ORIGINAL

IN THE MATTER OF:	)	
	)	
WATER QUALITY STANDARDS AND	)	
EFFLUENT LIMITATIONS FOR THE	)	No. R08-9
CHICAGO AREA WATERWAY SYSTEM	)	
AND THE LOWER DES PLAINES RIVER:	)	
PROPOSED AMENDMENTS TO 35 ILL.	)	
ADM. CODE PARTS 301, 302, 303	)	
AND 304.	)	

TRANSCRIPT OF PROCEEDINGS held in the above-entitled cause before Hearing Officer Marie Tipsord, taken before Tamara Manganiello, RPR, at 160 North LaSalle Street, Room N-502, Chicago, Illinois, on the 28th day of July, A.D., 2009, commencing at 9:06 a.m.

APPEARANCES

ILLINOIS POLLUTION CONTROL BOARD
Ms. Marie Tipsord, Hearing Officer
Mr. G. Tanner Girard, Acting Chairman
Ms. Andrea S. Moore, Board Member
Mr. Thomas E. Johnson, Board Member
Mr. Shundar Lin, Board Member
Mr. Gary L. Blankenship, Board Member
Ms. Alisa Liu, Environmental Scientist

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BY: MR. FREDERIC P. ANDES,

Appeared on behalf of the Metropolitan Water Reclamation District of Greater Chicago.

HEARING OFFICER TIPSORD: Good morning, everyone. My name is Marie Tipsord. 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 River, Proposed Amendments to 35 Ill. Admin. Code 301, 302, 303 and 304. This is docket number R08-9.

With me today to my immediate left is acting chairman, G. Tanner Girard, presiding Board member, to his immediate left is Board member Gary Blankenship and then to Mr. Blankenship's left is Board member Shundar Lin. To my far right is Board member Thomas Johnson and to my immediate right is Alisa Liu from our technical staff.

A couple of things I want to note. First of all, for those keeping track, I believe this is day 29 on my count. Also, I received an e-mail this week from -- or last week from Tom Diamond, who's been in contact with the Exxon Mobil attorneys about the schedule of the hearing on August 13th. Both

Robin Garibay and Carl Adams -- I believe I'm pronouncing those correctly -- are flying in from out of state and so they would like to start with them to ensure that they hopefully are done. As you know, that's consistent with my attempts to try and keep people from coming back, except for Dr. Yates who has at our pleasure come back today. So we will begin with the Stephan (phonetic) witnesses on August 13th and then go to Exxon Mobil. I think we should still be able to do that in that time frame we have.

Also, just as a minor note, I had in the past been at the close of each hearing putting in cumulative exhibit lists and since the exhibit list is now very lengthy after each hearing from now on I will only be adding to that exhibit list. I won't be printing out the whole cumulative exhibit list to be included in the docket just to try and save some paper.

With that, I think today we are going to begin with Dr. Yates, Marylynn Yates, who was with us at the end of -- in

May. And if we have time this afternoon, which I think I've heard that we are going to, we will hopefully begin with Corn Products.

We will begin with the questions from the Metropolitan Water Reclamation District of Greater Chicago. Anyone may ask a follow-up question. You need not wait until your turn to ask a question. I do ask that you raise your hand, wait for me to acknowledge you, after I have acknowledged you, please state your name, whom you represent before you begin your questions.

Please speak one at a time. If you speak over each other, the court reporter will not be able to get your questions on the record. Please note that any questions asked by a Board member or staff are intended to help build a complete record for the Board's decision and not express any preconceived notion or bias.

We will go until around 5:00 today. We will have a lunch break. And with that, Dr. Girard.

DR. GIRARD: Good morning. On behalf of the Board, I welcome everyone to hearing day 29 in this rulemaking. Thank you for all the extraordinary time and effort that has been invested in helping the Board get a complete record for our decision. We look forward to your testimony and questions today. Thank you.

HEARING OFFICER TIPSORD: And with that, I believe we're ready to begin.

Dr. Yates, please remember you are under oath having been sworn in in May. We won't do that again.

THE WITNESS: Thank you.

MS. ALEXANDER: And we have one small housekeeping matter. Last time during Dr. Yates' testimony she referenced a CDC Morbidity and Mortality Report that documented a schistosoma outbreak. We referenced it having pulled it up on the internet and promised the Board that we would provide it as an exhibit. I have it today. It can be marked at the convenience of Board and counsel.

HEARING OFFICER TIPSORD: Let's go ahead and get that marked now and take care of it.

MS. ALEXANDER: Okay. So this will be Exhibit 286?

HEARING OFFICER TIPSORD: Actually, it's Exhibit 301.

MS. ALEXANDER: I'm sorry. Exhibit 289?

HEARING OFFICER TIPSORD: 301.

MS. ALEXANDER: I guess I missed some days.

HEARING OFFICER TIPSORD: It may be that you didn't print off the most recent ones since I started doing the different placement.

MS. ALEXANDER: How many copies do you need?

HEARING OFFICER TIPSORD: Can we get at least three?

(Document tendered.)

HEARING OFFICER TIPSORD: I have marked the CDC Morbidity and Mortality Report marked May 26th, 2000, Surveillance For

Waterborne Disease Outbreaks, United States, 1997 to 1998. If there's no objection, we'll mark it as Exhibit 301. Seeing none, it's Exhibit 301.

MR. ANDES: First, one scheduling question. After we're complete with the questioning of Dr. Yates, the plan was to move on to Corn Products witnesses. And as I mentioned to Ms. Alexander, we have trimmed down our questions somewhat for Dr. Yates so we could be completed with that fairly soon. I don't know if the Corn Products people are here and when they would be ready to go but...

HEARING OFFICER TIPSORD: Actually, I believe Mr. Reed indicated to me that they'll be available around the noon hour; is that correct?

MR. REED: That's right. 12:30.

MR. ANDES: Okay. Well, we could be done before then.

HEARING OFFICER TIPSORD: We'll take an early lunch.

MR. ANDES: Okay.

WHEREUPON:

MARYLYNN V. YATES, Ph.D.

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

EXAMINATION

BY MR. ANDES:

Q. Good morning, Dr. Yates.

A. Good morning.

Q. We have to cover a few issues that were raised in your previous testimony. One of them was a statement that you made concerning the upstream and downstream sampling. The statement that you made was that in the risk assessments we had assumed there was equal use of upstream and downstream locations when it was your understanding more miles of the CAWS were below or downstream of the treatment plants.

I want to start on that issue by looking at a map, which I know I have here somewhere. This is a figure that's already an exhibit in one of the exhibits, I believe the dry and wet weather risk assessment.

HEARING OFFICER TIPSORD: So this is already an exhibit, Mr. Andes?

MR. ANDES: Yes.

HEARING OFFICER TIPSORD: Then we won't enter it again. And I have additional copies if anyone needs one. And before we go any further, I just want to note for the record that Dr. Yates' initial testimony was Exhibit 249 for purposes of the record to try and keep things straight.

BY MR. ANDES:

Q. Dr. Yates, this is a figure that shows the sample locations that were used for the dry weather risk assessment. Let's contrast this for a moment and just confirm your understanding. This shows the samples where they were taken for the dry weather assessment upstream, downstream and at the outfalls. The wet weather assessment actually looked at locations all throughout the system. So your discussion was specifically about the dry weather sampling locations; am I right?

A. Correct.

Q. Now is it your understanding that these sampling locations were fairly close to each of the treatment plants, upstream and downstream?

A. I have to admit I don't recall exactly

how far from the treatment plants each of the sampling locations was.

Q. Now those sampling locations in the vicinity of the plants were then -- and confirming your understanding, these samples in the vicinity of the plants were then used to analogize and make conclusions for the rest of the system, correct?

