BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:

REVISIONS TO RADIUM WATER QUALITY STANDARDS: PROPOSED NEW 35 ILL. ADM. CODE 302.307 and AMENDMENTS TO 35 ILL. ADM. CODE 302.207 and 302.525

The Rulemaking Proceedings, before the Illinois Pollution Control Board, was held October 22, 2004, at 9:03 a.m. at 100 West Randolph Street, Room 2-025, Chicago, Illinois, before Amy C. Antoniolli, Chief Hearing Officer.

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APPEARANCES: (Continued)

ALSO PRESENT:

Mr. Dennis Duffield
Dr. Abdul Khalique
Dr. Theodore Adams
Dr. Brian Anderson
Mr. Charles Williams
Mr. Albert Ettinger
Ms. Cynthia Skrukrud
Mr. Douglas Dobmeyer
Mr. Jerry Kuhn
Mr. Jeffrey Hutton
Mr. Blaine Kinsley

HEARING OFFICER ANTONIOLLI: Good morning, everyone, and welcome back. Again, we're here today on revisions to radium water quality standards proposed new Illinois Administrative Code 302.307 and amendments to 35 Illinois Administrative Code 302.207 and 302.525.

Everything that I explained yesterday regarding the procedural rules applies again today. If you begin testifying and you haven't already, I'll stop you and have you sworn in. If you would like to testify today and you haven't signed up yet, there's a sign-up sheet at the back of the room. We'll try to save room for people who haven't pre-filed to testify when we finish with the questions for those who have pre-filed.

At this point I have on the witness list so far Mr. Abdul Khalique from the Metropolitan Water Reclamation District who signed up to testify and may or may not if you choose to and Mr. Dennis Duffield who signed up yesterday to testify from the city of Joliet.

At this point, do you have anything to add this morning?

MEMBER MELAS: Yes. Good morning everyone. I would just like to add my comments to what our hearing officer, Ms. Antoniolli, said and welcome you all here.

Thank you all very much for your participation and reiterate what obviously was covered by Ms. Antoniolli yesterday. The purpose of this is an information gathering hearing. We're trying to develop a complete record. And we thank you all very much for your participation. And we value very much the information that we are going to glean from your various comments. And we will then use all of that in our deliberations and come up, hopefully, with a rule that will meet the objectives of the Enviornmental Protection Act that we all operate under.

Thank you again.

HEARING OFFICER ANTONIOLLI: Thank you, Board Member Melas.

And I'd like to just add for the record that to the right of Member Melas is

Member Johnson. And we also have with us today from the technical unit Mr. Anand Rao and Mrs. Alisa Liu.

So with that, we finished yesterday. The Agency finished up questions for WRT Environmental witnesses. And with that this morning, do we have anyone else who would like to ask questions of WRT Environmental witnesses?

I know that, Mr. Harsch, we interrupted your questioning at the end of the third hearing. If you wish, you can --

MR. HARSCH: Sure. I have some questions.

HEARING OFFICER ANTONIOLLI: -- continue questioning.

MR. HARSCH: Thank you for the opportunity. Roy Harsch on behalf of the city of Joliet.

A lot of my questions have been addressed in answers at least asked by the Agency, so I have a lot fewer questions than I had at the last hearing.

Mr. Williams, what is the radium 226

and 228 loading that your system will have when the media is changed?

MR. WILLIAMS: It's dependent on each individual system. It depends on what the chemistry of each individual system is. Typically, the number would be from a low at a town like Wynstone of perhaps only 50 picoCuries per gram to a high of perhaps 1500 picoCuries 226 and 228 or 750 picoCuries 226.

MR. HARSCH: So a total of 1500?

MR. WILLIAMS: Well, again, it depends on each individual system, but I think 1500 is a good representative number for a high number of what we would anticipate our media to achieve.

MR. HARSCH: You mentioned that was for that particular system. What about, say, for example, Elburn where you're under contract?

MR. WILLIAMS: Elburn would be lower. I think we're only using a number of about 750 combined for Elburn which would be about 350 226.

MR. HARSCH: During the August

hearing, you had, I think, indicated that you had yet to file an application with the state. Have you filed an application with the state for your system?

MR. WILLIAMS: We have indeed filed an application with --

MR. FORT: Excuse me. The question of application to whom? I think they already have --

MR. HARSCH: Nuclear safety.

MR. FORT: To nuclear safety?

MR. HARSCH: Yes.

MR. WILLIAMS: We have indeed filed an application with nuclear safety. We actually have a copy here of what we have filed.

MR. HARSCH: Would you provide me with a copy at some point in time?

MR. FORT: Absolutely. In fact, we were going to make that an exhibit here, so we certainly will.

MEMBER JOHNSON: Roy, do you want to move up where we can see you?

MR. HARSCH: It's my understanding in

your standard contract that ownership of the media in your system is required to pass to the municipality; is that correct?

MR. WILLIAMS: There's several ways that we're handling it. The radium, which I think is more to the point, is the under the ownership of the municipality.

MR. HARSCH: You're not envisioning then that the media with the radium in it, while it resides in the vessel at the municipality, would be owned by the municipality?

MR. WILLIAMS: Well, actually, there's two ways we'd like to do our contracts. It could go either way, but I think the fundamental issue is the radium is generated by the pumping of the water as generated by the utility. We provide the mechanism for the removal from the water and the mechanism for the transportation to a safe load level disposal site.

MR. HARSCH: The municipality then -- you're still not addressing the question. Does the ownership transfer at any point of

the media and the radium to whatever company it is that is disposing of it?

MR. WILLIAMS: In the end, the radium is at -- title is actually transferred to the disposal site.

MR. HARSCH: Is there any -- there have been discussions with some representatives of WRT and the city of Joliet representatives, and these were informal discussions that the media potentially could be reused to remove uranium and other radium nuclides from uranium mines because of the low level loading from some systems. Is this going to, in fact, be a practice that you will follow?

MR. WILLIAMS: No. That's not even capable. The media that we use for removing radium is entirely different from the media that we use for removing uranium. Radium is a cation. It's a plus two charge. Uranium is an anion. The media does not absorb uranium.

MR. HARSCH: So there would be no intention of reusing, for any purpose, the media?

MR. WILLIAMS: The radium, you're meaning?

MR. HARSCH: Yes.

MR. WILLIAMS: No.

MR. HARSCH: I'm a little unclear on the corporate structures. WRT Environmental of Illinois is one entity, and then there's Water Remediation Technologies, LLC, a Colorado company. Can you explain on the record what the relationship is of these two companies and how they relate to what you're proposing with the various municipalities?

MR. WILLIAMS: Well, Water Remediation -- I'm not sure I even get all the names right -- is the parent company. It's an LLC. It has two principal owners. RMD Services is a company that does the removal and the transportation or arranges the transportation.

MR. HARSCH: How does that relate to WRT Environment of Illinois?

MR. WILLIAMS: WRT of Illinois is our Illinois group that does the sales and installation. RMD Services is a group that

does the removal and transport.

MR. HARSCH: And they're all subsidiaries of the parent company Water Mediation Technology?

MR. WILLIAMS: I believe that's correct. I could go back and try to find the statement.

MR. HARSCH: It's my understanding from the prior hearing that you have not tested the -- any full scale plant because you're only dealing with pilot scale plants in Illinois; is that correct?

MR. WILLIAMS: I think my testimony was that we have done numerous pilot plants and are in the process of installing our first full scale plants.

MR. HARSCH: But you have yet -- so you're not in operation?

MR. WILLIAMS: That's correct.

MR. HARSCH: What is the longest time you've run a pilot plant?

MR. WILLIAMS: It would be the city of Oswego. I'm not sure the exact number, but roughly 18 months.

MR. HARSCH: What was the radium -- what's the current estimated radium loading for 226 and 228 in that media?

MR. WILLIAMS: What was it in the pilot plant?

MR. HARSCH: Yes.

MR. WILLIAMS: Or what were we anticipating it was going to be?

MR. HARSCH: Pilot plant.

MR. WILLIAMS: We went up to something over 2,000. I understand that we ran that media beyond what we would normally run.

MR. HARSCH: If I recall also your testimony that some of your pilot plant testing you have shown increases in radon concentrations, that you believe that was within the scatter of the atom -- test atom?

MR. WILLIAMS: We had -- we have conducted radon testing for dischargers from our plant. The data indicates that there is no significant increase in radon across our plant. We have some numbers that are slightly higher and some numbers that are slightly

lower, but it does not indicate that radon contribution to the water is a problem.

MR. HARSCH: Your pilot plant systems operate open to the atmosphere; is that correct?

MR. WILLIAMS: We talked about this last time. Some operate to the atmosphere ultimately. Some have some back pressure. Concurrently we're running a test, I understand, in Joliet with back pressure.

MR. HARSCH: You're familiar with the Dow RSV Plain Systems?

MR. WILLIAMS: The Dow system is another system for absorption media and disposing of it in a low level site, yes.

MR. HARSCH: Are you aware that they have acknowledged that there is a radon increase in the water treated through their system?

MR. WILLIAMS: Dennis said -- Dennis Duffield said that they had. I've never talked to him, so I don't know. I've never seen any literature.

MR. HARSCH: Your system is not

designed to remove existing radon contained in the raw water, is it?

MR. WILLIAMS: No.

MR. HARSCH: Are you familiar with the radon levels one would expect to encounter in the deep well water that your system is being marketed to in Illinois?

MR. WILLIAMS: I -- we have data. I don't have it with me, but yes, we have data on those.

MR. HARSCH: A range of 100 to 200 picoCuries would be the system with the data?

MR. WILLIAMS: I believe so.

MR. HARSCH: And the current USEPA standard is 300 picoCuries with drinking water; is that correct?

MR. WILLIAMS: That's correct. I'm not sure that that's been enacted yet.

MR. HARSCH: Mr. Williams, do you know the normal construction practices for developing farmland in the residential housing tracts in Illinois?

MR. WILLIAMS: No.

MR. HARSCH: Have you ever been in a

publicly-owned treatment works in Illinois?

MR. WILLIAMS: No.

MR. HARSCH: Have you ever been in any publicly-owned treatment works?

MR. WILLIAMS: Oh, yes.

MR. HARSCH: Can you describe your understanding of how solids are handled in publicly-owned treatment works?

MR. WILLIAMS: Again, I think I testified at the last hearing that I'm not an expert on sewage or sewage treatment, so I have no knowledge of the handling or practices -- standard practices of sewage treatment plant.

MR. HARSCH: Do you have any knowledge regarding whether publically-owned treatment works load pile solids or sludge indoors or outdoors?

MR. WILLIAMS: Again, I'm not a sewage person. I would assume that some do with and some do without, but I'm not going to testify either way.

MR. HARSCH: Do you have any knowledge as to whether that loading would

generate dusty particulate emissions?

MR. WILLIAMS: Again, I'm not a sewage person.

MR. HARSCH: I think you testified that with respect to radium 226 and 228 principally -- I think both you and Dr. Adams made this point -- that the exposure -- and what you're worried about is really the alpha particles. And we're talking about through the skin -- or excuse me -- ingestion through the mouth and nose; is that correct?

MR. WILLIAMS: Well, radium 226 is both alpha and gamma. I think the principal roots of exposure are through the skin and through ingestion and inhalation, yes.

MR. HARSCH: And since you're not a UW expert, you don't really have any knowledge of work or safety requirement of ventilation requirements?

MR. WILLIAMS: No.

MR. HARSCH: The exposure that you've mentioned numerous times in your testimony from radon by-product, that would be breathing the radon gas, correct?

MR. WILLIAMS: The exposure in radon is from breathing.

MR. HARSCH: I'd like to switch to Mr. Adams at this point. Doctor, I may have a couple of follow-up questions.

I noted on page 13 of your pre-filed testimony for the August 25th hearing -- I think that's Exhibit 4 in this proceeding -- that you cite the ISCORS' technical report 2003/2004 recommendation that there's no need for further action when estimated dosages used in screening calculations are below ten millirems per year and that yet in your summary of your testimony, you did not include that point

For the record, do you agree with this ISCORS recommendation?

DR. ADAMS: The ISCORS recommendation was for a screening approach as guidance for POTWs who were not familiar with and probably would have no knowledge -- previous knowledge certainly of the concerns and hazards of being exposed to radiation. So as a screening, I do agree with the ten millirem.

MR. HARSCH: I'm just trying to point out why it was in your pre-filed but it wasn't in the summary. Do you agree with it as a screening?

DR. ADAMS: As a screening, that's correct.

MR. HARSCH: Isn't it also correct that where levels are greater than ten millirems per year that ISCORS recommends that the POTW contact the state for guidance on how to proceed?

DR. ADAMS: It does several things. It does recommend that the POTW do consult the state or regulatory agencies for additional guidance. It also suggests that the POTW take an active role involving monitoring their personnel sampling and do any additional work to understand whether or not they have a radiation problem.

MR. HARSCH: Thank you.

In Exhibit I that you testified to yesterday, which is the application I think for one of the nuclear plants, there are various values given for the influent and

effluent for radium, the radium compounds. If that's cooling water, wouldn't you expect that there would be substantial evaporative loss at that treatment plant -- or excuse me -- across that power plant?

DR. ADAMS: Cooling water going up an evaporator tower --

MR. HARSCH: Being evaporated when it's used for cooling purposes.

DR. ADAMS: I don't know this particular cooling process. Certainly evaporation is a process used.

MR. HARSCH: If you had evaporative loss, would you expect an increase then in the chemical constituents measured from the influent to the plant and the effluent to the plant?

DR. ADAMS: Yes.

MR. HARSCH: Could that explain then part of the reasons some of the data might show an increase -- slight increase?

DR. ADAMS: It certainly may, but I think the point here is that -- and the point I was trying to make was simply there are

other sources of the radium other than drinking water, water treatment plants.

MR. HARSCH: Do you know the source of the cooling water for that facility?

DR. ADAMS: No, I do not.

MR. HARSCH: If it was surface water and that surface water was then returned back to the stream, wouldn't we be talking about adding the same chemical constituents back to the stream?

DR. ADAMS: As going back to the receiving stream, yes.

MR. HARSCH: What's the normal data scatter that one would expect when measuring radium in those concentrations?

DR. ADAMS: I'm not sure I understand your question. Let me try.

