ORIGINAL

ILLINOIS POLLUTION CONTROL BOARD

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

REPORT OF PROCEEDINGS held in the above-entitled cause before Hearing Officer Marie Tipsord, called by the Illinois Pollution Control Board, taken before Laura Mukahirn, CSR, a notary public within and for the County of Cook and State of Illinois, at the Thompson Center, Chicago, Illinois, on the 5th day of May, 2009, commencing at the hour of 10:00 a.m.

A P P E A R A N C E S

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MR. THOMAS JOHNSON, Member
MR. ANAND RAO, Member
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HEARING OFFICER TIPSORD: Good morning, everyone. My name is Marie Tipsord, and I've been appointed by the Board to serve as hearing officer in this proceeding entitled Water Quality Standards and Effluent Limitations for the Chicago Area Waterway System and Lower Des Plaines, proposed amendments to 35 Ill. Admin. Code 301, 302, 303, and 304. The docket number is R08-9. With me today to my immediate right is board member Thomas Johnson, and to his immediate right board member Dr. Shundar Lin. Dr. Girard is attending business in Springfield today and tomorrow, so board member Johnson has agreed to act in his absence. To my immediate left is Anand Rao and to his left Alisa Liu from our technical staff.

Before I begin today, I want to note that I received an e-mail from Miss Frisbie that Thomas Bamonte will not be able to appear today, so he will be testifying tomorrow. So we'll go from Miss Yates to -- is it Dr. Yates?

THE WITNESS: Doctor.

HEARING OFFICER TIPSORD: Dr. Yates, I apologize. I thought so. We'll go from Dr. Yates to Miss Frisbie and as time permits we'll go from there. We are continuing to hear testimony from members of the public, and today the purpose of the hearing is to hear the testimony of two witnesses, Dr. Marilyn Yates and Margaret Frisbie. The testimony will be marked as an exhibit and entered as if read. And after marking the exhibit -- after marking the prefiled testimony as an exhibit, we will then proceed to the questions beginning with the Metropolitan Water Reclamation District of Greater Chicago and then the IEPA. Anyone may ask a follow-up question. You need not wait until your turn to ask questions. I do ask that you raise your hand, wait for me to acknowledge you. After I have acknowledged you, please state your name and whom you represent before you begin your questions. Please speak one at a time. If you are speaking over each other, the court reporter

will not be able to get your questions on the record. Please note that any question asked by a board member or staff are intended to help build a complete record for the board's decision and not to express any preconceived notion or bias. I also want to just give you all a heads up that on Thursday the board continued its closed deliberative session on the record until today at 3:00 o'clock. If we are not concluded by 3:00 o'clock, we will have to take about a half an hour break at that time for the board members to attend the closed deliberative session.

And with that, Mr. Johnson?

ACTING CHAIRMAN JOHNSON: Thanks. I want to welcome you and tell you that Tanner asked me to apologize for his absence today. I think this makes him 27 for 28, so that's pretty good. He's in front of the House Appropriations Committee both today and tomorrow. With that, we can start.

HEARING OFFICER TIPSORD: Thank you. Mrs. Alexander?

MS. ALEXANDER: Yes. I would like to

present Dr. Marilyn Yates and I have her testimony to be marked as I believe it's Exhibit 249.

HEARING OFFICER TIPSORD: That is correct. Let's have her sworn in before I mark it.

(Witness sworn.)

D R. M A R I L Y N Y A T E S,

called as a witness herein, having been first duly sworn, was examined and testified as follows:

Examination

By Mr. Andes

HEARING OFFICER TIPSORD: All right. If there's no objection, will mark Dr. Yates' testimony as Exhibit 249.

Seeing none, it is Exhibit 249. And with that, we'll begin with -- did you have anything else or should we begin with questions?

MS. ALEXANDER: We can begin with questions.

HEARING OFFICER TIPSORD: Mr. Andes?

MR. ANDES: Good morning, Dr. Yates.

THE WITNESS: Good morning.

BY MR. ANDES:

Q. Let me start off with question one. It concerns a statement on Page 1 of your testimony that dry weather pathogen contamination comes from wastewater treatment plants. Isn't it true that the actual measure concentrations of pathogenic microorganisms described in the risk assessment range from nondetect to very low numbers in downstream locations and were similar to the concentrations in the upstream locations?

A. Well, I wouldn't exactly characterize them as similar. As I pointed out later in my testimony on, I believe, Page 7, there are many cases where the concentrations of the pathogens are much higher in the downstream locations than they are in the upstream locations. I would also point out that only a fraction of the samples -- of each of the samples was analyzed for the different pathogens; and, therefore, it's very difficult to conclude when you've only analyzed a cup out of 75 gallons and found nothing in it. It's very difficult to conclude that the entire sample contained no microorganisms.

Q. Well, we always sample some subset,

correct? You wouldn't expect to sample the whole 75 gallons, right?

A. It is entirely possible to analyze the sample of a size of 75 gallons, sir.

Q. And do you have any reason to believe you would have found something different in terms of --

A. I can't exactly speculate. But when you analyze less than one tenth of a percent of a sample that was collected, I think that extrapolating to the entire sample certainly has the potential to provide information that may not be correct.

Q. Now, in terms of the example you provided on Page 7 of your testimony, you indicated as to the enteric viruses, it actually -- most dates there were no measurable concentrations to detect, correct?

A. I'm sorry. Can you --

Q. You only specify two dates in which measurable concentrations were detected of the enteric viruses. I assume that means on most dates, the levels were not detected?

A. I drew two examples from the north

side sampling location to illustrate the fact that there are occasions when the downstream concentrations are higher than those upstream. There certainly were occasions when there were no detects.

Q. Well, in fact, on your testimony you say those two dates were the only dates on which measurable concentrations of enteric viruses were detected, correct?

A. At the north side location, yes, sir.

HEARING OFFICER TIPSORD: Just for the record, Mr. Andes, when you refer to the risk assessment, you're talking about what is Exhibit 71?

MR. ANDES: Yes.

BY MR. ANDES:

Q. You have evidence to demonstrate that disinfection absent from the district would result in reduction of all human pathogens in the effluent?

A. Well, sir, I did not say that you would get elimination of all pathogens in the effluent through disinfection. I believe what I said was that the disinfection would substantially reduce the numbers of pathogens being contributed to

the CAWS during dry weather situations.

Q. And would some methods of disinfection deal with some pathogens and not others?

A. Every disinfectant has a different capability of reducing the numbers of different pathogens to different extents. That is certainly the case, yes.

Q. So chlorination, for example, is effective against some pathogens and not others?

A. The degree to which chlorine reduces the concentration varies based on different micro organisms certainly; but chlorination will reduce the concentration of essentially any pathogen. That certainly that I am aware of. The degree to which it reduces the concentration does vary by organism.

Q. And as to ultraviolet treatment as well?

A. The same thing is true. The effectiveness of any disinfectant is going to vary depending on what micro organism it is that you're talking about.

Q. You say as to viruses and protozoa, are those particularly susceptible to some forms of treatment and not others?

A. Again, it varies by micro organism.

Q. So to achieve complete -- to deal with the whole range of pathogens, would you have to apply chlorination and ultraviolet?

A. The types of disinfectants that one would apply would really depend on what the organisms were in the effluent that you were trying to remove, the levels of reduction you were trying to achieve, the intended location, where you were going to discharge that effluent, and the use of the water where the effluent was going to be discharged. So you might end up, depending on all of those different factors, you might end up having to apply a range of different treatment processes.

Q. So then you might have to apply two different treatment trains: Chlorination and ultraviolet to all these plants?

A. I would not want to say specifically what disinfection methods one would use. As I just said, depending on all the factors I just mentioned, you might end up using more than one treatment process.

Q. Let me go on to the second question. The statement you made is the dangerous human

pathogens are very likely present in the CAWS. What data suggest that the levels of indicator bacteria in the CAWS downstream of the reclamation plant outfalls are very strong evidence, as you state, of the presence of high levels of fecal material which likely contains human pathogens?

A. If I could, I would like to, and this is just a technical question, I wanted to refer to one of the references that I cited in my testimony which is the National Research Council Report on Indicators For Waterborne Pathogens. And I would point out that this committee was convened by the National Research Council which is a council of the National Academy of Science specifically to look at the question of indicators for waterborne pathogens. I was a member of that committee as was Dr. Charles Haas who has also, I understand, testified in these hearings. And I would quote from one of the pages of this document, specifically Page 97, where it states that it is generally but not always the case that the greater the number of indicator organisms in the water, the greater the number of pathogens. This was, as I said, this was a report of the National Academies of Science.