A. I'm really not sure what it is that you're saying.

Q. Well, in determining the risks throughout the system including, say, areas significantly downstream, these were the data points that were used?

A. That's my understanding, yes.

Q. Okay. Now since the bacteria levels would tend to attenuate particularly as you go significantly downstream on the Ship Canal or on the Cal-Sag, for example, your understanding is that that attenuation was not -- or decay was not factored in at all; am I right?

A. That's my understanding, yes.

Q. So then that would tend to overestimate what the risks are downstream?

A. If the concentrations of the pathogens

decreased significantly, which we do not know because they were not measured, but if the concentrations of the pathogens decreased significantly as you move downstream, then the risk that would be calculated based on that specific number would tend to be overestimated, yes.

Q. And you would expect ordinarily that those levels would decrease as you go downstream; am I right?

A. It would depend on a number of factors. The length of time that these -- that some of these pathogens can remain infectious can be weeks depending on the environmental conditions. So since those concentrations downstream were not measured, I really can't say as to whether they were lower than the concentrations at the sites that you measured.

Q. But they certainly wouldn't increase, right? The main sources that we're talking about here during dry weather are the treatment plants. You wouldn't expect -- there are not other sources coming in significantly, so you wouldn't expect the numbers to go up, they would only go down?

A. In general, that's correct, yes.

Q. Now in terms of the issue of sort of what's upstream and downstream, when we're taking samples at Stickney, for example, the upstream sample at Stickney, that's actually downstream of Northside, correct?

A. Not -- well, assuming, looking at this. I have not looked at, you know, the flows, but looking at this picture it certainly appears that that's the case, yes.

Q. Okay. So by including that as an upstream sample, it's not an upstream sample absent any contributions, it's an upstream sample that would take into account the contributions coming down there from Northside?

A. It appears that that would be the case, yes.

Q. Also, when you questioned whether the risk assessment assumed there was equal recreation both up and downstream, did you look at whether there are, for example, some high recreation areas in the Lake Calumet system that are upstream of the Calumet plant or Upper North Shore Channel activities that are upstream of the Northside plant? Did you look at the extent to which, in fact, there

might be some high recreation areas that were upstream?

A. I did not look at the amount of recreation that might be upstream or downstream. One of the points I was trying to make is that there's no justification in the report for the fact that you used both downstream and upstream pathogen concentrations in doing the risk assessment. The report does not justify in any way why that was done.

Q. Well, since the assessment looked separately -- and we can provide the table -- at what the risks are upstream, downstream and at the outfall, doesn't that show in some respects particularly a worst case because it's actually looking at what the risk assessment is for actually at the outfall?

A. I don't believe that the -- any overestimation of risk that might have been provided by looking upstream versus downstream outweighs the other numerous ways that we talked about when I was here last that the risks tended to be underestimated, for example, by looking at extraordinarily small sample volumes and

extrapolating to the entire sample. I believe those risks -- that the lack of consideration of those risks far underestimates the risk and that these risks, while they may tend in some places to overestimate risk, I think that when you combine the two you're still far underestimating risk.

Q. But as to this -- let's take one issue at a time. As to this issue in particular where we look separately at upstream, downstream and actually risks at the outfall -- and you would agree that people are probably not going to be canoeing for long periods of time directly at the outfalls of these plants, right?

A. I really couldn't speculate on that, sir.

Q. Well, let's look at the -- and this is not in this form. This table is not in this form in the record.

HEARING OFFICER TIPSORD: Let's enter it as an exhibit then.

MR. ANDES: It's entitled Illness Rates For All Pathogens. It's a summary of information in Exhibit 71.

HEARING OFFICER TIPSORD: If there is

no objection, we'll mark Illness Rates For All Pathogens as Exhibit 302. Seeing none, it's Exhibit 302. And there are more copies up here if anyone needs one.

BY THE WITNESS:

A. Could you please tell us which tables that are in the Exhibit 71 these data are from?

BY MR. ANDES:

Q. It is taken from table 4-7 of the dry weather report and I believe -- so not the main report in Exhibit 71, but I do believe that we've introduced the dry weather report.

HEARING OFFICER TIPSORD: Is that Exhibit 72, Fred, dry weather risk assessment of human health impacts?

MR. ANDES: That would be it, table 4-7 of Exhibit 72. And I'll note for the record that in reviewing that table we found a typo which actually increases the number. In the Stickney downstream sample, the table 4-7 reflected as .022 should have been .220, so the table we've just provided reflects the higher, corrected number.

MS. WILLIAMS: Are we going to have

testimony, Fred, on the -- I mean, is there any way to authenticate that that -- is there elsewhere in the document that this is just a typo?

MR. ANDES: Yes. We could certainly provide testimony to that. But if you go back into the dry weather report, .22 is reflected. That's the real number. We just -- it was reflected improperly in that table.

MS. WILLIAMS: Thank you.

BY MR. ANDES:

Q. So, again, these are dry weather risks, Dr. Yates, and you'll note that the analysis looks separately at upstream risk, downstream risk, combined upstream and downstream and actually at the outfall and the highest number here is about one illness rate per thousand and that compares, am I right, to the EPA primary contact criteria of eight per thousand?

A. I'm not sure what the question is.

Q. So the risk at the outfall -- and correct me if I'm wrong -- here is assessed as about one illness per thousand and that compares to the

EPA recommended primary contact criterion of eight per thousand?

A. If you're asking if the primary contact number that EPA uses is eight per thousand, yes, that's correct.

Q. Okay. And this is one per thousand. And that's at the outfall, correct, so you would agree that that would probably be the maximum risk that we'd be dealing with in a dry weather situation?

A. I really couldn't speculate on that.

Q. Okay. Let me move on to another issue, and you referred to it previously concerning the use of what you characterize as small samples. And I believe that our initial discussion was concerning the use of the equivalent of .2 liters to test out of a total of 300 liters and let's talk about that issue for a minute. To clarify, my understanding is you were specifically talking about norovirus?

A. I was specifically talking about norovirus because norovirus is the only virus for which you actually listed the equivalent volume of sample that was tested. I don't have the

information on the equivalent volume of sample that was tested for the other organisms -- the other viruses specifically.

Q. Okay. Well, let me try to lay out my understanding of how the process worked. And correct me if I'm wrong or if there's anything here that's inconsistent with your understanding.

MR. ANDES: And I would also say to the Board that if we have any questions or need any testimony, Dr. Gerba is here, whose lab conducted the test. He can certainly provide some clarification.

BY MR. ANDES:

Q. So let's start with the 300 liters of water. My understanding, explaining it as best a layman can -- and since we have you and Dr. Gerba here you can correct me if I'm wrong --

A. Don't worry, we will.

Q. -- is that you start out with 300 liters of water with bacteria in it. I'm sorry, not bacteria. I keep getting corrected on that. Viruses. And then that is filtered -- that is run through a filter so all of the viruses in that 300 liters of water are left on filter. That

there's then a process to separate the viruses off the filter and they're put into a one-and-a-half liter container.

Then there's another process by which that's filtered again and all of the viruses then are put in a 30 milliliter container of water. So all of the viruses that started in the 300 liters have now been put in a much smaller volume of water to make the analysis easier to do. Is that fair to characterize it that way?

A. First of all, it sounds like you've been to my class, so, very good, you would have passed that question on the exam.

The only point I would raise is that I was unable to find anywhere in any of the documentation what volume of final concentrate -- that 30 mls that you mentioned, I was unable to find that information anywhere in any of the documentation. So I could not tell what volume that 300 liters or in some cases 125 or whatever, I could not find out what final volume that original sample was concentrated to. You've said 30 milliliters. I couldn't find that anywhere in the documentation, which is one of the reasons I've been saying what

I've been saying all along is that I cannot go back and calculate the equivalent volume.