MR. HARSCH: I've had a lot of municipal clients over the years that have done a lot of radium tests to try to determine if they were in compliance to find out where they are. And they split a lot of samples. And at those levels, the results come back -- very seldom do they come back

being the same number. Wouldn't that be consistent with your understanding as well?

DR. ADAMS: Well, I think first we need to talk about the laboratory and its analytical process and procedures.

There are some laboratories that, per the client, will report levels of radium, for example, at less than 2 -- or 3 picoCuries per liter. If the process is carried out correctly, then, as in the case of LaSalle, we're seeing numbers in the order of total radium of four radium 226, 226. We have even some higher that go into the nine ranges. And those are clearly real numbers. Those are analytically defensible numbers with a certain plus or minus 90 percent error?

The outfall of the units 1 and 2 is -- radium is as high as nine, and radium 226 is reported less than .3. It's no different than any other chemical analytical data that we reported, whether it be a chemical or radiological.

MR. HARSCH: You get a number, but I think, if I heard you right, you said plus or

minus 90 percent error.

DR. ADAMS: No. I said within a 90 percent or 95 percent confidence band of error.

MR. HARSCH: So it hasn't --

DR. ADAMS: I'm confident within 95 percent that 9.0 is the total radium concentration of picoCuries per liter coming out of that outfall for units 1 and 2, which happens to be the rad waste treatment system.

MR. HARSCH: It has not been your experience if you split samples that those sample values are going to be -- reported results are going to vary?

MR. FORT: Object. May we have a little more specificity on what kind of a laboratory you're talking about?

MR. HARSCH: Mr. Fort, there are only a limited number of laboratories that are capable of doing the analysis.

DR. ADAMS: I disagree.

MR. HARSCH: I'll withdraw the question.

Mr. Adams, have you ever been in a

publicly-owned treatment works in the state of Illinois?

DR. ADAMS: Not in Illinois, but I have been in Pennsylvania, Ohio, and California.

MR. HARSCH: I understand that.

Please describe your understanding of solids handling in a normal publicly-owned treatment works.

DR. ADAMS: It varies from operation to operation. But in general, the influent comes into a settling unit and/or head works which reduces or eliminates the heavier insoluble material like grit. That goes into a primary secondary. And if the system has a tertiary system which basically continues to increase the bio solids loading moving the material from a liquid phase to a solid phase, again, depending on the process, the material may go through a high pressure, high temperature Zimpro process to take care of the biological and the toxicological components.

Depending on, again, the process, the material may be dewatered, put on a filter

bed. That material then is a sludge cake. Sludge cake may be incinerated which results in an ash, or it may then be directly loaded to a truck and disposed of.

MR. HARSCH: Are you aware of any -- strike that.

Are you aware of any POTW in Illinois that incinerates its ash?

DR. ADAMS: You wouldn't incinerate ash. You would incinerate sludge.

MR. HARSCH: Excuse me. Sludge resulting in an ash.

DR. ADAMS: I don't recall.

MR. HARSCH: What's the moisture content a POTW handles its sludge: In a wet form typically?

DR. ADAMS: I don't recall the soil or percentage moisture, but it is handled in a sludge. It's a relatively moist cake or sludge form, yeah.

MR. HARSCH: If it's handled wet, does 4 percent sound right?

DR. ADAMS: I'm sorry. I don't -- I have no...

MR. HARSCH: Do you know the moisture content if the sludge is dried through a filter press?

DR. ADAMS: It is run through a filter press, correct.

MR. HARSCH: If it is, do you know what the moisture content would typically be?

DR. ADAMS: I do not recall.

MR. HARSCH: Do you know what the solid content is?

DR. ADAMS: I have that information. I've read it before, but I don't recall.

MR. HARSCH: Are you aware of any dusty conditions that result from handling of either wet or dry bio solids or sludge at a POTW?

DR. ADAMS: Certainly the incineration process that is a very dusty, very dirty operation.

MR. HARSCH: Apart from incineration, just in the physical handling and loading of either wet or dry municipal bio solids or sludge, are you aware of any dusty conditions?

DR. ADAMS: Handling the grit can be

dusty; and the ash.

MR. HARSCH: Have you ever observed any dust handling of bio solids either wet or dry at a POTW?

DR. ADAMS: As ash, yes.

MR. HARSCH: Not as ash. Not from one that incinerates, but from one that simply loads out and disposes of the solids in either a wet or dry form.

DR. ADAMS: If it's on a drying bed, yes.

MR. HARSCH: You observed --

DR. ADAMS: Yes.

MR. HARSCH: -- dusty conditions?

DR. ADAMS: Yes, in the drying bed.

MR. HARSCH: Do you know if POTWs in Illinois typically load their sludge or bio solids indoors or outdoors?

DR. ADAMS: I do not know in Illinois.

MR. HARSCH: Are the alpha particles that are emitted from radium 226 and 228 stopped by skin?

DR. ADAMS: From an external

exposure, yes.

MR. HARSCH: Are they stopped by clothing?

DR. ADAMS: Yes.

MR. HARSCH: So if you were worried about ingestion, then it's either by putting the solids -- bio solids in your mouth or breathing in the particles or skin injections or cuts, if I read your testimony correctly; is that correct?

DR. ADAMS: When we were dealing with internal exposure, the alpha particles of concern would be for ingestion, inhalation, entering any wounds or cuts. We're also concerned about the gamma rays from the gamma machines, as well as the radon.

MR. HARSCH: Are you aware of what the normal worker clothing requirements are when dealing with treatment works?

DR. ADAMS: Typically it is an outer working garment, usually a one-piece zip type, although an alternative may be what we call a Tyvek disposable. The others are washable. Gloves, work boots.

MR. HARSCH: All those would minimize exposure to the alpha particles, correct?

DR. ADAMS: The alpha particles would have no effect on the gamma rays.

MR. HARSCH: I think you mentioned on page 5 of your testimony yesterday that there would be a 5 to 25 percent use of groundwater for back flushing. What's your source of that range of number; that number and the range?

DR. ADAMS: Part of the source was from my discussion with WRT.

MR. HARSCH: You're not a water treatment expert, are you?

DR. ADAMS: Actually, the Agency communicated that as a part of the transcript.

MS. WILLIAMS: Can you point to where?

MR. HARSCH: Actually, that was my next question.

MR. FORT: No.

MR. HARSCH: And your testimony, what's the basis for it? Show me what the basis for it is.

MS. WILLIAMS: I was just asking for

clarification, too, because we didn't testify at the last hearing.

MR. FORT: In the transcript of -- I think it was the first hearing, that was given as a range for back flushing. And I think this witness has testified he's talked to WRT representatives, and the other is the agencies and testimony. For a transcript cite, we didn't bring that part.

MR. HARSCH: Well, I'd like the know the basis for it, so, Mr. Fort, if you could provide that for me...

MR. FORT: Okay.

MR. HARSCH: On page 3 you reference that communities can save hundreds of thousands of dollars. What's your expertise that allows you to make that statement?

DR. ADAMS: I just want to make sure I know where we are. We're looking at page 3?

MR. HARSCH: Yes.

DR. ADAMS: Again, that was a discussion with WRT.

MR. HARSCH: You have no independent

technical or educational background to allow you to make that statement?

MR. FORT: I think he was still answering the question when you jumped in.

DR. ADAMS: What I was going to add is the cost of the additional effort that would be required if a -- particular POTWs that are going to be affected by the discharge of radium down the sewer is involved in anything from setting up a radiation protection program, writing plans and procedures, taking and doing personnel monitoring, medical monitoring, the TLD monitoring. And, you know, that's not cheap.

I'm involved in that personally right now in Ohio, and that is not something that should be taken lightly. A POTW is going to be a licensee, and that's a lot of liability, a lot of responsibility. That has cost.

MR. HARSCH: I need to confer with my client for a second. I'm almost done.

HEARING OFFICER ANTONIOLLI: Okay. I would like to note for the record during the

set of questioning, Kathleen Crowley, senior attorney at the Pollution Control Board, has joined us. That's just to note for the record. Thanks.

(Brief pause.)

MR. HARSCH: In attachment B, I don't know if I'm looking -- I guess it's the one that was originally filed on the corrected one, so bear with me. I think it's page 2 of attachment B; page 2.

DR. ADAMS: Page 2?

MR. HARSCH: Attachment B.

DR. ADAMS: Yes. I'm on the original.

MR. HARSCH: It's got sample calculations of water quality used in the BCG approach. There was a highlighted, in my version, statement that radiation sediments will increase due to continued discharge to the radium in the low-flow and no-flow streams.

Do you have any data that supports that in the state of Illinois?

DR. ADAMS: I don't have in the state

of Illinois. Looking at the state of Florida, the state of Florida has information that clearly describes that.

MR. HARSCH: If I recall, the Florida situation was lakes that are replenished by groundwater. Is that correct?

DR. ADAMS: Augmented by groundwater.

MR. HARSCH: In terms of low-flow and zero-flow streams in the state of Illinois or low-flow or streams anywhere, do you have any data?

DR. ADAMS: Data from where?

MR. HARSCH: Do you have any data to support this statement regarding streams that sediment would be expected to increase?

DR. ADAMS: From streams, no.

MR. HARSCH: How long has deep well water with high radium contents been utilized in Illinois, do you know?

DR. ADAMS: I believe somewhere in the year order of ten to 15 years.

MR. HARSCH: Switching to Dr. Anderson, radium is a naturally-occurring element; is it not?

DR. ANDERSON: Correct.

MR. HARSCH: How long do you believe that deep well water containing levels of radium in excess of five picoCuries per liter -- how long has that been used in drinking water in Illinois?

DR. ANDERSON: I couldn't give you a precise day, but obviously since the technology to tap that deep water has been available.

MR. HARSCH: Would it surprise you if it stretched back into the 1800s?

DR. ANDERSON: It would not surprise me.

HEARING OFFICER ANTONIOLLI: I'll remind you all again to speak up a little bit, even for those in the back of the room and the court reporter.

MR. HARSCH: Are you aware of any Illinois data regarding impact of continued discharge of an effluent from a POTW that services a community using deep well water for their public water supply?

DR. ANDERSON: Am I aware of any --

MR. HARSCH: Any data on any impact.

DR. ANDERSON: To the biota?

MR. HARSCH: To the biota.

DR. ANDERSON: No. We're notoriously pathetic in terms of tracking and researching those kinds of questions.

MR. HARSCH: You are aware that publicly-owned treatment works remove a portion of the radium in the sludge handling process?

DR. ANDERSON: Yeah, and potentially ion exchange, water softening, those kinds of things, yes.

MR. HARSCH: Can you summarize what your understanding is of the typical level of radium 226 and 228 in the discharge from publicly-owned treatment works?

DR. ANDERSON: At this point in time --

MR. FORT: Excuse me. Is that statewide, a part of the state?

MR. HARSCH: I'm just asking for a range that use the deep well water for the source of the water supply.

DR. ANDERSON: I've seen percentages that range anywhere from 20 to 80 percent can end up in the sludge. It's time variable.

MR. HARSCH: Mr. Williams, if the WRT system is cost competitive with other technologies that are being evaluated for the use to reduce radium levels in drinking water to a level in conformance with the drinking water regulations and your system has the inherent benefits that you and Dr. Adams have discussed, then why does WRT find it necessary to go to the lengths you're going through in this proceeding to, in essence, regulate the competition out of business?

MR. FORT: Object to that question. It's argumentative. Go ahead. Answer it.

MR. WILLIAMS: It's a good question. And why am I here is really what he's asking. And frankly, I'm here for a couple of reasons.

First of all, Illinois is the first state in the nation to be actively enforcing the radio nuclide rules. That puts you guys out at the forefront.

For over two years we have been

attempting to establish a dialogue with IEPA over these issues. And in all honesty, we have received: Hey, you guys are just trouble makers and you're trying to sell your equipment response. And this is the first forum we have had to actually get in front of the public and the decision-makers that radium is a problem. It is not the radium itself but the radiation that comes off of it. And it was our opportunity to put before the public and the government our views, not just for Illinois, but for all the states that follow.

Will WRT benefit if you keep the standard at one? Absolutely. However, I'll reiterate that in the event that you keep the standard at one -- and other treatment processes, they can be modified to do the same thing. We are not the only company. You mentioned Layne Christianson. They are certainly a direct competitor that does exactly what we do, and yet they're solid on this issue.

I can understand why Tonka is solid on this issue because HMO going into the water

treatment facility would be detrimental to their sales. But they do have the ability to refilter that backwash and keep it out of the POTW and out of the environment of Illinois. And I think that's important for everybody to hear. We weren't getting the message out.

MR. HARSCH: Your system -- we went through this in some length at the last hearing, but your system, if it treats the community water supply down to 4.5 and that is then sent to the POTW, and that POTW discharges below from stream, that water, in all likelihood, would be in excess of one picoCurie per liter?

THE COURT REPORTER: Can you repeat that?

MR. HARSCH: I'll start all over again.

Your system, assuming it is utilized in a community, produces a finished water of 4.5 picoCuries per liter in conformance with the drinking water standard and that community is serviced by a POTW that discharges to a zero-flow stream, then it

would not likely -- in all likelihood, absent dilution, that the effluent from the POTW would not comply with the one picoCurie per liter standard?

MR. WILLIAMS: There is a possibility that it would not comply with the one picoCurie standard. However, there are a lot of parameters that have to be looked at.

The principal one is how much is going into the sludge. If over 50 percent, then probably not. Under 50 percent, possibly. Again, that's assuming there's no inflow of surface water, there's no dilution before it gets to the POTW, and there's no mixing effluent POTW.

So can I guarantee that I can get to five and we would not exceed one? Absolutely not. Do I believe in all likelihood we would be under one? Absolutely.

MR. HARSCH: That concludes our questioning of WRT. Thank you very much.

HEARING OFFICER ANTONIOLLI: Thank you. With that, do you have questions?

MR. ETTINGER: We have a few

questions, but I've got to rearrange the furniture slightly.

(Brief pause.)

MR. ETTINGER: We just have a few clarifying question.

First of all, I do want to apologize to some of the other participants in the sense that we have not been able to give this matter as much attention the earliest we would have liked to have done. I do hope, however, that agencies and boards that have their own resource constraints realize that sometimes we have to make a pretty quick cut on what's likely to be critical and what isn't. Sometimes we make a mistake and later figure out that something we didn't give as much attention to in the first place needed more attention later.