MS. ALEXANDER: I have a copy with the excerpt that was just read by Dr. Marilyn Yates that I'd like to introduce as an exhibit. This would be, I believe, 250. This document is the title page, and the excerpt that Dr. Yates --

HEARING OFFICER TIPSORD: I need two or three copies. How many do you have? If there's no objection, we will mark this excerpt from Indicators For Waterborne Pathogens Committee on Indicators For Waterborne Pathogens Board on Life Sciences, Water Science of Technology Board, Division on Earth and Life Studies as Exhibit 250.

Seeing no objections, it's Exhibit 250.

BY MR. ANDES:

Q. And the statement you're referring to is on Page 97?

A. Ninety-seven, yes, sir.

Q. That it is generally but not always the case?

A. Correct.

Q. The greater the number of indicators,

the greater number of pathogens. Let me ask you about a number of studies and reports on that issue. The first one, which I believe was cited in our questions -- I'll provide you with a copy.

HEARING OFFICER TIPSORD: You were hoping to get Exhibit 250, weren't you, Fred?

I've been handed Validity of the Indicator Organism Paradigm For Pathogen Reduction and Reclaimed Water and Public Health Protection.

MS. ALEXANDER: I would point out for the record that this was not cited, I don't believe, in the prefiled questions. So this is the first time our witness has had the opportunity to review it. So I request a few minutes for her to look this over.

HEARING OFFICER TIPSORD: All right. It's by Harwood, et al, and it's marked June 2005. If there's no objection, we'll mark this as Exhibit 251.

Seeing none, it's Exhibit 251.

BY MR. ANDES:

Q. Dr. Yates, there were a couple statements made in this report that addresses a

particular issue that I wanted to see if you agree with. On Page 3168, on the second column, it states that the imperfect relationship between coliform bacteria and pathogens such as viruses and protozoa through wastewater treatment has been known for some time. Is that an accurate statement?

A. I'm not finding exactly where that is, sir.

MS. ALEXANDER: Where is that?

THE WITNESS: 3168. I see the page. I'm not --

MR. ANDES: Right-hand column.

THE WITNESS: Okay.

MR. ANDES: First paragraph.

THE WITNESS: First of all, what I would say is that this is one study that was conducted at, I believe, if I read this correctly very quickly just now, at six different wastewater reclamation facilities. And the results that they're presenting are based on those six facilities. I would also say that the statement that was made regarding the imperfect relationship between coliforms and pathogens, specifically viruses

and protozoan, I don't think anybody has ever said that it was a perfect relationship. We know that there are exceptions to every rule, but we -- and one of the reasons, actually, that EPA is extending so much energy at this point in time in their studies to establish new ambient water quality criteria is because we know that there are many, many, many occasions on which pathogens are present in a particular water body where we can't find the coliform bacteria. So their concern that there is underprediction of risk, pathogens are there, people are getting ill, and yet there are no coliforms present. And so, like I said, that's why EPA is expending so much energy in the studies that they're currently doing. And not just EPA, but many other individuals and agencies are also doing that.

Having said that, it is very, very, very well known that there are pathogens present in sewage. And we know that we can reduce the levels of those pathogens through treatment, especially disinfection. So, again, depending on the

different treatment process that's used, and I did not have time to read that, and this is the first time that I'm reading this particular document, I can't speak to what kinds of disinfection processes they may have used in these that lead to their results.

BY MR. ANDES:

Q. I should note for the record that this report was cited in the risk assessment document, so it was a reference in there.

Now, the statement that you just talked about talked about the relationship being imperfect, and that's been known for some time. But there's also a statement on the first page of the document at the bottom of Page 3163 which seems not specific to this study. Said it's been widely demonstrated that coliform bacteria do not adequately reflect the occurrence of pathogens and disinfected wastewater effluent. Due to the relatively high susceptibility of chemical disinfection and failure to correlate with protozoan parasites such as cryptosporidium and enteric viruses. That's a general finding, right?

A. And, actually, that agrees with the

statement I just made a moment ago, which was that typically the problem is that we find pathogens in a particular water body. So, therefore, there is a potential for disease, and yet the coliforms aren't there. So the coliforms are actually underpredictive of the potential risk because, as it states here, depending on the kind of disinfectant that's used, the coliforms can be more easily inactivated than can the pathogens.

Q. Haven't the studies shown both overprediction and underprediction?

A. It would -- Again, it's going to depend on the specific circumstance. And the other thing that I would like to indicate -- I shouldn't have used the term indicate. I'm sorry. The other thing I'd like to point out is we use the term indicator for a variety of different purposes. And so we need to be very clear that we understand the context in which we're using that term. We can use indicators to indicate how well a treatment process is working. We can also use them to indicate potential risks. So we need to be really clear exactly what context we're talking about indicators in.

Q. Well, in that regard, in fact, have you reviewed the testimony of Dr. Blatchley, Ernest Blatchley?

A. Yes, I did briefly review Dr. Blatchley's testimony.

Q. And he spoke at length about whether, in fact, conventional disinfection with the 400 limit proposed here would do much to address pathogens at all, correct?

A. I believe that was the substance of his testimony, yes.

Q. And, in fact, to remove pathogens to a significant level would require more like the reclaim water standards in California?

MS. ALEXANDER: Objection, vagueness. What do you mean by significant level? I mean --

MR. ANDES: I will refer back --

MS. ALEXANDER: There are different levels that one can reduce them. Reclaimed water is a radically different standard. What do you mean by significant?

BY MR. ANDES:

Q. Well, I believe Dr. Blatchley defined

that in his testimony. I'm wondering whether you disagree with any of the conclusions he made based on studies which related to the relationship between reducing indicators and reducing pathogens?

A. I guess that's too general of a question for me to be able to answer, sir.

Q. Okay. Well, Dr. Blatchley's -- in Dr. Blatchley's testimony --

HEARING OFFICER TIPSORD: Excuse me, Mr. Andes. That's Exhibit 93.

MR. ANDES: Thank you.

BY MR. ANDES:

Q. I'll just ask some general questions about the statements he made. One was that coliform bacteria are poor indicators of disinfection efficacy?

HEARING OFFICER TIPSORD: I'll ask that you tell us exactly was page you're reading from.

MR. ANDES: I'm sorry. Page 3 of his --

HEARING OFFICER TIPSORD: Exhibit 93.

MR. ANDES: Testimony, yes.

THE WITNESS: I'm sorry. I didn't

hear a question.

BY MR. ANDES:

Q. On Pages 3 and 4 of his testimony, Dr. Blatchley stated that coliform bacteria are poor indicators of disinfection efficacy. He went on to say a common impression among the lay public is that a wastewater effluent that has been disinfected is safe in terms of potential exposure to waterborne microbial pathogens. However, systems that are in compliance with coliform limitations similar to those that have been proposed for the District's facilities may still contain viable and/or infected microbial pathogens?

A. So I'm not sure what question you're asking me. I heard what you just read to me.

Q. Whether you agree with those statements. The question is even if one disinfected according to the limits proposed by the Agency, would that really reduce risk significantly or would you still have levels of pathogens because conventional disinfection wouldn't -- would not necessarily remove them?

MS. ALEXANDER: I still object to the word significantly, but you may answer.

THE WITNESS: Again, depending on what you mean by significantly. As -- The statement that you read is very general in that, I believe if I remember, if I can recall the beginning of that statement, you said that disinfection would remove -- I mean I'm going to paraphrase it, but disinfection would remove coliforms to a greater extent than pathogens. And, as I've already said, depending on the kind of disinfectant that you use, indeed, that may be the case. And, therefore, again, the problem is that coliforms are underpredicting the presence of potential pathogens in the water, and, therefore, underpredicting what public health risk might be associated with exposure to that water.

BY MR. ANDES:

Q. The question is if, as Dr. Blatchley says, conventional disinfection will lead to minimal improvements on viruses and protozoa, will be subject to the ability of microbes to repair and recover, whether -- even if you took the measure of conventional disinfection at these facilities and

spent all that money, whether -- do we have any idea what levels of pathogens would still be remaining such that the level of risk reduction would not be as much? We're trying to get a sense of how much are we really going to reduce risk by doing this disinfection?

A. Again, as we've already discussed, it depends on what type of disinfection you employ that will determine the amount of reduction of pathogens, of different pathogens that you would get.

Q. Okay. I'll move on to Question 2 Sub C. This refers to your statement on Page 2 of your testimony. There are hundreds of different types of pathogens that can be present in sewage contaminated wastewater. What evidence exists that there are hundreds of different types of pathogens in the CAWS which could cause multiple types of serious illness to sensitive users? And, in particular, do you have any evidence that waterborne diseases like cholera are common or exist at all in Illinois?

MS. ALEXANDER: Two objections: First of all, that's compound. Those are two connections. Secondly, there's no foundation for the second part. I don't believe that

Dr. Yates ever testified that cholera is common in Illinois. Can you please break the question apart first?

