

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:)
)
WATER QUALITY STANDARDS AND) **R08-9**
EFFLUENT LIMITATIONS FOR THE) **(Rulemaking - Water)**
CHICAGO AREA WATERWAY SYSTEM)
AND THE LOWER DES PLAINES)
RIVER: PROPOSED AMENDMENTS TO)
35 Ill. Adm. Code Parts 301, 302, 303 and)
304)

**METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER
CHICAGO'S PRE-FILED QUESTIONS TO MARYLYNN V. YATES**

1. Page 1 - Paragraph 3, First Bullet: Dry-weather pathogen contamination comes from WWTP.
 - A. Isn't it a fact that the actual measured concentrations of pathogenic microorganisms described in the Risk Assessment ranged from non-detect (<0.1) to very low numbers in the downstream locations, and were similar to the concentrations in the upstream locations (Dry and Wet Weather Risk Assessment of Human Health Impacts of Disinfection vs. No Disinfection of the Chicago Area Waterways System, Geosyntec Consultants, 2008; Tables 3-5a, 3-5b, 3-5c, 3-6 and 3-7)?
 - B. Do you have scientific evidence to demonstrate that MWRD effluent disinfection would result in reduction of all human pathogens in the effluent?
2. Page 1 - Paragraph 3, Second Bullet: Dangerous human-pathogens are very likely present in the CAWS.
 - A. What data suggest that the levels of indicator bacteria present in the CAWS downstream of MWRD water reclamation plants (WRPs) outfalls are very strong evidence of the presence of high levels of fecal material, which likely contains human pathogens?
 - B. What scientific evidence proves that there is higher likelihood of human pathogens due to high levels of indicator bacteria present in the CAWS downstream of the District outfalls, when the science has demonstrated that coliform bacteria do not adequately reflect the occurrence of pathogens?
 - C. What scientific evidence exists that there are hundreds of different types of pathogens in CAWS which can cause multiple types of serious illness to sensitive populations? Please provide evidence that dangerous waterborne diseases like Cholera are common in Illinois.

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- D. What scientific evidence confirms that there is a direct correlation between high levels of bacterial indicators (*E. coli* or enterococci) and the pathogens in an urban waterway such as CAWS?
3. Page 2 – Paragraph 1, First Bullet: Previous research shows risk to recreation users.
 - A. Please describe any scientific research studies in the U.S. to prove that water bodies with low concentrations of indicator bacteria, such as in CAWS, have demonstrated health risk to secondary contact recreational users from waterborne pathogens.
 - B. Was your statement based on white water canoeing studies in Europe or on speculation?
 - C. If based on published studies of paddlers in Europe, are you claiming that paddling in white water and CAWS are similar activities for health risk comparison?
 - D. If so, how does the illness rate for those engaging in the high water contact activities (paddling in white water) compare to limited water contact activities in the CAWS?
4. Page 2 – Paragraph 1, Second Bullet: Current efforts to re-evaluate pathogen indicator criteria have no bearing on the question of effluent disinfection.
 - A. Isn't it a fact that EPA has determined that fecal coliform bacteria are poor predictors of the presence or concentration of pathogens in water?
 - B. How can you state that the District's epidemiology study is unnecessary or inappropriate science when the settlement agreement over recreational water-quality criteria, which NRDC signed, calls for EPA to review epidemiological studies and to consider those studies in developing recreational criteria (paragraph 13 on page 6)?
5. Page 2, Paragraph 1, Third Bullet: MWRD's risk assessment has numerous flaws.
 - A. Please list any other scientific study that evaluated a large fraction of the human pathogens typically associated with sewage contaminated wastewater with all types of illness generally associated with such pathogens.
 - B. Isn't it true that the MWRD's risk assessment study acknowledges uncertainties that are inherent in any risk assessment methodology?
 - C. What scientific data proves that there is a real public health risk to incidental contact- recreating normal and sensitive population in the CAWS?
6. Pages 4-5, Documents Reviewed: Explain why fecal coliform data collected in the CAWS after 2002 and the District report on fecal coliform densities during dry and wet

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weather (District Interim Report No. 2005-15: Fecal Coliform Densities in Chicago Area Waterways During Dry and Wet Weather, 2004 and District Report No. 2007-79: Fecal Coliform Densities in the Chicago Waterway System During Dry and Wet Weather 2004-2006) were not reviewed for this testimony.

