHEERS. PC 580 at 2. USEPA states that previous studies have, in fact, "investigated the influence of prior rainfall events, bather densities, etc." to determine periods of specific fecal sources. *Id*. Where CHEERS does attempt to study source attribution information for general use waters, CHEERS failed to adequately consider the influence of CAWS backflows, CSOs, and wastewater treatment plants. PC 580 at 3.

USEPA criticizes the researchers' hypothesis that human bathers contribute human pathogens to Lake Michigan beaches, stating that periodic backflows from CAWS containing local wastewater are a likelier culprit. *Id*. Also, the presence of fecal indicators, enteric viruses, and higher counts of Giardia cysts than Cryptosporidium oocysts in the general use waters "all

likely adds up to a sewage-impacted waterway." PC 580 at 3. USEPA states that the "sewage impact" at both CAWS and general use waters sites, viewed in light of previous studies finding about 11 illnesses per 1,000 recreators in sewage-impacted waters, suggest that the CHEERS results "seem consistent with sewage-impact at both sites." PC 580 at 4.

USEPA challenges Dr. Dorevitch's claim that CHEERS's adjustment for 22 potential differences between the population of CAWS and general use waters users sufficiently supported the validity of comparisons between the two groups. PC 580 at 4, *citing* PC 562. USEPA states these 22 potential differences were not useful, "[g]iven the weight of evidence for sewage impact into general use waters sites." PC 580 at 4.

USEPA responds to Dr. Dorevitch's statement that USEPA's concerns about CHEERS's stool sample design were unclear, specifically USEPA's suggestion that the CHEERS sample tactics were unlikely to identify an etiologic agent. PC 580 at 4, *citing* PC 562. USEPA states that, while the "array of tests was good," not enough samples were collected "given the rate of infection and the likelihood of stool detection from such samples when compared to the expected background in the unexposed community." PC 580 at 5. USEPA cites the absence of *norovirus*, which appears in 1 to 10 percent of typical community samples, in the CHEERS results as evidence that CHEERS needed a larger number of stool samples to have adequate statistical power. *Id*. As no CHEERS samples tested positive for Norovirus, USEPA states "it is extremely unlikely for the design to be able to link water recreation to increased incidence of pathogens in the stool of recreators." *Id*.

While Dr. Dorevitch hypothesized that high rates of gastrointestinal illnesses among fishers and boaters were possibly attributable to the handling and ingestion of fish and the consumption of food and alcohol on boats, EPA believes that more work should be done before determining why fishers and boaters have higher rates of gastrointestinal illnesses. *Id*.

Finally, in response to Public Comment 565, USEPA states that the District's cost estimates for municipal nutrient removal processes at its wastewater treatment plant s were "substantially higher" than the costs per unit of treated wastewater detailed in ten different USEPA case studies. PC 580 at 6. USEPA asks the Board to take into account its document that details these cost estimates, titled *Municipal Nutrient Removal Technologies Reference Document*. *Id*.

USEPA (PC 584)

On May 16, 2011, the Board received a copy of a letter dated May 11, 2011, from Nancy K. Stoner, USEPA's Acting Assistant Administrator for Water addressed to Lisa Bonnet, Interim Director of IEPA. PC 584. The letter states that USEPA is "choosing to exercise" USEPA's discretion under Section 303(c)(4)(B) of the CWA to require specific use designations for several segments of the CAWS. PC 584 at 1-2. USEPA explains that under Section 303(c)(4)(B), the Administrator may require revised standards to meet the provisions of the CWA even if the State does not provide a submission. PC 584 at 2-3. USEPA notes that the authority is discretionary and resides exclusively with the Administrator, unless delegated. In this instance, the authority has been delegated to Ms. Stoner. PC 586 at 3.

Specifically, USEPA determined that revised use designations that allow for recreation on and in the water (swimmable) are necessary for segments of the CAWS. PC 586 at 2. USEPA further determined that "Illinois is required to revise its standards" and that "water quality criteria to protect recreation in and on the water are necessary" for the segments. *Id*.

USEPA states that over the past 25 years CAWS "has been transformed into a valuable recreational asset that citizens increasingly use for boating, canoeing, kayaking, jet and water skiing, tubing and swimming." PC 584 at 1. USEPA opines that Illinois is "long overdue" for updating of water quality standards. USEPA has determined that new or revised water quality standards that protect recreation on and in the water (swimmable) are necessary for the segments of the CAWS listed above. *Id*. USEPA states that Illinois is expected to adopt water quality standards consistent with this determination "expeditiously" and if Illinois does not do so then USEPA will. *Id*.

USEPA notes that Section 101(a)(2) of the CWA provides for a national interim goal of achieving by July 1, 1983, "water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water *wherever attainable*." PC 584 at 3 (emphasis in original), citing Section 101(a)(2) of the CWA. Under the rules implementing the CWA, waters that meet the CWA goal of fishable/swimmable must be protected unless those uses are shown to be unattainable based on a UAA. PC 584, citing 40 C.F.R. § 131.10. USEPA states that unless a State determines that fishable/swimmable is not attainable, the water must be designated and protected for those uses. *Id*. States are also required to review the water body segments every three years. PC 584, citing 40 C.F.R. § 131.20(a).

USEPA describes the history of the adoption of the Secondary Contact Waters designations from the Board's first notice opinion and order. PC 584 at 3-4, citing Water Quality Standards and Effluent Limitations for the Chicago Area Waterway System and Lower Des Plaines River: Proposed Amendments To 35 ILL. Adm. Code 301, 302, 303, and 304, R08-9(A) slip op. at 9 (Aug. 5, 2010). USEPA goes on to explain that when USEPA approved Illinois' revisions to the water quality standards to remove existing fecal coliform standards for Secondary Contact Waters, USEPA stated:

> Primary contact activities are likewise inappropriate due to limited access and danger associated with heavy navigation as well as general aesthetic constraints. USEPA approval of elimination of bacterial indicator water quality standards for Secondary Contact waters supports the elimination of this use. PC 584 at 4.

USEPA then approved Illinois' 1985 decision to retain Secondary Contact use designations for the CAWS, and as a result, the District stopped disinfecting certain discharges to the CAWS. *Id*.

USEPA acknowledges that IEPA's UAA work and proposal to the Board as well as the Board's proceeding. PC 584 at 5. USEPA opines that the information gathered during the IEPA's UAA work and the Board's proceeding indicate that recreation in and on the water is now attainable for those segments.

USEPA notes that the cost of constructing measures to insure water quality levels protective of recreation on and in the waters was not a factor cited by IEPA in 1985. PC 584 at 8. USEPA agrees that, while the record contains evidence regarding disinfection, no one has cited this as a reason for not being able to attain the recreational use of swimmable. *Id*. The USEPA further notes that there is a great deal of evidence regarding cost of disinfecting from the North Side and Calumet Water Reclamation Plants and completing TARP, but again no one has relied on this as a reason for not adopting the recreational use of swimmable. *Id*.

USEPA states that "[i]t is worth noting" that the District has "an enormous service population" and is better able to absorb substantial construction and operation costs than smaller service populations. PC 584 at 8. The USEPA points out that the District ranks as one of the lowest cost providers of wastewater treatment in the nation. *Id*. USEPA cites to the District's own information that a home worth $267,000 pays $222 per year in property taxes for sewer services and notes this is well below the average annual sewer rates paid by residents of many other municipalities. *Id*.

USEPA acknowledges that the District will need time to construct disinfection facilities and to complete TARP. PC 584 at 8. USEPA indicates that allowing time to comply with water quality standards may be done through the National Pollutant Discharge Elimination System Permits (NPDES). *Id*. The USEPA offers that NPDES permits could include compliance schedules for construction of disinfection facilities and the completion of TARP. *Id*.

To place costs into perspective, USEPA provided a "Summary of Annual Sewer Rates for Selected Cities"[5] (Sewer Rate Summary) for comparison. PC 584 at 8. Summary information for the Region 5 States is presented in the table below. USEPA indicated that these rates also reflect costs associated with long term remedial plans to address combined sewer overflow and sanitary sewer overflow problems. Sewer Rate Summary at 2.

Average Annual Residential Sewer Charges per Household for Selected Cities in USEPA Region 5

Municipality	**Current Average Annual Residential Sewer Charge per Household**
Chicago (MWRDGC)	$222
Indianapolis, IN	$215
Hamilton County, OH	$612
Cleveland, OH	$400
Columbus, OH	$471
Ft. Wayne, IN	$279
State of Ohio	$514

PC 584 at 8, Sewer Rate Summary at 8.

[5] USEPA's "Summary of Annual Sewer Rates for Selected Cities" is available from USEPA at http://www.epa.gov/region5/chicagoriver/pdf/annual_sewer_rate_updated20110519.pdf

USEPA noted that the District's currently ranks among the lowest of cost providers for wastewater treatment in the United States based on a the District's August 14, 2009 quoting Fitch Rating Report. PC584 at 8. USEPA refers to a District press release that indicates that a resident of a house valued at $267,000 (the average in Cook County) pays $222 per year in property taxes for sewer services. USEPA notes that this is "well below the average annual sewer rates paid by residents of many other municipalities." PC 584 at 8. USEPA commented that the District's service population is "enormous", greater than 5 million people, and as such has a better ability to absorb the substantial construction and operation costs than a smaller community. PC 584 at 8.

To assess the impact UV disinfection costs on property taxes, USEPA conducted its own analysis. Based on the District's cost estimates for UV disinfection at all three water reclamation plants, USEPA pared down the costs to only the North Side and Calumet water reclamation plants. UV disinfection costs without and with filtration represented 44.4 percent and 41.2 percent of the total cost for all three water reclamation plants, respectively. Sewer Rate Summary at 4. Using these percentages, USEPA then calculated the resulting percent increase in property taxes as a fraction of the District's estimated increase for all three water reclamation plants as 6.7 percent and 16.5 percent for UV disinfection without and with filtration. USEPA estimated the average residential increase in property taxes for UV disinfection without and with filtration would range from $15.74 to $38.77 per year, respectively. Sewer Rate Summary at 5.