BY MR. ANDES:

Q. Surely. What evidence do you have in terms of the types and numbers of pathogens present in the CAWS?

A. The sampling that was conducted as a part of the risk assessment study that was done detected a number of different types of pathogens present at various locations downstream of the wastewater treatment plants in the CAWS. Do you want me to -- you know what those pathogens were. I can certainly enumerate them.

Q. And one of the pathogens you have listed on Page 11 of your testimony is cholera?

A. Certainly, yes.

Q. But cholera is not present in Illinois, right?

A. I did not state that cholera was present in Illinois. This is a list -- the table, as you can see, is entitled human pathogens associated with fecal material. And nowhere did I state that these pathogens were present in Illinois.

The point was that these organisms are present in fecal material, and that, therefore, because they're present in fecal material, they can also be present in sewage.

HEARING OFFICER TIPSORD: And, if I might, as a follow-up, in that table don't you also indicate that it's relatively rare in the U.S.?

THE WITNESS: Yes, it is, actually. One of the reasons that I did choose to include this organism is, first of all, there are outbreaks and cases of illness associated with vibrio cholera and certainly in other countries. But there also are cases in the United States. I did not say in Illinois. There are cases associated with exposure to vibrio cholera that -- in recreational water that results in disease. But one of the things about this particular organism is that there is sufficient concern about its potential to cause health effects that the Environmental Protection Agency has put it on their contaminant candidate list for potential organisms to regulate in drinking

water.

HEARING OFFICER TIPSORD: And that is the United States Environmental Protection Agency?

THE WITNESS: Yes. I'm so sorry. Yes. It's the United States Environmental Protection Agency.

BY MR. ANDES:

Q. That's a drinking water list. Is there --

A. That's correct.

Q. Can you refer to studies showing outbreaks of cholera in recreational waters?

A. There --

Q. In the U.S.?

A. There is a report from the Centers For Disease Control on recreational outbreaks of waterborne disease that I believe, I believe has been introduced into testimony. This is the most recent report that came out in 2008 and talks about the 2006 -- excuse me -- 2005, 2006 outbreaks that occurred in recreational water. And there are -- there is at least -- there is a report in there that there are outbreaks associated with various types of

vibrio including vibrio cholera from recreational waters.

HEARING OFFICER TIPSORD: Would that be report that's Exhibit 239, CDC MMWR September 12, 2008 surveillance --

THE WITNESS: Correct, correct. That is the one.

MS. ALEXANDER: And just a quick follow-up question. Dr. Yates, are there pathogens listed on Exhibit 6 other than cholera that you do believe pose a risk of illness to recreators when found in water?

THE WITNESS: Certainly. And some of those -- some of the pathogens that are listed in Table 1 actually were found during the course of sampling the CAWS. For example, the adeno viruses were found in the CAWS. The viruses that are listed here called coxsackie A and B viruses and the echo viruses are members of the group of enteroviruses that there was sampling and detection of enteroviruses in the CAWS. There was no further analysis to determine exactly which of those enteroviruses were

present. But the coxsackie A and B viruses and the echo viruses are members of that large group of enteroviruses.

In addition, noroviruses were found in the CAWS during the course of the sampling. Giardia cryptosporidium, all of these pathogens were found during the course of sampling the CAWS that are reported in the risk assessment document.

BY MR. ANDES:

Q. I'm looking at a page regarding vibrio in the CDC document. It seems to indicate that it's primary a marine issue, outbreaks in marine venues, and the most common exposures are through surfing and swimming?

A. And I, as I said, my point in bringing up vibrio was that, indeed, there are cases in the United States where vibrio cholera has been contracted through recreation, and that it is a significant enough concern to the Environmental Protection Agency that they have placed it on their list of potential contaminants to regulate in drinking water.

Q. Would measuring fecal coliform give

you a sense of whether, in fact, you're addressing vibrio levels in water body?

MS. ALEXANDER: I object on vagueness. What do you mean addressing? Do you mean reducing it all? Eliminating? What do you mean by addressing?

BY MR. ANDES:

Q. Would it give you any indication of vibrio levels?

A. Of vibrio levels? I really couldn't speculate on that, sir.

Q. Let me move on to Question 3 where you state that previous research shows risk to recreational users. Can you describe any studies that have shown that water bodies with the kind of concentrations of indicator bacteria as in the CAWS have shown health risks to secondary contact recreational users?

A. Well, I will admit there have not been a lot of studies that have been done on secondary contact, that that's just a fact.

Q. Are there any?

MS. ALEXANDER: I don't believe the witness was finished with the statement.

Were you finished?

THE WITNESS: I was not.

There have been studies that have been done to assess whether or not there is a health risk associated with exposure to water -- now my sentence is getting all screwed up. There have been studies that have been done looking at secondary recreational users to assess whether or not there are health effects associated with exposure to that water during the exposure to those recreational activities. And those studies have shown, not all of them, but there are studies that have shown that there is a risk associated with those activities, yes.

BY MR. ANDES:

Q. And which studies are those?

A. Well, if you would go to my testimony and look at, I believe, pages 16 and 17, I have listed some of those studies.

Q. So the first study regards wind surfing. You believe the conditions of exposure to water during wind surfing are comparable to

canoeing?

A. The point that I believe is relevant is that there is exposure to water during secondary recreational activities. Certainly there is exposure to water during canoeing activities as was shown in the risk assessment that was done. They assumed some level of exposure to water during canoeing. The point is that if you're exposed to water as a -- as a -- while you're recreating, if you're exposed to water and there are pathogens in that water, it can result in illness.

Q. My --

MS. ALEXANDER: I have a quick follow-up on that.

THE WITNESS: Sure.

MS. ALEXANDER: Do you believe that studies of primary contact recreation risk are relevant in assessing secondary contact risk?

THE WITNESS: Certainly. Again, the -- What's differing between the primary contact recreation and the secondary contact recreation in general is the volume of water to which a person is exposed. So it's very

well documented that swimming, which is a primary contact activity, is associated with health risk and disease. So the main difference between the two kinds of activities is the volume of water to which you're exposed; and, therefore, the level of pathogens to which you're exposed about. So we can learn about health risk from even primary contact recreation studies.

BY MR. ANDES:

Q. Dr. Yates, your statement, though, indicated that there were risks in secondary contact, nonprimary contact situations. So what I'm asking --

A. Correct, correct.

Q. -- as to each of these studies, is is this, in fact, secondary contact, or is it closer to primary contact in terms of level of exposure. Wind surfing, are you saying the level of contact in wind surfing is not primary contact?

A. I really don't believe that it is my job to define what is a primary versus a secondary contact activity. I would point out that in a risk assessment study that was done for the Metropolitan

Water District of Southern California on which Dr. Charles Gerba was a member of the project team and Dr. Charles Haas was a member of the scientific blue ribbon panel that reviewed that report, the kinds of body -- or the kinds of nonbody contact recreational activities that were considered included wind surfing, kayaking, jet skiing, water skiing. I can't remember if I said canoeing. And all of those activities were assumed by the experts I just mentioned as well as members of the Environmental Protection Agency, people from the Centers For Disease Control. All of those activities were considered to be activities in which a person would be exposed to water during the course of that recreation; and, therefore, they would be at some health risk as a result of ingestion of water on the contained pathogens.

Q. I'll ask first, I don't believe we've seen a copy of that report in the record there.

MS. ALEXANDER: All right. I can offer this one.

THE WITNESS: I apologize.

MS. ALEXANDER: I apologize that, again, I don't have enough copies. But --

HEARING OFFICER TIPSORD:

Miss Williams also has a follow-up.

If there's no objection, I will mark Predicted Public Health Consequences of Body Contact Recreation on Water Reservoirs, May 2002 journal AWWA as Exhibit 252.

And when you get a chance to take a look, is there any objection? Seeing none, it's Exhibit 252.

MR. ANDES: Since this report is fairly voluminous and wasn't introduced before, I'd reserve the right to ask the witness further questions later after we've reviewed it.

But let me go back to the question at hand, because I'm not sure based on your characterization that this really even relates to the question at hand which was the statement in your testimony concerned secondary -- excuse me -- I'm losing your testimony. It concerned a secondary contact. It said previous studies have demonstrated risk even absent primary contact use. So I'm

trying to figure out where is the nonprimary contact, whether it's in wind surfing or white water canoeing, and we'll talk about the other studies as well. But would you agree that wind surfing and white water canoeing could be closer to primary contact in terms of their level of exposure.

MS. ALEXANDER: I'm going to object to that. We haven't defined primary contact. What do you mean? I'm not even sure we've agreed in this proceeding what's the appropriate definition. Do you mean swimming?

MR. ANDES: I'm talking about the types of contact in the CAWS that implication of the statement of Dr. Yates' testimony was that contact levels of exposure similar to those in the CAWS create risks and that studies have demonstrated that. I'm trying to understand where there's any study here that shows people undergoing the levels of exposure that they undergo in the CAWS showing a significant health risk.