7. Pages 5-7, Paragraph 3, IV: MWRD Sampling Data Reflect WWTP Effluent as the Primary Source of Pathogens During Dry Weather.
 - A. On page 5 of the testimony regarding the CAWS, you state that “lingering pathogen contamination from combined sewer overflows” could occur for a few days immediately following a wet weather event.
 - (1) Are you aware that this lingering contamination could last up to several weeks at some locations for some rainfall events?
 - (2) If disinfection were practiced, could the level of pathogens resulting from this wet weather phenomenon be equivalent or possibly greater than are currently observed at some locations during dry weather without disinfection?
 - B. Please provide scientific evidence to prove that the high levels of indicators during dry weather in the CAWS downstream locations as described in Figures 1-2 directly correlate with high levels of pathogens in the CAWS.
 - C. Are you aware that the comparison of higher levels of pathogens at the outfalls as compared to the upstream levels on page 7, first full paragraph, is reported incorrectly?
 - D. When you analyzed the data for the North Side for 08/18/05 and 08/25/05, why did you neglect to indicate that less than 1.28 MPN/100L of enteric viruses were found in the outfall sample and the occurrence of 3.25 MPN/100 L in the upstream (1-m depth) sample?
 - E. The overall total culturable enteric virus results confirm that the concentrations in the North Side and Calumet WRP effluents were lower than observed in a study in Milwaukee and in Arizona (Sedmark et al., 2003 and Rose et al., 1987)¹. Given this scientific data as evidence, how can you confirm that the dry-weather contributions of enteric viruses were primarily from the District outfall?

¹ Sedmak, G, David Bina, and Jeffrey MacDonald. 2003. Assessment of an Enterovirus Sewage Surveillance System by Comparison of Clinical Isolates with Sewage Isolates from Milwaukee, Wisconsin, Collected August 1994 to December 2002. Applied and Environmental Microbiology, December 2003, p. 7181-7187, Vol. 69, No. 12.

Rose J B; Madore M S; Gerba C P; Arrowood M J; Sterling C R. 1987. Occurrence of Cryptosporidium oocysts in sewage effluents and selected surface waters. The Journal of Parasitology 1987;73(4):702-5

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- F. In addition, you point out that there are more enteroviruses downstream of the outfalls than upstream based on MPN levels, i.e. <0.1 and 1.04 MPN/100 liters upstream, and 2.12 and 16.07 MPN/100 L at the downstream sites. Are you aware that there is probably no difference between these numbers because of the inherent statistical standard deviations for the MPN method?
 - G. What is your basis for believing that the levels would be constant for fecal coliforms upstream and downstream if animals were the source?
 - H. What about the large numbers of birds that land on the water?
 - I. What about the large barges passing through the waterway which stir up the bottom, resulting in increased concentrations of fecal coliform?
 - J. What scientific evidence exists that there are no pathogens (enteric viruses, Giardia, Cryptosporidium) in the North Shore Channel upstream of the North Side WRP at Oakton, Central, and Dempster Streets and in the North Branch of the Chicago River upstream of the North Branch dam?
 - K. What scientific evidence exists that there are no pathogens (enteric viruses, Giardia, Cryptosporidium) in the Little Calumet River upstream of the Calumet WRP at Indiana Avenue and from the Little Calumet River at Ashland Avenue at a point that is tributary to the CAWS?
8. Page 8, Paragraph 2: Disinfection of WWTP effluent would substantially reduce CAWS pathogen loading during dry weather.
- A. Without knowing the current bacteria levels in the waterway, how can you conclude that the technology-based effluent limitation of 400/100 mL for fecal coliform bacteria will effectively reduce or eliminate the pathogens (enteric viruses, Giardia, Cryptosporidium)?
 - B. Are you aware of the data in the District's risk assessment report that demonstrate presence of pathogens in the upstream samples at both the North Side and Calumet locations?
 - C. Isn't it true that effluent disinfection will not reduce or eliminate the microorganisms from these sources?
 - D. Do you have data to show that effluent disinfection will result in reduction of bacteria in the waterway to concentrations that are less than the proposed effluent limitation of 400/100 mL for fecal coliform bacteria?
 - E. Figure 3 titled "Urban Rivers Analysis" attempts to show that rivers in which sewage is disinfected have fewer fecal coliforms. Isn't it true that these are large rivers and the low numbers are probably in large part due to dilution of the wastewater?