USEPA also estimated the additional increase in property taxes to fully fund TARP, which accounts for an additional $355 million in construction costs. To fully fund TARP, USEPA calculated the average residential increase in property taxes would be an additional $40.05 per year on top of the tax increase for disinfection. Sewer Rate Summary at 5.

USEPA (PC 994)

On June 8, 2011, USEPA filed a comment in response to the Board's proposed second notice opinion and order in Subdocket A (Water Quality Standards and Effluent Limitations for the Chicago Area Waterway System and Lower Des Plaines River: Proposed Amendments To 35 ILL. Adm. Code 301, 302, 303, and 304, R08-9 (A) (June 2, 2011). The Board docketed the comment in Subdocket B as well because USEPA specifically addressed water quality standards. *See* PC 994. USEPA commended the Board for taking prompt action to designate segments of the CAWS for recreation on and in the water (swimmable). PC 994. USEPA stated:

> US EPA also recommends that the Board clarify in its second notice opinion, order and rule that Illinois' existing, federally-approved fecal coliform criteria for protection of primary contact recreation, 35 Ill. Adm. Code 302.209, apply to these five segments.
>
> The issues raised in US EPA's May 11, 2011 letter will be adequately addressed if the Board adopts a formal rule by August 27, 2011 that: (1) establishes a Primary Contact Recreation use designation for the five segments identified in the

determination letter; and (2) clarifies that existing Illinois fecal coliform criteria are applicable to that use designation. PC 994.

District (PC 565)

Effect of Rainfall and CSOs on Microbial Quality of CAWS (Item 1)

The District filed a report entitled "Rainfall and Combined Sewer Overflow Effects on Microbial Water Quality in the Chicago Waterways: A Technical Report" as a part of the information filed in response to Board questions. PC 565, Item 1. The objective of the study was to "use linear models to explore the ability of data-driven statistical models, which aim for the optimum statistical prediction of microbial concentrations, and conceptually-driven statistical models, which utilize explanatory variables that can be readily monitored in real time, to explain changes in microbial concentration in the CAWS associated with rainfall and CSO events." PC 565, Item 1 at 6.

The report states that statistical models were developed from both data-driven and conceptually-driven approaches. In both approaches linear mixed effects models were ultimately used with location as a random effect on intercept. PC 565, Item 1 at 35. This approach, the report notes allows "variability in microbe concentrations between locations in the CAWS to be included in the statistical models without inflating the number of variables, and thereby decreasing the efficiency and power." *Id.*

The data driven model results indicate that the models of *E. coli*, enterococci, and Giardia cyst performed moderately with correlation coefficient (R^2) in the range of 0.5 to 0.55. PC 565, Item 1 at 35-36. The models of somatic coliphages and male-specific coliphages performed well with R^2 in the range of 0.7 to 0.75. *Id. at 36.* However, the models for *cryptosporidium* oocysts concentrations performed poorly with a R^2 less than 0.33, indicating that the models do not have reliable predictive power. *Id.* The report notes that the data-driven models have numerous variables with different units, and have different direction for their effects. These factors hinder the interpretation of rainfall and CSO effects in the CAWS. *Id.* at 37. The report concludes that data-driven models are more suitable for predicting microbe concentrations, as indicated by lower R^2 and lower random effect standard deviation.

The report notes that the conceptually driven models for all microbes indicate that rainfall in the 24 hours prior to sample collection is associated with increased microbe concentrations. CHEERS found variation between microbes when looking at the effect of more distant rainfall, *i.e.* greater than 24 hours. Similar results were observed with CSO events and microbe concentrations. PC 565, Item 1 at 37. The report states that conceptually driven models show that the concentrations of indicator microbes and Giardia differ in the CAWS under "wet" and "dry" weather conditions. The model results suggest defining the wet weather starting point as rainfall greater than 0.1or 0.25 inches in the previous 24 hours and CSO event for more than 1 hour in the previous 24 hours. However, the report notes that further model development would be necessary to optimize selection of thresholds and time-frames to meet specific policy objectives for microbial water quality. *Id.*

Status of New or Revised USEPA Recreational Water Quality Criteria (Item 3)

The District indicated that USEPA is currently evaluating development of new or revised recreational criteria for coastal waters. PC 565, Item 3 at 1. USEPA is planning to publish new or revised recreational water quality criteria by October 2012 in accordance with a Consent Decree[6] and Settlement Agreement[7] that address coastal recreational waters.

The District noted that USEPA has not formally indicated if these new or revised recreational water quality criteria will apply to inland waters like the CAWS. PC 565, Item 3 at 1. However, USEPA is evaluating the ability to apply data from the epidemiological studies it has done in the fresh waters of Great Lakes to inland waters. PC 565, Item 3 at 1, PC 568 Exh. C. Such epidemiological studies were done as a part of the NEEAR water study. PC 565, Item 3 at 1.

Based on a November 2010 USEPA report entitled "Applicability of Great Lakes NEEAR Dataset to Inland Recreational Water Criteria: Summary of Key Studies", USEPA evaluated whether additional studies, such as an epidemiological study or quantitative microbial risk assessment, would be needed to apply the coastal criteria to inland waters. After reviewing 13 reports and publications, USEPA does not appear to think that new studies are needed, although researchers and stakeholders have expressed concerns that inland waters differ significantly from coastal waters. PC565, Item 3 at 1. USEPA's November 2010 report states, "data and relationships from the Great Lakes waters studies, which are affected primarily by POTWs, can be applied to inland waters that are also affected primarily by POTW effluents." PC 565, Item 3 at 2.

As for development of criteria for secondary contact, the District notes USEPA has not addressed this issue in USEPA's work on the new recreational water quality criteria. PC 565, Item 3 at 1. USEPA has not established formal guidance for setting water quality standards for secondary contact, and has not indicated any guidance will be forthcoming. PC565 at 2. The District notes that USEPA's focus has been on developing rapid indicators and epidemiological-microbiological studies, along with tools, such as the quantitative microbial risk assessment and sanitary survey. However, USEPA has not stated that these studies and tools could not be used to establish secondary contact criteria. PC 565, Item 3 at 3.

USEPA's current guidance (1986) and November 2010 report provides flexibility for States to consider local conditions, such as wet weather, epidemiological studies, microbial risk assessments, and sanitary surveys in setting primary contact water quality standards. USEPA also indicated, "[US]EPA is working to identify and develop tools to assist with development of

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[6] National Resources Defense Council, County of Los Angeles and Los Angeles County Flood Control District, and National Association of Clean Water Agencies v. USEPA, Filed 9-4-2008. Case No. CV06-4843 PSG (JTLx)

[7] Settlement Agreement between USEPA, National Resources Defense Council, County of Los Angeles and Los Angeles County Flood Control District, and National Association of Clean Water Agencies. Case 2:06-cv-04843-PSG-JTL. Filed 8-8-2008.

site-specific criteria by states" that "would allow for development of alternative criteria value as long as same level of risk is achieved". PC565, Item 3 at 1-2 and "Stakeholder Webinar on EPA's Development of New or Revised Recreation Water Quality Criteria, October 12, 2010 at 48.

As for secondary contact, a report from USEPA's experts' workshop indicated the same approach could be used for waters designated as secondary contact as used for primary contact.[8] PC 565, Item 3 at 3. This means that epidemiologically-based health data could be used to define acceptable exposure limits. Quantitative microbial risk assessment could also be used for these purposes to supplement available epidemiological information. *Id*.

For secondary contact, USEPA has approved both narrative and numeric criteria in the past. States with narrative secondary contact criteria include Oklahoma and Rhode Island. USEPA has also approved numeric criteria (geometric mean) for Ohio, Kansas, and Missouri up to nine times greater than the primary contact water quality standard. PC 565, Item 3 at 3.

Effect of Nutrient Removal on Effluent Bacteria Levels (Items 7A & 7B)

At the Board's request, the District provided information on the effect of nutrient reduction efforts on effluent bacteria levels. 10/20/10Tr. at 23. The District responded by providing information on nutrient reduction studies performed at the District's own John E. Egan and Hanover Park water reclamation plants as well as studies performed at other locations. PC 565, Item 7F.

The District explained that the nutrient removal process in its full-scale study on phosphorus reduction at the Egan water reclamation plant involved adding ferric chloride ($FeCl_3$) and then removing the nutrients in fine particulate form through filtration. PC 565, Item 7F. Water reclamation plants in other studies used chemical phosphorus (P) removal, biological nitrogen (N) removal, N and P removal, and conventional activated sludge process. In each study, filtration was also used. Additionally, the studies were all conducted during seasons when no disinfection was required.

For each study, bacterial indicators and/or pathogens were measured before and after the water reclamation plant filters. Bacterial indicators studied included fecal coliform, *E. coli*, enterococci while pathogens included coliphage, enterovirus, *Giardia*, *Cryptosporidium*. According to the studies, the District noted that the average removal rate of fecal coliform ranged from 60 percent to 98 percent in systems using chemical P removal or N and P removal, each followed by filtration. PC 565, Item 7F. In addition to fecal coliform, removal of pathogens during nutrient removal was also observed. PC565, Item 7F.

[8] USEPA. 2007. Report of the Experts Scientific Workshop on Critical Research Needs for the Development of New or Revised Recreational Water Quality Criteria. Proceedings from Workshop at the Airlie Center, Warrenton, VA. March 26-30, 2007. Office of Water, Office of Research and Development, June 15, 2007.

The District noted that the studies show that removal rates of indicator microorganisms are influenced by many design and operational factors. PC 565, Item 7A. The District emphasized that "installation of nutrient controls would be expected to result in substantial reductions in effluent bacteria levels, without the need to incur additional costs for disinfection systems." PC 565, Item 9.

Regarding a timeframe to design and construct nutrient removal facilities, the District developed a 10-year schedule. The District emphasized the need for initial pilot-scale testing to identify the appropriate process and develop design criteria due to the unprecedented large scale of such facilities at each of the three District water reclamation plants. PC #565, Item 7B.