MS. ALEXANDER: So are you asking her

whether the activities studied are identical or close to identical to what goes on in the CAWS?

BY MR. ANDES:

Q. Could they be characterized as secondary contact or are they closer to primary contact, the statement and the testimony relates to nonprimary contact. So I'm not sure how the witness is defining that. I'm trying to understand what absent primary contact use there are health risks, and I'm looking at the studies and saying is this absent primary contact. It's wind surfing, it's white water canoeing, whether there are significantly different levels of exposure?

A. When I say primary contact, I'm referring to swimming. So nonprimary contact would be things other than swimming. Does that help?

Q. And you think the levels of exposure in wind surfing are similar to the levels in canoeing?

A. I have not done a study to determine the volume of water that is ingested during those two different activities. However, as I've just said, a scientific panel comprised of experts from

across the country, including Dr. Charles Haas, Dr. Mark Sobski from the University of North Carolina, individuals from the Centers For Disease Control and the United States Environmental Protection Agency, all agreed with the characterization of activities other than swimming as noncontact recreational activities, and those included kayaking, canoeing, wind surfing, et cetera.

Q. Did this study find a significant health risk from the secondary contact use? And if you can, please point to where that says that in the study?

A. The purpose of this particular study was actually not to determine whether or not there was a significant risk to the recreators. The purpose of this study was to determine the risk to -- this -- I apologize that you haven't had an opportunity to review this document. The purpose this study was to determine whether or not allowing noncontact recreational activities on this particular reservoir would result in an increased risk to individuals who drink drinking water that this reservoir was used as a source of. So it was a

different context. My point was that the individuals who reviewed this study which included Dr. Haas and the individuals on this review team who did the study who included Dr. Charles Gerba, Dr. Joan Rowes (ph.) accepted the definition of noncontact recreation as known for swimming and including the activities we mentioned.

HEARING OFFICER TIPSORD: Mr. Andes, Miss Williams has a follow-up that may, I think, talk about the primary contact versus secondary contact.

MS. WILLIAMS: I do want to ask a follow-up. With regard to these studies -- good morning. I'm Deborah Williams from the Illinois EPA.

THE WITNESS: Hi.

MS. WILLIAMS: With regard to these studies in Table 2 of your testimony, are you aware of whether the Metropolitan Water Reclamation District of Greater Chicago relied on any of these studies in developing its risk assessment document?

THE WITNESS: I am not.

MS. WILLIAMS: That's all. Should I

ask about this? Let me ask one other question just to clarify. Exhibit 252 that you just entered.

HEARING OFFICER TIPSORD: Miss Williams, please --

MS. WILLIAMS: I'm trying to figure -- it looks like this exhibit may contain multiple papers. Is that correct? There's a --

THE WITNESS: We don't have a copy of it. I'm sorry. I thought it looked awfully long. There's more than one document there.

MS. ALEXANDER: Yes. I believe there's more than one document. It got miscopied. My apologies. I will fix it during the break.

MS. WILLIAMS: That's all. Thank you.

MS. ALEXANDER: I have a couple of quick follow-ups if we can do that. First of all, Dr. Yates, have you ever made assumptions in your research as to volumes of water swallowed in connection with canoeing?

THE WITNESS: The study that we were just discussing, the one that was published

in AWWA, we assumed that the volume of water that we ingested during any of those nonprimary contact recreational activities was 30 milliliters.

MS. ALEXANDER: And do you have an understanding as to whether an assumption was made regarding ingestion of water in the risk assessment that is Exhibit 71 in this proceeding?

THE WITNESS: Based on my review of that document, indeed, assumptions were made as to the volume of water that would be ingested during the course of different recreational activities including canoeing, boating, et cetera, yes.

MS. ALEXANDER: Okay.

ACTING CHAIRMAN JOHNSON: Let me ask. So you assumed that a recreator who is windsurfing ingests the same amount of water as someone who's canoeing?

THE WITNESS: For the purposes of our studies, yes, we did.

MR. ANDES: Do you really think that's true?

THE WITNESS: I have not conducted any studies to verify that. Again, this study that I've mentioned, the one -- Exhibit 252 was reviewed by a national scientific panel. They reviewed every one of the assumptions that we made including the assumption that 30 milliliters of water would be the volume that would be ingested during the course of all the different nonswimming activities that were anticipated to occur on this particular reservoir and they all concurred including Dr. Gerba, Dr. Rows, Dr. Haas, that this was an appropriate assumption to make.

MS. ALEXANDER: One quick follow-up. Was it your understanding that that assumption was intended as an average as opposed to a direct representation of -- applicable to each activity?

THE WITNESS: Certainly it's an average that would occur. One would assume that there'd be some individuals doing some activities that would ingest smaller volumes, there would be some individuals that would ingest lower volumes. And, therefore, when

we did our risk assessment, we did take into consideration the fact that these were ranges, that these were just average behaviors that we were modeling.

BY MR. ANDES:

Q. So your assumption was that for swimming, 30 milliliters was the proper assumption you used for ingestion, right?

A. No, sir. No, sir. Nonswimming. I'm sorry if I wasn't clear. Nonswimming.

Q. Okay. And is it true -- Isn't it true that in the risk assessment document that that, in fact, is used as one of the assumptions to model the range of distributions of exposure?

A. That that was assumed?

Q. Thirty?

A. Thirty mils was --

Q. Used as a conservative projection of exposure in the risk assessment?

A. In the current risk assessment, the Geotech --

Q. Yes.

A. The exposure volumes were varied based on the different kind of activity, and they were

not, to my understanding, they were not an absolute, but they varied based on the length of time an individual was exposed to the water. So it was a volume per hour, if I remember correctly.

Q. So but 309 was used as a conservative assumption, correct? I mean we can find it, but I'm confident we will.

A. I don't recall exactly 30 mills. That may, indeed, be the case. I have no reason to doubt you, and I could look through it and find it, too. Again, I'm recalling in my memory the table that showed the volume ingested per hour for the various recreational activities.

MS. ALEXANDER: I have one more follow-up on this if you're about to move on. Are you moving on to the next question? Because I have one follow-up before you do.

MR. ANDES: I'm not moving on to the next question yet.

MS. ALEXANDER: Okay. So continue.

BY MR. ANDES:

Q. Okay. Now, one of the studies in the Table 2 on 16, Dr. Yates, that you cited was the Taylor Study from South Africa. And it concerns

canoeing.

A. I believe this is the same article that you've already handed out.

MR. ANDES: I don't believe so.

MS. ALEXANDER: This is identical to what you gave us before. You handed me the Harwood article.

MR. ANDES: I'm sorry.

HEARING OFFICER TIPSORD: I have another one up here if you guys need it. If there's no objection, we will mark this Survey of Waterborne Pathogens Amongst Canoeists in South Africa by M.B. Taylor, et al, from Cambridge University Press, 1995, as Exhibit 253.

Seeing no objection, it's Exhibit 253.

BY MR. ANDES:

Q. Dr. Yates, this report concerns canoeing in an area of South Africa?

A. Mm-hmm.

Q. And I want to raise a question about first whether you agree or how you would react to the findings, and then I'll go back to some of the

details. On Page 306 it indicates in this study a significant association between canoeing and antibody response to Schistosoma spp, but not HAV and NV noroviruses has been demonstrated. Now, are you aware of what schistosoma is and how schistosomiasis comes in a risk issue?

A. Yes, in general. It's not my specialization, but I am aware of schistosomiasis.

Q. Well, let me introduce an exhibit that should help everyone understand that. Simply a chart labeled schistosomiasis?

HEARING OFFICER TIPSORD: If there's no objection, we will mark the figure Schistosomiasis as Exhibit 254, if there is no objection. Seeing no objection, it's Exhibit 254.

BY MR. ANDES:

Q. Is it accurate to summarize this by saying that these particular organisms, I guess worms, penetrate snails, then are released by the snails, penetrate skin, migrate through the body, lay eggs in the bowels and then are excreted, which my daughter characterized as gross when she reviewed this chart.

A. You don't want to hear the conversations at the dinner table at my house. That was not gross at all. You know, when you work with sewage, what can I say.

I would say that that's a fairly accurate characterization of the figure that you just handed out.

Q. And in the report on Pages 304 and 305, it indicates that schistosoma is endemic in certain areas of the coastal regions of South Africa. All people using these waters are at risk. And, in fact, on Page 305 that South African canoeists are well aware of these risks and many take anti-schistosomal drugs regularly?

A. Yes.

Q. So that's a significant risk that was found in this report was for schistosomiasis which is not known to occur in the United States, correct?

A. Not correct. Schistosomiasis does occur in the United States, sir.

Q. In this area?

A. I could not speak to whether or not it occurs in Illinois, but there have been outbreaks associated with schistosomiasis in the United States

in the last few years according to the Center For Disease Control.