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- F. Can you please inform us of the percent of river flow in the Mississippi, Fox and Delaware rivers that results from effluent from the major municipal sewage treatment plants on those rivers?
- G. Please explain how those situations compare with the CAWS (i.e., what are the differences in dilution factors).
- H. Please explain and describe if there is any direct correlation between the numbers of indicator microorganisms present in the CAWS and the numbers of pathogens present.
- I. Do you know that during wet weather, the CAWS receives water and significant microbial pollutant loads from sources other than the District's WRPs?
- J. Are you aware that there are more than 250 CSO outfalls and 3 major pumping stations that can discharge into the CAWS during rain events?
 - (1) How would effluent disinfection result in reduction of pathogens in the waterway during wet weather events?
 - (2) Is it possible that effluent disinfection alone can give a false sense of security to the CAWS recreators?
 - (3) What data do you have to demonstrate that indicator effluent limits on the District's WRP effluents will reduce the levels of pathogens in the waterway?
 - (4) Do you believe that the indicator effluent criteria for fecal coliform can shield recreational users of the CAWS from pathogen exposure and pathogen related illness?
 - (5) What is your knowledge of the relative contribution of sources other than the District's effluents on microbial pollutant loads in the CAWS during wet weather conditions?
 - (6) What data can you present to demonstrate that if the fecal coliforms in the District's effluents meet the IEPA discharge criteria, the different reaches of the waterway would be free of pathogens and safer for recreational use?
 - (7) What data can you present to demonstrate that effluent fecal coliform limits will be protective of recreational users during dry and wet weather conditions?
 - (8) Are you aware of any outbreaks of disease associated with the recreational use of the waterway? In preparing this testimony, did you look for that type of information?

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- (9) Can disinfection designed to remove indicators (fecal coliform) be effective in the removal of pathogens and in the reduction of pathogen risks?
 - (10) What are the risks associated with microbial pathogens compared to those associated with disinfection by products (DBPs) which are persistent chemicals and some of which have relevant toxicological characteristics?
 - (11) Do you have an inventory of probable DBPs that have the potential to form in the CAWS and cause adverse health effects?
 - (12) Is it necessary to assess risk from exposure to DBPs to understand the true impacts of disinfection on human health?
 - (13) Considering post-disinfection re-growth of bacteria, relatively poor virucidal or protozoa effectiveness of certain technologies, and generation of persistent DBPs, what is your basis for concluding that wastewater disinfection will yield improved effluent and receiving water quality?
 - (14) What disinfection technology can protect the public under both dry and weather conditions for all pathogens?
9. Page 9 – Paragraph 2: You state, “I note also that disinfection is a longstanding standard practice in most major metropolitan areas in the U.S., and is implemented in many smaller communities as well (occasionally with limitations based on season or other factors). Chicago is very much an outlier in implementing this basic public health precaution that has long been in place elsewhere.” Are you aware that in other parts of the world; such as Western Europe, wastewater disinfection is the exception and is practiced only in areas where a direct threat to human health is possible, such as with facilities that discharge to bathing areas or shellfish breeding grounds?
10. Pages 9-10, Paragraph 3: The sampled levels of indicator bacteria show a likely presence of dangerous pathogens: A. Types of waterborne pathogens associated with sewage. The District’s treated wastewater has been demonstrated to have relatively low levels of pathogenic microorganisms during dry weather conditions; therefore, please provide scientific evidence to explain the following:
- A. What evidence is there that the pathogens listed in Table 1 exist in high concentrations in the CAWS?
 - B. What is the current health risk to normal and sensitive CAWS recreating population due to bacteria levels in the CAWS without disinfection?
 - C. What is the rate of illness among sensitive populations for those who engage in limited contact recreation on the CAWS under current conditions?
 - D. What evidence exists that the proposed effluent disinfection limitation of 400 FC/100 mL will lead to effective control of microbial pathogens (viruses and

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protozoa) listed in Table 1, when it is documented in the comments column that viruses are resistant to UV and protozoa are resistant to chlorination?