Q. Okay.

A. It's nowhere in the documentation.

Q. We can certainly have Dr. Gerba clarify that at this point. He's already been sworn in.

A. I'll accept that that's the case, sir. I'm just saying it's not in the documentation. I'll accept that it's 30 mls. That's fine. That would be a very typical volume. I'm not going to argue with it.

Q. Okay. And I believe that was in the appendix to the report.

A. I have read all of the appendices, sir, and I cannot find that information.

Q. Okay. Well, we can certainly have testimony as to it and then we can provide documentation at a later point if that can't be located. If that's not available, we can provide laboratory information.

A. Again, it doesn't matter. I accept that it was 30 mls. As I said, that's a very typical volume and it's going to be within a couple

of mls of that. That's fine. My point is that I could not find it documented anywhere.

Q. And so we may have this issue with regard to the next step as well, so let's take it to the next step. And if we need to fill in the gaps either with a document or with Dr. Gerba's testimony, we can.

But my understanding, again, speaking as a layman, is that that 30 was then split into two samples of 15 milliliters, one of which was sent off site to one lab and another was sent to -- was used by Dr. Gerba's lab specifically, then most of that 15 milliliters was used to test for adenovirus?

A. Actually, this information was in the appendices and it states that 10 milliliters were sent to Dr. Gerba's laboratory and that 8.3 of them were analyzed for adenoviruses.

Q. Okay. So 8.3 of the ten were --

A. Right.

Q. -- tested for adenovirus?

A. Uh-huh.

Q. Then a small amount -- a much smaller amount, the equivalent of .2 liters of the larger

sampling was tested for norovirus?

A. Approximately, right. That information is provided in the tables in Exhibit 71, the exact volume, but it's around 200 milliliters, yes.

Q. Okay. So of this concentrated sample, we end up with most of what was at Dr. Gerba's lab to be tested for adenovirus, a small amount being used to test for norovirus. Now that was the equivalent of .2 liters or 200 milliliters, right?

A. That's according to the tables in the document, yes.

Q. Now the normal assumption you've used in terms of intake -- ingestion of water in recreation is 30 milliliters, right?

A. In studies that I have done, yes, we've assumed 30 milliliters of water being ingested during recreation.

Q. So this 200 milliliter equivalent actually represents a much larger amount of water relative to virus concentrations -- virus amounts than you ordinarily assume in a study?

A. Two hundred milliliters, of course, is more than 30. The point is that you only tested

200 milliliters of water and if you didn't find anything in that particular 200 milliliters volume, you assumed the entire rest of the sample contained no noroviruses.

So while the 200 milliliters that you looked at that some people might have swallowed didn't contain any noroviruses, the other 299.8 liters of water may have contained millions of noroviruses, therefore, people exposed to that 99.9 plus percent of the sample that you didn't analyze, somebody could have swallowed 30 mls of that and it could have contained numerous noroviruses sufficient to cause them to become infected and potentially ill.

Q. Now --

A. So I don't believe there's any relevance to the volume that a person might ingest and the volume that you actually analyzed. They're two totally separate issue.

Q. Now when you do a norovirus test -- which is a DNA-based test; am I right?

A. RNA.

Q. RNA. Thank you. That's usually done on a small sample; am I right?

A. That's correct, yes.

Q. So the sample size used here was actually fairly typical of what you would ordinarily do in -- rather than testing on large samples? In fact, it would be a lot of effort to have to sort of keep testing over and over on small samples?

A. That's correct.

Q. And the number of samples taken will also affect -- you're talking about a risk that there's a false negative. So to take 125 samples as was done here would actually be something to reduce the risk of not getting a norovirus in the sampling, correct?

A. Not really, no. I think you're combining two totally different issues here.

Q. The more samples you take, don't you reduce the risk of getting one where, you know, there's a lot of noroviruses floating around but you just didn't happen to get it in your sample? The more samples you take, the less risk there is of that?

A. I guess. But still I don't agree that it's going to overcome the fact that you looked at such a tiny, tiny, tiny fraction of the sample. You

are trying to make a determination as to whether or not there's a health risk associated with recreating in this particular water body. And to analyze such a tiny, tiny, tiny amount of a sample, less than a tenth of a percent of a sample, and then extrapolate that to the rest of the sample and say, oh, okay, we're good, this water is not -- it doesn't pose a health risk to me is just not the appropriate way to do it.

There should have been much more effort taken to analyze more of the sample if you're going to base such a huge decision as to whether or not to disinfect the water and thereby reduce the concentrations of pathogens and protect public health.

So I just think that when the stakes -- if you're doing a research study, it might be different. But the stakes here, you're setting policy decisions that are going to have a huge impact on the health of the people in this community and it just to me is irresponsible to look at such a small fraction of a sampling and extrapolate to the rest and say we're fine. It's just too important.

Q. You don't have -- so, first, you don't

have that issue as to what we did, say, for adenovirus or bacteria, you're just speaking specifically here about the norovirus, correct?

A. The norovirus is probably the best example of where you had the potential to underestimate because you looked at such a tiny, tiny fraction.

With the adenoviruses, we had this discussion last time, where, okay, with the adenovirus you analyzed about a quarter of the sample, right?

Q. Let me interrupt for a moment because we'll get to that issue with the adeno. Let's take one issue at a time. Your issue is that --

A. The norovirus is the place where you analyzed the tiniest fraction of the sampling, that's correct.

Q. So that would mean for the other viruses we analyzed a pretty large fraction of the sample, right?

A. You analyzed more of the sample, that's correct.

Q. Well, if it was tiny for one, then it was probably all the rest for the others, right,

because it didn't just -- logic would say --

A. I don't know. I don't know. You said you ended up with 30 mls of concentrate. Dr. Gerba's lab analyzed less than 10 mls of it for the adenos and the noros. I assume -- I don't know how much was analyzed at HML for enteros and I don't know what happened to the rest of the sample. So I can account for about -- in Dr. Gerba's lab for less than a third of the sample, a third of the sample, essentially.

Q. But taking a third of the sample, the chance that you're going to get a non-detect when there's a lot of viruses floating around is not appreciable, correct?

A. I wouldn't say not appreciable. I would say that the risk of not -- I shouldn't use the word risk, should I?

Q. It can be a false negative, right?

A. The chances are much less if you're analyzing a third of the sample than if you're analyzing a tenth of a percent of the sample.

Q. Thank you. We're going to use a table and this is in Exhibit 71.

HEARING OFFICER TIPSORD: This is

table 3-9, summary of dry weather virus detection, and it's already also table 3-10 from Exhibit 71, correct?

MR. ANDES: Yes. And there are no changes in these tables.

HEARING OFFICER TIPSORD: And we have extra copies if anyone needs one.

BY MR. ANDES:

Q. So, Dr. Yates, what we're talking about here as to norovirus is specifically table 3-9 where you can see that the norovirus levels are one detect out of 25, three detects out of 25 and one detect out of 25?

A. Uh-huh.

Q. Now it would be relevant, wouldn't it, to think about, well, what generally is the risk when we're sampling for norovirus that we're going to get non-detects when there really are significant levels there? Let me refer you to answer that question.

Let's look at the wet weather samples because on table 3-10 we see that in wet weather we do have a lot of detects of norovirus. Same method used, same issues you would have in

terms of small samples, but we find the norovirus in a fair number of samples, low levels, but it's detected which tends to indicate -- at least it would seem to indicate that you do have a fair chance of picking up noroviruses using this method when there are noroviruses actually there. And if you compare the wet weather samples where you did find noroviruses even in these small samples to the dry weather samples where you really didn't find it, it would be logical to assume that there is a lot less norovirus in dry weather than there is in wet weather, correct, wouldn't that be a reasonable conclusion?