With that introduction, my questions are primarily to Brian Anderson. And I just want to try and see how we follow here.

HEARING OFFICER ANTONIOLLI: Can you introduce yourself again one more time?

MR. ETTINGER: I'm Albert Ettinger.

I'm here on behalf of the Illinois Chapter of the Sierra Club. Albert

HEARING OFFICER ANTONIOLLI: And also, Ms. Skrukrud, if you'd like to introduce yourself...

MS. SKRUKRUD: Cindy Skrukrud, S-k-r-u-k-r-u-d. And I work as the clean water advocate for the Illinois Chapter of the Sierra Club.

HEARING OFFICER ANTONIOLLI: Thank you.

MR. ETTINGER: Okay. I just wanted to try and clarify some things in my own mind.

I understand there's a DOE study that suggests that for terrestrial life, terrestrial critter to use the technical term, that it's been calculated that .1 rads per day is a proper limit?

DR. ANDERSON: Terrestrial and riparian. They discriminate between organisms that are -- mammals is the group of most concern in riparian area and terrestrial. But yes, it's .1 for those, essential for mammals.

MR. ETTINGER: For us guys who don't

like Latin, give me a few examples of riparian animals.

DR. ANDERSON: Oh, otters, muskrats. Some of the small mammals are particularly water shrews, all -- jumping mice. Some of them are very specific to riparian areas as opposed to terrestrial.

MR. ETTINGER: And then terrestrial are?

DR. ANDERSON: Higher up, farther away from the stream.

MR. ETTINGER: Okay.

DR. ANDERSON: They may still use the stream, but they don't predominantly live in the riparian corridor.

MR. ETTINGER: Okay. I understand somewhere there's been a calculation in this record as to how we get from .1 rad today to something over three or somewhere picoCuries per liter. Where in the record do we see that?

DR. ANDERSON: That's in the DOE standard 1135-2002.

MR. ETTINGER: And is that part of

one of these exhibits?

DR. ANDERSON: Yes. That has been made part of the record.

MR. ETTINGER: Okay. Just for the boys and girls at home, could you tell me what page it is in this thing?

DR. ANDERSON: This is actually a summary. It's a little easier to read.

HEARING OFFICER ANTONIOLLI: And it's been made Exhibit 15.

MR. ETTINGER: This summary is Exhibit 15?

HEARING OFFICER ANTONIOLLI: Not the summary, the actual document from the Department of Energy.

MR. FORT: Two steps. The procedure is Exhibit 15. The specific calculation on radium is part of -- I guess it's Group 14, attachment B,
page B-5.

MR. ETTINGER: Okay. Great. This is B-5. Thank you very much.

Is B5 the example, or is there a specific calculation somewhere?

DR. ADAMS: It's just an example. It's a generic formula to illustrate how DOE went about this methodology. B-5 is a general formula. Then B-6 is plugging some values into the formula just to show you the next step.

MR. ETTINGER: And so B-6 is where we actually calculate and get this 3.75 picoCuries per liter number that's been tossed about for riparian life?

DR. ANDERSON: The 3.75 picoCuries per liter does not take into account any contribution of radiation from the sediments. This example does. So this is much more conservative than 3.75 picoCuries per liter radium 226, radium 228 50/50.

MR. ETTINGER: I'm sorry. Conservative is a dangerous term both in politics and in this. It's conservative in the sense that it's too low or that it's too high? Or what do you mean by conservative?

DR. ANDERSON: 3.75 assumes no contribution from the sediments, no buildup of material that generates radiation from the

sediment.

MR. ETTINGER: Okay. So that there's no background level of radiation in the sediment already?

DR. ANDERSON: Right.

MR. ETTINGER: Just having been there?

DR. ANDERSON: That's correct.

MR. ETTINGER: Okay. Now, that's -- I'm dealing with my daughter's high school Algebra now very poorly, but using this formula then, I gather there's another figure that goes for aquatic life. And that's 1.0 as opposed to .1?

DR. ANDERSON: Correct.

MR. ETTINGER: Would it be safe then to assume that this isn't -- that if I ran the same set of calculations for 1.0 instead of .01 -- or .1, I would come out with a figure here that was ten times as much?

DR. ADAMS: I don't know that I want to draw that conclusion.

DR. ANDERSON: It would be bigger, but not necessarily ten times. We'd have to

check, do the calculations.

MR. ETTINGER: Have you done the calculation like here anywhere for aquatic life?

DR. ANDERSON: Let me tell you why we didn't.

The question in my mind is fundamental. Is the requirement to protect just stuff swimming in the stream or other wildlife associated drinking the water, eating the stuff in the stream, et cetera? That seems to me to be the fundamental issue.

MR. ETTINGER: I'm just trying -- if all I cared about in the world -- let's say -- if all I cared about in the world was fish and mussels, would I be going off of this one rad per day figure?

DR. ANDERSON: Just fish and mussels?

MR. ETTINGER: Right.

DR. ANDERSON: No, but the DOE standard very specifically, for aquatic systems, includes consideration of riparian animals.

MR. ETTINGER: Okay. So just to get

it right, though, I'm just saying, what critters is my 1.0 for as supposed to my .1?

DR. ANDERSON: The things that are immersed in the water is 1.0. The things that don't necessarily live in the water all the time, .1.

MR. ETTINGER: Thank you.

DR. ANDERSON: Sorry.

MR. ETTINGER: Table 6.2, this is part of Exhibit -- the court reporter would probably like a number better than just handed out.

MR. ANDERSON: Table 6.2?

MR. ETTINGER: Right. Could you just explain what's going on here?

HEARING OFFICER ANTONIOLLI: Where we're at is in Mr. Adams' pre-filed testimony, right, that was filed on October 8th for this hearing. It's in Exhibit C, page M1-38.

MR. ETTINGER: Thanks

I'll put this question to the panel, so to speak.

Would you explain to us generally what's going on here?

DR. ANDERSON: Obviously we're dealing with radium in the first column, radium 226 and 228, several isotopes down in column 1. The first number is the -- what we call the bio concentration guide for water. And in the general formula, what you do is you take the number of picoCuries per liter, concentration of radiation for 226 over the BCG for radium 226, plus the concentration for 228 over the BCG for 228. You add them together. And if they're greater than one, they exceed the threshold. Now, that is, again, not including sediments.

If you want to include sediments, then you move over to the fourth column and do the same calculation: The contribution of radiation from the sediments 226, over the BCG sediment, plus the concentration of radium 228, over the BCG sediment. And then you add all four together. And if they're over one, it exceeds the DOE threshold.

MEMBER JOHNSON: When it exceeds the threshold, that's when you're indicating you need to do more studies?

DR. ANDERSON: That's right. They describe the threshold as being indicative of a number below which no population effects to organisms have been documented.

MR. ETTINGER: Now, you notice on these organism responsible for limiting dose in the water, that's the one that's most sensitive?

DR. ANDERSON: Correct.

MR. ETTINGER: Okay. Do you have some understanding as to why it's the aquatic animal in some cases as to some of these things and why it's the riparian animal in others?

DR. ANDERSON: Yeah. Let me give you an example.

The kinds of things they looked at, when they looked at aquatic animals, things immersed in water, the limiting factor that was identified was gametogenesis in fish, the formulation of eggs and sperm. They can't reproduce; obviously a population limiting effect. Okay.

The situation in the riparian

animals is different. At .1, you start to have the same kinds of effect that have you in humans. It builds up in the skeleton, radiates other tissues. They didn't specifically, to my recollection -- I -- it may be here, but I can't recall specifically whether it was a gametogenetic effect in the riparian mammal or whether it was direct mortality, increased cancers. I just frankly don't recall. But that's the concept, the weak link.

MR. ETTINGER: Now, by definition, the aquatic animals are in the same water all the time?

DR. ANDERSON: Yes.

MR. ETTINGER: Are there riparian animals in Illinois that basically have 24-hour-a-day exposures to the same riparian system?

DR. ANDERSON: There are -- particularly small mammals have very small home ranges that may never leave the riparian area. That's what you mean.

MR. ETTINGER: Right. So there are

species in Illinois that basically are going to be riparian in the same stream, more or less, their whole lives?

DR. ANDERSON: Yes.

MR. ETTINGER: And what kind of critters are we talking about?

MR. ANDERSON: Oh, everything from insects to small mammals, the larger mammals, you know, raccoons. They could. There might be individuals.

MR. ETTINGER: Would like beavers be in one stream?

DR. ANDERSON: They would be there almost all the time. Muskrats all the time.

MR. ETTINGER: Otters?

DR. ANDERSON: Otters. They were recently taken off the endangered species.

MR. ETTINGER: They were taken off the endangered species list?

DR. ANDERSON: Either they were made threatened or they were just recently removed because they've recovered.

MR. ETTINGER: You may have gone into this, but why isn't it safe to go from 3.75 to

some multiple of 3.75 when we talk about aquatic life rather than riparian animals?

DR. ANDERSON: The problem with 3.75 is; one, that calculation is based purely on radiation contributed from radium. There may be other contributing sources.

The second thing is that it deals with population level effects. In the case of things like threatened and endangered species where the loss of an individual is not only problematic biologically but illegal, it's not necessarily protective.

Let's see. Other problems...

DR. ADAMS: It's without sediment also?

DR. ANDERSON: Yes. It's also without sediment.

MR. ETTINGER: I'm sorry. I didn't make my question clear. I was trying to go from the 3.75 is to protect riparian life. I think we went over that reasonably well. But I was just saying if you were focusing on aquatic life, why is it that we can't just multiply the number there? Are there other

factors that come into play in that?

DR. ANDERSON: The BCGs may not be the same.

DR. ADAMS: Well, I don't have it in front of me, but yes, there's different input parameters and different assumptions that go along with the terrestrial versus the aquatic.

MR. ETTINGER: I guess what I'm saying is you pointed to -- just to be a little more clear here, we've pointed to a number of forms of Illinois wildlife which would be affected by going to having a standard over 3.75; or potentially effected. I'm just trying to get an idea of the range of aquatic life that might be affected.

In order to do that, I'm trying to get some sort of ballpark figure as to what the aquatic life number is so that I can get some sort of idea as to when we might be concerned about effects on endangered mussels and things like that.

And so I'll just put that to our panel. Is there some way for me to get some sort of estimate as to -- using the

methodology used here as to what the range should be to protect mussels and other aquatic life.

DR. ANDERSON: You can do that calculation. That is a possibility. And we'll have to find the BCGs.

The problem that I have, as a biologist, with that is you're talking about protecting aquatic organisms and writing off everything that -- the higher organisms that live in the riparian zone because there's a fundamental principle that the BDAC committee talks about.

Lower life forms are more resistant to mortality due to radiation. Okay. But the problem is is that's also where they bio concentrate. So through bio magnification, you get bio accumulation into those other organisms. And either way, it's a double whammy. You can knock out the system.

MR. ETTINGER: And that's helpful. I just wanted to assure you, the Sierra Club doesn't not care about riparian animals. We are concerned about it. We're just trying to

get the full range of what we should be worried about here.

DR. ANDERSON: Okay.

MR. ETTINGER: And the level of my screams will be louder if I find out that you're endangering, you know, federally listed mussels in addition to recently delisted otters.

MR. WILLIAMS: Let me use the specific example of the Florida work.

The pumping from the Florida aquifer had an average concentration of about 3.6 picoCuries 226. The concentration of the lake water where the mussels lived had a concentration of only 1.6 picoCuries per liter. And yet the concentration in the mussel flesh was 200 picoCuries per liter, which, according to their study, gives a rad reading of 5.5 rad per day, five times the one that you've been asking about. And that's only with a 1.6 level in the water.

MR. FORT: For the record, you're referring to the part of the report that's part of Mr. Adams' testimony. I think it's

attachment D to the supplemental testimony.

HEARING OFFICER ANTONIOLLI: Right. Okay.

MR. FORT: There is a letter in there and the report from the Florida investigators. I think that's what you're referring to.

MR. WILLIAMS: That's what I'm referring to.

HEARING OFFICER ANTONIOLLI: Thanks.

MR. ETTINGER: I've heard a lot of numbers thrown around in two days. One of the numbers I heard was 1.88 rad per day as being a significant number.

DR. ANDERSON: The reason is that's, more or less, half of 3.75. That's just if you're looking at radium 226.

MR. WILLIAMS: That's picoCuries, too.

MR. ETTINGER: I'm sorry. 1.88 picoCuries per day -- picoCuries per liter.

MEMBER JOHNSON: Brian, yesterday, you suggested that there was a misunderstanding -- and I think you're right -- with respect to the numbers.

Sometimes we look at them and they're just 226. Other times, there's a combination of 226 and 228.

Because I didn't follow you all the way through that, will you try and clear that up for me?

MR. ANDERSON: The current standard is one picoCurie 226. Now, typically you're going -- if 226 is present, you're going to have 228 as well. And again, the proportions can vary in those two radioisotopes.

As a rule of thumb, the numbers that I've been seeing, it looks like it goes 60/40-ish, either way under the normal situation.

The MCL for drinking water that's being proposed is five picoCuries combined 226 and 228. So really, the general standard is one 226, effectively two 228. So we're looking at two versus five as opposed to one versus five.

MEMBER JOHNSON: Okay.

MR. ETTINGER: I think we're done.

HEARING OFFICER ANTONIOLLI: At this

point do we have further questions for WRT?

MR. DUFFIELD: I have one question.

HEARING OFFICER ANTONIOLLI: Okay. Mr. Duffield.

MR. DUFFIELD: Dennis Duffield with the city of Joliet.

Mr. Williams, you testified just a minute ago about the Florida lake and the bio accumulation. Now, I wanted to make sure it was clear to everyone, we're talking about a lake as opposed to a stream; is that correct?

MR. WILLIAMS: That's correct.

MR. DUFFIELD: A lake that's subject to high evaporation rates?

MR. WILLIAMS: It's -- I don't know what the evaporation rate is. The evapo transpiration rate, if you look at that rate versus rainfall, rainfall is in excess of evaporation. The principal problem -- and this was asked earlier -- that they have to augment these lakes because they're leaking.