- E. How could you prove that low concentrations of pathogens detected in the CAWS locations both upstream and downstream of the District WRPs are viable and/or infective pathogens likely to cause detectable health effects?
11. Page 11, Paragraph 1: You state, "While the concentrations of pathogens may be reduced incidentally during primary and secondary sewage treatment processes, disinfection is specifically designed to decrease the concentrations of pathogenic microorganisms, as discussed above."
- A. Do you agree that reduction of the concentration of microbial pathogens is *assumed*, based on a given level of indicator inactivation by disinfection system, and that the degree to which this assumption holds true depends on the microorganism(s) in question, and the disinfectant(s) applied? For example, UV radiation is a disinfectant for control of most bacteria and common protozoan parasites (*C. parvum* and *G. lamblia*); however, UV is less effective against some viruses (*e.g.*, Adenovirus).
- B. Your statement, "Those whose age or physical conditions make them more vulnerable to infection", implies that it takes a lower infectious dose to cause an infection. Please provide any evidence to support that statement. Isn't it true that the outcome of infection is more severe, but it still requires the same number of organisms to infect the sensitive populations?
12. Page 12 – Paragraph 1: Multiple exposures pathways from non-primary contact use.
- A. Do you have scientific data to answer the following questions?
- (1) How much actual water is swallowed, inhaled and directly exposed by rowers, paddlers, boaters and fishers in the CAWS?
 - (2) What is the actual microbial exposure dose consumed, inhaled, exposed by rowers, paddlers, boaters, and fishers?
 - (3) Are you aware of any outbreaks of disease associated with the designated recreational use of the CAWS?
 - (4) What evidence exists that non-primary water contact activities in the CAWS pose higher levels of risk?
 - (5) What is the relationship between microbial measures of water quality and rates of illness among those who engage in non-primary contact water recreational activities in the CAWS?
- B. Do you know of any study published in the peer-reviewed literature that estimated how much water people swallow when recreating?

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- C. If no such study has been done, what is the basis for concluding that sufficient quantities of water are swallowed by fisherman, boaters and rowers to produce illness?
- D. In Figure 4, you present a chart from the CDC² showing the number of recreational water-associated outbreaks in the US from 1978-2004. Isn't it true that the CDC's definition of recreational water includes natural and treated water, and "treated water" venues will include facilities such as swimming and wading pools?
- E. Isn't it true that in the period 2003-2004, which was the subject of this survey, 62 waterborne disease outbreaks (WBDOs) were reported to have occurred in recreational water settings, and 43 (69.4%) of the reported WBDOs occurred at treated water venues, resulting in 2,446 (90.7%) cases of illness?
- F. Why is the CDC reference cited in context to CAWS when the vast majority of reported disease outbreaks appear to be taking place in treated water venues, not in natural water systems?
- G. Are you aware that over the past 23 years of the non-disinfected secondary treated wastewater discharges in the CAWS, there have been no documented public health outbreaks?
- H. You state that "gastroenteritis, associated with ingestion exposure pathway, is not always the cause of the majority of water recreation-associated outbreaks."
- (1) Isn't gastroenteritis an outcome of the outbreak (rather than a cause)? Have you examined the cause of the outbreaks associated with CDC's latest report on waterborne disease outbreaks (Appendix B in CDC, 2006, pp. 28-30)?
 - (2) Isn't it true that most of the non-gastroenteritis outbreaks in the figure are associated with hot tub or swimming pool water or water not impacted by sewage discharges, and some of these non-gastroenteritis outbreaks are associated with pathogens that naturally occurred in non-sewage contaminated water?
 - (3) Isn't the cause generally bather-to-bather contamination in treated water venues?
- I. What data can you present to demonstrate that if the fecal coliforms in the District's effluents meet the IEPA discharge criteria (400 FC/ 100 ml), then

² Centers for Disease Control and Prevention (CDC) (2006). Surveillance for Waterborne Disease and Outbreaks Associated with Recreational Water – United States, 2003-2004 and Surveillance for Waterborne Diseases and Outbreaks Associated with Drinking Water and Water not Intended for Drinking- United States, 2003-2004. December 22, 2006. MMWR 2006:55(No. SS-12).

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various reaches of the waterway would be free of pathogens and safer for recreational use to sensitive populations?