A. I don't think so.

Q. Really? So --

A. I wouldn't look at it that way.

Q. So since you're finding norovirus in wet weather, 44 percent, 63 percent, 17 percent, so even with this small sample size you're finding plenty of norovirus, you're capturing it and you can't capture much more than 63 percent, but yet when you look at dry whether you don't find it. You're saying that's because you took two small samples.

But when we took those same small samples on wet weather we found it. So one could say, well, okay, so more likely it's there in wet weather and not there in dry weather. There's no difference in the sampling methods or the sample size, it's really a difference in what's in the water?

MS. ALEXANDER: I think this was asked and answered. The witness has said that she wouldn't look at it that way. Perhaps you need to allow the witness an opportunity to explain why.

BY MR. ANDES:

Q. Sure.

A. Well, there's a couple of different things here. Again, if you're looking at wet weather one could assume that if you'd actually analyzed a larger portion of the sample, two things would have happened, A, you would have had much higher percentages of the samples being positive and, B, the concentrations you would have measured would have been higher.

You have an issue when you're looking at a small sample not just of whether or not

the organism is there, but you have a detection limit issue. You can only detect a certain -- down to a certain level. So I think that there are -- I don't agree with your characterization that looking at that tiny, tiny sample volume was justified.

Q. Well, but your point was focused on detection and saying the fact that we found -- we detected norovirus very rarely in dry weather and you're saying that's because of the sample size?

A. Uh-huh.

Q. We're saying, well, but we have the same sample size in wet weather and we found it all over the place so --

A. Well, I wouldn't say 17 percent is all over the place.

Q. But 63 percent would be?

A. Not really.

Q. Really?

A. Not really.

Q. So ten out of 16 samples of it detected, that's pretty widespread, isn't it?

A. Well, it depends on how you characterize widespread. I would say that if you really have a good method and if you really do have

viruses all over the place, then you would have detected them in closer to 100 percent of the samples. I don't characterize 63 percent as that huge and I certainly don't characterize 17 or 44 percent as that high either.

Q. There's a significant difference between 63 percent and 12 percent, right?

A. I haven't done a statistic, sir. I couldn't say if it's significant.

Q. We're going to move on to the next issue. Let's talk about the issue of adeno and enteroviruses. As I understand your issue here, Dr. Yates, the question -- and I'll pull some tables and we can start talking about this. Let's get all of our tables straight here. Let me make sure I have all my copies. This table, as well, is from Exhibit 71, it's table 3-6.

A. I don't need it. I have it right here.

Q. Let's walk through this again and I'll try to provide a layman's perspective. We have a number of samples here, and this is dry weather, where there was a test for viruses, the total levels found are reflected in the total MPN per 100 liter

column. Then there was a PCR confirmation. And if PCR was positive for adenovirus, then the people doing the study assumed that that entire concentration of virus detected was all adenovirus, correct?

A. That is my understanding, yes, sir.

Q. So, for example, at Calumet outfall 72605 where there was a 7.52 count and a positive confirmation, it was assumed then that the entire amount was all adenovirus, 7.52, correct?

A. That is my understanding, yes.

Q. And, in fact, that's a conservative assumption, am I right, because that's not necessarily all adenovirus and doesn't necessarily all have that level of risk posed by adenovirus?

MS. ALEXANDER: Is that a question?

BY MR. ANDES:

Q. Am I right, that that's a conservative assumption that it's all 100 percent adenovirus?

A. I couldn't say whether or not that's a conservative assumption.

Q. Well, if -- you're assuming that it all contributes to risk at an adenovirus level, correct?

A. That's what you assumed, yes.

Q. And that's not necessarily true, right, because it's been --

A. Correct.

Q. -- PCR confirmed? Okay.

And we'll see later how that contributes to the total risk.

Now in a situation such as Northside where you had a sample of 13.9 and negative on PCR, that was not felt to contain adenovirus so wasn't counted toward adenovirus and you're contention is -- well, let's stop for a minute.

So there are approximately 11 samples on this table out of 42 -- I'm sorry. Out of 75 samples there were 42 that had detectable virus. Some of them had less than one, meaning not detect. Thirty-one of them had PCR positive, so we're down to 11 where there was PCR negative, so no adeno, so those were sort of put aside.

Your contention is -- correct me if I'm wrong -- that we should have looked at them for enterovirus?

A. The point that I made last time was

that you went to great lengths to say how wonderful this cell line was because it enabled you to detect both enteroviruses and adenoviruses, therefore, when you got a cell culture positive result you knew that the virus -- first of all, there were viruses in that sample and that those viruses were either entero or adenoviruses.

You then did a test looking to determine whether or not the viruses that were present were adenoviruses. If they were not adenoviruses, you counted the sample as being negative when indeed you already had proof that there were viruses present in that sample.

And according to the work that has been done by Dr. Gerba, you know that that cell line allows enteroviruses to grow in it. And if it wasn't adenovirus positive, you just ignored the possibility that indeed those were enteroviruses. You never analyzed the sample for enteroviruses. You just counted that sample as being negative when indeed you knew there were viruses in it.

Q. Now, first, when you say that we took great pains to use that method because it would detect adeno and entero --

A. No. What I said was that you went to great pains to explain to me how wonderful it was that you had this cell line that enabled both of these viruses to grow in it.

Q. Are you saying that I did that or is that in a report?

A. Actually, in the questions -- the pre-filed questions to me, you did, or whoever wrote the questions to me went to great lengths to say aren't you aware that both of these viruses can grow in this cell line and that is why we used it. I could go back and read specifically the questions.

Q. Sure. I just want to make sure I know which question you're referring to.

A. I have to find exactly which one it was.

(Brief pause.)

BY THE WITNESS:

A. Ann is telling me it's question 31A: Are you aware that the cell line used is not designated or designed to be specific for adenoviruses as a cell line was selected because it will detect --

HEARING OFFICER TIPSORD: Doctor, slow

down a little bit.

BY THE WITNESS:

A. Question 31A: 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.

BY MR. ANDES:

Q. And your concern laid out in the testimony that we were responding to was that you actually thought that cell culture analysis for adeno appears to produce a relatively large number of false positive results. Would that be false positive for adeno and for entero?

A. No. False positive for adeno.

Q. So you didn't -- so your concern was that it wasn't doing a good job of detecting adeno. And isn't it logical to say this question then was directed to saying, yes, it is designed to address adeno; the issue at hand in your bullet and then in our question was really whether it was going to do a good job of detecting adeno?

MS. ALEXANDER: You're asking her what you meant by your question?

BY MR. ANDES:

Q. Wasn't your point specific to adeno?

A. I'm making two points. Point number one is that obviously this analysis is not specific for adeno because you detected virus signal, you had infective, growing, living virus -- not living, but infective viruses present in the samples and then you looked to see whether they were adenoviruses and they were not, so it was not specific for adeno. That is one concern.

The bigger concern is that you ignored samples that had viruses in them but were not adenoviruses and you did that with the full knowledge that that cell line enabled both adenoviruses and enteroviruses to grow.

Q. And it also -- now is that human and non-human enterovirus?

A. I really do not know, sir.

Q. And does it detect other kinds of viruses, as well?

A. I do not know, sir.

Q. So it's possible there are other types of viruses that are also detected. Do you have any information indicating that it only detects adeno

and entero?

A. I'm just going by what you have indicated in here. I have not done studies with this particular cell line myself.

Q. And you're aware that the other portion of those samples was sent off to be tested with another method for enteroviruses, correct?

A. I am aware that another fraction of the sample was tested for enteroviruses, yes.

Q. So it's not that we didn't test for enterovirus, you're saying we should have also looked at these samples, as well, to see if there was entero?

A. That is exactly my point --

Q. Now --

A. -- because you have said that this cell line enables enteroviruses and adenoviruses to grow in the sample. And when you did not find adenoviruses, you just ignored the fact that you had other viruses growing.