MR. DUFFIELD: So they're on poor soils; the water goes back into the groundwater?

DR. ANDERSON: That's correct.

MR. DUFFIELD: So they are essentially circulating the water through there?

DR. ANDERSON: I don't know if they're going back to the aquifer they're pumping from, but...

MR. DUFFIELD: So water goes in, and there's evaporation water goes out. And all this water is filtered by the mussels because that's their biology?

DR. ANDERSON: Yeah. The concentration of the lake is about 1.7.

MR. DUFFIELD: So this is a function of the biology as opposed to a concentration of the water?

MR. FORT: Excuse me. Is this a question or testimony?

HEARING OFFICER ANTONIOLLI: I think he's asking a question.

MR. DUFFIELD: I asked it as a question, counselor.

MR. FORT: I'm just listening.

MR. WILLIAMS: The mussel reflects

the environment it lives in. The environment it lives in, according to the study, not my personal knowledge, is an environment of 1.6 picoCuries 226. That's the air it breathes, right.

MR. DUFFIELD: And it's able to accumulate that at high numbers?

DR. ANDERSON: And it accumulates that at high numbers.

MR. DUFFIELD: Very good. Thank you.

DR. ANDERSON: Two numbers that are five and a half times what they are considering safe for the populations, 5.5 rad per day versus the 1.0 which is considered safe for aquatic animals in the lake.

MR. DUFFIELD: But in a lake, water is essentially --

HEARING OFFICER ANTONIOLLI: Mr. Duffield, if you wish to testify later, we can have you sworn in now.

MR. DUFFIELD: I'd be glad to swear in. I was trying to ask a question.

HEARING OFFICER ANTONIOLLI: Oh, sure. But if you're going to testify later,

too, we can have you sworn in now.

(The witness was duly sworn.)

MR. DUFFIELD: In a lake environment, the same water is essentially available to the shell fish on a daily basis. It circulates back around through their system. That's basically what they do is filter water. And where in a stream different water comes by tomorrow than was here today; is that correct?

MR. WILLIAMS: Well, no. That would be correct if they pumped all the time. They only pump when they need to.

MR. DUFFIELD: I'm not talking about circulating the whole lake. I'm talking about the function of the shell fish which circulates the water that's around it back through its own system.

MR. WILLIAMS: Yeah. The shell fish lives in its environment. It doesn't go into the lake or river. It's just a shell fish breathing.

MR. DUFFIELD: So the water with 1.75 -- I believe is close to the number that you mentioned -- would be circulating through

this shell fish?

MR. WILLIAMS: Yeah. I would assume that that's what it's breathing.

MR. DUFFIELD: Where in a stream the water concentration is not always the same and could vary over time?

MR. WILLIAMS: I assume that the water, especially in a low-flow, no-flow stream, is going to be fairly consistent in its radium content. It may go up and down. And the mussel would be affected by the average of whatever it sees.

MR. DUFFIELD: And in a zero-flow stream, would you expect a lot of mussels to live?

DR. ANDERSON: I would expect them to only live where there's consistent water.

MR. DUFFIELD: Very good. Thank you.

HEARING OFFICER ANTONIOLLI: Thank you, Mr. Duffield.

At this point, Mr. Ettinger, do you have another question?

MR. ETTINGER: I just have a clarifying question. I guess this is, again,

mainly for Dr. Anderson from Illinois.

Do we have a lot of streams in Illinois that are impounded?

DR. ANDERSON: Yeah, yes, many.

MR. ETTINGER: And a lot?

DR. ANDERSON: Yes, many.

MR. ETTINGER: And are most of our rivers impounded in Illinois?

DR. ANDERSON: Most.

MR. ETTINGER: Do --

DR. ANDERSON: Larger, larger. I mean, when you say rivers, I assumed you mean big things, yes.

MR. ETTINGER: Right.

For relevant purposes here, do impounded streams or rivers have some of the same characteristics of lakes?

DR. ANDERSON: They're more lacustrine and less palustrine, yes. They're more analogous to a lake than a free-flowing stream, yes.

HEARING OFFICER ANTONIOLLI: Thank you.

Now I see that Ms. Williams has some

more questions, and so does Mr. Khalique. Ms. Williams, do you mind if we take Mr. Khalique and then turn it over to you again?

MS. WILLIAMS: Sure.

HEARING OFFICER ANTONIOLLI: Do you have a question for the WRT Environmental witnesses?

DR. KHALIQUE: Yes.

HEARING OFFICER ANTONIOLLI: You can come up here today again and introduce yourself again for the Board.

DR. KHALIQUE: My name is Abdul Khalique. I'm a radiation chemist at the Metropolitan Water Reclamation District of Chicago, and I have some questions.

My understanding is that based on the subject effective dose rate USEPA standard for radium 226 and 228 combined of five picoCuries per liter?

DR. ANDERSON: I mean, yeah. I mean, I actually -- I think I was responsive to a question something like. That has been a long, ongoing debate, and I'm comfortable with

the resolution which is the five picoCuries MCL personally. I don't know if I speak for WRT in that regard.

DR. KHALIQUE: Anyway the regulation is set by USEPA and it's being accepted by us as is being imposed now?

DR. ANDERSON: They didn't consult me, but yes, this seems to be a good thing.

DR. KHALIQUE: What will the effective dose of radium 226 and 228 combined on humans: drinking two liters of water per day for a lifetime?

DR. ADAMS: About four millirems.

DR. KHALIQUE: Four millirems per year?

DR. ADAMS: About four millirems.

DR. KHALIQUE: Based on one of the documents by Dr. Adams in his testimony, the DOE indicates that the available data indicates that the dose rates below one rad per day for aquatic animals and terrestrial plants caused no adverse effects to the population of the plants and animals?

MS. WILLIAMS: Which document?

MR. FORT: He said Exhibit 10. Is this the document you're referring to?

DR. KHALIQUE: Is that the memorandum?

DR. ADAMS: Memorandum, yes.

DR. KHALIQUE: On page 21.

HEARING OFFICER ANTONIOLLI: This is the Department of Energy document that you're referring to in the first section.

DR. KHALIQUE: Yes.

Page 21 on the DOE Standard: A Graded Approach for Elevating Radiation Doses to Aquatic and Terrestrial Biota.

MR. FORT: Excuse me. Module 21 or --

MR. RAO: There's no module 21. There are only three modules in the document.

MR. FORT: Are you saying module one?

MR. RAO: I think so.

DR. KHALIQUE: Do you want me to show you what it is?

HEARING OFFICER ANTONIOLLI: Sure. We have it. This is the memorandum that prefaces the Department of Energy document.

Okay. Thank you.

DR. KHALIQUE: On page 21, Roman XXI.

HEARING OFFICER ANTONIOLLI: Roman numeral XXI. Page Roman numeral XXI begins scope, purpose, and organization.

DR. KHALIQUE: That's correct.

And the first paragraph, last five lines, the technical standard assumed a threshold protection for plants and animals at the following: For aquatic animals, one rad per day; for terrestrial plants, one rad per day; and for terrestrial animals, 0.1 rad per day.

MR. RAO: Correct.

DR. KHALIQUE: Available data indicate that dose rates below these limits cause no measurable adverse effects to the population of plants and animals.

DR. ANDERSON: However, later in the document it very clearly points out that riparian animals, which are in the category here of terrestrial animals at .1, are part of the aquatic community. And therefore, the limiting number that's used for calculations

affecting aquatic life is .1 as opposed to one rad. This gets back to this issue of do you consider riparian animals part of the aquatic community. And in this standard, they clearly do.

DR. KHALIQUE: I think Dr. Adams may be able to help me on that. To calculate the effective dose, you have to multiply that by the quality factor?

DR. ADAMS: Yes, that's correct.

DR. KHALIQUE: For gamma emitting radionuclides, that factor is one; is that correct?

DR. ADAMS: Correct.

DR. KHALIQUE: For beta, the factor is one?

DR. ADAMS: One, correct.

DR. KHALIQUE: For alpha, the factor is 20?

DR. ADAMS: Correct.

DR. KHALIQUE: One rad per day for aquatic animals and terrestrial plants -- 0.1 rad per day for terrestrial animals will cause no adverse effect to the aquatic plants and animals, correct?

DR. ANDERSON: Correct, including riparian.

DR. KHALIQUE: Yes.

DR. ANDERSON: Yes.

DR. KHALIQUE: If you multiply that by one for gamma emitting radionuclides, it will be one rad per day?

DR. ADAMS: Right.

DR. ANDERSON: Correct.

DR. ADAMS: Correct.

DR. KHALIQUE: If you convert that to millirems per hour, it comes out to be almost 42 millirems per hour, correct?

DR. ADAMS: I will assume your math is right. Sure.

DR. KHALIQUE: One mrem per hour is one millirem per day divided by 24, so --

DR. ADAMS: Okay.

DR. KHALIQUE: We talked about drinking water regulations, and it says four millirems per year is safe for human beings. And based on these calculations, 41.7 millirem per hour for aquatic animals and the difference of hour and year is safe for the plants and animals.

Am I right?

MR. FORT: I'm just going to object that we're doing a lot of math here. We're doing it without even a white board to write it down. You clearly have thought this out, but I don't know that we can do much else than say: Sounds right. I don't know where we're going with this.

HEARING OFFICER ANTONIOLLI: What we should do now is have you sworn in. So why don't we do that first?

(The witness was duly sworn.)

HEARING OFFICER ANTONIOLLI: And we realize that there are a lot of calculations going on here, but we do want as much information as we can on the rulemaking, so if there's something that you'd like to address after the hearing, you can do so in writing.

But you can go ahead, Mr. Khalique, and finish your questions at this time.

DR. KHALIQUE: I was getting to the point that the four millirems per year for human being is acceptable by USEPA according to the regulations. And based on Dr. Adams'

testimony, 41.7 millirems per hour causes no adverse effect to the aquatic animals based on the calculations.

DR. ADAMS: Let me tell you the difference, though.

The difference is that in the aquatic system calculation, one needs to take into consideration the exposure and impact to sediment. And in the NCRP 109, they used the biota -- excuse me -- bio rad model. Those conversion factors that were used to get from the picoCurie per liter to the millirem per day or year did not include the sediment, and that was a shortcoming. And DOE saw that.

DOE, among other international and national communities of science, recognized that. And that's why the DOE went forward stemming off from that document to develop the biota dose approach.

MR. RAO: Just for purposes of clarification of the record, you know, we've been using different units of radiation and exposure -- radiation exposure. Can you please explain what these terms mean just so

somebody reading the transcript will know when you're talking about a rems, millirem, rad, you know...

DR. ADAMS: We'll start out with the absorbed dose, which is simply the amount of energy and radiation that an individual or an animal receives, let's just say, in the body. It could be from alpha, it could be from beta, and it could be from gamma; three types.

That is the absorbed dose, and the units are rads, r-a-d-s. To equate that type of exposure to man, we need to go to rem, roentgen equivalent man, r-e-m, rems.

To do that, as Mr. Abdul said, we need a correction factor or a quality factor. And for each type of radiation, there is a different number. So you take the absorbed dose of rad. If it is an alpha radiation, we multiply that number by 20. If it's beta or gamma, we multiply that rad number by one. So we go from absorbed dose rad to rem, man equivalent.

And usually, for example, we talk about protective standards NRC of 100

millirem, one-thousandths of a rem per year. If you're a radiation worker like myself, we are allowed up to five rem or 5,000 millirem per year and so on and so forth.

MR. RAO: Okay. In response to Mr. Khalique's question, you said how the drinking water rems are not the same as for aquatic life because sediments were not considered. So do you have any information as to what kind of levels there are in Illinois stream sediments to emit?

DR. ADAMS: Right now? I don't think so.

MR. RAO: I thought you may not have the information, but just based on the information from the Florida lakes, the levels that were there, if you use those numbers, how will these values come out? Like this 42 rems per hour that Mr. Khalique said, will that, you know, decrease significantly so that it will be --

DR. ADAMS: Let me ask my panel to help me here because there's been a lot of literature that I have reviewed with the

Florida study. But the one -- give me ten seconds here because I think it's part of my testimony.

HEARING OFFICER ANTONIOLLI: It is about right now 10:35. We can take a break now. Let's say come back at ten to 11:00. Let's go off the record.

(A recess was taken.)

HEARING OFFICER ANTONIOLLI: Let's go back on the record. We're about five minutes to 11:00 right now. And where we ended up before we broke is a question for Mr. Adams. And if you'd like to continue with that...

DR. ADAMS: Sure.

HEARING OFFICER ANTONIOLLI: Go ahead.

DR. ADAMS: I think the best way to answer your question is to look at Exhibit D of my testimony which includes the work of Bruce Tuovila and Dr. Teaf, which is the Florida study on human health risk assessment which is the August 2000.

If we turn first to page 10 of their report, we see the concentration of

groundwater for levels of radium 226 and 228 for augmenting Round Lake was 3.6 picoCuries per liter. And for the lake water, radium 226 and 228 Round Lake, they reported two and a half picoCuries per liter.

On page 11 under sediments, section 3, down approximately in the middle of the first paragraph, they document that the sediment measurements were 12.06 and 12.11 picoCuries per gram. Somewhere about 12.1 picoCuries per gram were the sediments of the Round Lake.

And then if we move over a couple pages to page 13, second paragraph, we have their conclusions. The preliminary evaluation of ecological risk was based on the highest total radium content found in fish and mussels. And it continues: The internal dose calculations were performed using the method of sample, et al., 1997, table 9.

Based on those calculations, the estimate total internal dose to fish from radium 226 and its short-lived decay products and tissue and bone is .3 rad per day.

The total internal dose to mussels is five and a half rad per day, which, if we're looking at the DOE standard, we exceed those.

So it's quite possible, as demonstrated here -- not possible. In reality, based on their study of the Florida ecosystem, a low concentration in the lake water, 12.1 picoCuries per gram in the sediment, but over 200 picoCuries per gram in the mussels is what was reported by them, which led to a calculation of five and a half rad per day.

So based on their study, it would be definitely possible to exceed the DOE standard for riparian and aquatic animals.

MR. RAO: I guess, you know, your response answers a part of my question. I think I was asking you about how this -- you know, the results of this study compares with the USEPA's, you know, calculation of the safe dose that Mr. Khalique -- Dr. Khalique mentioned: About four rem per year. Is that correct?