13. Page 13- Paragraph 2: High levels of indicator bacteria signal the presence of high levels of pathogens. What scientific report or data did you analyze to conclude that levels of fecal coliform and *E. coli* in sampling results signal the likely presence of human pathogens in the CAWS with the potential to cause illness to recreational users?
14. Page 13, Paragraph 3: You stated that the MWRD sampling in the CAWS near its outfalls reveals indicator bacteria levels that are higher than USEPA benchmark level of 5 times the primary contact standards for recreational waters.
 - A. Are you aware that there is currently no federally recommended bacterial criterion for non-primary contact recreational activities, and that the federal criteria for primary contact activities have been criticized as inappropriate to use as a basis for protection of non-immersion or secondary contact recreational activities?
 - B. Why is the level of fecal coliform bacteria in the final effluent outfall at the North Side and Calumet WRPs shown in Figures 5 and 6 during the May through October, 2002 not compared with the level of fecal coliform bacteria in the upstream and tributaries locations?
 - C. What was the rationale for ignoring these findings on upstream fecal coliform levels in the CAWS?
 - D. Is there data or scientific evidence to make an inference that the higher levels of fecal coliform bacteria in the CAWS relate to higher levels of pathogenic microorganisms?
 - E. If so, please discuss it and indicate where it is presented.
 - F. Have you reviewed and analyzed the risk assessment report data to determine if the high levels of fecal coliform in the outfall contributed to occurrence of higher levels of pathogens in the CAWS?
 - G. Why is it that bathing beach water quality standards are being compared to CAWS when primary contact is not the recreational use designated by the IEPA?
15. Page 15 – Paragraph 3: Reports of Illness or Disease Outbreaks are not a Good Measure of Risk.
 - A. You state that many of the symptoms caused by the pathogenic microorganisms associated with undisinfected sewage effluent are common but are not reported and the causes are difficult to trace. What evidence exists that the mild case of diarrhea is not due to causes such as food (raw salad, sea food, hamburger, etc.) or poor personal hygiene?

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- B. Isn't it true that the Milwaukee waterborne disease outbreak was a drinking water outbreak, not a recreational water outbreak?
 - C. Isn't it true that the Milwaukee outbreak was due to contamination of drinking water with disinfectant (chlorine) resistant pathogen, Cryptosporidium?
 - D. Isn't it true that the Milwaukee outbreak proved that compliance with water quality standards using traditional fecal indicators is not necessarily a reliable indicator of public health protection?
 - E. Isn't it true that incidents of waterborne illness have occurred when water quality met bacteriological standards?
 - F. Isn't it true that the unusually high spring runoff from the agricultural land and wildlife, especially the non-point sources, were suspected as the possible sources of drinking water contamination in Milwaukee?
 - G. Isn't it true that exposure to infectious pathogens and chemical contaminants found in the undisinfected sewage water environment are not unique to water, and there are other sources of contamination in the individual's environment such as food, soil, and air which must be ruled out during clinical confirmation of possible sources of contamination?
 - H. You admit that the exposure to a microorganisms does not always result in clinical illness, and it is unlikely that secondary infections will be traced to contact with contaminated water. Therefore, given these uncertainties, isn't it true also that these health effects are not uniquely caused by water exposure?
16. Pages 15-17: Previous Research Shows Risk from Pathogens to Recreational Users.
- A. Isn't it true that there are substantial water quality and hydrology differences between English whitewater canoe slalom courses and the CAWS?
 - B. How were data quality and representativeness addressed in each of these studies?
 - C. Please discuss any limitations in the size and methodologies of these studies.
 - D. Isn't it true that the majority of these studies did not identify pathogens responsible for acute infections among recreators, sufficient to establish an connection to water as a source of illness?
 - E. Isn't it true that these surveys were not performed in accordance with EPA or other generally-accepted quality control procedures?
 - F. Please explain how the relationship between microbe concentration and illness rates that were derived from white water canoeing studies of high water contact sport is scientifically informative in predicting rates of illness attributable to incidental contact recreation on the CAWS.

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- G. Do you believe that estimates of the amount of water swallowed during swimming or occupational divers can be applied to incidental water contact activities?
 - H. If so, why?
 - I. Isn't it true that estimates of water ingestion are unavailable for non-swimming recreators, so that modeling risk among non-swimmers relies upon assumptions that have not yet been validated by an epidemiology study?
17. Pages 17-19: Indicator Bacteria Guidelines are Broadly Sufficient to Suggest Potential Human Health Risk from Pathogens in the CAWS.
- A. Isn't it true that currently there is no federal recommended bacterial criterion for non-primary contact recreational activities?
 - B. Do you believe that EPA's current primary contact criteria are suitable or applicable for the protection of human health relative to the proposed designated recreational uses for the CAWS?
 - C. If so, why?
18. Page 18 – Paragraph 2: You state, “The concern being addressed by the indicator bacteria re-evaluation is not that the presence of indicator bacteria overpredicts the risk potential from human pathogens, but rather that it underpredicts the risks posed by such pathogens. While indicator bacteria may correlate well with the presence of some types of pathogens, especially pathogenic bacteria, USEPA's primary concern is that the absence of indicator bacteria may give a false assurance of safety when, in fact, there are pathogens present that would not be detected through indicator bacteria measurement. Thus, any standard that emerges from this re-evaluation process is likely to result, ultimately, in more stringent controls on the presence of human waterborne pathogens, not less stringent controls.”
- A. What is your basis for concluding that wastewater disinfection systems that are designed to meet a coliform standard, such as the standard proposed by IEPA, will accomplish reduction of the concentration of microbial pathogens in a waterway such as the CAWS?
 - B. Is it your belief that the indicator effluent criteria for fecal coliform can shield recreational users of the CAWS from pathogen exposure and pathogen related illness under both dry and wet weather conditions?
 - C. Considering post-disinfection re-growth of bacteria, relatively poor virucidal or protozoa effectiveness of certain technologies, and generation of persistent DBPs, why do you think that wastewater disinfection will yield improved effluent and receiving water quality?