I am aware that you had another fraction of the sample tested for enteroviruses. There were other samples -- the samples that you had tested for enteroviruses, there were times when

those samples were negative for enteroviruses. However, the other portion of the sample that came up -- that was tested in Dr. Gerba's laboratory that was positive for viruses but negative for adenoviruses, you have already said that that cell line allows the enteroviruses to grow.

You did not test that sample to determine whether or not those samples indeed contained enteroviruses. They were negative by the test at HML for enterovirus and yet you know that they were positive for something in the samples tested in Dr. Gerba's laboratory and you didn't check to see whether there were enterovirus knowing full well that enteroviruses could grow in that cell line. So you said that sample was negative for enteroviruses. You completed ignored it.

Q. Well, let me clarify. The issue wasn't whether it was negative for enteroviruses. The study used a different --

MS. WILLIAMS: I think he's trying to testify.

MS. ALEXANDER: Same objection.

BY MR. ANDES:

Q. Let me clarify. The study used

another method to test for enteroviruses, correct?

A. Are you talking -- I want to make sure I know what study.

Q. This risk assessment -- in this risk assessment another method with the other half of the sample was used specifically to test for enteroviruses, correct?

A. I don't know if half of the sample was tested for enteroviruses, but a fraction of the sample was sent to another laboratory and tested using a different method for enteroviruses, yes.

Q. Is that a method that is accepted by EPA?

A. My understanding is that the method that was used by HML was EPA's standard method for enteroviruses. However, as you have said, the test that Dr. Gerba used to detect the adenoviruses also detects enteroviruses. You had a positive virus sample, it was not adenoviruses and therefore you ignored the fact that it could be enteroviruses.

The fact that some other portion of the sample that was analyzed by HML was negative for enteroviruses does not mean that these were not enteroviruses.

Again, I pointed out last time that's one of the issues that you face when you take a sample and split it into different portions. You are assuming that the viruses are uniformly distributed throughout the sample and that may not indeed be the case and this is a perfect illustration of that.

You have taken a whole sample, taken a part of it, analyzed it, found it to be negative, taken another part of that sample and analyzed it using a different method but a method which is published in the peer-reviewed literature and shown to be able to detect that enterovirus and you did not go the extra step necessary to determine indeed whether or not it did contain those enteroviruses knowing full well that the decision that you're making at the end of the day has huge implications for public health.

Q. So you're saying that even though we used an EPA approved method for detecting enteroviruses and we found certain results, we should have also done something with this other test that detects some virus, we don't know what they were, and we should have tried to figure out if

there were enteroviruses in there too even though we had already used the approved method? And by the way, the method we're talking about that detects both is not an EPA approved method for detecting enteroviruses; am I right?

A. It's not an EPA approved method for detecting adenoviruses either.

Q. So wouldn't it make sense to use the EPA approved method for detecting enteroviruses in this study? Wouldn't you have --

HEARING OFFICER TIPSORD: Mr. Andes, we have beat this horse to death. It's time to move on. We covered this at the last hearing and we're doing it again. It's time to move on.

BY MR. ANDES:

Q. I believe one of the statements you just made was that this was of enormous consequence. I don't remember the exact words you used. I will refer you to a table. I thought I had a copy of this table, but I don't seem to be able to locate them. But this is table 5-13 in the report in Exhibit 71.

A. Yes.

Q. Let me read from this and then I'll provide it. Dr. Yates, this table presents a breakdown of the illnesses per thousand exposures due to various pathogens. And the total illnesses, if I can summarize, for the three different areas of the Waterway were 4.15, 5.67 and 0.41 illnesses per thousand.

Now when we look at the enteric virus part of it, which is the part we're talking about here, the numbers are .002, .002 and .001 out of 4, 5 and .41. So it's a small percentage of the total illnesses due to enteric virus; am I right?

A. If you're asking if .002 is a small fraction 4.15, yes, I would agree that it is.

Q. So even if you took those 11 samples out of 75 and found there were detectable levels of enterovirus and even if that, say, doubled the amount of illness attributable to enterovirus, we would be up to .004, .004 and .002. That would still be a fairly small percentage of the total contribution toward illnesses, correct?

A. It would. But, again, this just is one example of where you have made an error -- in my opinion, an error in the manner in which you

calculated the risks. This is one example and there are numerous others throughout.

But the very specific issue that you asked, if you would like me to answer, is .004 still a small fraction of 4.15, yes, it is.

Q. Thank you. We'll move on from that issue. Let's go toward one of the other issues we talked about a little bit the last time was the amount of water ingested typically. And I believe -- I'm just looking for some of my charts here. I believe that the amount that you've usually used in tables -- I'm sorry, in studies has been 30 milliliters ingested, correct?

A. That is correct.

Q. In a primary contact situation, right?

A. Again, we're getting to this issue of how you define primary contact. If you're defining primary contact as swimming, no, this was not swimming.

Q. Okay.

A. The context in which I used it was not swimming.

Q. Okay. And that's not material to the issue at hand.

A. Okay.

Q. We're just talking recreation generally for now.

A. Okay.

Q. Let me provide you with some tables again, tables and figures. These are figure 5-3 and table 5-4 from Exhibit 71.

A. I have it.

Q. Okay. So in this study when we look at table 5-4 and we look at the high exposure scenario, which was canoeing, you'll see that the 90th percentile it was assumed that people are ingesting about 14 milliliters an hour?

A. Uh-huh.

Q. So that would mean that -- correct me if I'm wrong -- it was assumed that 10 percent of the people recreating would be ingesting about 14 milliliters an hour in that exposure group, am I right, 14 or more?

A. Just a second. I'm thinking of --

Q. It's not a trick question. I'm just trying to --

A. I know. And it's taking me a minute because you're asking it in the opposite way. So my

understanding is, yes, if the 90th percentile is 14 mls per hour then there would be ten out of 100 ingesting 14 or more per hour, yes.

Q. And there are smaller amounts of people, 5 percent, two-and-a-half percent, et cetera, that would actually be assumed to be ingesting more than 14 milliliters an hour, at the 95th percentile level and above they'd be ingesting 17 or 22, correct?

A. Correct.

Q. Okay. Now if we go to figure 5-3, which shows the duration distribution for canoeists in the study, this showed the duration of their canoeing experience and the mean number of hours that they're assumed to be on the water body as 2.67; am I correct?

A. Yes.

Q. And, in fact, a fair number of people are assumed to be on the water three, four, even almost five hours in this distribution, right?

A. Correct.

Q. Okay. So then those people, if we do a very simple math and say, well, you had 10 percent of the people with at least 14 milliliters an hour

of exposure -- I'm sorry, 14 milliliters an hour of ingestion of water and about two-and-a-half hours average on the water, that would put them at something like 30 some milliliters of water?

A. Sure, roughly.

Q. Okay. So that would actually be fairly consistent with the kind of ingestion scenarios you've used in other studies with 30 milliliters, actually even higher than 30?

A. Okay.

MS. ALEXANDER: Is that a question?

BY MR. ANDES:

Q. I'm just confirming that the ingestion scenarios used here were at least as conservative in that regard as have been used in other studies. I think, in fact, 37 something if we just multiply 14 by 2.67.

A. I'll believe you. I don't have my calculator here so I'll believe the math. That would be about right.

Q. Okay. Let me move on to another issue. And I don't want to go over ground that we've covered before, so if I stray into that I trust I'll hear about it.

MS. ALEXANDER: You can bet on it.

BY MR. ANDES:

Q. Dr. Yates, we talked at the last hearing about -- and I don't think this will be repetitive. There was a study provided by Ms. Alexander at the last hearing, a study by Teunis and Moe, Norwalk Virus: How Infectious is It?