Q. Okay. Well, I'll introduce a document that refers to the CDC which lists areas of the world where this occurs. And I don't see North America anywhere on the list, but I guess we can introduce that document.

A. Sure.

Q. Is this an issue that we would have significant concern about such that we, by not looking at it in risk assessment, we have underestimated risk for the CAWS recreational user?

A. I have, as I've already stated, I have no knowledge as to whether or not schistosomiasis occurs in Illinois.

Q. In the final study you have on Table 2 regarding fishing, and cryptosporidium levels detected in the -- on the fisherman's hands were significant -- were significant, you can define that however you want, levels of cryptosporidium found in the sampling results taken in the CAWS. Do you have any reason to believe that there are high levels of crypto in the CAWS?

MS. ALEXANDER: I'm going to object to

the vagueness of high, but you can answer.

THE WITNESS: There were cryptosporidiosis found in the CAWS. Characterizing them as high or low is someone else's job, I guess.

BY MR. ANDES:

Q. In fact, that was laid out in the risk assessment as low levels. So I'm wondering whether you agree with that.

A. In my opinion, the finding of any levels of cryptosporidium in the water that is used for recreational purposes because it can result in a public health outcome is cause for concern. So characterizing it as high or low is, I think, more of a policy decision.

Q. Are you aware that crypto found in the risk assessment was noninfectious?

A. I have to admit that the main focus of my review of this document was on the virus, parts of the document. However, if the assays that were done to look for cryptosporidium found that absolutely none of them was infective, certainly I have every bit of confidence in Dr. Clancy's laboratory and their -- I use that laboratory. So

it's an excellent laboratory. They're very good at what they do. I would just mention that because they didn't find any viable -- or I shouldn't say viable, any infectious cryptosporidium in their samples does not mean that there are no infectious cryptosporidia in the water at all. Because they didn't sample every day all over the river, so.

Q. Okay. We'll move on to the next.

HEARING OFFICER TIPSORD: Miss Alexander had a follow-up.

THE WITNESS: Go ahead.

MS. ALEXANDER: I'm sorry. I just had one follow-up moving back to the water ingestion issue. I just wanted to ask whether a study of risk associated with a higher likelihood of ingestion can be relevant to determining the risk of an activity with a lower likelihood of ingestion?

THE WITNESS: Again, what -- The big difference is in the volume of water, and, therefore, the number of pathogens to which a person is exposed. So if it's shown that during the course of a study of an activity

where a larger volume of water is ingested, there is a significant -- there is a health risk, a measurable health risk. Those data, those results can inform a study in which there's a smaller body of water that's ingested. You just adjust for the different exposure levels. Is that responsive?

BY MR. ANDES:

Q. So you adjust for the different exposure levels. So if you think that the levels of exposure in secondary contact are one-tenth of the levels in the swimming, you would -- you just divide it by ten or multiply it by ten? Aren't they -- aren't they different exposure scenarios and you have to look at each one individually?

A. What I meant when I said exposure levels, I meant the number of micro organisms in which a person is exposed during the course of the activity. So if during one activity you're exposed to 100 milliliters of water, that contains a certain number of organisms. If during another activity you're exposed to ten milliliters of water, you're exposed to a lower number of organisms assuming that the concentration of organisms -- of the organisms

are evenly distributed throughout the water.

Q. But if the question is risk, not level of micro organisms or number of organisms you're exposed to, don't you need study the lower levels to actually determine if those levels of exposure, what the risk really is? You can't simply multiply or divide from the higher levels of exposure.

A. I don't believe that I said that that is what you would do. I said you would adjust based on the different exposures. And so you would use a different dose in the exposure assessment part. You would assume they were exposed to a different dose, and then use that as you went through the rest of the risk assessment calculation.

MS. ALEXANDER: Okay. I have another follow-up on that. Am I -- Were these assumptions regarding likely exposure associated with the certain activity intended to represent across the board an average likelihood in the sense that some individuals might swallow more water, be exposed to more water than others, but you're attempting to come up with one number. Is that correct?

THE WITNESS: That's my understanding,

yes.

MS. ALEXANDER: Would it also be fair to say that if you're looking at a particular individual who, say, fell in the water and ingested some, that their risk or that he -- I shouldn't say their risk. The amount they ingested might, in fact, be comparable even to the amount ingested while swimming. Would that --

THE WITNESS: That could certainly be the case, yes.

MS. ALEXANDER: Okay.

BY MR. ANDES:

Q. Didn't the risk assessment expressly take that into account in looking at the exposure scenarios to be conservative?

A. My understanding of the risk assessment is that they did look at a range of exposures, yes, to take into consideration the fact that there would be a range of exposures based on the different activities that were going on, yes.

Q. Okay. I can move on to the next question. On Page 2 of the testimony you made a statement, Dr. Yates, that current efforts to

reevaluate pathogen indicator criteria have no bearing on the question of effluent disinfection. Let's put aside the efforts by EPA to reevaluate the -- well, let me first ask. The EPA ongoing effort right now to reevaluate the recreational criteria concerned primary contact, correct?

A. It is my understanding that in studies that the EPA is currently doing, they are evaluating primary contact recreation, yes.

Q. And as I understand it under the settlement agreement in the case concerning those criteria which was entered into by NRDC, EPA and other parties that specifically called for EPA to, in fact, conduct epidemiological studies, correct?

A. That is my understanding. Yes, sir.

Q. And I understand, correct me if I'm wrong, that several studies have now been begun in terms of epidemiological studies with regard to beaches?

A. That is also my understanding, yes, sir.

Q. So you believe that those studies will be relevant in determining recreational water quality criteria for primary contact?

A. I certainly hope so.

Q. Okay. Whatever the results, they will be relevant, correct?

A. They will be one part of the considerations that EPA evaluates and members of the scientific community evaluate as they develop those criteria. They're not just doing risk assessment studies. That's one component of the process.

Q. And the epidemiological study being done as to the CAWS, which is the first one being done as to secondary contact, you would agree that that would as well be relevant in determining appropriate water quality standards for the CAWS?

A. I would say that the epidemiological study that's being conducted by Dr. Gorovich would certainly be one piece of information that would be relevant to consider when determining what happens with respect to the issues at hand here.

MS. WILLIAMS: I'd like to follow up on this question four real quick.

Can you explain the statement that Mr. Andes has flagged here from your testimony regarding efforts to reevaluate pathogen indicator criteria have no bearing

on the question of effluent disinfection. Could you just explain what you mean by this statement or how you draw this conclusion?

THE WITNESS: Sure. The EPA is reexamining the appropriateness of specific indicators that are being used to determine whether or not it's -- one should be allowed to recreate at a particular recreational site. So, in other words, you go out, you measure the water quality at a particular beach, for example, on a particular day, and as a result of whatever that analysis shows, you make a determination as to whether or not you should allow people to recreate at that beach or not. And that's really what the point of their current activity is. That, to me, is a very different situation than making a determination as to whether or not one should disinfect or not disinfect sewage effluent that is being put into a water body that is then going to be used for nonprimary contact recreation. They're just two very very different situations.

BY MR. ANDES:

Q. If I can follow up on that. Can you point to any statement by the District indicating that the EPA reevaluation of the primary criteria is a reason for the board not to require disinfection here? Isn't the District's position that the two are completely separate since this secondary contact?

A. I really could not -- I have not, to go back to the first part of your question, I have not seen any statement to the effect of that --

Q. Because your statement in your testimony indicates that the revision process shouldn't lead to a conclusion of disinfection is unnecessary. It implies the District was contending that. And I'm trying to find out if there is someplace where the district has said that that criteria revision process has any bearing here?

MS. ALEXANDER: I'm going to object to the extent you're asking her to comment on what the district may or may not have contended anywhere. I don't believe that's what she's here to testify to.

THE WITNESS: Yeah. I have no

knowledge of any such statement.

BY MR. ANDES:

Q. Okay. We can move on to the risk assessment. And the statements you made on Page 2, but also elsewhere in the report. First, do you know of any other studies that have looked at actual pathogens associated with sewage contaminated wastewater and types of illness?

A. I'm sorry. Could you repeat that.

Q. Have you seen any other studies that have looked at significant number of human pathogens and assessed risk relative to sewage contaminated wastewater?

A. What kinds of studies are you referring to?

MS. ALEXANDER: I'm sorry. Are you --

BY MR. ANDES:

Q. Anything comparable, have you seen anything comparable to this risk assessment?

MS. ALEXANDER: Are you on a prefiled question?

BY MR. ANDES:

Q. Question 5A. I'm sorry.

MS. ALEXANDER: Got it. Okay.

Continue.

THE WITNESS: So you're asking specifically about the risk assessment study?

MR. ANDES: Yes. Your statement on Page 2 was regarding the risk assessment. I'm trying to understand if there are other comparable studies that have been done.