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- D. Are you familiar with the EPA expert workshop report titled “Report of the Expert Scientific Workshop on Critical Needs for the Development of New or Revised Recreational Water Quality Criteria” (EPA 823-R-07-006)³?
- E. Isn't it true that this report pointed out that fecal coliform bacteria are detected where fecal contamination is absent, possibly resulting in an inaccurate assessment of recreational safety?
- F. You have discussed the importance of nonpoint sources in making recreational waters unsafe, citing an EPA statement that “[i]t's the main reason that approximately 40 percent of our surveyed rivers, lakes, and estuaries are not clean enough to meet basic uses such as fishing or swimming” (Yates & Noble, 2007, pp. 8-9)⁴. In your opinion, would nonpoint sources make the CAWS unsafe at times even if disinfection was provided at the water reclamation plants?
- G. In your report in the BEACH Act case (Yates & Noble, 2007, p. 5), you stated, “EPA must justify the level of risk upon which any revised or new criteria are based.” Would criteria designed to protect for incidental contact recreation be less stringent (e.g. higher) than criteria designed to protect for primary contact recreation such as swimming?
- H. Isn't it true that to establish microbial criteria sufficient to protect the designated uses specified in section 101(a) (2) of the [Clean Water] Act, it is required that the criteria be based on sound science?
- I. In this context, did IEPA provide justification as to the level of risk upon which they base their proposed technology-based effluent limits to protect for incidental contact recreation?
- J. You referenced a study where 46 anglers' hands and fish were examined for the presence of Cryptosporidium. Based on the outcomes, would you recommend that anglers, in general, wash their hands after fishing?
- K. If Cryptosporidium were present, would proper hand washing protect their health?
- L. You stated that “Any substantial level of contact with pathogen-contaminated water (not just immersion) carries with it a significant risk of illness.” What is meant by “significant?”
- M. How does this compare to being exposed to a pristine mountain stream contaminated with Giardia from wildlife?

³ Report of the Experts Scientific Workshop on Critical Research Needs for the Development of New or Revised Recreational Water Quality Criteria (EPA 823-R-07-006; June 2007), July 13, 2007

⁴ Yates, Marylynn and Noble, R. (2007). Analysis of the United States Environmental Protection Agency's Noncompliance with the Beaches Environmental Assessment and Coastal Health Act. October 5, 2007. 34 pp.

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- N. How does this compare to the risk of becoming ill as a result of eating at a restaurant?
 - O. How does this compare to the risk of sending your child to a daycare center?
 - P. How does this compare to the risk of sending your child to a public swimming pool?
19. Page 19, Paragraph 2: You discuss the basis for the establishment of drinking water standards.
- A. Are you aware that the quoted reference here only deals with drinking water and not recreational waters?
 - B. Are you suggesting that the CAWS should be “drinkable?”
20. Page 20 – Paragraph 1: The likelihood that the revised Beach Act pathogen criteria will allow the level of contamination now evident in the CAWS is extremely low.
- A. Isn't it true that the EPA work plan for development of new or revised criteria includes no provision to assess health risks and formulate criteria associated with any secondary contact recreational activities?
 - B. What is the basis for your statement “If a WWTP does not disinfect—as with the MWRD facilities—pathogen levels in the effluent will be high,” when the science has demonstrated that coliform bacteria do not adequately reflect the occurrence of pathogens?
 - C. Isn't it true that disinfection will not reduce the background bacteria levels in the CAWS, which will be higher than the effluent bacteria standard that the District WRPs will have to meet?
21. Page 20 – Paragraph 4: You describe the impact of disinfection as binary.
- A. Isn't it true that the “binary” argument may hold only under steady-state conditions; but the steady-state conditions rarely apply (though they are often assumed)?
 - B. Do you agree that variations in the levels of fecal coliform could present different levels of risk or protect for different uses?
 - C. Isn't disinfection to protect for primary contact recreation going to be different than for reclaimed water?
22. Page 21 - Paragraph 2: Isn't it true that the EPA standard discussed only applies to swimming and not to non-contact recreation?