A. Uh-huh.

Q. And I had a few questions to ask about that. I believe you were using this study to indicate -- correct me if I'm wrong -- that if you were to ingest a single norwalk virus that the risk was 50 percent that you would get ill; am I right?

A. The point -- can you refer to which exhibit that was?

HEARING OFFICER TIPSORD: I believe it's Exhibit 255, Norwalk Virus: How Infectious is It by Peter Teunis and Christine L. Moe, et al.

THE WITNESS: Thank you.

BY THE WITNESS:

A. So your question?

BY MR. ANDES:

Q. Well, I wanted to confirm, first,

that's what you're using this study in support of that?

A. My point in raising this study was to indicate that the conclusion of Drs. Teunis and Moe was that the average probability of infection for a single norovirus particle would be close to .5, which is higher than reported for any other virus that had been studied to that point in time.

Q. Now the study on page -- I want to ask a couple of questions about the study itself. One aspect on Page 1469 of the exhibit mentions that the 8F2A inoculum in the first column has been stored in a stock suspension for more than 25 years and that this suspension of veal infusion broth with a half a percent bovine serum albumin contains high concentrations of protein acting as a sticky matrix resulting in considerable aggregation of suspended virus. It then points out that, therefore, the low dosage administered in this challenge study represents virus clumps rather than single viruses.

Do you have any information as to how representative that is of a way one would encounter viruses ordinarily?

A. My knowledge of the way that most

viruses might be present in fecal material would be that they would be present as aggregates or clumps of more than a single virus particle at a time.

Q. In fecal material?

A. Correct.

Q. Are most studies done on actually looking at the risk from ingestion of a single particle?

A. Different studies are done in different ways. Typically, you would feed people more than a single particle.

Q. So there's nothing about this -- and I thought this is, in fact, pointed out that there's some unique aspects of this study because it looks at the viruses in clumps rather than in single particles?

A. I'm not sure that that was a question.

Q. Well, for example, let me point you to Page 1471. This says in the first column, aggregation of infectious particles changes the dose response relation in several ways including the parent does may be lower than the number of viruses that was actually present. There may be other effects associated with being part of an aggregate.

We have no data in these areas.

So the single-hit model of infection was used in this study even though the information was actually in virus clumps rather than in single particles and I'm wondering how that shifts the nature of the risk assessment and it sounds like they don't have data on that.

A. Again, these two -- the authors of this manuscript are world-renown experts in this area. Dr. Teunis has literally an international reputation specifically in dose response modeling and, therefore, I have every confidence that when he states that to the best of his ability to determine the infectious dose when he says that the probability from a single particle would be .5, I have absolutely every confidence that he is in a position to make that judgment knowing as he did all of the peculiarities of the particular system within which he was working.

So I have every confidence that what he has stated -- what he and Dr. Moe have stated in this article are the best information that they could possibly get knowing all of the caveats that are associated with the samples that they had

to work with.

Q. Well, on Page 1475 it talks about the differences in the infectivity of individual sporozoites causes -- this is getting very technical -- heterogeneity inactivity infectivity and influences the parameter estimates in the shape of the dose-response relation.

I guess what I'm asking is isn't it possible that there are differences here between the nature of the assessment because they're using these clumps from this 25-year old sticky particle sample and then using a single-hit model for looking at what the risks are from a single particle? There's some uncertainty involved in that and this seems to note that there could be some changes in the dose-response relation simply because of the difference between the clumps and a more heterogeneous sample.

A. I didn't hear a question. I think you're just trying to -- you're restating what he has said and I --

Q. You don't disagree with any of that?

A. What I have already said is that Dr. Teunis is a world-renowned expert, he

understands the pitfalls, he understands all of the potential assumptions that are being made as he does his mathematical modeling to determine what the infective dose is and he understands the assumptions that are going into it and, therefore, when he states that to the best of his ability to calculate it the median -- the mean infectious dose is .5 -- or there's a probability of infection from being exposed to a single particle is .5, I have absolutely no reason to doubt him.

The important point that's being made here is that the infectious dose for norovirus is extraordinarily low and the probability of becoming infected from an extremely small dose, as low as one, maybe a clump of ten, who knows, is very, very, very high, 50 percent in this particular case.

Q. And to clarify, when we talk about 50 percent or some other number, that's livery of a particle for directly to the target. In a risk assessment, that's not looking at what's the probability of exposure, what's the probability that you're going to ingest a particle, how much water are you going to be drinking, any of those issues?

A. No. That probability is specifically saying if you ingest some number of particles, what is your probability of becoming infected as a result of being exposed to that number of particles. It's irrelevant what -- you know, it doesn't take into account the volume of water, anything like that, it's how many particles got into your body.

Q. Okay. So it's one portion of a larger risk assessment? You're not contending that it's the whole picture?

A. Correct. It's one step in the risk assessment process, yes.

Q. And have you looked at how that issue was dealt with in the risk assessment done here in Exhibit 71?

A. I'm not sure what --

Q. Have you looked at how that issue, the risk of infection from a norovirus particle was dealt with in the risk assessment?

A. In the risk assessment my understanding is that you used a particular dose response that followed a beta poisson for the norovirus; is that what you're asking?

Q. Right.

A. Yes.

Q. And that was around 26 percent. So a significant number was used, as well, in this report to show the chance of being infected by one norovirus particle?

MS. ALEXANDER: Objection.

BY THE WITNESS:

A. I don't know where you're coming up with 26 percent.

MS. ALEXANDER: Objection. I don't think that was a question and I object to the term significant as vague. I think we need to define terms like that.

BY MR. ANDES:

Q. Okay. So in table 5-5 -- and this is adapted from Haas and Rose studies -- the N50 was 6.17 indicating that six particles would give you a 50 percent chance of infection, correct?

A. That's what it says here.

Q. And do you have any reason to believe that's not straight from the literature?

A. No.

Q. Okay. So your main point is simply the norovirus is very infectious?

A. Correct. I was responding directly to one of your questions that had to do with whether I felt that the dose response parameter that was used was conservative and my point was that there is more recent information in the literature that would state that the number you used wasn't necessarily as conservative as it could have been. That's all.

Q. But you don't have any reason to doubt the reports that we based our risk assumptions on?

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

Q. Okay. Thank you.

MR. ANDES: I'm probably almost done, but I wonder if we can take a short break and I can assess that.

HEARING OFFICER TIPSORD: Sure. Let's take ten minutes.

(Whereupon, after a short break was had, the following proceedings were held accordingly.)

HEARING OFFICER TIPSORD: Back on the record. Mr. Andes, you are officially done with Dr. Yates; is that correct?

MR. ANDES: Yes.

HEARING OFFICER TIPSORD: Okay. In that case, the IEPA has a few questions for Dr. Yates.

EXAMINATION

BY MS. WILLIAMS:

Q. Dr. Yates, I'm going to ask some of my pre-filed questions. Some of them have already been answered and even a couple of these that I'm asking you've gone into great detail already, but I'm looking for just a broad overview in my answer; does that make sense?

A. Yes. But if I get too specific, please remind me and I will try to generalize.

Q. Pre-filed question number two states, in your opinion, what were the analytical errors you found with the microbial risk assessment study conducted by MWRDGC? I know we've spent many -- you've answered many, many detailed questions, but just in a broad overview sense could you summarize that for us?

A. My overview answer -- I hope this is an overview -- would be in the fact that such small sample volumes were analyzed that, especially in the case of norovirus, that there was an underestimate

of the exposure from noroviruses. And the other big issue with respect to the analytical methods was the ignoring of the potential enterovirus positive samples.

So in all, I believe that the biggest flaw in the analytical portion of the sample analysis portion of the risk assessment was that there would be an underestimate of the magnitude of the exposure to human pathogens in the water and therefore the risks would be biased low.