UV Disinfection Costs (Items 7B 7D, 7E & 9)

The District pointed out that "installation of nutrient controls would be expected to result in substantial reductions in effluent bacteria levels, without the need to incur additional costs for disinfection systems." PC 565, Item 9. Nutrient removal costs alone are expected to range from $2.7 to $4.7 billion in capital costs for the District's three water reclamation plants, with a corresponding *ad valorem* property tax increase of 88 to 182 percent. PC 565, Item 6, 7B, 7D.

The District also presented probable costs of UV disinfection with and without tertiary filtration at the North Side, Stickney, and Calumet water reclamation plants. PC 565, Item 7D at 8. The total costs in present worth for each facility are: 1) the North Side water reclamation plant with filtration is $379 million and without filtration is $206.8 million; 2) Calumet water reclamation plant with filtration is $448 million and without filtration is $201.6 million; 3) Stickney water reclamation plant with filtration is $1,326 million and without filtration is $511.2 million. *Id*.

As to funding sources, the District indicated that funds for the District's operations are generated through the following mechanisms: *ad valorum* property tax, personal property replacement tax, user charges, interest income, and other miscellaneous fees and charges. PC 565, Item 7E at 3. The District indicated some disinfection projects might be eligible under the State Revolving Fund (SRF) program, but the State's funding is limited. If SRF funding were available for disinfection and/or nutrient removal, the District indicates that funding would be in lieu of funding for currently planned projects. PC 565, Item 7C. The District would need to drop currently planned projects in order to fund disinfection. PC 565, Item 7D at 1.

Property Tax and User Rate Increases (Items 5, 7D & 7E)

Tax Increase. The District published a brochure entitled "[t]he Disinfection Debate, Understanding the science and facts about effluent disinfection and the Chicago Area Waterway System". Exh. 414, 10/20/10Tr. at 16-17. Referring to implementation of UV disinfection technology (without filtration) at the District's three water reclamation plants, the brochure states that to implement IEPA's proposal for disinfection,

> [Property] Taxes paid to the MWRD would increase by approximately 15 percent to cover the cost of disinfecting effluent . . .. It would cost about $500 million to construct the disinfection facilities, and annual operations and maintenance would be another $25 million per year. These costs would result in an estimated 15 percent increase in the MWRD component of Cook County property taxes. Nearly two thirds of this increase (10 percent) for the capital cost would remain for 30 years until bonds were paid off. The remaining third (5 percent) increase for annual operations and maintenance would remain in perpetuity, and perhaps increase with inflation. Exh. 414 at 9.

For the additional costs to taxpayers, the District provided a breakdown. Based on the 2009 tax rate, the costs of UV disinfection would increase the tax rate approximately 3.98 cents per $100 of Equalized Assessed Value to a total of 29.99 cents, representing a 15.3 percent increase. PC 565, Item 5.

If the District determined filtration would be necessary for effective UV disinfection, the District estimated it would cost about $1.6 billion to construct disinfection facilities with UV disinfection and filtration. The breakdown showed an increase of 10.76 cents per $100 of Equalized Assessed Value to a total of 37.57 cents, representing a 40.1 percent increase. PC 565, Item 7D.

User Charge Rate Increase. For users who do not pay an "*ad valorem* tax", the District also addressed the increase in user charge rates that would apply if UV disinfection (without filtration) were implemented. User charge rates apply to Industrial Users and Tax Exempt Users who pay no *ad valorem* tax and all federal, state, and local government users, excluding publicly owned facilities discharging solely domestic waste. PC565, Item 6 at 1. The District noted that user charge rates cannot be used to recover initial capital costs, so rates are only based on operation, maintenance, and replacement costs.

To place the potential increase for disinfection into perspective, the District addressed the increases for disinfection in combination with other requirements currently being considered in this rulemaking (dissolved oxygen) and in future anticipated rulemakings (nutrient removal). The District estimated property tax increases to be 15 to 40 percent for UV disinfection with and without filtration and another 88 to 182 percent for nutrient removal, or 115 to 209 percent for UV disinfection, nutrient removal and DO control together. PC 565, Item 6, 7D. Corresponding increases in user charge rates would be 8 to 10 percent for UV disinfection without and with filtration, and another 52 to 135 percent for nutrient removal, or 61 to 146 percent for UV disinfection, nutrient removal and DO control together. PC 565, Item 6, 7D, PC 567 at 26.

Tax and Bond Caps. Money to fund the District operations is generated through the following mechanisms: ad valorum property tax, personal property replacement tax, user charges, interest income, and other miscellaneous fees and charges. Of these, the main source of operating funds is the *ad valorem* property tax. PC 565, Item 7E at 3. Currently, the District is subject to a tax cap that limits increases in the aggregate tax levy to the lesser of 5 percent or the change in the national consumer price index plus allowable increases for new property. PC 565, Item 7E at 4. The District explained that aggregate levy is the total levy of all funds except the

Bond Redemption and Interest Fund and Stormwater Management Fund. PC 565, Item 7E at 3-4, Exh. 159 at 3. Further, the District notes that in 2010 the Illinois General Assembly passed legislation limiting the amount of non-referendum bonds the District can issue to $150 million per budget year (plus authorized but unissued bonds during the previous three budget years) through December 2024. PC 565, Item 7E at 3.

District's Alternate Proposal (Items 8 & 9)

Based on CHEERS Supplement (PC 556), the District proposed an alternative to IEPA's proposed effluent standard. The District noted that CHEERS Supplement found no relationship between levels of bacterial indicators and risk of illness in the CAWS. CHEERS supplement found that although microbe concentrations were higher in CAWS than in general use waters, the risk of gastrointestinal illness attributable to limited contact type activities was nearly the same in CAWS as in general use waters. [9] PC 556 at iii, PC 478 at II-45. Based on the lack of a relationship, the District found no technical basis on which to develop numeric water quality standards for recreational uses. However, to ensure recreational uses continue to be protected, the District proposed narrative standards. PC 565, Item 8, PC 583 at 23-24.

The District's proposal would require dischargers to comply with all provisions in their NPDES permits, including advanced treatment systems currently specified in permits. The proposal would also provide a specific provision for wet-weather sources, including CSOs and municipal separate storm sewer systems (MS4s). Without a wet-weather provision during and following times that wet weather sources are discharging, the District states that applicable uses and criteria may not be attained. The District suggested the appropriate time period for application of wet-weather provisions would be 72 hours after the conclusion of the wet-weather event based on CHEERS Interim Technical Report (PC 300 at 17-18) and Dr. Rijal's report (Exh. 113, Attach.5 at 25-32.) PC 565, Item 8, 10.

The District notes that with its alternative proposal, there would be no costs associated with installation of disinfection systems at the District's water reclamation plants. However, provisions of the proposed narrative criteria would incorporate substantial capital and operation/maintenance costs associated with existing requirements that are incorporated into the alternative proposal, including TARP. PC 565, Item 9. The District proposes the following narrative standards:

Section 302.401 Scope and Applicability

Subpart D contains the Chicago Area Waterway System and Lower Des Plaines River water quality ~~secondary contact and indigenous aquatic life~~ standards. These must be met only by ~~certain~~ waters specifically designated in Part 303. The Subpart B general use and Subpart C public water supply standards of this Part do not apply to waters described in 35 Ill. Adm. Code 303.204 and listed in 35 Ill. Adm. Code 303.220 through 303.237 as

[9] Microbes analyzed included *E. coli,* enterococci, somatic coliphages, and male-specific coliphages.

the Chicago Area Waterway System or Lower Des Plaines River ~~designated for secondary contact and indigenous aquatic life (Section 303.204)~~.

Section 302.403 Pathogen Indicators ~~Unnatural Sludge~~

For Incidental Contact Recreation waters and Non-Contact Recreation waters, pathogen indicator levels shall not result in impairment of the applicable designated uses. To ensure compliance with this requirement, NPDES permittees discharging to or upstream of these waters shall comply with applicable requirements in their permits, including but not limited to Suspended Solids (SS) effluent limitations and operation and maintenance requirements. During and after wet-weather events, a wet-weather limited use designation shall apply instead of the otherwise applicable designated uses, and the following water quality-based requirements shall apply:

(1) Combined sewer overflow (CSO) discharges shall comply with the provisions of the approved CSO Long-Term Control Plan, as incorporated into the applicable NPDES permits; and
(2) Municipal separate storm sewer (MS4) discharges shall comply with best management practices (BMPs) and other requirements of the applicable NPDES permits.

The otherwise applicable designated uses and related narrative criteria shall apply again 72 hours after cessation of CSO and MS4 discharges that result from the wet-weather event.

~~Waters subject to this subpart shall be free from unnatural sludge or bottom deposits, floating debris, visible oil, odor, unnatural plant or algal growth, or unnatural color or turbidity.~~ PC 565, Item 8.

TARP Status (Item 11).

The District provided a status report on the Tunnel and Reservoir Plan (TARP) completion. By way of background, the District explained TARP's main goals are to protect Lake Michigan as the region's drinking water supply and to reduce street and basement sewage backup flooding. TARP covers a 375 square mile combined sewer area consisting of Chicago and 51 suburbs. TARP consists of two main phases. TARP Phase I is primarily for pollution control, capturing about 85 percent of the CSO pollution from the TARP service area for later treatment. TARP Phase I consists of 109.4 miles of deep, large diameter rock tunnels. Construction of TARP Phase I was completed in 2006, and the entire system is now in operation. TARP Phase II consists of three reservoirs: Thornton Reservoir, McCook Reservoir, and Gloria Alitto Majewski Reservoir (previously the O'Hare CUP Reservoir). PC 565, Item 11.

According to the District's TARP Status Update, "[t]he TARP System [serving CAWS and LDPR] will be completed when the Thornton Composite Reservoir and the McCook Reservoir Stages 1 and 2 are operational. The Thornton Composite Reservoir is estimated to be

completed in 2015, and Stages 1 and 2 of the McCook Reservoir are estimated to be completed n 2017 and 2029, respectively." PC 565, Item 11. When completed, the Thornton Reservoir will provide 7.9 billion gallons of storage, including 3.1 billion gallons for overbank flood relief. The McCook Reservoir Stage 1 will provide 3.5 billion gallons of storage, and Stage 2 (which was expanded and replaced the previously planned third stage) will hold 6.5 billion gallons. PC 565, Item 11.