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23. Page 21 – Paragraph VII: The Risk Assessment Prepared on Behalf of MWRD has Numerous Flaws.
- A. Isn't it true that current EPA standards are only based on gastroenteritis?
 - B. Why did you refer to the CDC document, which directly refers to swimming pools and pathogens that are not associated with sewage contamination?
24. Page 22, Bullet 2: Study of a small subgroup of pathogens.
- A. In your opinion, is it possible to measure all pathogens present in a water or wastewater sample?
 - B. Have you personally designed and executed any microbial sampling programs in waterways similar to the CAWS that included a larger number of pathogens?
 - C. Can you cite other microbial risk assessment studies that have measured a larger number of pathogens?
 - D. How many pathogens, in your view, are appropriate for a similar microbial risk assessment study?
 - E. Please cite the names of additional pathogens and the required EPA-approved analytical methods that, in your opinion, should have been included in the microbial risk assessment study for the CAWS.
25. Page 23, Bullet 2: Failure to take into account sensitive populations.
- A. Dose–response parameters selected for this assessment are considered for general population risks. Can you provide sensitive population dose-response parameters?
 - B. You state that not all individuals are equally sensitive to pathogens. What is your basis for this statement?
 - C. Are you aware that the largest impact to sensitivity to infection is the immune status of the individual (i.e., if they have antibodies to the particular pathogen), which was excluded from the analysis?
 - D. Would lack of consideration of immunity status tend to overestimate or underestimate risk?
26. Page 23, Bullet 3: Conflation of upstream and downstream pathogen levels.
- A. Do you believe that recreational activity is conducted more frequently near the WRP outfall or in areas directly downstream of the WRP?
 - B. If not near the outfalls, wouldn't the risk estimates overestimate the risk for recreators who are recreating in areas further removed from the WRP?

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27. Page 23, Bullet 4: Conflation of wet and dry weather conditions.
- A. Do you believe that people may be exposed to the waterway on rainy days or in the days immediately after a rain event?
 - B. The risk assessment does not take into account the fact that rain may decrease recreational use of the waterway – there were no data available in the UAA on this variable. Do you believe that this effect would tend to overestimate or underestimate the risks?
 - C. Do you understand that including the sampling data from both dry and wet weather is necessary to evaluate the impacts of disinfection on the overall microbial risk associated with the waterway?
28. Page 24, Bullet 2: Calculations are based on limited data: You state that there were 5 weeks of data for dry weather and 3 occasions of wet weather data. Do you know that each sampling event included collection of multiple samples at several locations at each WRP, and the report clearly states that 75 dry weather samples and 50 wet weather samples were collected?
29. Page 24, Bullet 3: Insufficient conservative dose-response assumptions.
- A. Are the pathogen dose-response parameters employed in the risk assessment typically used in agency risk assessments?
 - B. You claim that there is a lack of conservatism in the adenovirus dose-response parameter, and that this is a significant flaw in the methodology. Do you believe that the dose-response parameter cited for respiratory infection with adenovirus accurately reflects the risks for gastrointestinal illness?
 - C. Are all adenoviral pathogens equally capable of producing gastrointestinal effects?
 - D. Would you agree that including all adenovirus detected, not just those strain typically associated with gastrointestinal illness, may overestimate the risk for this pathway?
 - E. Dose response parameters were developed for several other pathogens. For example, do you believe that using rotavirus as the dose response parameter for *Caliciviruses* is a conservative assumption?
 - F. One of the pathogens that showed the higher level of risks is *E. coli*. Do you believe that the risks developed for *E. coli* are based on conservative assumptions?
30. Page 24, Bullet 5: Insufficient Information is presented to enable an accurate evaluation of sampling results.