Q. Question three asks, in your opinion, why is MWRDGC's epidemiological study not a sufficient tool to assess the needs for disinfection?

A. First, let me say that I believe that the epidemiological study in general is being conducted in a very thorough way and I have absolutely no reason to doubt that the information that comes out of that study will be extremely useful especially as it relates to the secondary recreational activities.

I do believe, though, that there are some things that are not going to be determined through that study, one of them is the risk of

secondary spread. So in other words the people who are exposed to the water may become infected but not ill, they can pass that infection onto others outside of their family and those risks are not being taken into consideration in this particular study. So, again, you could be biasing the risk low.

My main issue with this is that this is only one piece of information that one should consider when determining whether or not we need to disinfect. Even though, like I said, the study is being conducted in a very thorough manner with a couple of exceptions, this is only one piece of information. It's studying a relatively small portion of people over a small -- a short time period and I think there are a lot of other pieces of information that need to go into doing -- into making such a huge decision as to whether or not to disinfect the effluent.

And so while this is one piece of information that obviously should be considered, I don't think it should be the only piece.

MR. ANDES: If I can follow-up with that? Have you heard anyone say it should be

the only piece of information considered?

THE WITNESS: I would have not been privy to all of the discussions. However, again, this is one epidemiological study that's being conducted. And as a scientist an NF1 is never sufficient, especially not when we're making a decision as large as the decision that's being considered here, do we disinfect or do we not disinfect, okay?

The other issue -- another issue that is not being considered in this particular epidemiological study or I don't know how it's being considered is the issue of the susceptibility to infection and illness of at-risk -- at higher-risk populations. I have no idea how they're going to be -- or whether they're going to have sufficient numbers of very young children, elderly, other immunocompromised or immunoincompetent if you prefer that term, other individuals who are going to be at higher risks.

So, again, this is one study and for what they're doing I believe they're

doing a good job, but there are certain things that they're just not going to be able to take into consideration and it's just impossible at this point for me to say that this particular study is going to be sufficient to make a decision of this nature.

It's one study. There are issues they're not considering and therefore a lot of other issues need to be considered when making a decision about whether or not to disinfect.

MR. ANDES: And, Dr. Yates, you talk about things that are not being considered, but as to sensitive populations you said you just have no idea how those are being addressed?

THE WITNESS: I don't know whether -- I don't have information on whether or not they have sufficient numbers of individuals enrolled in the study that belong -- that are members of those categories, so I do not know whether they will have a sufficient sample size to do statistically meaningful analyses of those populations.

MR. ANDES: So that's something we won't know until we actually see the results, correct, until we see results from the study?

THE WITNESS: That certainly is correct. Until you know whether or not you have sufficient numbers of people in those categories, you couldn't calculate the statistical power that you would have with that.

MR. ANDES: And, in general, in terms of the overall study, I think you're probably aware, but we recently filed papers indicating that over 9,000 people who already have been enrolled in the study is a fairly significant amount of people.

THE WITNESS: The total number of individuals that have been enrolled -- I did read the latest information from Dr. Dorevitch and the total number of individuals who have -- who are enrolled in the study appears that it's going to be -- he's going to exceed -- probably exceed his original goals. So as I said, in general, I believe that this study is -- I have no real

issues with it.

MR. ANDES: And this is the first study done of this sort, epidemiological study on secondary contact in this country; am I correct?

THE WITNESS: To my knowledge, it is.

MR. ANDES: And the EPA effort currently to develop primary contact recreational criteria, it's my understanding -- correct me if I'm wrong -- that EPA is using or intending to use both quantitative risk assessments and epidemiological studies in a process where they will reach ultimate conclusions about safe bacteria levels; am I right?

THE WITNESS: I have not spoken with anyone at the -- and we're talking about the US EPA here?

MR. ANDES: Yes.

THE WITNESS: My understanding is that the United States Environmental Protection Agency is using a variety of sorts of information in determining what types of standards they are going to set for

recreational water quality.

But, again, the types of -- the situation with the EPA I believe is a very different situation from what -- the US EPA. It's a very different situation from what we're dealing with here in that the epidemiological studies that are being conducted by the United States Environmental Protection Agency are intended specifically to look at associations between health effects and levels of different microorganisms and try to determine relationships between those and then come up with a standard that would be used to determine whether or not we're going to be closing a beach on a particular day.

That's a very different kind of a decision than what we're talking about here where we are looking at using a single epidemiological study and a risk assessment that has numerous flaws, as we've discussed, and using that information to decide do we disinfect this effluent or do we not disinfect this effluent when we have full

knowledge that this effluent contains disease-causing microorganisms and that -- and knowing that if we disinfect this effluent we will decrease the concentrations of those microorganisms thereby decreasing the risks. We're just talking apples and oranges here.

MR. ANDES: Let me clarify, Dr. Yates. Aren't the EPA bacteria criteria used not only for beach closures but, in fact, to determine control requirements for sewage treatment plants, combined sewer overflows, the same issues concerning disinfection that we're talking about here?

THE WITNESS: The EPA standards -- my understanding of the criteria that EPA is developing, they will be used for beach closures, they will also be used for such things as total maximum daily load, TMDL, determinations and some other uses.

MS. WILLIAMS: I would like to follow-up on your follow-up, please.

MR. ANDES: Feel free.

BY MS. WILLIAMS:

Q. Do you have any reason to believe that US EPA is looking at establishing technology-based effluent requirements for sewage treatment plants as part of this analysis?

A. I do not have that understanding, no. The other thing I would say is that I do not believe based on every conversation I've had and every meeting and every expert workshop that I've been associated with related to this particular issue I have no reason to believe that EPA is going to establish water quality criteria that are less stringent than the ones that are currently in place.

MS. WILLIAMS: Are you done with your following up because that's one of my pre-filed questions?

MR. ANDES: No. First, the numbers we're talking about for EPA, you don't know yet so nobody at EPA knows yet what the numbers are going to be, correct, because the studies have not been done that are going to help establish those criteria?

THE WITNESS: When you say the numbers, you mean the numerical values that the criteria are going to be?

MR. ANDES: Yes.

THE WITNESS: I do not know what the numerical values of the criteria are going to be, no, because the studies are still ongoing.

MR. ANDES: And, in fact, those studies include, as EPA has recently announced, specifically that one of the important things is doing -- under a consent decree is to do epidemiological studies that will be used in establishing what those numeric criteria are going to be, correct?

THE WITNESS: Under the consent decree my understanding is that the EPA will be conducting additional epidemiological studies in order to help form the basis for the establishment of the new criteria, yes.

MR. ANDES: And those studies are just going to be starting soon?

THE WITNESS: They have already conducted some studies. They are -- I don't know exactly when the new studies are going to start, but they are going to be doing additional studies.

MR. ANDES: And those are all primary contact studies, correct?

THE WITNESS: My understanding, yes, is that those are primary contact studies.

MR. ANDES: Okay.

BY MS. WILLIAMS:

Q. Dr. Yates, question six asked why you believe that US EPA's revised bacteria criteria will be more stringent than the current criteria rather than either less stringent or simply more targeted?

A. It's well documented in a number of documents in the literature, some of which have been talked about during these very hearings, that the organisms that are typically used as indicators, the coliform bacteria, the fecal coliform bacteria, E. coli, enterococci, et cetera, that those organisms -- the use of those organisms tend to underpredict risk and EPA is very concerned that they establish criteria that are going to be adequately protective of public health at whatever risk level they deem to be appropriate.

Knowing that the current indicators that are used will underpredict risk, especially from organisms such as viruses and

protozoan parasites like cryptosporidium and giardia, EPA is making special efforts to look for either better indicators or to make sure that whatever levels they establish of the indicators will be better predictors of risk.