Acceptable Risk Levels For Primary Contact Recreation (Item 12)

To provide a better understanding of USEPA's development of recreational water quality criteria over the years, the District summarized the studies on which USEPA relied and the rates of illness considered acceptable.

Originally in 1968, USEPA relied on epidemiological studies done in the 1940s and 1950s at three fresh water beaches, a swimming pool, and an ocean beach. A technical advisory committee[10] evaluated the studies and found they were able to establish a statistical relationship between excess illnesses and total coliforms, but for fresh water only. The committee was not able to find a relationship at the ocean (marine) beach. The committee found that excess illnesses in fresh water were detected when the total coliforms (geometric mean) were greater than 2300 CFU per 100 mL. The total coliform value was then translated into just the fecal coliform component, which resulted in a value of 400 CFU per 100 mL. The committee divided the 400 value in half to arrive at a fecal coliform criterion for freshwater beaches of 200 CFU/100 mL. The District pointed out that the decision to divide the 400 value in half was intended to eliminate detectable risk, but the half value was arbitrary and the hypothesis was never tested. PC 565, Item 12 at 1.

Then in 1969, USEPA responded to reports that the 200 CFU/100 mL criterion was too restrictive. USEPA commissioned new epidemiological-microbial studies to produce criteria based on swimming in sewage polluted water. Although the studies weren't to be completed until 1979, USEPA adopted the NTAC-recommended 200 fecal coliform CFU/100 mL criterion for both fresh and marine bathing waters in 1976. At the time, USEPA found that Salmonella in marine waters increased sharply when fecal coliform densities were more than 200 CFU/100 mL. The District noted that this was the apparent rationale for adopting the fecal coliform criterion of 200 for both fresh and marine waters. PC 565, Item 12 at. 2.

Later in 1983-1984, USEPA published the analysis of its most recent epidemiological-microbiological studies. USEPA was able to find a strong statistical relationship between gastrointestinal illness rates and the two indicator bacteria enterococci and *E. Coli* in fresh waters, but only for enterococci in marine waters. PC 565, Item 12 at 2. USEPA also found that the illness rates in marine waters were higher than in fresh water even when the indicator bacteria densities were the same because more pathogens would be found in marine waters. PC 565, Item 12 at 2.

[10] The National Technical Advisory Committee (NTAC) to the Federal water Pollution Control Administration

Then in 1986, USEPA used the results of the studies to set new recreational use criteria[11]. Based on the different illness rates, USEPA stated that acceptable illness rates would be 19 gastrointestinal illnesses per 1000 swimmers for marine waters, and 8 in fresh waters. USEPA established these illness rates based on the 1976 criterion of 200 fecal coliform CFU / 100 mL. The 1986 criteria therefore set levels for marine waters of 35 CFU enterococcus / 100 mL, and for fresh waters of either 33 CFU enterococcus / 100 mL or 126 *E. coli* / 100 mL. PC 565, Item 12 at 1-3. The 1986 Criteria provided flexibility for states in criteria development, stating, "[I]n many situations States may want to adjust water quality criteria developed under section 304 to reflect local environmental conditions and human exposure patterns before incorporation into water quality standards." SR Attach. X at iii. The 1986 criteria is USEPA's current ambient water quality criteria for bacteria for primary contact recreation. PC 565, Item 12 at 1, Exh. 71 at 2.

In 1997, USEPA created the Beaches Environmental Assessment and Coastal Health (BEACH) Program to reduce risks to human health from pathogens in coastal recreational waters, both fresh (Great Lakes) and marine. Exh. 71 at 2. Then the BEACH Act of 2000 amended the CWA by adding Section 303(i)1)(A) which required States to adopt water quality criteria and standards for coastal waters by April 10, 2004. Exh. 71 at 2-3. In November 2004, USEPA followed by promulgating water quality criteria for coastal recreation waters, using the same acceptable risk levels as the 1986 criteria of 19 gastrointestinal illnesses per 1000 swimmers for marine waters, and 8 in fresh waters. PC 565, Item 12 at 1,3 referring to 69 FR 67218-67243 November 16, 2004.[12] The requirements of the BEACH Act apply to the fresh waters of Lake Michigan but do not apply to inland waters like CAWS. Exh. 71 at 3.

In 2002, USEPA issued draft Implementation Guidance for Ambient Water Quality Criteria for Bacteria[13]. Exh. 71 at Table 5-10. The 2002 USEPA guidance used the methods described in the 1986 criteria to calculate enterococci and *E.coli* water quality criteria based on different risk levels. The 2002 guidance provided calculated water quality criteria for acceptable illness rates of 8 to 14 per 1000 swimmers for fresh water and 8 to19 for marine waters. In 2003, USEPA issued another draft implementation guidance on its ambient water quality criteria for bacteria[14]. Exh. 71 at 6.

Since the 1986 criterion was published, USEPA clarified why different risk levels were calculated for fresh and marine waters. In a 2006 fact sheet, USEPA stated, "[T]here is no *a priori* reason to establish a higher level of protection for fresh waters than for marine waters."

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[11] EPA, 1986, Ambient Water Quality Criteria for Bacteria, EPA-440/5-84-002.

[12] The Board notes that Illinois has not yet adopted the USEPA promulgated ambient freshwater quality criteria for bacteria for the open waters of Lake Michigan to update 35 Ill. Adm. Code 302.505. IEPA indicated that when USEPA determines what indicator organism should be used, IEPA will initiate another rulemaking to address the bacterial standard for Lake Michigan. SR at 43.

[13] USEPA. 2002. Implementation Guidance for Ambient Water Quality Criteria for Bacteria, May 2002 Draft. EPA-823-B-02-003.

[14] USEPA. 2003. Implementation Guidance for Ambient Water Quality for Bacteria. EPA-823-B-03-xxx. November. DRAFT.

USEPA explained the difference in the acceptable risk levels (8 illnesses per 1000 swimmers in fresh water versus 19 in marine waters) was based solely on the calculated risk levels from USEPA's 1976 recommended criterion of 200 fecal coliforms per 100 milliliter (mL).[15] PC 565, Item 12 at 1-2 referring to EPA-823-F-06-012[16].

In the 2006 fact sheet, USEPA also addressed "questions regarding the appropriate risk level (or levels) a state may choose when adopting into the state's water quality standards bacteria criteria to protect its coastal recreation waters." USEPA clarified that states could use a scientifically sound manner to develop a concentration for indicator bacteria in fresh waters that corresponds to an illness rate higher than 10 and up to 19/1000. PC 565, Item 12 at 1 referring to EPA-823-F-06-012.

In 2007, USEPA convened a scientific workshop of experts on the research needs for developing new or revised recreational water quality criteria. The District pointed out the expert panel found USEPA's decision to use 19 and 8 illnesses per 1000 to represent acceptable risks in the 1986 criteria was "an arbitrary decision that was not well founded." PC 565, Item 12 at 3 citing USEPA, 2007[1] at 96.

CHEERS Peer Review Agreement (Item 13).

The District submitted a letter of agreement between the District and the Water Environment Research Foundation (WERF) signed by the parties on September 4 and 11, 2007. The letter describes the roles, responsibilities, and funding arrangements regarding the peer review of CHEERS entitled "Epidemiologic Study of Recreational Use of the Chicago Area Waterways". PC 565, Item 13 at 1. In addition to describing the objectives of epidemiologic study, the letter describes the roles and responsibilities of the WERF and peer review committee. The letter sets forth that WERF's role is provide expert objective oversight of CHEERS, including the assemblage of the peer review committee. The objectives of the peer review committee include: review and input on the program scope and design; review ad feedback on quality assurance project plan; peer review and oversight and direction during CHEERS progression; and peer review insight on the final products. *Id.* at 2.

The letter also assigns the roles and responsibilities of the District and the University of Illinois at Chicago (UIC) research team. These terms set forth that the District and UIC team will be responsible for addressing all comments received from WERF on behalf of the peer review committee. Further, the District is required to assemble a stakeholder advisory work group to work with the WERF to coordinate input from the committee groups. In addition the letter of agreement sets forth tentative project schedule and approval of a budget to cover travel, food and lodging for members of the voluntary peer review committee. PC 565, Item 13 at 3.

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[15] USEPA. 1976. "Quality Criteria for Water." U.S. Environmental Protection Agency, Washington, DC, 1976.

[16] USEPA. 2006. Water Quality Standards for Coastal Recreation Waters: Considerations for States as They Select Appropriate Risk Levels. Office of Water. EPA-823-F-06-012. August 2006.

District (PC 567)

The District urges the Board not to adopt the effluent bacteria standards proposed by IEPA at Section 304.224 because the rule does not satisfy the statutory requirements. The District notes that recreation on the CAWS presents no additional human health risk as compared to other waters receiving disinfected or no effluent. PC 567 at 5. The District asserts that the Board should adopt effluent standard only if they are necessary to prevent pollution that would render the receiving water injurious to public health. *Id.* However, the District argues that imposition of disinfection requirements is unnecessary to protect public health or support recreational uses in the CAWS. *Id.* at 6.

The District notes that the District has conducted a multi-phased research program and invested over $10 million to assess the recreational health risks and to protect the identified uses of the CAWS. PC 567 at 7. These efforts have culminated in two reports: the Microbial Risk Assessment Report; and CHEERS. The District notes that the Microbial Risk Assessment concluded that low pathogen levels in the District's effluents and in the CAWS downstream of the plants posed minimal risk of gastrointestinal illness associated with recreational use on the CAWS. *Id.* at 8. The District contends that the risks associated with incidental contact recreation on the CAWS are below the most conservative risk threshold that USEPA applies to criteria for primary contact recreation. *Id.* Further, the District maintains that any existing risks, which are mainly due to secondary loadings under wet weather conditions from CSO's and other discharges, would not be improved by disinfection of District's effluents. *Id.* at 8-9.