DR. KHALIQUE: Four millirem per year

for drinking water.

MR. RAO: Yes. Is there any way you can translate this into that unit?

DR. ADAMS: You want to compare the animal exposure to a human?

MR. RAO: Not compare it; just a number. I think Dr. Khalique, what he said was he had this USEPA number for humans, and then he calculated a number for aquatic life, which was like -- what was it: 42?

DR. KHALIQUE: I took the data from the DOE report at one rad per day exposure -- less than one rad per day exposure for aquatic animals will cause no harmful effect to the aquatic life.

MR. RAO: Yeah.

DR. KHALIQUE: And based on that, I calculated it.

MR. RAO: It was on the basis of per hour, right? What was the number?

DR. KHALIQUE: 41.7 millirem per hour for aquatic animal and 2.1 for the terrestrial.

MR. RAO: And in response, you said that for aquatic life, we did not include

sediments. So I was asking you if there's a way to include the sediments and come up with a number so we can see where those numbers are.

DR. ADAMS: I don't think we could do that here today.

MR. RAO: Okay. If it's possible for you to submit it, it would be helpful.

At the same time, Dr. Khalique, if you can provide the Board with your calculations in written form, that would be helpful, too.

And I will just elaborate a little bit more as to where I'm coming from.

One of our Board, Dr. Tanner Girard, asked me to ask both the Agency and you questions about, you know, what does it mean with this five picoCuries per liter standard that we have for drinking water. He wanted me to ask you whether that would be an acceptable level for a water quality standard for the state streams.

And I guess where he was coming from in your graded approach, you say if you go

about this threshold level of one rad per day, there's a need for a site-specific evaluation. And so if that's the case, you know, if five picoCuries per liter was an acceptable level, would it be more reasonable to, you know, deal with these POTW issues on a site-specific basis rather than remove the standard from the general use center for the state streams?

DR. ANDERSON: Yeah. Let's -- okay. At some point, I'm hoping Dr. Khalique will continue on his line of reasoning because he's making a point, and I'm not quite sure what it is. But with regard to five picoCuries per liter, it is -- it's over 3.75. So there are certainly some issues.

I think the Agency has made some -- they've presented testimony that presents concern that POTWs can meet one picoCurie per liter. And as I remember or recall, the numbers of those were -- give a range of up to maybe 100. And they specifically mentioned a few right now.

From my perspective, my understanding of streams in Illinois, it would appear to me

that the most problematic situation are POTWs discharging to low flow and what we refer to kind of in a silly way as no-flow streams. And I've already testified that I believe if you dealt with POTWs separately as a unit, there may be things, because of the unique processes involved, that you could do to -- how do I say? Example? That's not a good word.

MR. FORT: I think site-specific would work.

MR. ANDERSON: Yes. A site-specific component that would allow them not to have to meet the one picoCurie. I think there are reasonable things you can do.

One of the things that I discussed, a real problematic issue from the ecological side is when you take sludge and land apply it. That's really problematic if you have solids, if you have precipitated the radium because in the, IEPA/IDNS cooperative agreement, the fundamental concept is if you have higher numbers, you spread it more widely. If it's radium in solution, that

works. But if it's precipitated as particles, you get the potential for real hot spots and, you know, earth, wind take a particle that's real hot.

You could -- if you said we didn't -- if you said a POTW was not going to accept solids, radium as solids, then you would significantly decrease the threat to the biota from land treatment.

On the other end of the spectrum, you might look at something like moving -- for POTWs only if they meet some of the criteria -- and all of the things that have been referenced today: To protect workers from sludge. And then maybe look at an effluent standard instead of making them meet the general water quality standard. I think there are reasonable things that could be explored.

HEARING OFFICER ANTONIOLLI: Does that answer your question?

DR. ANDERSON: Is that responsive to Dr. Girard's question?

MR. RAO: Yes. I think one of the

things he had mentioned to me was about the five picoCurie per liter standard.

DR. ANDERSON: Right. I've got problems with that for everybody because there are other sources. There are -- but for these -- for a narrow group of POTWs that are making good faith efforts to protect the biota in other ways, I think that would seem more reasonable. But I would leave the standard -- the general standard and then provide a site-specific exception for POTWs meeting these special circumstances.

MR. RAO: Does the Agency have anything to say about that?

MS. WILLIAMS: We might -- we have some comments I think on that that might be more easily developed through a line of redirect.

HEARING OFFICER ANTONIOLLI: Okay.

MEMBER JOHNSON: Can I ask since you brought up site-specific procedure and obviously they currently have in place that all POTWs have the ability to now go in and ask for -- be the proponent in a site-specific

rulemaking, I think maybe Mr. Duffield would be the best one to ask.

Can you estimate how many site-specific rules would have to be done statewide if indeed that were to be the manner in which we chose to proceed?

MR. DUFFIELD: Well, my guess would be that it's however many communities are impacted by the radium drinking water standard, which is, to my knowledge, 100-plus. Jerry would probably have best information on the number of communities impacted. They would each have to investigate whether they needed site-specific rules. And a good portion of those would have to go forward.

MEMBER JOHNSON: Okay.

MR. RAO: So, Mr. Duffield, do you believe that not all of the 100 facilities may need site-specific relief?

MR. DUFFIELD: Yes. I believe that that's true. Not all facilities are on low- or zero low-flow streams. And those that have adequate dilution will probably not need a rule change.

There's also an issue that comes up. When you operate a deep well system, when you first start the well, it's typically pumped to waste. When we say pumped to waste, it's discharged out to a local storm sewer or drainage ditch, which is technically waters of the state. And just the fact that you pump raw water into that would create a water quality violation if you establish a water quality standard at five because the reason you're treating the water is because it's greater than five. And so that issue would have to be dealt with.

Now, that's an intermittent problem. It's not a continuous impact on the stream. We're talking about biological impacts that would typically be there because, as I understand, some of these testings, they assume that the animal was in the stream 24 hours a day, even those riparian animal.

MEMBER JOHNSON: That would be a problem if we adopted the rule as proposed by the Agency currently, right, because that's the --

MR. DUFFIELD: No. That problem would not exist with the Agency's proposal because the Agency's proposal is to generate the five standard only at public water supply intakes and food processing facilities.

MEMBER JOHNSON: Okay.

MR. DUFFIELD: So it would not be a problem.

MEMBER JOHNSON: Thanks.

MR. MOSHER: I think we need to add to that statement. If we are looking at keeping the existing standard, how many --

HEARING OFFICER ANTONIOLLI: Can you introduce yourself again?

MR. MOSHER: I'm sorry. Bob Mosher from Illinois EPA.

If we are talking about keeping the existing standard of one for all waters, it's not just the communities that are having trouble meeting the drinking water standard for radium. There may be communities out there -- and I would -- Jerry, you can confirm this, but they might have a well that has four picoCuries per liter. They're meeting the

drinking water standard, but when they send that through the sewage treatment plant, they are not going to meet one at the end of the pipe. If they go to a low-flow stream, which you should start calling these 7 Q 10 zero-flow streams, then if the Agency were to regulate, we will write them a permit limit of one. They wouldn't meet it.

So beyond 100 and some communities, it could be much more --

MR. KUHN: We've had communities up to 200 -- up to 200 communities that have detections of radium in their water source.

MR. RAO: Bob, you're talking about if we keep the standard at the current one picoCurie per liter?

MR. MOSHER: Yes.

MR. RAO: Would that change if the standard were five picoCuries per liter combined?

MR. MOSHER: Well, my addition to the problem would immediately go away because they're meeting drinking water coming from the ground. They're not going to add anything

through their sewage treatment plant, so they would meet five.

I don't know that we've analyzed how many we think have greater than five picoCuries in their sewage effluent and go to zero 7 Q 10 flow streams. Some. I don't know how many.

HEARING OFFICER ANTONIOLLI: Okay. I think, Dr. Anderson, you had something to add?

DR. ANDERSON: If they're pumping four and delivering four for drinking water, it goes to a sewage treatment plant. We've had testimony from several places that talk about some of that moving into the sludge, typically a number of 50 percent. It comes out at two. That's two combined. You're at the standard. So I'm having trouble with the math.

HEARING OFFICER ANTONIOLLI: Do you have anything to add?

MR. MOSHER: Well, what I thought that was -- he was saying is if they're removing 80 percent in the sludge, then that bumps up higher the amount they could have in

that raw water and still meet one at the end of the pipe. That's something that's unique to the sewage treatment plant is how much it's removing in the sludge. They're probably all a little different. Different methodologies of sewage treatment are going to be greater or lesser removers in the sludge.

It's hard to put an exact number on the number of facilities affected under all these scenarios. I don't think, Jerry, we've ever attempted to do so.

MR. KUHN: No, no, we haven't. And actually, the number could be up to 5.4. So anybody up to 5.4 would not necessarily be out of compliance.

HEARING OFFICER ANTONIOLLI: Any further questions?

MR. RAO: Yes. I have some. Alisa, do you have some, too?

HEARING OFFICER ANTONIOLLI: Before we start with new questions, let's let Mr. Khalique finish, I think, with your questions.

DR. KHALIQUE: I will go back to

Dr. Adams' testimony. He made a reference of one of the NCRP report, number 109: Effects of Ionizing Radiations on Aquatic Organisms.

MS. WILLIAMS: It's Exhibit 10, if that helps anybody.

HEARING OFFICER ANTONIOLLI: Yes.

DR. KHALIQUE: Chapter number 7, page 15. It says: Dose to aquatic organisms and man from environmental radioactivity. I'll just read some of the paragraphs on this.

Radiation protection standards have been expressly developed for the protection of human health. However, it has been generally accepted and adopted by those involved in radiation -- with radiation standards that by protecting humans, we are protecting environment. I just want to correlate the limits from drinking water to the aquatic life.

HEARING OFFICER ANTONIOLLI: Okay.

DR. KHALIQUE: It says protecting human -- protecting humans, we are protecting the environment. If we have four millirems per year for drinking water, aren't we

protecting the environment?

It further says: A statement for general acceptance of this philosophy was found in the 1972 BEIR report: Biological Effects of Ion Radiation. It says: Evidence to date indicates that probably no other living organism of radium much more sensitive than man, so that if man as an individual is protected, then other organism as population would be most likely -- most unlikely to suffer harm. Based on this report from BEIR, that's the biological effect of ionizing radiation. If the human beings are protected, then most unlikely that it will be harmful to other living organisms.

HEARING OFFICER ANTONIOLLI: So your question then for the panel is whether they agree?

DR. KHALIQUE: Yes.

DR. ANDERSON: No. Well, first of all, you know, these are general statements about radiation. It's not specific to radium.

The reference report was in the '70s. The BDAC assessment is so much more detailed

looking at the entire ecology, different species, representations, the various metabolic activities where radioisotopes are involved.

But I still am missing this. What it appears that what you're saying is we only allow four millirems per year to protect humans. Are you proposing, therefore, that we should reduce the exposure to four millirems per year for aquatic life, or do you want to go the other way?

DR. KHALIQUE: I am saying that whatever IEPA is proposing I am for it.

DR. ANDERSON: Well, the other thing to consider is this disparity in number. I mean, I suppose if you want to be so stringent as to only allow four millirems per year exposure to aquatic life, I'm for that. But the reality is that would probably not be practical because, because that exposure -- the human exposure is based on protecting individuals. We're talking about a one in 10,000 reduction in cancers, whereas we're -- for the aquatic biota, the numbers we're

talking about are population level effects. They would impact not just individual organism but population of organisms. That's why those numbers are much higher.

MR. WILLIAMS: Can I say something here?

Four millirems per year, just so everybody is clear, is many, many, many times fewer than even we are proposing. The number that we are proposing, if you use the one rad per day, would be something like 700,000 millirem a year.

So if he wants to say let's keep animals down to four millirems a year also, then your radium standard to do that is going to have to be .000 something picoCuries.

DR. KHALIQUE: I'm not asking for that. What I'm saying is that four picoCuries per liter combined radium 226 and 228 is only four millirems. I should take it back. It's not millirem. It's beta and gamma. Four millirems, but it includes radium 226 and 228.

MR. WILLIAMS: May I ask you a question? And I'm trying to clarify, not be

problematic here.

The exposure -- the danger to a person is from exposure to radiation, right? If there's five picoCuries of combined radium in the drinking water, that leads to an exposure on an annual basis of four millirem per year. Is that correct?

DR. KHALIQUE: (Nodding head.)

MEMBER MELAS: Millirem or milligram?

MR. WILLIAMS: Millirem. Millirem.

Now, the exposure to a human is because he only drinks however many liters per day. So the exposure is small based on five.

The exposure to an organism like a mussel from living in the water, we're saying is -- should be limited to one rad per day. And let's just consider a rad and a rem effectively the same. One rad per day transferred into millirems per day would be 1,000 millirem per day. So that mussel is getting 1,000 times every day what a person is getting in a year; is that correct?

DR. KHALIQUE: (Nodding head.)

MR. WILLIAMS: We're saying that's

okay. But be very careful about trying to say five picoCuries to a human in water is the same as five picoCuries to a mussel. It's different. We drink it. They live in it. Their exposure is many, many, many times higher than it is to a person. And we're saying that's okay. One rad is probably right. One rad is probably right. That's what the scientific literature says. But five picoCuries per liter does not equate to an exposure dose to animals. Am I clear?

MR. RAO: I think you explained that clearly. So if the mussel was drinking two liters per day, then you could compare?

MR. WILLIAMS: You could compare. You could say five to five. But the real number is exposure. It's not what is in the water. It's exposure of the animal. And we would never presume to say that your exposure to an animal should be the same as the exposure to the human because if you did, it would just be an unpractical low level of exposure.

Now, there is a danger, however, when

you look at endangered species because it's exactly what we say in endangered species. We say that we should expose endangered species at the individual level like we do at the people level. And if you look at that, then even one picoCurie into the environment is too much.

MR. RAO: Okay. Going with what you said and looking at Mr. Adams' calculation, in the example that you have, if we add up all the components here that you have on the numerator side on the left-hand side, it adds up to about 4.74 picoCuries per liter which equates to about, you know, approximately one rad. So my question is if the --

MR. WILLIAMS: That's including the sediments.