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- A. You state that, "During dry weather, the volume of water sampled for viruses was stated to vary from approximately 100 liters for outfall samples to 300 liters for the upstream and downstream samples (no information regarding the wet weather virus samples was provided)." However, page 19, Section 2.3.2.1, Paragraph 2, Line 5, of the April, 2008 report states that during dry and wet weather at each location, 300-L of samples were collected upstream and downstream of the WRPs, and 100-L samples were collected at the outfall. Also, Appendices A-1 and A-2, referenced on Page 16, Paragraph 1 of the report, clearly report the sample volumes collected for each pathogen and indicator during dry and wet weather, respectively. Is your statement concerning the volume of water sampled incorrect?
- B. You state on page 25, "Enteroviruses and adenoviruses show no information on the actual volume of sample that was analyzed for each of the viruses for each sample was provided." However, Appendices B-1 (Dry Weather) and B-2 (Wet Weather) provide copies of all the laboratory lab bench-sheets that clearly present the sample volume analyzed. Is your statement about volume of samples incorrect?
31. Page 25, Bullet 3: Lack of specificity of the adenovirus assay.
- A. Are you aware that the cell line used is not designed to be specific for adenoviruses, as the cell line was selected because it will detect both adenoviruses and enteroviruses?
- B. Do you know that adenoviruses are more common in wastewater than enteroviruses. and that is why they were included in the study?
- C. As a result, isn't your statement that there were not large numbers of false positives for adenoviruses incorrect?
- D. PCR analyses were only conducted on the cell lines to confirm the presence of adenoviruses, so that an estimate of their concentration in the water could be determined. A PCR negative cytopathogenic producing cell culture indicated that enteroviruses were the cause of the CPE. This is documented in detail in a recently published study by Dr. Gerba ("Comparison of BGM and PLC/PRC/5 Cell Lines for Total Culturable Viral Assay of Treated Sewage," Applied and Environmental Microbiology. 74: 74:2583-2587, 2008). Weren't you the editor that accepted that article for publication in that journal?
32. Page 25, Bullet 4: Insufficient information on input variables is provided to enable an assessment of the risk calculations.
- A. Are you aware that all input variables are listed in the text, including the parameters of the input distribution used in the analysis, and that figures were only provided for a few examples?
- B. What input parameters are missing?

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33. Page 25, Bullet 5: Lack of probability distribution results.
- A. Are you aware that the results in the report were computed as full probabilistic distributions?
 - B. Sensitivity analysis was conducted using the full underlying exposure distribution. For simplicity of presentation, the results were developed into a point probability for comparison to the acceptable illness rates used by the EPA. So would you agree that your statement about the lack of probability distribution results is incorrect?
34. Page 26, Bullets:
- A. What primers were used for the calicivirus analyses?
 - B. What caliciviruses are detected using those primers? (Assessment p. 25).
 - C. Are you aware that this information is detailed in the SOP from Dr. Gerba's lab, which is included in the SAP and the QAPP?
35. Page 27: In your report in the BEACH Act case, did you criticize EPA's Critical Path Science Plan because EPA did not include a procedure for deciding how the results of other ongoing studies, specifically including the District's epidemiological study, could be incorporated into the process for development of new criteria?
36. Page 27: In your report in the BEACH Act case, did you state, as to the Chicago epidemiological study, that "[t]his research will be the first US study to address the health of individuals who engage in limited contact water recreational activities, such as boating, fishing, canoeing, kayaking, and rowing."?
37. Page 28: Conclusions.
- A. You state that, "The types of pathogens associated with undischarged sewage effluent...are capable of causing potentially serious infection among the population that uses the CAWS recreationally." Would the seriousness be dependent upon how people use the CAWS, and at what frequency?
 - B. You state that there are abundant data and information currently available to support a conclusion that WWTP effluent to the CAWS should be disinfected in order to protect public health. Please be specific and list the data that support your conclusion.

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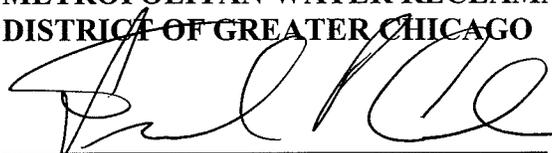
- C. You state that the CAWS contains high levels of at least some sewage-related human pathogens despite any uncertainty as to their exact nature and level. Can you explain how you can conclude that the levels are elevated when you don't know their nature or level?

Dated: August 25, 2008

Respectfully submitted,

**METROPOLITAN WATER RECLAMATION
DISTRICT OF GREATER CHICAGO**

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