Next, the District notes that the CHEERS report concludes that rates of gastrointestinal illness are not higher among CAWS recreators as compared to recreators on GUW that do not receive undisinfected wastewater treatment plant effluents. PC 567 at 13. The District asserts that CHEERS used the gold standard of observational epidemiologic studies and followed the format used by the USEPA's National Epidemiological and Environmental Assessment of Recreation (NEEAR) study. *Id.* at 9-10. CHEERS was designed to investigate the occurrence of illness associated with secondary contact recreation on the CAWS. The District notes that a total of 11,733 people completed field interviews and 96.4 percent of them participated in the follow-up telephone survey. Additionally, CHEERS involved the analysis of over 5,000 water samples and 750 stool samples. CHEERS found that incidental contact recreation on the CAWS waters would result in approximately 12 to 13 cases of gastrointestinal illness per 1,000 users. The District notes that this rate is statistically indistinguishable from rate of gastrointestinal illness attributable to same type of recreational activity on GUW. *Id.* at 13.

While the CHEERS found that incidence of eye symptoms among CAWS users was higher than those of GUW, the District maintains that such higher incidence is due to lower rates of hand washing among CAWS recreators who ate or drank. Further, the analysis of stool samples of CHEERS participants who reported gastrointestinal illness did not indicate the presence of waterborne pathogens such as Salmonella, Shigella and *E. coli*. PC 567 at 14-15. The District also notes that CHEERS supplement investigated any potential relationship between water quality and health risk. CHEERS found that there was no relationship between microbe concentration and occurrence of gastrointestinal illness among CAWS recreators, whereas gastrointestinal illness for GUW recreators could be predicted on the basis of enterococci levels.

The District notes that for heavily exposed CAWS users, CHEERS found that the occurrence of a recent CSO event was associated with an increased risk of developing gastrointestinal illness, which is consistent with the findings of the Microbial Risk Assessment.

Based on the Microbial Risk Assessment and CHEERS, the District concludes that disinfection at the District's plants will do nothing to lower the risks associated with CSO discharges. PC 567 at 16. Further, the District maintains that based on CHEERS, disinfection is not necessary to support the proposed uses for the CAWS, since the risk to recreators in the CAWS is no greater than the risk to recreators on GUW. *Id.* at 20. Instead of requiring disinfection, the District believes that IEPA should use the results of CHEERS to develop appropriate, science-based requirements to protect recreational uses on the CAWS. *Id.* at 31. The District argues that there is no technical basis for developing numeric water quality standards for bacterial parameters, since CHEERS supplement found no relationship between bacterial levels and risk of illness. The District recommends narrative criteria that would provide for the protection of the designated uses.

Regarding funding for disinfection, the District states: "[b]ased on the District's limitations and restrictions on generating revenues to fund programs, fund disinfection would require legislative action, a voter referendum, or significant reductions in funding the District's existing capital improvement plan, which is designed to maintain and upgrade the District's aging infrastructure." PC 567 at 24, 10/28/08Tr. at 118. Mr. Kunetz followed by stating that failure to maintain and upgrade the aging infrastructure will jeopardize the water reclamation plants' ability to meet existing NPDES effluent limits and will allow infrastructure to degrade beyond repair. Exh. 153 at 6-7, PC 567 at 24.

Additionally, the District maintains that even if the limitations were lifted on the tax cap, non-referendum bonding authority and debt service extension, significant increases in the tax rate would be needed as indicated above to fund UV disinfection, nutrient removal, and/or dissolved oxygen control. PC 565, Item 7E at 6. The District states: "[t]he significant costs of installing and operating disinfection processes at District facilities would impose an unnecessary financial burden on the residents of Cook County." PC 567 at 2.

In sum, the District urges that the Board decline to adopt the proposed rule, and instead adopt the narrative standards recommended by the District to protect the recreational uses on the CAWS. *Id.* at 32.

District (PC 581)

The District argues that the final comments of the IEPA, the People, and the Environmental Groups do not demonstrate that the proposed effluent standard is necessary to prevent pollution that would be detrimental to public health or the disinfection is economically reasonable in light of possible benefit. PC 581 at 3. The District reiterates that the Board should decline to adopt the proposed rule requiring disinfection of the District's effluents. The District argues that IEPA proposed effluent bacteria standards as interim measure until scientific basis for a recreational water quality standard became available. The District contends that with the completion of the Microbial Risk Assessment and CHEERS, scientific basis for developing

water quality standards is available and the District has proposed appropriate water quality standard for the protection of the proposed designated uses of the CAWS. *Id.* at 3-4. Therefore, the District asserts that there is no need for interim technology-based effluent bacteria standards.

The District maintains that the commenters have failed to show that the discharge of undisinfected effluent to CAWS is harmful or detrimental or injurious to public health, or imposition of disinfection would significantly lower the already low risks that do exist for recreators on the CAWS. PC 581 at 5-6. The District argues that the human health risks associated with primary contact activities in the studies relied upon by the commenters do not represent the risks associated with the non-contact and incidental contact recreational uses proposed for the CAWS. *Id.* at 6. The District maintains that the Board should consider risks to human health from the specific activities proposed for the CAWS, rather than the risks associated with recreating bathing beaches or primary contact waters. In this regard, the District notes that the Microbial Risk Assessment and CHEERS provide information on the risks of recreating on the CAWS. *Id.* at 7.

The District argues that the commenters' objection concerning the comparison of risk levels in the CAWS to those in GUW study ignores the fact that recreational activities of CHEERS participants in the CAWS and GUW are the same. Therefore, to compare the illness rates between the two systems is reasonable. The District argues that CHEERS had sufficient statistical power to identify the differences in risk. *Id.* at 8. The District maintains that the commenter's position that CAWS recreators are at risk because of high bacteria levels on the CAWS is misplaced, since bacteria themselves do not pose a risk to recreators but rather the presence of underlying pathogens that bacteria may indicate. The District notes that the actual levels of pathogens associated with gastrointestinal illness in the CAWS is relatively low. Further, direct measurement of risk to recreators on the CAWS demonstrates no relationship between bacterial levels and risk of illness. *Id.* at 9. Additionally, the District contends that levels of both indicators and pathogens would be further reduced if and when the District install control technologies to address expected nutrient requirements. The filtration technology necessary to achieve the likely nutrient reduction scenarios would remove between 60 to 98 percent of fecal coliform from plant effluent, depending on design parameters. *Id.*

Regarding commenter's contention that disinfection is necessary because health risks identified in CHEERS exceed USEPA's benchmark of 8 to 14 illnesses per 1,000 uses attributable to bacteria alone, the District notes that CHEERS finding of 12.5 illnesses per 1,000 uses to secondary contact recreation from all possible sources, including bacteria. *Id.* at 9-10. Further, CHEERS supplement found that no relationship between bacteria levels and risk of illness when risk associated with bacteria levels on the CAWS were isolated from other possible causes. Additionally, the District argues that the USEPA risk levels based on swimming as benchmark are not appropriate for the incidental contact activities proposed for the CAWS. *Id.* at 10.

The District next addresses the commenters' objections regarding the use of Microbial Risk Assessment and CHEERS to support the Board's decision on the proposed rule. PC 581 at 11. The District again emphasizes that the studies were conducted by a team of nationally-recognized experts in Microbial Risk Assessment, bacterial human health effects, and

epidemiology. The District argues that the Board should not reject good science just because the commenters do not like the results. *Id.* at 12. Regarding the concerns that CHEERS yielded negative results, the District notes that the results were extensively reviewed by a WERF expert panel, which made no finding that CHEERS contained anomalous or contradictory results. CHEERS found positive risk levels for three different groups of recreators, but no increased risk to CAWS users exposed to secondary treated undisinfected effluent when compared to other water recreators. The District contends that it is disingenuous to suggest that CHEERS results should be rejected because of its negative findings. *Id.* at 13.

Regarding the commenters' position that regulatory decision should not be based on a single study, the District states that the Microbial Risk Assessment and CHEERS provide the best information available to the Board on the risks associated with recreational activities proposed for the CAWS. The District argues that based on the USEPA's approach to development of recreational water quality criteria, the Microbial Risk Assessment and CHEERS are sufficient for the Board to make its decision on the proposed rule. PC 581 at 14. The District notes that some of the concerns about the limitations of epidemiologic studies and inapplicability of epidemiologic conclusions to certain rare and severe events apply to any epidemiologic study, but do not support the conclusion that the Board should reject CHEERS results. *Id.* at 15-16.

The District also addresses the issue of confounding factors that can result in bias or affect the statistical power of CHEERS. The District notes that confounding factors were appropriately addressed in CHEERS. While there are no scientific methods to determine the statistical power necessary to fully evaluate risk, CHEERS utilized interaction analysis to identify if a subgroup is at higher risk. Further, there was no selection bias since participants were selected without regard to outcome or water quality. PC 581 at 16-17. With respect to the issue of heterogeneity bias raised by the commenters, the District notes that the analysis adjusted for varying activities depending on the particular water body. Thus, the District contends that if there was any bias it was towards including more heavily exposed people in the parts of the waterway with highest level of indicators and pathogens. *Id.* at 17.

Regarding the validity of the survey questions, the district notes that CHEERS questions related to water ingestion were validated and followed the USEPA-recommended study format. PC 581 at 17. Next, the District agreed with the commenters that CHEERS was not designed to account for asymptomatic spread of infection. However, the District notes that there is an equally likely possibility of transmission into or out of CHEERS group. As such, the District contends that the issue of asymptomatic infection should not serve as a basis for disregarding CHEERS results. *Id.* at 18. Finally, the District notes that the commenters overstate the current science and regulatory thinking on the risks to subpopulations such as children and elderly. While USEPA has found some evidence of sensitivity in children, risks to elderly and pregnant subpopulation have not been assessed due to lack of sufficient populations. The District states that the USEPA findings regarding children are based on swimming, which is not an appropriate activity under the proposed recreational uses for the CAWS.

In response to Dr. Boyle's conclusion that Cook County residents would be willing to pay almost $1 billion for improved water quality on the CAWS, the District pointed out the Dr. Boyle never surveyed Cook County residents directly. PC 581 at 25 *citing* Exh. 286 at 1 and 5-

20-09 Tr. at 11. Dr. Boyle's conclusion is based on studies from other areas, such as a study of lakefront property owners who recognized their property values would increase if the lake were clearer. PC 581 at 25 referring to Exh. 286 at 12.