MR. RAO: Yes. So if the sediment contribution is around what you have in your example, then this 4.74 picoCuries per liter would be considered safe under the DOE document?

MS. WILLIAMS: Could I just clarify? It's .1 rad, though, that that's based on, not

the one rad, correct?

HEARING OFFICER ANTONIOLLI: Let me just clarify, too. This is the example on page B-5, and there's also an example on page B-6. So the one Anand is looking at right now is the example on page B-6 of Mr. Adams' pre-filed testimony for this hearing. So I just wanted to identify which page we're looking at, which equation.

DR. ADAMS: You're on page B-6, right?

MR. RAO: Right.

DR. ADAMS: It's still 3.75.

MR. WILLIAMS: If you check the math, I think it's 3.75 is what it adds up to.

MR. RAO: That's three times six. And then there's one -- you have the sediment contribution which is equal to about one.

MR. WILLIAMS: No. I think that's .01, correct?

MR. RAO: No. It's the plus -- you have --

MS. WILLIAMS: Can I ask one clarifying question to him that might maybe

elicit it?

MR. RAO: Go ahead.

MS. WILLIAMS: You use the default values for this, correct, from the DOE model, right?

DR. ADAMS: Yes.

MS. WILLIAMS: And these were based on the most -- what that saw as the most sensitive, which was the riparian animals?

DR. ADAMS: Correct.

MS. WILLIAMS: So you were looking at exposure of .1 rad per day in these calculations, correct?

DR. ADAMS: Correct.

MS. WILLIAMS: And would you be able to do for us an exposure or -- it would be possible then for you to take the defaults and do a one rad per day exposure, correct? You could probably do that if you wanted to, right, rerun the calculations with one rad default?

DR. ADAMS: That's not how --

MS. WILLIAMS: I'm not questioning whether, you know -- but it would be possible

to do that if we wanted to see that information?

MR. WILLIAMS: If you want to do it, then do it.

MS. WILLIAMS: No. I believe I'm not -- I don't believe that our folks or the Board or anyone has the technical capability to take the default assumptions that are in that model and redo the calculations with the one rad per day. I think you are the only one in this room that can do that. I believe that. I mean, I'm trying to be sincere here. And I think it would be very helpful to everybody that -- I think that Albert's questions were getting at that and some of Anand's. We would like to see what the 3.75 number would look like if you were looking at the one rad per day exposure rate. Does that make -- am I making it worse?

HEARING OFFICER ANTONIOLLI: That's fine. Thank you for your comment. And I think Dr. Anderson had a response possibly.

MR. FORT: I think there's some clarifications here. I'm not sure we've got

the math right on the number here.

Can you go back through your calculations on the range -- it was in your testimony -- about considering sediments, don't consider sediments, and what this procedure using the concentration factors that would use? I don't think it's 4.74.

DR. ADAMS: Are you asking me to go through the B-5, B-6 and --

MR. FORT: Yes. That would be one way to do it, yes.

DR. ADAMS: On B-6 -- B-5 was simply an example of a typical calculation that the Biota Dose Assessment Committee -- the calculator actually does. I'm just simply putting it on the page to grab the concept.

B-6 is a calculation that was used simply to demonstrate what level, what concentration in water would exceed one.

MR. RAO: I misspoke. When I completed the rad, I actually used a ratio --

DR. ADAMS: It's not a one rad. Maybe there's some misconception there. It's simply one. And it's a very simple

comparison. If it's above one, then additional site-specific information needs to be done.

What it is saying is that you've exceeded the established limits of the .1, or in the terrestrial it would be -- excuse me. In the aquatic it would be one, and the terrestrial/riparian animal, it would be .1. This one is just a ratio number, that's correct.

MR. RAO: Okay.

DR. ADAMS: So all I did in B-6 was simply demonstrate just the impact of meeting or exceeding the DOE limits based on the concentration in the water.

So just so everyone is following, the 4.08 and the 3.4, those come off of the table. These are round off numbers. 3.4 and 4.08 is four. All right. And simply taking half of those BCGs and, for the most part, the radium 226 and the radium 228 that at half a picoCurie per gram, we just put there just to show you that just with the water alone, half and half contribution, you exceed the one.

That means you've got to go off and do additional site-specific.

So my one statement there if radium 226 plus radium 228 in water is greater than 3.75 picoCuries per liter without sediment, you would exceed, and it would be required to do additional work. That's really what that is trying to say.

MR. RAO: That helps.

DR. ANDERSON: I think I can go back now and clarify your question about can we do a calculation based on an exposure of one rad per aquatic animals versus .1 because of the presence of -- because of the riparian animal being the limiting factor even in the aquatic system.

In consulting the standard, they don't give a BCG for the aquatic animal because it's not limiting because -- they do for other radio isotopes that aren't bio accumulating. Because radium is bio accumulating, they only calculate BCG for radium based on the limiting dose in water for riparian animals.

So actually, there is no way to do that calculation given the standard methodology.

MR. RAO: Okay. I have a question for Mr. Adams based on what you're talking about the site-specific evaluation.

Have you been involved with any of the site-specific evaluations that the BDAC document talks about?

DR. ADAMS: I have been involved at a DOE facility in western New York where the bio dose assessment methodology was applied. It went through step one, which was the basic evaluation that they failed. In other words, they exceeded the one and went into the second step which was to gather site-specific information on the aquatic and riparian animals. And after getting the site-specific information, sediments, the water, in that particular case, they did meet criteria that was not specific for radium. But the answer is yes, I have.

MEMBER JOHNSON: Just to apply, just to use this BDAC damage formula, you're going

to do have to do some minimal site-specific work anyway, right?

DR. ADAMS: That's correct.

MEMBER JOHNSON: So you're talking about step two?

DR. ADAMS: Correct.

MR. RAO: Do you have any general estimates of the costs of that kind of an evaluation?

MR. ADAMS: To go out and actually do a methodology study step one, it's available on the Internet, and it's very user friendly. It's very simple. When I say simple in that it is a step-by-step --

MR. RAO: Not the initial screening step. If you want to do a site-specific evaluation for a facility to go gather the information and...

DR. ADAMS: Well, it would be a day to a week, depending on your site, but you'd be collecting sediment samples. That usually can be done in a day unless you want to go off and do an annual -- quarterly, annual type of sampling for the specific region. You would

look at water.

So it would be no different than what a POTW or a particular discharge or what the EPA, assuming they want the programs, would do in a normal case.

The results of the samples would then go to an analytical lab to be analyzed. Then the rest of it is a matter of number crunching on the computer.

So, I mean, it's a technician or two to go out and collect samples. Depending on the frequency -- my experience, we did it over a year to get good, solid data. But that's dependent on the discharge point and then the cost to do the analysis and then the evaluation and the report.

MR. RAO: Thank you.

MS. LIU: Does any of that analysis involve also taking samples of the biota indigenous to that particular water body?

DR. ADAMS: For example, the fish or the mussels, yes.

MS. LIU: So in addition to the sediment and water samples, there would be --

DR. ADAMS: Thank you. That's correct. You want to try to be complete. You're looking at a complete ecosystem. Thank you.

MS. LIU: Okay.

MEMBER JOHNSON: Would you characterize the figures you used in your example that came up with the number 1.01 as low numbers? I mean, the .5 you're using for the sediments, is that a typical number? Is that a -- I guess what I'm trying to get at, is this something that practically is going to nearly always be at point -- or at 1.0 or higher?

DR. ADAMS: I think that's going to be the case. I mean, if you let me use Florida, for example, you can see there where they clearly seek a half a picoCurie per gram on the order of 12.

MR. WILLIAMS: I believe the intent of that was to minimize any impact on the calculations from the sediment. Certainly it could -- we could have plugged in 12 or even 20 because we see one lake in Florida with 20.

What we chose to do there was plug in a very low number so that you're only looking at the water instead of sediment.

MEMBER JOHNSON: Which says to me that really what you're going to do is say move on immediately to step 2 because nearly every place you're going to take samples from is going to exceed the one that says to go ahead and study further.

MR. WILLIAMS: I think it really comes back to a simple question. If you discharge radium into the river, over, frankly, what your current standard is of one 226, if you're very high above that at all, you're going to have to go into the site-specific studies. That's what BDAC ultimately says because if you have one of 226, you've probably got one of 228. You've probably got some sediment contribution. And so your chances of ending up over one are pretty doggone good, unfortunately. So you have to go to site-specific studies.

The danger with setting a water quality limit above the 3.75 is that you --

without doing those scientific studies -- and I'll respond to your question about the cost -- studies are never cheap. I promise you studies are never cheap.

If you ignore and go to what the Agency has asked for, which is no standard, let's recognize the rulemaking before the Board is that we eliminate any standard. And we're also saying we know we're going to be above a screening level, in most cases, if you discharge to the POTW then. I think we have not protected the environment. That's my read on it.

Now, we think that the best solution is don't put the stuff in the sewer so you don't put it in the river. If you don't put it in the sewer, you don't have to worry about what's going into the stream even if you're five in your water. If you're above it, you're just barely above it.

So once you take it out of the drinking water, don't put it back in the environment.

MR. FORT: Do you want to specify

don't put it down the sewer actually is what you're referring to?

MR. WILLIAMS: Don't put the residuals from removing radium from the drinking water back in the sewer. If you don't put it back in the sewer, you're not endangering the POTW worker. You don't have to do the studies. You don't have to do the monitoring. You don't have to monitor what goes out in the field. You don't have to do the worries about is radium going to end up in people's basements. You don't have to worry about what goes into the river. And you don't have to worry about the biota impact.

We have an opportunity here, by taking the radium out of the drinking water, to get rid of it. We can do that. Other technology can do that. The rule change that is being proposed is only being proposed, according to their testimony, to make sure that those who put it down the sewer don't violate another rule.

MEMBER JOHNSON: Which is the service your company provides. We're bound to look at

economic feasibility with respect to all these suggestions. So -- and I'll be the first to admit I've got three of these folders now, and eventually everything gets read. I don't recall coming across any testimony from you -- or maybe you haven't been asked for it. Maybe it's something that you even want to provide, but with respect to the cost of doing that to the local --

MR. WILLIAMS: We have. And I will reiterate it for you just briefly.

We have two companies -- or two cities under contract. Both of those cities have, in the press, said by choosing us, they're saving in excess of $2 million over the next 20 years. One of those is Oswego. I think the press article is actually entered in the record. The other one was Elburn, and the press was entered into the record also.

MEMBER JOHNSON: I did read that, for the record. I guess what I -- do you have -- would you put contracts with these entities into the record, or is that something you're not prepared to do?

MR. FORT: Let us take that under advisement because the problem is that all of these bids are supposed to be confidential.

MEMBER JOHNSON: I understand that.

MR. FORT: So you -- and we have competitors. We're glad to give you economic information, and maybe there's some way of synthesizing the economics of different approaches so that you can consider that on a larger scale.

MR. HARSCH: Mr. Johnson, all those contracts with municipalities are public documents in the state of Illinois.

MR. FORT: That's true. So I didn't say we wouldn't do it, Roy. I just said let me think about it.

MR. HARSCH: I'd be happy to.

MR. WILLIAMS: And we're not -- I want to keep reiterating even though we are the only people here who are protesting the rule change, the only people from industry protesting the rule change, Layne Christianson markets the media very similar to ours, which would be disposed in a low level site.

They're active in all of the U.S. They have operating facilities. I know of one in Colorado, Red Mountain, that's been running for at least five years. And they take the material before it ever sees the sewer, and they send it to a low level radioactive waste site.

HMO, which is the preferred method by Joliet, the only thing that stops them from putting it down the sewer is they have to add a clarifier or a filter of some type. And yes, that will add cost. I don't know what those costs are. I'm sure Dennis could calculate for us. He's got the expertise. And then the cost of disposal.

The request before the Board is not to raise the limit to five. I mean, that's a misconception, I think, because -- if I could confirm that your testimony where you have the map of the streams that will actually have no limit?

HEARING OFFICER ANTONIOLLI: Is that map A or E from your pre-filed testimony?

MR. WILLIAMS: It's A.

HEARING OFFICER ANTONIOLLI: Okay. This is Mr. Adams' pre-filed testimony, which is Exhibit 14.

MR. FORT: It's actually map A in the corrected attachments.

HEARING OFFICER ANTONIOLLI: Okay.

MR. WILLIAMS: If you look at this map, the black dots are, from the IEPA testimony, that these are where water is taken out of the river. And in those points, the drinking water standard is five. The red dots are the points of communities that have drinking water radium over five. And the proposal before the Board is that all of the yellow; in other words, hundreds of miles of Illinois streams would have no water quality standard; I mean, radium -- water quality standard for radium. I think that's the proposal before the Board.

DR. KHALIQUE: Based on that, can I ask a question?

HEARING OFFICER ANTONIOLLI: Go ahead.

MS. WILLIAMS: I can respond.

MEMBER JOHNSON: Is it correct?

MS. WILLIAMS: It's correct that the proposal before the Board proposes to remove the general use water quality standard and replace it with a public and food processing standard of five picoCuries per liter because we were unable to find any evidence of any other use impacted besides drinking. I think the Agency has been open to looking at more information that would give us some guidelines for a different number if it's out there.

MR. WILLIAMS: And we would be glad to work with the Agency to try and come up with some solution that protects the environment and help set -- give our input to setting that number. That's why we're here is to give our input.

HEARING OFFICER ANTONIOLLI: I see comments from also Dr. Khalique and also Mr. Harsch.

MR. HARSCH: I would really like to get on with the questioning by the Metropolitan Water Reclamation District. These folks want to have an opportunity to

hear from the Agency after lunch. It's quarter to 12:00 already.

HEARING OFFICER ANTONIOLLI: We'll do that. Then I'll turn it over to Dr. Khalique again. Do you have further questions -- or a comment first?

DR. KHALIQUE: How would you dispose of the radioactive waste from the water communities?

MR. WILLIAMS: Well, there are currently three or four sites that accept low level radioactive waste. We, in order to keep the cost down, have gone out and established 40-year contracts for disposal with two of those. One is Hanford, Washington. One is Grandview, Idaho. We're currently working with another group in Texas to be able to dispose there. And it gives you a fixed price adjusted by an index EPI so that the communities know what their disposal costs are going to be for the next 20 years.