THE WITNESS: Okay. I believe the question that you asked was whether -- you referred to a significant number of pathogens. I'm not --

BY MR. ANDES:

Q. Well, I can read the question directly and we can answer that.

A. Sure, sure.

Q. Please list any other scientific study that evaluated a large fraction of the human pathogens typically associated with the sewage contaminated wastewater with all types of illness generally associated with such pathogens.

A. Well, I guess you're characterizing your study as having evaluated a large fraction of human pathogens. And, as Dr. Gerba himself testified before this board, there -- he's -- he

quoted between 160 and 200 different pathogens that could be present in sewage. I indicated that there is -- there could be more than 100. The point is that it's very well known that there are -- choose a number. More than 100 different kinds of human pathogens that could be present in wastewater. And this study looked at, I would consider, a handful as opposed to a large fraction of them.

Q. And if we refer back to Dr. Gerba's testimony, the first question is didn't he state, and we can go back to his testimony, that a number of pathogens did not need to be evaluated because they weren't associated with sewage?

A. He did indicate that there are some pathogens that he didn't feel needed to be studied because they weren't associated with sewage. That's correct. Yes.

Q. And, in fact, he explained the rationale for selecting the ones which were analyzed as being the most common?

A. He did explain his rationale for why the organisms that he choose to study were studied, yes.

HEARING OFFICER TIPSORD: Excuse me.

That's Exhibit 69 for the record.

MS. ALEXANDER: And what was that rationale? I'd just like to ask a follow-up.

THE WITNESS: There were actually two points that were made with -- made in the document and in testimony regarding the rationale for choosing the organisms. My mind just blanked. I know one of them was that there was standard procedures available for the analysis of those organisms and the other one was organisms that are commonly associated with outbreaks in recreational settings. Those are the two rationales. However, as has already been pointed out by others, there are no EPA-approved methods, any generally-accepted standard operating procedures for at least two of the pathogens or groups of pathogens that were studied during the course of this risk assessment. Those would be the adenoviruses and the noroviruses.

MS. ALEXANDER: And one other follow-up. Is it your understanding that the risk assessment evaluated all sewage-related

pathogens?

THE WITNESS: Absolutely not. As I said, there's a handful of sewage-related pathogens that were studied during the course of the risk assessment. But there were others that were not.

BY MR. ANDES:

Q. And if I can refer back to Dr. Gerba's testimony on September 9, 2008, and this would have been Page 39 of the afternoon transcript, he said, and I quote, we also selected to represent what we figured would be the ones most commonly present, ones that could be detected by methods currently available, because methods weren't available for all of these. And the ones that -- and the ones would be there in the greatest concentration. So they would present the greatest risk based on knowledge of those responses in the occurrence of wastewater. Do you disagree with that?

A. That's Dr. -- I don't disagree that that's what Dr. Gerba said.

Q. Do you disagree with his statement?

A. I would say that there are othe microorganisms that are present in sewage that are

responsible for recreational waterborne disease outbreaks that he did not study. And I would also say that the methods that were used for doing the analyses for the neuroviruses and the adenoviruses, as I've said before, there are no standard methods for those particular analyses. So those were methods that are used in Dr. Gerba's lab, but I would say that if you looked at other laboratories that are doing those kinds of analyses, you would find that they use different methods.

Q. Well, do you have --

A. And these concerns are not just mine. As you know, the EPA has -- the United States Environmental Protection Agency has also expressed these very same concerns.

Q. Do you know of specific methods that Dr. Gerba used that were in error that he should have used another method?

A. I'm not --

MS. ALEXANDER: Another method for what? I'm sorry.

BY MR. ANDES:

Q. Analytical method.

A. For?

Q. You just laid out that there were other methods available for some bacteria, for some pathogens. I'm trying to understand if you're saying that his use of one method versus another significantly underestimated the risk. Do you have any reason to believe that?

A. What I'm saying is that the methods that were used by Dr. Gerba to do the adenovirus and the neurovirus assay were methods that are in use in his laboratory. I'm not saying that the methods -- that there was an error in the actual analysis that was done. What I'm saying is that those are methods that he is using in his laboratory. You could go to another laboratory and they'd be using a different method and you could get very different results. The reason that we -- or how do I say this? To become a standard method, or an EPA method, requires testing, extensive testing across the country in a number of different laboratories in large numbers of different water matrices by a number of individuals so that they can look at how reproducible the results are, look at how these methods work in a variety of different water matrices, et cetera. And so the fact that there are no standard methods for

these organisms makes it so it's difficult for us to say that the results that Dr. Gerba got would have been the same results that would have been obtained by someone else doing -- analyzing those same samples in their laboratories.

Q. So you don't have any reason to believe that use of Dr. Gerba's methods were, in fact, went beyond -- went into areas where EPA simply had not approved methods yet so used what was available. You don't have any reason to believe that that underestimated the risk in any way?

MS. ALEXANDER: I think we need a clarification here. Are we talking just specifically about the narrow question of doing assays, or are we talking about the broader issue of methodology? Because I believe it's clear that Dr. Yates' testimony contains criticisms of methodology such as the assay coupled with the PCR process. But we're talking about something narrower?

MR. ANDES: Yes.

MS. ALEXANDER: Okay. Making sure.

THE WITNESS: And that narrower --

BY MR. ANDES:

Q. I'm trying to figure out why there's a problem with the fact that Dr. Gerba, for pollutants that don't have an EPA approved method, used the method that was in use at his lab? What's the problem with that?

MS. ALEXANDER: Okay. I'm going to object on foundation. Because I don't believe that Dr. Yates' testimony was that there was a problem with that. I believe that her testimony had to do with discussion of the stated rationale for choosing those particular pathogens. There was a statement that one of the reasons for choosing to study a particular pathogen was because there was an EPA method. Dr. Yates has made a statement that, no, actually there were not EPA methods for all of the ones chosen. I don't believe that was a criticism of the choice to study those. Only a statement that the rationale provided doesn't match up with the facts.

THE WITNESS: That's correct.

MR. ANDES: Well, if I can correct the

record. I think what you'll find and what Dr. Gerba testified to was he focused on one where there were currently available methods, not only EPA approved. And we obviously know from your own testimony that he did use some methods that -- for pollutants that don't have an EPA-approved method, right?

THE WITNESS: But, again, I'm going back to the risk assessment document itself wherein it states that there were two rationales for choosing the organisms that were chosen. And one of them was the availability of U.S. EPA approved laboratory standard operating procedures. And --

BY MR. ANDES:

Q. So --

A. There weren't for the adenoviruses or the norovirus.

Q. So, in other words, if he selected them based on either/or, based on either they are ones that are commonly present or they have EPA-approved methods, there are some that you looked at which are commonly present which don't have EPA-approved methods like adenovirus and norovirus

and he did test for them, corrects?

A. My understanding was that it was not an or situation. It was an and situation; that they were commonly present and that there were SOPs. But I --

Q. Well, if I can quote from Page 9 of the risk assessment.

HEARING OFFICER TIPSORD: Which is Exhibit 71.

MR. ANDES: Yes. The criterion specifically presented there was there are EPA-approved methods or laboratory standard operating procedures available for the measurement of the selected pathogens.

THE WITNESS: Okay. That's not what you just said. You said the or was related to CAWS outbreaks. But, if, indeed -- I do believe what you have read. And, yes, it is true that Dr. Gerba has standard operating procedures in his laboratory for the analysis. Either way, the fact is that has been testified to by more than one person, there are more than 100 different pathogens that can be present in fecal material,

therefore, present in sewage. We studied a few of them, and is that sufficient to enable one to make a decision with the large potential public health consequences associated with disinfecting or not disinfecting that effluent.

BY MR. ANDES:

Q. Don't we --

A. But we know that disinfecting effluent will reduce the numbers of pathogens that are present, and, therefore, reduce the public health risk.

Q. Don't we often use indicators to measure for the presence of a suite of pollutants. Do we usually measure every pollutant in a water body, or do we measure some and use them to make decisions?

A. Again, it depends on what the purpose of the sampling and analysis is. But yes, we do frequently use indicators because it's difficult to measure for all pathogens.

Q. So you're not saying that the study would only be relevant if it measured all 100 pathogens?

MS. ALEXANDER: What do you mean by relevant? Do you mean a sufficient basis for a public health determination or relevant to what?

MR. ANDES: This proceeding on the water quality criteria?

MS. ALEXANDER: But, again, I object to the term relevant. I think it's vague. You can answer it if you understand.

BY MR. ANDES:

Q. Do you believe that a study that doesn't look at all 100 should be ignored?

A. I don't believe that a study that doesn't look at all 100 should be ignored. But I don't believe that it should be the only basis upon which a decision should be made as to whether or not one would disinfect effluent knowing that that disinfection is going to result in an improvement -- or is going to result in a reduction in risk to public health.

Q. And are you aware of anyone here who is contending it should be the only basis?

A. I'm not aware of that, but there might be. I don't really know. I don't want to try to

speculate on what people might be thinking.