The District noted Dr. Blatchley testified that the reduction in risk to recreational users from disinfection would only be nominal. PC 581 at 20 referring to Exh. 93 at 3. For what may be a negligible reduction in pathogens, the District suggested that Dr. Boyle's estimates do not accurately represent the willingness of Cook County residents to accept the economic impact of increased property taxes and fees, especially given the current economic climate. PC 581 at 26. The District suggests, "Such nominal improvements cannot reasonably be said to have significant monetary value to Cook County residents, as suggested by IEPA." PC 581 at 20.

The District noted that the Illinois Supreme Court indicated that balancing the "cost of compliance against the benefits to be achieved" is appropriate under the Act. PC 581 at 23, citing Granite City Division of National Steel Co. v. IPCB, 155 Ill.2d 149, 183-84, 613 N.E.2d 719, 734-35 (1993). The District believes that disinfection under IEPA's proposal is not economically reasonable, not only because of the tremendous cost to taxpayers, but also because IEPA's proposed effluent standard is not necessary to protect public health and would only provide minimal benefits at best. PC 581 at 23.

Based on the foregoing reasons, the District reiterates the position that requiring disinfection at the District's facilities would provide very little, if any, benefit to public health because direct measurements demonstrate no increased risk from recreation on the CAWS. *Id.* at 19.

District (PC 583)

On February 15, 2011, the District filed a reply to comments on the proposed regulations on effluent bacteria standards for discharges to the CAWS and LDPR. The District notes that the comments filed by the Environmental Groups and the USEPA attack the CHEERS Report and Supplement, criticize the District's cost estimates, and raise a few other miscellaneous issues. The District maintains that the issues raised by the Environmental Groups and USEPA do not demonstrate that disinfection is necessary to protect the recreational uses of the CAWS. PC 583 at 1. Regardless of parties' criticisms of CHEERS, the District asserts that sufficient evidence has been presented to demonstrate that disinfection is clearly not necessary to support the uses of CAWS. *Id.* at 3. The District addresses the USEPA concerns on point by point basis in a 7-page table. See PC 583 at 6-12.

District (PC 1010)

On June 10, 2011, the District filed a comment in response to the Board's proposed second notice opinion and order in Subdocket A (Water Quality Standards and Effluent Limitations for the Chicago Area Waterway System and Lower Des Plaines River: Proposed Amendments To 35 ILL. Adm. Code 301, 302, 303, and 304, R08-9 (A) (June 2, 2011). The Board docketed the comment in Subdocket B as well because the District specifically addressed water quality standards. *See* PC 1010. The District disagrees with the USEPA and IEPA that the Board should "clarify" that 35 Ill. Adm. Code 302.209 applies to Primary Contact Recreation and

argues that those standards do not apply. PC 1010 at 3. The District opines that the costs to meet higher levels than those proposed for Incidental Contact Recreation would be higher and sources other than the District's wastewater treatment plants would need to be controlled. PC 1010 at 3-4.

The District's Board of Commissioners adopted a new policy that will require installation and operation of disinfection equipment at the North Side and Calumet plants. PC 1010 at 4. The District will hold a series of public meetings and the District expects that issues regarding implementation of Primary Contact Recreation will be discussed. PC 1010 at 5. The District also expects that other segments of CAWS and the District's Stickney facility will be discussed. The District therefore asks the Board to delay issuing a first notice in Subdocket B and the District proposes to file a status report in 60 days. *Id*.

DISCUSSION

As explained earlier, the R08-9 rulemaking docket was divided into four subdockets as a strategy for dealing efficiently with this lengthy rulemaking. Subdocket A designated recreational uses to protect in segments of the CAWS and LDPR. At this time, the Board has issued a second notice opinion and order in Subdocket A and does not expect to make major changes before adopting final rules, following review of the rules at second notice by the Joint Committee on Administrative Rules. *See* Water Quality Standards and Effluent Limitations for the Chicago Area Waterway System and Lower Des Plaines River Proposed Amendments to 35 Ill. Adm. Code 301, 302, 303, and 304, R08-9(A) (June 16, 2011).

The major issue to be decided in Subdocket B is whether or not either water quality standards or effluent limits for waterborne human pathogens are necessary to protect the recreational use designations made in Subdocket A. In the discussion that follows, the Board will examine the record to determine what standards are necessary to protect the use designations; and, more specifically, whether or not water quality standards or effluent limitations are necessary to protect the designated recreational uses for the various segments of the CAWS and LDPR. The Board will also discuss the economic reasonableness and technical feasibility of proposed standards or effluent limitations.

Standards Necessary to Protect Use Designations

In designating recreational uses for the CAWS and the LDPR, the Board proposed four use designations: Primary Contact Recreation, Incidental Contact Recreation, Non-contact Recreation, and Non Recreation. IEPA did not include a Primary Contact Recreation use designation in the original R08-9 rulemaking proposal. After extensive review of the record in this proceeding, the Board created the Primary Contact Recreation use designation for six segments of the CAWS. The Primary Contact Recreation designation protects those six segments to insure compliance with the Clean Water Act goal that waters should be "swimmable" when that condition is attainable in the foreseeable future.

In Subdocket B, the Board must determine what limits on waterborne pathogens are necessary to provide protection for each of the four recreational use designations for the CAWS

and LDPR. The record in Subdocket B did not directly address what type of water quality standards or effluent limitations would be necessary to protect water segments designated as Primary Contact Recreation. However, the Board can look to existing regulations governing General Use Waters of the State that are deemed "swimmable" and the extensive record in R08-9 to craft protective rules for the four types of recreational use designations in the CAWS and LDPR. The Board will address each of the four types of recreational use designations below.

Primary Contact Recreation

As noted above, when drafting rules to protect the Primary Contact Recreation use designation the Board will look to existing regulations for General Use Waters of the State for guidance. *See e.g.* 35 Ill. Adm. Code 302.209, 304.121. The Board has established both water quality standards and effluent standards for General Use Waters of the State and these waters are protected for primary human contact. Section 304.121 establishes an effluent standard of 400 fecal coliforms per 100 mL for discharges to General Use Waters. 35 Ill. Adm. Code 304.121. Section 302.209 sets a water quality standard for fecal coliform that prohibits any exceedance of a geometric mean of 200 per 100 mL. Not more than 10 percent of the samples during any 30 day period may exceed 400 per 100 mL in protected waters. 35 Ill. Adm. Code 302.209. Protected waters include waters that presently support or have the physical characteristics to support primary contact. *Id*.

History of Fecal Coliform Water Quality and Effluent Standards. In 1966 and 1967, the Illinois Sanitary Water Board (SWB), the Board's predecessor, first adopted bacteria water quality standards for primary contact recreation. The standards applied to certain intrastate and interstate waters that were designated for primary contact. The standards were codified as Rule 1.06 and provided in part:

> Bacteria: As determined by multiple-tube fermentation or membrane filter procedures, and based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content of primary contact recreation waters shall not exceed a geometric mean of 200/100 ml, nor shall more than 10% of total samples during any 30-day period exceed 400/100 ml. Rule 1.06: SWB-8, 9, 10, 11, 12, 14.[17]

The Rule 1.06 fecal coliform standards were consistent with the science relied on upon by USEPA in the epidemiological studies conducted during the 1940s and 1950s. These were the studies that led USEPA to the 200 fecal coliform CFU/100 ml number in 1968 and 1976, as summarized in the history of acceptable risk levels for primary contact above. Portions of the Rule 1.06 language mirror the USEPA 1976 criteria[18] as well as the Board's current general use standards for fecal coliform at Section 302.209.

[17] Criteria were adopted on the following dates: SWB-8, 9, 10, 11: December 1, 1966; SWB-12, 14: March 7, 1967.

[18] USEPA. 1976. Quality Criteria for Water. PB-263 943 (Red Book) at 79.

In 1972, during the early days of the Board, the Board adopted an effluent standard of 400 fecal coliform per 100 mL for waters with primary contact, which had the effect of requiring disinfection. As the Board stated,

> "The standards did not specifically identify that disinfection had to take place, but rather limited the number of fecal coliform bacteria, an indicator of microbial contamination, which could be discharged and which could be present in the ambient aquatic environment. However, since almost all undisinfected municipal wastewater effluents contain fecal coliform bacteria in numbers greater than the standards, the effect was to require essentially universal disinfection." *See* Proposed Amendments to Subtitle C: Water Pollution Fecal Coliform and Seasonal Disinfection, R85-29 slip op. at 4 (June 30, 1988); Effluent Criteria, R70-8, slip op. at 18 (Mar. 7, 1972).

The current fecal coliform effluent standard for general use waters is found at 304.121.

Development of Water Quality Standard for Primary Contact Recreation Waters. The IEPA and USEPA asked the Board to clarify that "Illinois' existing, federally-approved fecal coliform criteria for protection of primary contact recreation, 35 Ill. Adm. Code 302.209, apply" to the waters designated as Primary Contact Recreation. PC 994, *see also* PC 1003. The Board interprets this request to mean that the IEPA and USEPA advocate applying both the existing fecal coliform water quality standards and effluent limits to Primary Contact Recreation water. The District disagrees with the USEPA and IEPA and opines that the costs to meet the existing, but stricter criteria than the fecal coliform effluent limit proposed by the IEPA for Incidental Contact Recreation waters would be higher. PC 1010 at 3-4. The District also suggests that effluent sources other than the District's wastewater treatment plants would need to be controlled. *Id*.

As noted above, the Board's fecal coliform water quality standard was established by the Board based on science that pre-dates the USEPA's publication of the 1986 criteria. While the Board's General Use standard relies on measurement of fecal coliform, USEPA's guidance recommends using measurements of bacterial indicator species such as *E.coli* and enterococci to indicate the presence of human pathogens. In addition, the current general use standard only applies from May to October, while the record in this rulemaking indicates the recreational season in the CAWS and LDPR extends from March through November. Further, USEPA is continuing to research whether or not using bacterial indicator species is the best method to indicate the possible presence or absence of human pathogens in water. USEPA is also reevaluating risk assessment for primary human contact in waters. USEPA is planning to publish new or revised recreational water quality criteria by October 2012 in accordance with a Consent Decree[19] and Settlement Agreement[20] that address coastal recreational waters. *See infra* 95.