And if you look at the -- if you look at waterborne disease outbreaks, for example, what you'll see is that the number of outbreaks -- the trends in outbreaks between recreational outbreaks and drinking water outbreaks has reversed itself in recent years. In other words, in the past more of the outbreaks were associated with drinking water. Now we've moved to the point where more of our outbreaks are associated with recreational water.

And I believe that EPA would point to the revisions and increasing their attention to the microbiological standards for our drinking water as resulting in higher quality drinking water in the United States and thus better public health protection of our drinking water that people consume.

Now they're turning their attention to the recreational waters. And knowing

that increasing the stringency of the microbiological quality standards for drinking water has resulted in what EPA would point to as better public health protection, there's absolutely no reason to believe they wouldn't do exactly the same for our recreational water quality.

They know that if they come up with indicators that are better predictors of human health risks, we will end up with better protection of public health from recreational sources.

Q. Do you have any opinion as you sit here today of what indicators might be better or does that remain to be seen?

A. That really does remain to be seen. I have not seen the outcome of all of the studies that the EPA has already conducted, much less the ones that they're planning to conduct so I really couldn't speculate.

Q. Thank you. I'm going on to question nine. On Page 13 you state, quote, US EPA has in recent years informally applied a standard of five times the primary contact standard, paren, sometimes as high as ten times, closed paren, or a 1000 CFU per 100 milliliters in evaluating proposed state

standards for recreational waters in which non-primary contact recreation takes place.

Do you have an opinion on whether this informally applied standard is appropriate or based in the scientific literature?

MR. ANDES: If I can first ask -- that's clearly evidence being provided -- is there any document indicating that that's an EPA number?

MS. WILLIAMS: I'm quoting from the pre-filed testimony. That was a quote from the pre-filed testimony.

MR. ANDES: Okay.

BY THE WITNESS:

A. If you're asking whether this informally applied standard for non-primary contact recreation has a basis in the scientific literature, I am not aware that it does. I am not aware of what the basis for that was, no.

MS. WILLIAMS: Did you have any follow-up, Fred?

MR. ANDES: No.

BY MS. WILLIAMS:

Q. I'm moving on to question 11. On Page

20 you state, quote, the process of disinfection itself is not susceptible to fine tuning, it's impact is binary, closed quote. Please explain this statement.

A. The point that I was making with that statement was that if you disinfect, you reduce the concentration of organisms, if you don't disinfect, you don't. It's as simple as that.

So by disinfecting the water, you reduce the concentration of pathogens thereby decreasing the risk of exposure to pathogens and improving public health. If you don't disinfect, you don't.

MR. ANDES: Can I follow up on that? I guess my first question about that is that I believe you testified earlier -- correct me if I'm wrong -- that some methods of disinfection reduce some pathogens and other methods of disinfection reduce other pathogens; am I right?

THE WITNESS: I would characterize it slightly differently. I would say that different disinfectants have different degrees of efficacy against different

pathogens.

MR. ANDES: So you're not saying that disinfection will reduce all pathogens? Any particular disinfection technique would not reduce all pathogens, correct?

THE WITNESS: No, that's not what I'm saying at all, sir. I'm saying that for a given disinfectant the degree to which it would reduce different pathogens may be different, but it would be highly unusual for a particular disinfectant to have absolutely no effect against any given pathogen -- against a particular pathogen.

MR. ANDES: So it might have some effect against some pathogens?

THE WITNESS: Correct. It's going to be different.

MR. ANDES: And it won't eliminate the pathogens, correct?

THE WITNESS: Again, it's going to depend greatly on how we define our universe. But you could potentially find a situation where for a finite volume of water and for a given number of pathogens that you could

completely decrease the concentration of those pathogens -- that particular pathogen to non-detectable levels.

MR. ANDES: And have you reviewed the testimony of Dr. Blaxley on that topic where he contrasts conventional disinfection, which clearly doesn't do that, versus extreme disinfection that would cost a lot more but achieve a higher level of removal?

THE WITNESS: I'm not sure what you're referring to by extreme disinfection.

MR. ANDES: Such as using California with gray water.

THE WITNESS: I don't know what California's disinfection requirements are for gray water.

MR. ANDES: You haven't looked at what level of disinfection would be required to achieve various levels of removal; am I right?

THE WITNESS: I am not a wastewater treatment engineer, as I've mentioned before. All I know is that depending on the type of disinfectants that you use you can achieve

different levels of removal of different pathogens.

MR. ANDES: And when you testified that there's sort of an either/or here, that either you disinfect or you don't, you may have reviewed testimony by -- I can't remember if it was Dr. Oris or Dr. Gorlick (phonetic) indicating that, in fact, secondary treatment removes up to -- and I believe that actually we talked about this -- that secondary treatment removes up to 99 percent of pathogens. I think you said that wasn't enough. But that's not zero.

So when you say either remove pathogens or you don't, you're saying once you go on to secondary treatment, which could remove a lot of pathogens, then you either disinfect or you don't? You're not saying there's zero removal of pathogen if you don't disinfect because you admitted --

THE WITNESS: No. I've never said that there's zero removal if you don't disinfect.

MR. ANDES: Because you had conceded

that secondary treatment could remove in the 90s, just in terms of percentages you just felt that wasn't enough; am I right?

THE WITNESS: I was disagreeing with your characterization of 99 percent or 90 percent as being a lot. But certainly it is documented that secondary treatment will reduce the concentrations of different pathogens to different degrees.

MR. ANDES: Okay.

BY MS. WILLIAMS:

Q. There was one follow-up question I wanted to ask last time you were here but didn't get a chance.

A. And you still remember it?

Q. Yeah. I wrote it down. So I'd like to just quote a couple sentences from the transcript if that's okay. I'm on Page 18 of the morning transcript, Line 15. You state, the other thing I'd like to point out is we use the term indicator for a variety of 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 clear exactly what context we're talking about indicators in. Do you recall that?

A. I do.

Q. And the follow-up I wanted to ask at that point was in this proceeding in which we are holding hearings on the Illinois EPA's proposal to the Pollution Control Board, which context of the term indicator are we looking at?

A. I believe that the main characterization of indicators in this particular context would be using the indicator organisms to tell you something about the overall microbiological quality of the water with respect to its potential to have a public health impact.

Q. That's fine if that's your answer. I don't know if that answer is based at all on a review of the Agency's proposal to the Pollution Control Board in this proceeding.

A. I mean, at other points during the time that I've been here in some of these other documents we have used indicators in other ways talking about how well a particular wastewater treatment process will indicate a particular -- how

well a particular wastewater treatment process will inactivate an indicator organism and what does that tell you about how well it inactivates a particular pathogen, which is a somewhat different way of using indicators.

But overall I think what you're concern is is using the indicators as a way to tell you something about the microbiological quality of that treated water to which people are being exposed.

Q. Do you know if the Agency is proposing an indicator organism that is reflective of the quality?

A. I do not.

MS. WILLIAMS: That's all I have for this witness. Thank you.

HEARING OFFICER TIPSORD: Any other questions for Dr. Yates?

Dr. Yates, thank you so much for coming back. We appreciate your testimony and I hope you got your pizza.

THE WITNESS: I did. I can't believe you remember that, Marie, but I did get my pizza. It is fabulous. Thank you.

HEARING OFFICER TIPSORD: On that note, a couple of things -- off the record.

(Which were all the proceedings had in the above-entitled cause on this date.)

STATE OF ILLINOIS)
) SS.
COUNTY OF WILL)

I, Tamara Manganiello, CSR, RPR, do hereby certify that I reported in shorthand the proceedings held in the foregoing cause, and that the foregoing is a true, complete and correct transcript of the proceedings as appears from my stenographic notes so taken and transcribed under my personal direction.

Tamara Manganiello

TAMARA MANGANIELLO, CSR, RPR
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JULY 8, 2013

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