DR. KHALIQUE: Do you have any idea how much is the disposal cost?

MR. WILLIAMS: I know exactly how

much the disposal cost is. It's quite -- the cost that we have worked out, you know, is confidential, but the list price would be in the ordinary basis of $80 per cubic foot of media.

Now, we are able to remove the radium from the water and put in the equipment and monitor the equipment and manage the equipment and ship it and get it to the disposal site and pay for the disposal for virtually the same price as running -- actually less than the same price of running an ion exchange system.

DR. KHALIQUE: Public water communities, I don't know. I'm just guessing. How much waste will it generate in a year and the $80 per square foot? I don't know how much it will cost them to dispose of the low level radioactive waste in addition to whatever else they have for the treatment of the water. I just want to make...

HEARING OFFICER ANTONIOLLI: A comment. Okay. Thanks. And do you have further questions?

DR. KHALIQUE: Yes. I would like to continue with this report.

The first thing is that let me clarify, we are talking about radium 226 plus radium 228, five picoCuries per liter, and that we are talking about four millirems per year. Four millirems per year as far as beta rate and alpha in radium 226, I'll define four millirem. Am I right?

DR. ADAMS: Just repeat the last part of your statement.

DR. KHALIQUE: Radium 226 emit alpha and gamma.

DR. ADAMS: Alpha and gamma?

DR. KHALIQUE: Yes. And beta -- radium 228 beta rate. So in those four millirems per year radium 226, the alpha will not be accounted for in the four millirem per year figure, or is it --

DR. ADAMS: I'm still trying to understand your question, but you're saying is in the four millirem per year --

DR. KHALIQUE: Radium 226 is included or not, I am not sure.

DR. ADAMS: I thought it was included

DR. KHALIQUE: Included. Okay.

So five picoCuries per liter in drinking water, that's what the drinking water standards are. And if we keep those standards, the aquatic life have -- should have, based on the calculation I presented from the DOE document, be very less than what you are suggesting?

DR. ADAMS: Well, I have a response, but go ahead.

DR. ANDERSON: I'm still confused. I thought in your calculation it was ten times higher. It was 41 versus four.

DR. KHALIQUE: So we are exposed to only four millirem per year?

DR. ANDERSON: Yes. And based on the five MCL, yes. But the 3.7, the biota is sustaining an exposure ten times higher; actually, many more times because it's daily, hourly; thousands times higher. I'm just -- okay.

DR. KHALIQUE: What I'm getting at is that we are just -- for the drinking water

standards 5 picoCuries which comes to four millirems per year?

MR. WILLIAMS: Right.

DR. KHALIQUE: Per human. As compared to 41.7 millirems per hour for aquatic life.

DR. ANDERSON: Yeah. There's a huge disparity. I acknowledge that. And as an environmentalist, that makes me a little uncomfortable, but I'm willing to live with the experts at the DOE and the BDAC.

DR. KHALIQUE: I just wanted to make a point.

HEARING OFFICER ANTONIOLLI: Okay.

DR. KHALIQUE: Based on Dr. Anderson's comment on this report, which is from 1972, on the same page number 15, they have a footnote, and it says on page 15, footnote: More recently the ICRP has modified the statement on the subject as follows: The commission believes that the standard of environmental control needed to protect man to the degree currently thought desirable reassures that other species are not

put at risk. Occasionally individual member of non-human species might be harmed but not to the extent of endangering the whole species or creating imbalance between the species. And this statement is dated 1991.

DR. ANDERSON: Correct.

MR. WILLIAMS: Does that refer to the exposure?

DR. KHALIQUE: That refers to the man is safe from the ionized radiation and the animal species.

HEARING OFFICER ANTONIOLLI: Thank you.

DR. KHALIQUE: Thanks.

HEARING OFFICER ANTONIOLLI: Thank you. Thanks for your comments and questions.

Right now, it looks like it's about five minutes to 12:00. Let's go off the record for a minute.

(Discussion had off the record.)

HEARING OFFICER ANTONIOLLI: Let's go back on the record.

MS. WILLIAMS: I just wanted to ask Mr. Adams one question. I had two questions.

One I was able to ask earlier to clarify being that we're not able to understand exactly how the calculations are done and so if you would able to replicate the model using an aquatic life focus. But I guess it's your testimony that you cannot?

DR. ANDERSON: Yeah. Actually, I think I responded to that.

MS. WILLIAMS: I know you did.

DR. ANDERSON: I looked it up in here in the standard, and they don't give the BCG for radium for the aquatic systems for anything but the riparian animal because, in their view, that's limiting because -- it looks to me like it's because of bio concentration. They have it for some of the other isotopes which aren't so notoriously bio concentrated. So I don't think you can do what you asked us to do based on the DOE standard.

MS. WILLIAMS: Is that what you were going to say?

DR. ADAMS: I would agree, using that methodology.

MR. RAO: Are you saying just by using the table you cannot do it, but is there some way you can determine the BCG for aquatic life and...

DR. ANDERSON: You'd be going back and changing the assumptions on how to calculation a BCG theoretically. But boy, I'd like to have that whole committee do it rather than me or Ted.

MS. LIU: Aren't the procedures, though, actually in those modules in the DOE document for how to calculate individual BCGs when you need to do further site-specification?

MR. ANDERSON: I'd have to look at it further to see if that is something --

DR. ADAMS: Well, there are general equations, formulas on how to calculate internal, external dose to terrestrial and to aquatic.

The difficulty, as Dr. Anderson said, is the output is the limiting organism, and that is where the tables constrain you to. So that's the reason. There are other

approaches. You can certainly -- you can take other formulas in other documents. This is not the only approach. And you can do a calculation. But for this particular methodology, it's most difficult.

MS. LIU: Is the Agency more interested in the aquatic life rather than the interference from the riparian side? Is that why you were asking him to make that calculation?

MS. WILLIAMS: Well, I have some questions maybe about the assumptions built into using the riparian, so if we would have the aquatic to compare it to, it might provide more useful information. Bob can talk about that.

My question was very quick. That was not it. Exhibit I: Can we talk about Exhibit I a little bit: The LaSalle station documents? I just had one quick question I wanted to ask you that came out when I was listening to your earlier responses. Did you locate that?

DR. ADAMS: The NPDES?

MS. WILLIAMS: Yes. If you go -- the first few pages are permits. Then they have the sampling information.

DR. ADAMS: The reported results?

MS. WILLIAMS: Yes.

DR. ADAMS: Yes.

MS. WILLIAMS: And I'm looking at the first page, and it talks about a radium value total radium of nine picoCuries per liter; is that correct?

DR. ADAMS: Correct.

MS. WILLIAMS: And a radium 226 value of less than .3 picoCuries per liter?

DR. ADAMS: Right.

MS. WILLIAMS: Is that consistent with your experience of the ratio of radium 226 to total radium?

DR. ADAMS: It varies. My experience would be it's not inconsistent, but the ratio of radium 226 to 228 is very dependent on the system, whether there's any particular affinity for any type of cleanup system. Certainly a man-made system could change. And in nature, you know, being natural, you have

different ratios.

MS. WILLIAMS: So this ratio does not cause you to question the validity of the data received here: 9.0 to .3?

DR. ADAMS: Well, that's a different question. That's a different question. Whenever I see a less than sign, I always ask a question about how good is that number; in other words, what is the analytical validity.

MS. WILLIAMS: What's the detection limit? Do you know what the detection limit is?

DR. ADAMS: Yes. The ability --

MS. WILLIAMS: I'm sorry. Not a definition, but for radium, do you know what it is?

DR. ADAMS: Actually, it is quite low, less than one picoCurie per -- I don't know if it's liter or gram, but down into the less than one picoCurie point.

MS. WILLIAMS: So this doesn't -- well, okay. Did you answer the question about whether this ratio causes you to have concerns about the validity of the measurement?

DR. ADAMS: The validity -- it just raises my interest. I don't know that it's a concern. It's just I would -- I'd probably -- if this data came in front of me and I didn't know anything about the laboratory, I would go back and I would ask them please explain to me what their level of detection is for that particular analytical procedure. And they would either demonstrate that to me and I would accept it, or I would have to go back and redo it.

MS. WILLIAMS: Let's go then from that page to --

MR. WILLIAMS: May I say something? Just a quick comment. The nine --

MS. WILLIAMS: Can I get to the page first because I was in the middle of describing what page I wanted to flip to? I think we will get confused because they're not numbered, right?

MR. WILLIAMS: I was going to stay on the same page. You asked if the 9 to the .3 is out of ratio. If you look at the alpha and the beta, remember the alpha comes from 226;

the beta comes from 228. They're in the same type ratio. So at least the alpha and beta analysis confirmed the 226 total analysis. Does that make sense to you?

MS. WILLIAMS: Yep.

Let's flip three pages beyond that to the page -- it's the next to last page of my copy.

HEARING OFFICER ANTONIOLLI: Of Exhibit I of Mr. Adams' testimony, right?

MS. WILLIAMS: Yes.

HEARING OFFICER ANTONIOLLI: Okay.

MS. WILLIAMS: Did you look at the same figures total output, total beta, total radium, total radium 226? Explain the same -- explain what the ratio is and whether that seems correct to you.

DR. ADAMS: Well, I mean, the ratio, total radium is made up of 226 and 228 and so --

MS. WILLIAMS: What is the number on that page of total radium?

DR. ADAMS: 2.2. I'm sorry.

MS. WILLIAMS: And what's the number

for radium 226?

DR. ADAMS: 226, 2.6.

MS. WILLIAMS: So the number for radium 226 is higher than the number for total radium?

DR. ADAMS: As reported, that's correct.

MS. WILLIAMS: Can you explain why that might be?

DR. ADAMS: Well, as -- I can't explain it without additional information. What I would -- again, what I would do is; one, get better information from the discharger so I understand the process; and two, I'd go back and look at the laboratory. What is not reported here is -- is a standard of error.

MS. WILLIAMS: Is it possible for both numbers to be accurate? Is it physically possible for the total radium to be less than radium 226?

DR. ADAMS: Well, in Reportingg analytical data, yes, it can be.

DR. ANDERSON: They could have

different standards of error.

MS. WILLIAMS: In nature is it possible I guess is the question. I don't think it was a confusing question, but...

DR. ADAMS: I think we're into theoretical stuff here.

MS. WILLIAMS: That's all. I just wanted to take a look at those and have you explain.

So in nature is it possible for total radium to be less than radium 226?

DR. ADAMS: If the analytical issues are set aside, no.

MS. WILLIAMS: Okay. Thank you.

MR. FORT: I have a question. Did the Agency question that data and go back and look at the data and what was the result of it, because if your point here is if the data is wrong, well, did you do anything to check to follow up? Do you know if they followed up on it?

MS. WILLIAMS: Well, I mean, I don't think we followed up on this data because we don't regulate these facilities, but we can

talk about some follow ups we've done on what -- where it could come from, yeah.

HEARING OFFICER ANTONIOLLI: Any further questions for the WRT Environmental witnesses?

(No audible response.)

HEARING OFFICER ANTONIOLLI: Not at this time.

MS. LIU: If I could explore this document a little bit more, I'm not an expert and enjoy hearing you talk about it, but as I was listening to the discussion that the Agency brought up about calculating BCG specifically for aquatic life, I noticed on module 3, page 22, there is a paragraph that begins water BCGs for aquatic animals followed by an equation. And I was wondering if it was possible to do that calculation.

MR. FORT: Which page are you looking at?

MS. LIU: 322 and 23.

DR. ADAMS: I found it. Go ahead. Please repeat your question.

MS. LIU: Would you be able to use

this portion in the module to calculate a water BCG specifically for aquatic life versus riparian?

DR. ADAMS: I certainly could use either this formula or an equivalent formula to do just what you've asked. But I caution you that what DOE said was it's not the aquatic organisms -- organism that are -- or is the limiting organism. It's the riparian. So you can do the calculation and come up with a number, but that's not what the standard is going to hold you to.

MR. ANDERSON: It would appear to me that what you're getting to, the really germane issue is whether the water quality standards have an obligation to protect riparian life uses as part of aquatic life uses. That's what you're really going to.

And, you know, I actually asked an attorney -- it might have even been this one -- and I got the impression that the obligation is to protect the fish and wildlife in the state of Illinois, whether it's a fish or whether it's some small mammal in the

riparian zone.

So it -- it's an interesting exercise, but I'm not sure it's a useful one unless the Board decides that the objectives here are only to protect things that swim full-time water.

MS. LIU: I was just interested in helping the Agency to obtain the information they were asking for, and I'm not sure of the underlying reason, but I wanted to make sure if that calculation could be performed and if you asked for it that we might be able to do that.

DR. ADAMS: And everything is available on the web site.

DR. ANDERSON: Yeah. They could do it, if they choose.

MS. LIU: Ms. Williams indicated that you were probably the best ones to do that, so I didn't want to --

DR. ANDERSON: Could we testify to the contrary? Maybe we think they are.

MS. LIU: Did we resolve anything?

MEMBER MELAS: I just want to follow

up.

Mr. Ettinger is gone now, but I thought that I wanted to follow up. So, Ms. Williams, when the Agency submitted that testimony at the prior hearing with the list of questions, question number one, does the Agency believe that radium is harmful to aquatic life at some level. And they keep talking on all their questions using the term aquatic life.

From what Dr. Anderson just said now, it's not just the standard of the aquatic life that you've got to worry about. It's the riparian. I mean, that's the -- that's the gist that I'm getting now. And I just wondered if you have some further comment on that.

MS. WILLIAMS: Well, one comment I'd like to make is that we were responding -- those were terms used by the questioner, but I think that Bob might want to respond somewhat on this issue of protecting riparian life.

MEMBER MELAS: Right. Because that seems to be where the difference is coming in

now. Obviously, Mr. Ettinger, like myself and many others, are just using general terms and not the specific terms that the two gentlemen have used.

Bob, do you have any comments?

MR. MOSHER: I don't agree with that table on very much, but I agree with them on that point that it does appear that we should look at the riparian mammals as the most sensitive group of organisms. I think I'm going to say more this afternoon in our organized way, if I could.

MEMBER MELAS: Yes.

HEARING OFFICER ANTONIOLLI: Sure.