[19] National Resources Defense Council, County of Los Angeles and Los Angeles County Flood Control District, and National Association of Clean Water Agencies v. USEPA, Filed 9/4/08. Case No. CV06-4843 PSG (JTLx)

Given the uncertainty associated with the water quality criteria for primary contact recreation at the federal level, the Board declines to develop a water quality standard for human pathogens for the Primary Contact Recreation segments of the CAWS at this time. The only statements in the record supporting a specific water quality standard are the comments of IEPA and USEPA to adopt the water quality standard at Section 302.209 that applies to General Use Waters. IEPA and USEPA have not presented supporting evidence beyond their statement. The Board invites the participants to provide comments on whether the Board should adopt the existing water quality standard for CAWS and the LDPR before proceeding to second notice.

Effluent Standard for Primary Contact Recreation Waters. Most of the testimony and comment in the R08-9 rulemaking has addressed the proposed effluent standard for discharges of fecal coliform into the CAWS and LDPR. While the Agency proposed the fecal coliform effluent standard for Incidental Contact and Non-Contact Recreation waters, the Board finds that the proposed effluent limit may appropriately be considered for Primary Contact waters since that limit is based on the effluent fecal coliform standard for General Use waters. The record addressing effluent standards, the present uncertainty in the scientific community regarding bacteria water quality standards, and USEPA's plan to issue guidance in 2012, leads the Board to find that an effluent limit is the best method to protect the six segments of the CAWS designated for Primary Contact Recreational use at this time. The Board will propose the same effluent discharge limits of 400 colony forming units (fecal coliform) per 100 mL of water that is the current effluent discharge limit for General Use Waters for those six segments designated as Primary Contact Recreation use.

According to the record, the North Side and Calumet water reclamation plants operated by the District, discharge effluent to water segments designated for Primary Contact Use. Attach. B at 3-8 and 3-10. The North Side facility discharges effluent to the North Shore Chanel near Howard Street. *Id*. The Calumet facility discharges effluent to the Little Calumet River near the ACME bend. *Id*. Both facilities discharge effluent with fecal coliform levels above 400 CFU per 100 mL 99 percent of the time. *Id*. at 4-33 and 4-90. Testifying for the District, John Mastracchio states that to meet the effluent limit for fecal coliform of 400 CFU per 100 mL, the District would need to disinfect the effluents from its water reclamation plants by either chlorination/dechlorination or ultraviolet disinfection process. Exh. 159 at 1-2. The Board notes that at many places in this record the participants frequently interchange the terms "effluent disinfection" and "effluent limits" because of the general knowledge that the District will be required to disinfect effluent to meet the proposed fecal coliform effluent limits. So, in the context of this rulemaking, testimony or comments for or against effluent disinfection is effectively for or against effluent limits for the current indicator species, fecal coliform.

The IEPA originally proposed that effluent limits for human pathogen discharges be imposed during the time period March 1 through November 30 based on observations of recreational use of the waterways *See* PC 568 at 8. For example, rowing teams use segments of

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[20] Settlement Agreement between USEPA, National Resources Defense Council, County of Los Angeles and Los Angeles County Flood Control District, and National Association of Clean Water Agencies. Case 2:06-cv-04843-PSG-JTL. Filed 8/8/08.

the CAWS designated for Primary Contact Recreation use as early as March and as late as November. *Id*. Therefore, the Board will propose a rule applying the effluent limit for fecal coliform of 400 CFU per 100 mL from March 1 to November 30.

Effective Date of the Proposed Effluent Limit. The next issue for the Board to address is the effective date of the proposed effluent limit for fecal coliform. The IEPA has proposed that compliance with the effluent limit be achieved within three years of the Board's adoption of the rule; however, the IEPA has offered little justification for that timeframe. *See* PC 568 at 8. The District indicated that design, construction and implementation of disinfection would take eight years for North Side and Calumet and ten years for Stickney. *See* Exh. 146 at 9-10. However, the District's position on disinfection has changed since the District's timeframe was provided to the Board. The District informed the Board that the District's Board of Commissioners adopted a new policy that will require installation and operation of disinfection equipment at the North Side and Calumet plants. PC 1010 at 4. The District plans to hold a series of public meetings and the District expects that issues regarding implementation of Primary Contact Recreation will be discussed. PC 1010 at 5. The District also expects that other segments of CAWS and the District's Stickney plant will be discussed. The District asks the Board to delay issuing a first notice in Subdocket B and the District proposes to file a status report in 60 days. *Id*.

In considering the District's request that the Board delay issuing a first notice in Subdocket B, the Board first observes that this rulemaking has been active for almost four years. The Board is also cognizant of the District's recent change in policy on disinfection. The Board believes that there is a sufficient record to issue a first notice in Subdocket B, and that a first notice opinion and order will help focus the discussion as we move forward.

As to the date by which effluent limits must be met, there are conflicting timeframes between the District and the IEPA. IEPA suggests a date that would be near March 1, 2015, while the District proposes a date near March 1, 2020. The Board notes that the testimony from the District outlining the time needed to comply with effluent standards by disinfection was provided to the Board in 2008. Since that time, the District has changed positions regarding disinfection. Also, the Board notes that IEPA offered little explanation why three years would be sufficient to comply. Therefore, in proceeding to first notice the Board will not choose a compliance date. The Board expects the participants to update the record and clarify what compliance schedule is appropriate. The Board anticipates that a date between March 1, 2015 and March 1, 2020 will be appropriate. The Board will incorporate a specific time for compliance at second notice.

The Board proposes for dischargers to Primary Contact Recreation use waters, the following rule language:

> Section 304.224 Effluent Bacteria Standards for Discharges to the Chicago Area Waterway System and Lower Des Plaines River
>
> Effluent discharges to the Primary Contact Recreation waters listed in 35 Ill. Adm. Code 303.220 must not exceed 400 CFU fecal coliform per 100 ml from March 1 through

November 30. All effluents in existence on or before the effective date of this Section must meet these standards. All new discharges must meet these standards upon initiation of discharge.

Incidental Contact Recreation

The IEPA proposed effluent limits for dischargers to Incidental Contact Recreation and Non-Contact Recreation waters. The Environmental Groups argue that disinfection is necessary to protect public health and three "facts remain indisputably clear". PC 564 at 8. The Environmental Groups argue that the first of these facts is that exposure to waterborne sewage pathogens can cause illness to recreators. *Id*. According to the Environmental Groups the second fact is that both indicator and pathogen levels in the CAWS are substantially attributable to the District's undisinfected wastewater treatment plant effluent during dry weather. *Id*. The Environmental Groups state that the third fact is that disinfection technology will significantly reduce the indicator and pathogen levels, without an appreciable downside risk. *Id*.

The District in contrast argues that based on CHEERS disinfection is not required to protect recreators on Incidental Contact Recreation and Non-contact Recreation waters. CHEERS provides data that indicates that cases of gastrointestinal illnesses occur with no greater frequency for CAWS recreators than on GUW.

The relevance of CHEERS has been challenged by IEPA and others; however, the Board cannot ignore the results. The Board recognizes that CHEERS is the only epidemiological study in the record of the CAWS waterway. CHEERS indicates that incidental contact, recreators on the CAWS are at no more risk of gastrointestinal illness than those recreating on GUW. Further examination of CHEERS, other studies, or USEPA's anticipated 2012 criteria might help in identifying an appropriate indicator organism indicative of pathogens and illness in these incidental contact waterways.

Currently the record for establishing an effluent standard for Incidental Contact Recreation is not as convincing as for Primary Contact Recreation. Therefore, the Board will not require discharges into Incidental Contact waters to meet an effluent discharge limit for bacteria in this rulemaking. The Board also notes that the District proposed a narrative standard for Incidental Contact Recreation waters that essentially requires all dischargers to comply with their NPDES permit provisions at all times, including times of wet weather, and sets forth that applicable designated uses and related narrative criteria will not apply during a period 72 hours after cessation of CSO and MS4 discharges that result from the wet-weather event. The Board declines to adopt a narrative standard at this time. When USEPA has provided guidance for drafting water quality standards in 2012, the Board invites the IEPA to propose bacteria water quality standards for the CAWS and LDPR that will be protective of Incidental Contact Recreation.

The Board notes that Stepan's Millsdale plant and the District's Stickney water reclamation plant both discharge into Incidental Contact Recreation waters. Stepan's Millsdale plant discharges into the Upper Dresden Island Pool. The District's Stickney plant discharges into the CSSC in Cicero. Therefore, the effluent discharge from the Stepan's Millsdale plant and

the District's Stickney plant will not be subject to effluent limits for fecal coliform as a consequence of this rulemaking.

Non-Contact Recreation and Non-Recreation

The segments of the CAWS and LDPR designated for Non-Contact Recreation and Non-Recreation will have less human contact with the water than segments designated as Incidental Contact Recreation. Therefore, since the Board is not establishing an effluent limit for Incidental Contact Waters at this time, the Board declines to establish an effluent limit for Non-contact Recreation and Non-Recreation water segments in this rulemaking

Technical Feasibility

The District testified that disinfection of the District's effluent would be necessary to meet a fecal coliform effluent limit of 400 CFU per 100 mL of water. Exh. 159 at 1-2. To achieve this effluent limit, the District evaluated eight different methods of reducing pathogen discharge levels before choosing two (UV radiation and chlorination/dechlorination) for further study. UV disinfection yielded the highest scores based on relative safety and lack of no known toxic byproducts. Exh. 146 at 5. The District previously disinfected effluent at the North Side, Calumet, and Stickney water reclamation plants using chlorination from the early 1970's until the rules requiring disinfection were changed in 1985. 9/8/08P Tr. at 25.

IEPA argues that effluent disinfection is technically feasible. Effluent disinfection has been a long-standing requirement, successfully used by domestic wastewater treatment facilities throughout Illinois since the 1970s. Exh. 1 at 19. Further, IEPA "believes strongly" that the proposed effluent disinfection is technically feasible and that a long history of the use of disinfection technologies supports such a conclusion. PC 568 at 17. The People also believe that disinfection is technically feasible as is evidenced by the "near-universal" practice of disinfection in American metropolitan areas. PC 566 at 19-20.