Q. Do you have any reason to believe, to disagree with conclusions by Dr. Gerba that in essence the risk assessment looked at the most important parameters for public health? You talked about the greatest risk, basic knowledge of dose response and the response of wastewater. Do you have reason to believe that there's something they missed that had -- would have significantly changed the risk estimate?

MS. ALEXANDER: The parameters by public health, are you still referring to the specific pathogens or is your question --

MR. ANDES: Yes.

THE WITNESS: Again, there are other pathogens that we know are associated with human fecal material and are, therefore, present in sewage. And if people are exposed to them, they can have some fairly serious health consequences as a result and some of those were not studied. EPA has brought this up as well with respect to the fact that there are other pathogens out there that we know cause waterborne disease and can have

serious health consequences and they were not studied.

BY MR. ANDES:

Q. Well, let's talk for a minute about that. Have you reviewed -- Let me ask this. In your testimony you indicate that you reviewed a number of documents, I'm not sure if this is exclusive. It includes the dry and wet weather risk assessment and the review of the risk analysis by U.S. EPA. There were a number of other documents that went back and forth between EPA and the reclamation district including one that was recently filed which contained the detailed response to all comments submitted by EPA. Have you reviewed all of those documents?

A. I have reviewed a number of documents. You'd have to tell me specifically which one you're referring to. I've reviewed several.

Q. This document was filed in the record but it wasn't introduced during the hearings.

HEARING OFFICER TIPSORD: It's a part of the puzzle.

MR. ANDES: No. We filed this document on April 10. So it is in the

record. But I'm not sure if it's listed in the exhibits.

HEARING OFFICER TIPSORD: It's probably not listed in the exhibits, but it's docketed in the clerk's office.

MR. ANDES: Yes.

HEARING OFFICER TIPSORD: Was that the CD that you filed? Was that on the CD?

MR. ANDES: I don't think so.

HEARING OFFICER TIPSORD: Let's mark it as an exhibit. Even though it's repetitious, it would be easier.

THE WITNESS: If you can tell me the date of the document to which you're referring, maybe that would expedite matters.

MR. ANDES: April 10, 2009, is when we filed it with the Board.

MS. WILLIAMS: Was it March 13, the date of the --

MR. ANDES: The document itself was dated March 13.

THE WITNESS: I do have a copy of correspondence dated March 13, 2009. You realize I have to get on an airplane and I'm

not going to be able to carry this.

MR. ANDES: Sorry about that.

HEARING OFFICER TIPSORD: This is already -- actually, it's got public comment number at the top, so we won't need to mark it as an exhibit. It's Public Comment No. 186. And there are additional copies if anybody needs one. So we won't mark this as an exhibit since it has a public comment number.

BY MR. ANDES:

Q. Have you reviewed this document?

A. I believe I have, yes. This is -- there's a lot of it that -- and the only reason for my hesitation is that there appears to be several attachments to this. So, yes, with different dates on them, and I can't state with absolute certainty that I've reviewed every single one of them. But I'd have to compare page by page, so.

Q. And we don't necessarily have to go through detail now, but you referred to criticisms made by EPA?

A. Correct.

Q. And I believe you referred to them

later in your testimony. This is the latest document by the district responding to all of the issues raised in the latest comments by EPA. And I wondered if you had reviewed this and assessed the comments and the District's responses?

A. Yes, I have.

HEARING OFFICER TIPSORD: This is U.S. EPA we're talking about?

MR. ANDES: Yes.

THE WITNESS: Yes.

MR. ANDES: We'll come back to some detailed questions about that later.

BY MR. ANDES:

Q. So in terms of the various, and this is Question 6, and I'm just rephrasing it, on Pages 4 and 5 of your testimony where you laid out the materials you had reviewed, it included, for example, fecal data collected in the CAWS, but it didn't appear after that you had looked at data after 2002. There were other district reports that have been submitted since then which aren't listed. So the first question I had was whether, in fact, you had reviewed all of those materials as well?

A. I'm not sure exactly what you mean by

when you say all of those materials, sir.

Q. In Question No. 6 there were specifics: Fecal coliform data collected after 2002, district report on fecal coliform densities, two district reports on fecal coliform densities. And I wondered if those had been reviewed. They weren't listed in your testimony.

A. Those studies were not on the District's website when I submitted my testimony. I have since, since they have been made available on the website, I have reviewed those reports, yes, sir.

MS. ALEXANDER: And one quick follow-up. Have you reviewed fecal coliform data in any form after 2002 from the district's sampling?

THE WITNESS: Yes, I have,

MR. ANDES: Okay. Move on to Question No. 7.

MS. ALEXANDER: Can I ask another follow-up if you're moving on, which is did you believe that these studies after you reviewed them have had any relevance to your conclusions?

THE WITNESS: I didn't find anything in the later studies that contradicted the points that I had made in my testimony, no.

BY MR. ANDES:

Q. Concerning Question No. 7, Page 5 of your testimony, you state that lingering pathogen contamination from combined sewer overflows could occur for a few days immediately following storm events. Have you reviewed the testimony of Dr. Steven Melching in this proceeding?

A. No, sir, I have not.

Q. Or Dr. Garcia?

A. No, sir, I have not.

Q. Are you aware of information indicating that contamination from combined sewers can last up to several weeks after rainfall events?

A. Specifically in this particular setting in the CAWS?

Q. Yes.

A. I'm not aware of that information, no, sir.

Q. If disinfection were practiced, do you have a sense of what would be the levels of the pathogens that would be resulting in any way from

combined sewer overflows stemming from wet weather events?

A. My testimony focussed on dry weather situations, not on wet weather situations or CSOs.

Q. Are you aware of testimony concerning how often we have precipitation events in this area?

A. The only information I have is what is in the risk assessment report that contains data for the period during which the sampling was done for the purposes of this study.

Q. You don't have any reason to doubt that?

A. To doubt the information that's in the risk assessment report with respect to how often there's wet weather?

Q. Right.

A. I have no reason to doubt that, no.

Q. I'm going to skip to part D of Question 7. In the testimony -- I may come back to B and C. But in the testimony on Page 7 you talk about the enteric virus levels. On August 18, 2005, and August 25, 2005, and you indicate that the levels downstream were higher than upstream, but -- and I believe we have a table here somewhere. You

didn't note that the outfall sample found less than 1.28 MPN and the upstream, one of the upstream samples had 3.25. So, actually in table -- excuse me one moment. I want to be sure we have the right table.

The Table 3-5A indicates one of the upstream samples was significant, 3.25, correct?

A. I'm not sure what you mean when you say significant.

Q. Well, you cited 1. -- 2.12 at downstream as being a significant level. But we see one upstream sample that's higher than that, 3.25. And we see one sample at the outfall that's less than 1.28. I'm trying to look at the whole collection of data. And those weren't mentioned in your comparison?

A. My purpose in citing the numbers that I cited was that there are occasions when the concentration downstream is higher than the concentration upstream. So the occasions that I cited on, for example, on the 25th at north side, the upstream concentration was 1.04 MPN per hundred liters and 16.07 downstream, MPN per 100 liters downstream. My purpose was not to rehash every

single thing that was in all of your tables. I was making an example for illustrative purposes.

Q. And this is solely focussed on dry weather. You haven't looked at how the concentrations changed wet weather including what the levels are coming in upstream, correct?

A. My focus was on the dry weather results, sampling results.

Q. Did you review the wet weather report?

A. I did. I did review the wet weather report. Yes, sir.

Q. Okay. And do you have any conclusions relative to the levels shown from wet weather sources in the wet weather report versus what the changes are during dry weather?

A. The results from the wet weather, again, as I said, my focus was really on the dry weather. But the results from the wet weather sampling did show that there were potentially other sources of human pathogens to the CAWS.

Q. But you haven't assessed their importance relative to the treatment plants?

A. As I've said, my focus is really on the dry weather, whether it's clear that the

wastewater treatment plants are putting human disease-causing pathogens into the CAWS. It's known that there are people who are recreating there; and, therefore, because during those dry weather events you are putting those organisms into the water, there is a risk to the people who are recreating there. And that risk can be reduced if, indeed, you reduce the levels of pathogens that are present in the effluent through treatment.

MS. ALEXANDER: And just to clarify with a follow-up. When you referenced other sources of contamination, of pathogen contamination, were you referring to other wet weather sources?

THE WITNESS: My understanding is that, indeed, it was other wet weather sources such as CSOs.

MS. WILLIAMS: Dr. Yates, I'd like to ask a quick follow-up.

Are you familiar at all with the location of the sampling point that Mr. Andes is referring to as upstream versus downstream?

THE WITNESS: Only as they're shown in

the document. I have not physically visited any of the sampling locations, no.

MS. WILLIAMS: Do you have an opinion one way or another whether the site is being described as upstream of the north site plant are actually impacted by the discharge from the north side plant?

THE WITNESS: I do not.

MS. WILLIAMS: Thank you.

BY MR. ANDES:

Q. Now, I'll ask you a question, Sub E. The overall total culturable enteric virus results show concentrations in the effluent on the north side and Calumet were lower than observed in the study in Milwaukee and Arizona, studies by Sedmark and Rose. Given this data, how do you know that the dry weather contributions from enteric viruses were primarily from the district outfalls?

A. I have to admit I'm somewhat confused about you're referencing these two particular articles. I don't understand how they're relevant to the CAWS. The Sedmark article, that was posed in Applied and Environmental in December of 2003 examines the influence to sewage treatment plants,

and, therefore, would not be at all surprising that you would find higher concentrations of viruses in raw sewage than one would find in treated effluent.

The study that you referenced by Dr. Rose that was published in the Journal of Parasitology to in 1987 is focussed specifically on cryptosporidium oocysts. So, again, I don't understand the relevance of that particular article to dry weather contributions of enteric virus from the treatment plants.

BY MR. ANDES:

Q. Well, let me ask a follow-up based on your statement concerning the raw levels versus treated levels. Since one of the issues here is that most of the water in the CAWS is secondarily treated effluent from the district, are you aware of the statements made by Dr. Orris and Gorelick in the last round of testimony concerning the levels of of pathogens that are removed by secondary treatment?

A. I did review their testimony. I could not quote to you what levels of removal they indicated were removed by secondary treatment.

Q. Do you have any reason to doubt that

there is significant levels of removal by secondary treatment?

A. Define --

MS. ALEXANDER: Define significantly.

THE WITNESS: Sorry. You'd really need to define significantly to me.

BY MR. ANDES:

Q. We'll I just let it stand based on their testimony.

In Question Sub F, you point out that there are more enteroviruses downstream than upstream based on MPM levels, although I guess we've looked at that data, it seems like there are also some high ones upstream and some low ones at the outfall.

Are you aware there's probably no difference between these numbers because of the statistical standard deviations for that method?

A. Well, it would have been nice to have been provided with the standard deviations associated with the MPM evaluations that were done, so I don't have those. I did look at the data to determine whether or not I could actually calculate those myself. However, the raw data were not

provided, so I could not do those calculations.

I would say, however, that based on, and this is always a dangerous thing to do so I'm not sure I should even do it, but depending on exactly what the raw data would show, it very well could have been that there would be significant differences between 12.12 and 16.07, for example. Again, I couldn't calculate them and they weren't provided --

BY MR. ANDES:

Q. Let me correct the record on that. The raw data were an appendices to the report.

A. I actually have looked at the appendices, and I did not see any raw data, sir.

Q. We gave a disc including all raw data to counsel, so you --

MS. ALEXANDER: We'll have to straighten this out because we were not able to locate it.

THE WITNESS: Not raw data.

BY MR. ANDES:

Q. We'll move on. What is your basis or belief in the levels would be constant for fecal coliforms upstream and downstream if animals were

the source?

A. Well, I, as I've said, I haven't physically visited the sites, so I don't have any reason to believe that there would be any higher probability that an animal would be contributing to the concentrations of indicated organisms upstream than downstream. In other words, I have no reason to believe that there wouldn't -- that there would be any different probability of an animal --

BY MR. ANDES:

Q. Well, let me ask you a question --

A. -- going upstream versus downstream. And as you can see there are significantly different concentrations of these organisms upstream versus downstream. And if animals were the source, I would expect them to be very much more evenly distributed both upstream and downstream.

HEARING OFFICER TIPSORD: Okay. Dr. Yates, you are saying as you can see and pointing to documents --

THE WITNESS: I am so sorry.

HEARING OFFICER TIPSORD: Which the transcript cannot see.

MS. ALEXANDER: Allow me to clarify

for the transcript that I have in front of me that Dr. Yates is referencing blow-ups of figures that are contained in her testimony. To my far right is the one that is Figure --

THE WITNESS: Figure 2 which is the Little Calumet River and Cal-Sag Channel River, May to October 2002 Geometric Mean Fecal Coliform Concentrations. And the other figure we're showing is Figure 1 on Page 6 of my testimony which is the North Shore Channel and North Branch Chicago River Ambient Made to October 2002 Geometric Mean Fecal Coliform Concentrations. Sorry about that.

HEARING OFFICER TIPSORD: Thank you.

BY MR. ANDES:

Q. So, Dr. Yates, those are fecal coliform concentrations?

A. Correct.

Q. Those are not concentrations of any particular pathogens?

A. It is not known whether those fecal coliforms include any pathogenic strings of E. coli, for example, but that's a just a general fecal coliform analysis.

Q. Okay.

A. But, again, if animals were the source, animals -- well, maybe I didn't quite understand the point of your last question. The point is that the -- if animals were contributing significantly to the concentrations of coliforms in the water, one would anticipate that, again, the concentrations would be relatively stable both upstream and downstream. But also the fact is that we know, as I've already indicated based on the statement in the National Academy Science Report, which I believe was 2 -- Exhibit 250, I believe. That we just introduced this morning. We know that there are correlations --

HEARING OFFICER TIPSORD: Yes.

THE WITNESS: -- in general that higher levels of indicators correlate with higher levels of pathogens. Here you can see that downstream there are lower levels of coliforms which one could then infer based on that statement there would be lower levels of pathogens downstream of the wastewater treatment plants; there are higher levels of coliforms and one could then infer that there

would be higher levels of pathogens as well.

BY MR. ANDES:

Q. Would that -- Given that there's data, there are data in the risk assessment, looking at specific pathogens and actually indicating levels below both upstream and downstream.

A. And I didn't hear the first part of the question that -- I didn't here what made that a question, sir.

Q. So wouldn't that say that perhaps in this situation that you're finding low levels of pathogens both upstream and downstream? So the levels of fecal would not really be a good indicator of levels of risk?

A. Well, again, I would have to remind you that the risk assessment -- in the risk assessment in the sampling and analysis that was done for the risk assessment, you didn't look at all potential pathogens. You only looked at a handful of the, as we've already agreed, more than -- maybe we don't agree, but as numerous people have indicated the more than 100 different pathogens that are present in the -- potentially present in human fecal material, and, therefore, in sewage. So you

only looked at a handful of those potential pathogens. And for those pathogens that you did sample and analyze for, take norovirus as an example. Again, more than 75 gallons, generalizing from the data that I've seen, samples of an order of 75 gallons were taken. And yet for noroviruses maybe a cup of that was analyzed, and then inferences drawn to the entire 75 gallons were drawn. So, again, the robustness of the data are not necessarily -- well, we'll just leave it at that.

The other thing I would point out is that there are many occasions on which you analyze samples for adenoviruses using cell culture, and you found using your follow-up analysis with PCR that, indeed, the cell culture results that turned out positive were not actually caused by adenoviruses. The PCR results -- the cell culture results said that there were viruses present, the PCR results showed that those positive cell culture results were not caused by the adenoviruses, and, therefore, it was concluded that those cell culture results, which indicate the presence of infected viruses, were actually caused by enteroviruses. And

this was explained by Dr. Gerba during his testimony. So the point is that there were a number of samples where you did have enteroviruses present in the sample, you confirmed this using the cell culture assay in Dr. Gerba's laboratory, and yet those samples were counted as a negative for enteroviruses during the risk assessment.

Q. We'll come back to that one. I'm going to skip questions I, J, and K. We may come back to those later. I don't know if we're close to taking a break.

THE COURT: We can take lunch now and come back about five to 1:00.

MR. ANDES: Okay.

HEARING OFFICER TIPSORD: Everybody is okay with that?

MS. ALEXANDER: I just want to just point out so that everybody knows, Dr. Yates has a plane reservation at 8:00 p.m. tonight which means that she would need to be out of here essentially at 5:00. And, you know, I know we have other witnesses on today, but I just want to say that just to gauge the timing.

HEARING OFFICER TIPSORD: Okay.

MR. ANDES: I don't know if we'll be -- it's hard to say at this point if we'll be done by then.

THE COURT: And if not we'll make arrangements for her to come back.

MR. ANDES: Right.

HEARING OFFICER TIPSORD: Let's take lunch.

(Lunch break taken.)

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STATE OF ILLINOIS)
) SS.
COUNTY OF COOK)

I, LAURA MUKAHIRN, being a Certified Shorthand Reporter doing business in the City of Chicago, Illinois, County of Cook, certify that I reported in shorthand the proceedings had at the foregoing hearing of the above-entitled cause. And I certify that the foregoing is a true and correct transcript of all my shorthand notes so taken as aforesaid and contains all the proceedings had at the said meeting of the above-entitled cause.

Laura Mukahirn

LAURA MUKAHIRN, CSR

CSR NO. 084-003592