Of the eight possible effluent disinfection methods studied, the District chose three types of disinfection technology for additional analysis: ozone, UV disinfection, and chlorination/dechlorination. Exh. 146 at 3. The District stated that chlorination/dechlorination, as well as ultraviolet disinfection technologies, would be technically feasible at the CAWS plants, but qualified the statement by noting that UV disinfection has never been used for such large plants (which process 250-800 mgd). 4/23/08 Tr. at 82-83.

The Board will consider chlorination/ dechlorination, and UV disinfection technologies as technically feasible alternatives to meet the proposed fecal coliform effluent limit. Therefore, the Board finds that compliance with the proposed bacterial effluent standard for the District's plants is technically feasible based on the record.

Economic Reasonableness

The IEPA did not do a formal economic analysis of the costs of any particular rule change, except to generally discuss disinfection costs with the stakeholders groups. 1/28/08 Tr.

at 53. But, the IEPA comments that the SAIC costs are a useful guide. PC 568 at 22. However, the IEPA believes that the SAIC costs are not reflective of the actual cost to consumers because the District charges customers based on assessed property values. PC 568 at 22. The IEPA used SAIC's disinfection cost estimates and the District's explanation of fees to calculate a projected cost. *Id*. IEPA calculated that for a home with an assessed value of $100,000 the increased tax cost would be between $9 and $12 per year. *Id*. The IEPA opines that even the "very high total costs of disinfection at all three" District plants are economically reasonable. *Id*.

The Environmental Groups note that the USEPA's analysis of the cost of certain types of disinfection (SAIC) determined that the cost per household per month could be $1.94, while other types of disinfection might have higher costs, the increase would not be great. PC 564 at 77-78, citing Exh. 148 at 15. The Environmental Groups argue that while the District has criticized the analysis, the District has not offered a cost analysis demonstrating that the costs would be significantly higher. PC 564 at 78.

The Environmental Groups assert that economic reasonableness under Section 27 of the Act (415 ILCS 5/27 (2010)) has been established particularly in view of the USEPA's analysis of costs. PC 564 at 78. The Environmental Groups observe that disinfection is "near-universal in the United States" and this fact belies the District's argument that disinfection is economically unreasonable. *Id*.

The People also take issue with the District's estimate arguing that the estimate is misleading because the estimate does not take into account the economic impact that rejection of the water quality standards would have on public health and welfare. PC 566 at 15. The People opine that the cost to public health and welfare would justify the investment in the disinfection criterion. *Id.* The People's witness, Dr. Boyle, opined that a conservative estimate of the economic benefit is $1.05 billion or $47 per household per year. Exh. 286 at 2.

The USEPA comments that the District has "an enormous service population" and is better able to absorb substantial construction and operation costs than smaller service populations. PC 584 at 8. The USEPA opines that the District ranks as one of the lowest cost providers of wastewater treatment in the nation. *Id*. USEPA cites to the District's own information that a home worth $267,000 pays $222 per year in property taxes for sewer services and notes this is well below the average annual sewer rates paid by residents of many other municipalities. *Id*., Sewer Rate Summary at 1-8.

USEPA comments pared down the District's estimated costs for UV disinfection to only the North Side and Calumet wastewater reclamation plants. USEPA estimated the average residential increase in property taxes for UV disinfection without and with filtration would range from $15.74 to $38.77 per year, respectively. Sewer Rate Summary at 5. USEPA also estimated the additional increase in property taxes to fully fund TARP of an additional $40.05 per year on top of the tax increase for disinfection. Sewer Rate Summary at 5.

The District looked at three types of disinfection technology to analyze the economic reasonableness of effluent disinfection: ozone, UV disinfection, and chlorination / dechlorination. The District selected UV disinfection for further evaluation based on the lower

capital and operating costs, wide use for effluent disinfection throughout the US, and absence of known disinfection byproducts. The 20-year present worth costs for UV disinfection without filtration were estimated to be $206.8 million for the North Side water reclamation plant, $201.6 million for Calumet water reclamation plant, and $511.2 million for Stickney water reclamation plant. Exh. 146 at 7.

The District argues that the final comments of the IEPA, the People, and the Environmental Groups do not demonstrate that the proposed effluent standard is necessary to prevent pollution that would be detrimental to public health or the disinfection is economically reasonable in light of possible benefit. PC 581 at 3. Dr. Zenz also points out that the SAIC cost estimates included less information than the estimates provided in the cost studies performed for the District. 10/27/08 Tr. at 144, 148-149, Exh. 12, 148, 412. Further, the District suggested that Dr. Boyle's estimates do not accurately represent the willingness of Cook County residents to accept the economic impact of increased property taxes and fees, especially given the current economic climate. PC 581 at 26. The District suggests, "[s]uch nominal improvements cannot reasonably be said to have significant monetary value to Cook County residents, as suggested by IEPA." PC 581 at 20.

The District provided a breakdown of the additional costs to taxpayers if the District were to disinfect at all three plants. Based on the 2009 tax rate, the costs of UV disinfection would increase the tax rate approximately 3.98 cents per $100 of Equalized Assessed Value to a total of 29.99 cents, representing a 15.3 percent increase. PC 565, Item 5. The Board notes that based on the costs for the North Side and Calumet plants alone, the increase in the District's property tax levy would range from 6.67 to 16.5 percent for UV, and the increase in user charge rates would range from 3.5 to 4.1 percent[21]. PC 565, Item 6, 7D, PC 567 at 26, PC 584 at 8, Sewer Rate Summary at 4-5.

In addition to the costs of effluent disinfection, the District provided testimony concerning the District's ability to raise funds to meet the effluent bacteria standard. The District currently lacks the financial resources to fund the capital expenditures and operation and maintenance costs necessary to disinfect the District's discharges to meet the IEPA proposed bacterial effluent standard. Exh. 159 at 4. Specifically, if the District cannot generate sufficient capital because of the Property Tax Extension Limitation Act's restrictions, obtaining the remaining funds elsewhere would still exceed the District's Tax Cap and the non-referendum bonding authority. *Id.* at 4-5.

The Board has carefully reviewed the economic information in this proceeding. The District's argument against disinfection seems to be that the cost of disinfection is not worth the improvements to the water quality that will be made. The Board disagrees. The benefit of cleaner water in the CAWS and LDPR cannot be quantified, though Dr. Boyle's testimony attempts to do so. Conversely the costs are quantified and using the District's number, taxpayers

[21] The property tax and user charge rate figures have been adjusted to reflect the costs at only the North Side and Calumet plants of approximately 44 percent and 41.2 percent of the values presented by the District for UV disinfection without and with filtration, respectively.

will be required to pay up to 15 percent more in District property taxes for cleaner water. Currently, according to USEPA, the District's sewer rates are below average. Furthermore, the record establishes that disinfection of the effluent will improve the water quality substantially in dry weather. Also of note is the District's new policy that will require installation and operation of disinfection equipment at the North Side and Calumet plants. PC 1010 at 4. Thus, the District will be undertaking disinfection at two wastewater reclamation plants in the future, even without the Board requiring disinfection. Based on the economic information provided to the Board, the Board finds that disinfection is economically reasonable for the District's effluent, particularly for the North Side and Calumet plants.

CONCLUSION

The Board proposes for first notice a rule establishing an effluent limit of 400 CFU fecal coliform per 100 mL from March 1 through November 30 for effluent discharges to Primary Contact Recreation Use water segments of the Chicago Area Waterway System (CAWS). Those segments are 1) Lower North Shore Channel from North Side Water Reclamation Plant to confluence with North Branch of the Chicago River; 2) North Branch of the Chicago River from its confluence with North Shore Channel to its confluence with South Branch of the Chicago River and Chicago River; 3) Chicago River; 4) South Branch of the Chicago River; 5) Little Calumet River from its confluence with Calumet River and Grand Calumet River to its confluence with Calumet-Sag Channel; and 6) Calumet-Sag Channel. The Board finds that the rule proposed is economically reasonable and technically feasible.

The Board declines at this time to establish an effluent limit for other segments of the CAWS and Lower Des Plaines River that are designated as Incidental Contact Recreation Use, Non-contact Recreation Use, and Non-Recreation Use waters. The Board also declines to adopt bacterial water quality standards for the Chicago Area Waterway System and Lower Des Plaines River, but invites participants to file comments on whether the Board should adopt the existing General Use fecal coliform water quality standard for Primary Contact Recreation waters of the CAWS. Further, the Board invites participants to file a proposal to address bacterial water quality standards for all waters of CAWS and LDPR after USEPA issues new guidelines in 2012 for establishing such standards.

ORDER

The Board directs the Clerk to cause the publication of the following rule in the *Illinois Register* for first notice:

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

PART 304
EFFLUENT STANDARDS

SUBPART A: GENERAL EFFLUENT STANDARDS

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

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 22 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. 2365, effective February 2, 2006; amended in R08-9B at ___ Ill. Reg. _____, effective _____.

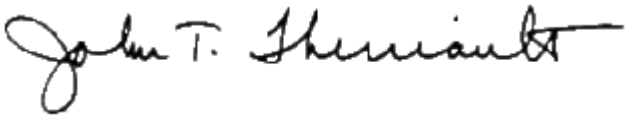
SUBPART B: SITE SPECIFIC RULES AND EXCEPTIONS NOT OF GENERAL APPLICABILITY

Section 304.224 Effluent Disinfection

Effluents discharged to the Primary Contact Recreation waters listed in 35 Ill. Adm. Code 303.220 must not exceed 400 fecal coliforms per 100 mL from March 1 through November 30. All effluents in existence on or before the effective date of this Section must meet these standards. All new discharges must meet these standards upon the initiation of discharge.

IT IS SO ORDERED.

I, John T. Therriault, Assistant Clerk of the Illinois Pollution Control Board, certify that the Board adopted the above order on July 7, 2011, by a vote of 5-0.



_____
John T. Therriault, Assistant Clerk
Illinois Pollution Control Board