MEMBER MELAS: I just had just one other little curiosity question a few moments ago. We were talking about how long have Illinois communities been using water -- drinking water from these deep aquifers. And Mr. Harsh said probably back into the 1800s. It just goes against common sense. The technology existed where some of the earlier settlers here in the earlier communities have been using this water for over 150, 200 years?

I'm sure -- you're a biologist. You're not an expert on deep well --

DR. ANDERSON: Drilling.

MEMBER MELAS: -- drilling. Bob, do you have any idea?

MR. MOSHER: I'm going to defer to Jerry on that.

MEMBER MELAS: Mr. Duffield, maybe you can answer.

MR. DUFFIELD: What they call percussion drilling methods have been around for years.

MEMBER MELAS: Decades?

MR. DUFFIELD: Before the turn of the century. And I'm not talking about 2000. I'm talking about 1900.

Basically table tool drilling or percussion drilling, you have a long cable with what's essentially a hammer on the bottom of it. And you just keep dropping it on the rock and penetrating the sandstone. And then you go down with a tool that cleans that rock up. It's got a little flap on the bottom that gathers up the rocks. The flap closes. You

pull them to the surface. It's a slow, slow method of drilling. Still in use today in some places.

Rotary drilling is more modern. It's much quicker. We can drill a well in under 30 days. But percussion methods have been around for a very long time.

MEMBER MELAS: Joliet has been using this water for how long?

MR. DUFFIELD: The Des Plaines Street well I believe was drilled in 1912. Now, there's records at the Illinois State Water Survey of the age of wells in Illinois. And this is easily found.

MEMBER MELAS: So it's over 100 years?

MR. DUFFIELD: It's over 100 years. I've got a lot of wells that are in the 50 to 75 range.

MEMBER MELAS: So we have people that have been drinking this water for several generations?

MR. DUFFIELD: Yes, sir.

MEMBER MELAS: Thank you.

HEARING OFFICER ANTONIOLLI: Let's break for lunch now. Let's go off the record.

(Discussion had off the record.)

(A lunch recess was taken.)

AFTERNOON SESSION

HEARING OFFICER ANTONIOLLI: We're back on the record, and it is about 20 after 1:00. Where we ended up before we broke for lunch was a question by Member Melas and we had a response by Mr. Duffield. And from there, I think we're going to turn it over to the Agency now.

MS. WILLIAMS: Okay. Yes. I think it might be the most sufficient use of time for us to go through a few questions that we've seen that might elicit some additional testimony that would clarify and then open it up for anybody else. And I can start with Bob Mosher.

HEARING OFFICER ANTONIOLLI: Please do.

MR. FORT: This is further things coming out of additional testimony we filed? That's the focus? Or is it broader than that?

MS. WILLIAMS: I guess I don't understand.

MR. FORT: I guess I'm just trying to get my mind around what issues I need to be thinking about.

MS. WILLIAMS: I think it's primarily expansions on their testimony and the result of questions raised in your testimony, if that makes sense.

HEARING OFFICER ANTONIOLLI: At the last hearing.

MS. WILLIAMS: At the last hearing because we haven't presented any testimony since -- no one was here when we presented any testimony basically. I think some of it might be summarizing some things that are already in, but no one here really was there except for some of the Board. But, I mean, I don't think it's going to take very long. If you have objections, feel free to make them to the questions.

MR. FORT: Just if you would have had something that was going to be prepared to be delivered today, it would have been nice to

have it to read and look at and help formulate questions, but go at it.

HEARING OFFICER ANTONIOLLI: And I think that's why Ms. Williams is saying that it's more in response to some of the testimony that was already -- I guess that came out at the third hearing, as well as this hearing today and yesterday.

MS. WILLIAMS: I think that's right.

HEARING OFFICER ANTONIOLLI: Go ahead.

MS. WILLIAMS: Bob, I'd like to refresh your memory about a statement that you made in your initial testimony. You stated that the Illinois EPA conducted a literature search for radium impacts to aquatic life and found no scientific papers or other information on the subject. Do you still stand by that statement?

MR. MOSHER: Yes, I do. And I'd like to take -- go through a little history on just what we do and how we do it.

In 1986 USEPA came out with a guidance document that is still in use today

and is a methodology for deriving water quality standards from aquatic life toxicity data. These would be fish and other aquatic organisms.

A few years later USEPA came out with a methodology for deriving water quality standards that would protect wildlife. And, of course, this is two of the groups of organisms that we're talking about today.

The data prescribed by these methodologies are studies that are controlled experiments. These studies are usually done in a laboratory setting. By controlled, we mean that these studies are limited to one variable that is controlled in that laboratory. These are repeatable studies which means that somebody in another laboratory could duplicate what the first laboratory did and see if they agree with it or not.

These studies are almost always published in peer reviewed journals, and so there is a process of other scientists looking at that work before it's published to see if

they think it was done right. The methodologies themselves are peer reviewed, exhaustive USEPA public notices so that the aquatic life methodology and the wildlife methodology gets well discussed in the community before it's adopted by USEPA.

The Board took each of those methodologies and adopted them as part of their regulations. The aquatic life are found in subpart F of part 302 water quality standards. The wildlife standards are also in subpart F, as well as an updated version of each of those are in the Lake Michigan water quality standards.

So when we set out looking for studies, that's what we're looking for. I don't think it matters whether the toxicity is from the metal itself or from the radioactive nature of the metal. You can still do controlled experiments on those substances like radium. There just aren't any that we found in the literature that meet the requirements that we normally use. And we've been using those -- that methodology and those

requirements for the past almost 20 years now.

I hear from WRT witness Dr. Anderson that on one hand, he knows of controlled experimental studies that are relevant. I don't see them submitted. I haven't been able to look at them. I don't know the names of them.

But on the other hand, Dr. Anderson says: Well, no one would do a study like that on radium because it's too dangerous to do that in a lab because of the radon gas, which I don't agree with that statement.
I think you could do a study like that. I just believe that no one has done a study like that.

So I stand behind our data searching that Clark Olson and I did. And again, if people know, anybody, WRT or anybody else, knows of these studies, we would just like to see them.

MS. WILLIAMS: Bob, have you at the same time then still taken a look at these studies that have been cited to you in the testimony?

MR. MOSHER: Yes. These are studies that we have been talking about all day. We have the copies. They are either studies that are observational studies such as the Florida study where somebody looked in a lake, found some mussels, did some analysis. It's not an experiment. It's observations.

We've also got studies that are models, and to various degrees there is some data backing up those models. But again, it's not real apparent what data that is because it's not provided.

The first study provided by WRT we -- is Exhibit 10. And when Clark Olson was still with the Agency, he looked into that. He found a reference in that study that dealt with radium, and that reference was really to sort of a model. It's not the same model that we ended this morning's discussion about. It was another kind of model to predict what aquatic life tolerance would be for radium based on its radioactive properties.

Clark derived a number based on that model from that reference. WRT has never

provided any number that they thought corresponded to what that document was trying to say, but Clark did and he came up with 22,000 picoCuries per liter radium would be somewhere around the threshold of harmful effects to aquatic life.

I stated a while ago that I don't believe that aquatic life is the most sensitive type of organism. I agreed with WRT that it is the mammals that live in or near the water that are most sensitive. So okay, they provided that. We looked at it. That's our interpretation of it. That's a real high number.

MS. WILLIAMS: Would you ever suggest to the Board to use a number that high for a standard?

MR. MOSHER: No. It's been our position all along that you only need a standard where you have actual environmental conditions in our state that would be somewhat near this threshold. If your threshold is way higher than what you have present in the environment, then why have a standard?

I can give lots of examples of other elements that we don't have standards for. For example, tungsten is an element. It's a metal. We don't have a water quality standard for tungsten. And my theory of why we don't is that the toxic threshold tungsten in the environment doesn't come anywhere near the actual levels of tungsten that we have, and so it's not an issue for anyone. No one bothers to do the studies that would be necessary to establish the standard. We don't talk much about it. We don't do much with tungsten. And there's lots of other things like that as well.

An analogy that I thought up late last night -- it might not be a real good analogy, but I'll give it to you anyway -- is that some city somewhere might have a bicycle path and they're worried about what the speed limit should be for bicycles. And they might do some research into, you know, what other traffic is going to be on that bicycle path or whatever, and they come up with well, the bicycle speed limit should be 40 miles an

hour.

And then someone says: Well, how fast do bicycles go? Bicycles only go 20 miles an hour at their maximum. Do we need that speed limit of 40 miles an hour for bicycles? Well, no. As fast as bicycles can go is a safe level.

That may be not a perfect analogy, but I think it's what we're getting at when we say we don't think we need a radium standard in general use waters that aren't being used for public water supply.

MS. WILLIAMS: Bob, did you also try and look into the Department of Energy model that was presented at the last hearing?

MR. MOSHER: Yes, I did. My angle for investigating that was to talk to the experts at the Department of Energy and elsewhere who put that model together. In other words, instead of using my limited time to read all of the articles about that, I chose to call these people up on the telephone and talk to them.

I talked to three individuals for

about an hour each, had other communications with them, and had communications with other people also. But the three people I talked to were Dr. Steven Domotor from Department of Energy. I think we've heard his name before today. I talked to Dan Jones who formerly worked for Oak Ridge National Laboratory and is I think what they term an environmental radiation biologist. It's kind of a very rare breed out there that is this kind of scientist. Dan Jones now works for a private consulting firm.

I also talked to a Dr. Wicker from Colorado State University.

I talked with all three of these individuals about this model. All three individuals were instrumental in putting this model together from a slightly even larger group of people.

MR. FORT: Excuse me. Are you going to be testifying about what they said to you or what you heard them say to you?

MR. MOSHER: Yes.

MR. FORT: You don't have any writing

from them, no e-mails, nothing to corroborate what you're going to say they said?

MR. MOSHER: I have some writing.

MS. WILLIAMS: Obviously if you want to make an objection, we can talk about --

MR. FORT: Obviously it's hearsay, and it's what this witness heard and remembered, not necessarily what they said. And I don't want to take everyone's time going through the usual things that you would ask about anything allowed to be done as hearsay like what did you say, what time it was, all those sort of things. We'll be here for a lot longer. So I'll object to it.

MS. WILLIAMS: You will or you won't?

MR. FORT: I'm objecting to the hearsay testimony.

MS. WILLIAMS: I mean, we'll just be frank. We've tried to be frank with everything that we've done in this rulemaking. I don't think we're going to disagree that for Bob to testify about what other experts told him is hearsay by the strict rules of Civil Procedure. We all know that the Board has the

ability to let in information that would otherwise under the law be hearsay. I think it's in the Board's interest to listen to the research that Bob did even if the format in which he did the research would be hearsay. I think it's information that the Board would want to hear.

If the Board wants to determine that -- you know, they can give it the weight that they think it deserves based on that. So...

HEARING OFFICER ANTONIOLLI: Well, I think what we can do and Mr. Mosher being an expert, I think you are giving us a foundation of where you got -- what kind of research you did and where you found the information. And we'll take into consideration what you talk about as far as conversations you had with somebody else. But we know that you can gather your own conclusions and form your own opinions. As an expert we'll hear your explanation of those conversations.

MR. MOSHER: Okay. And I might add, the Board's technical members or the Board

members themselves, call these people up and talk to them yourself and see if what I'm saying isn't right. Is that fair enough?

MEMBER MELAS: Sure.

MR. FORT: I'm going to object to the process you're suggesting given the context here.

I would just make one other suggestion here is that Mr. Mosher is clearly invested in the proposal here, and I don't think that Mr. Mosher liked this approach that we came up with, so I would just ask that -- he is not an independent expert here. He is somebody who is very involved in this proceeding. But I don't want to get into an argument. You made your ruling, so I just want to make that clear.

HEARING OFFICER ANTONIOLLI: And I note your objection.

MS. WILLIAMS: We all allowed the testimony from Mr. Adams about his conversation with Mr. Domotor, so I'm not really sure how at this point --

MR. FORT: It's different because you asked him, so you opened it up.

HEARING OFFICER ANTONIOLLI: Well, I note your objection. And that's a valid point that you make noting everybody's positions here. I think we're aware of the Agency's position as experts. You can go ahead and continue.

MR. MOSHER: Okay. The common theme that I got from talking to these experts was that this model was not created to establish state water quality standards. It was established to evaluate DOE cleanup sites. These are sites where nuclear weapons dumps from the -- weapons program of the country, nuclear power programs dumps. These were all sites that were terrible -- I wouldn't call them accidents, but carelessness on the part of what people did with nuclear materials. And the angle that this model was created for was from that clean up perspective rather than from developing protective state water quality standards perspective.

When these people were aware that

Illinois was considering the use of this model for development of water quality standards, I received cautions. The cautions were that this is an extremely conservative approach and that it's a screening value. What the proposal here for the four picoCurie per liter radium standard is using that screening approach, the default first cut screening approach value.

They cautioned me that if we were to proceed with this model -- and they like their model and they think this model could be useful handled in the right way for our purposes. But I was given information from these experts that an order of magnitude or two orders of magnitude might be the end result of this model once some Illinois site-specific information was plugged into that model. So instead of four picoCuries per liter to protect mammals that live along streams, it could be 40 or 400.

Now, when I explored what all that meant, it was explained to me that the default model that results in this four picoCuries per

liter level, when you look at the default assumptions, you are looking at your species of mammal, your raccoon or your mink or whatever that species is. Raccoon seems to be the most popular example to use given their habits, their food preferences, and so forth.

So the raccoon has to live in the midst of this stream in Northern Illinois that receives this radium discharge for its entire life. That's the assumption. The raccoon doesn't go raid a garbage can somewhere. The raccoon doesn't climb a tree and sleep in the tree. It doesn't go to the cornfield and eat corn or persimmons or something else. It lives in that stream 24 hours a day on top of that stream on top of the sediment. It eats everything out of that stream for its diet.

And probably most importantly, the concentration in that stream that it's exposed to is, if you choose ten picoCuries per liter as the likely occurrence in an Illinois 7 Q 10 zero stream receiving one of these sewage plant discharge, then the assumption is that it's ten all the time. And at some point

here I want to explore that because I think that's a very important assumption that is very, very overly protective in this model.

I used this example when I was talking to Dr. Domotor. I said if I understand this correctly, to use a different venue, if we were in Florida and we were interested in protecting manatees from radium and a manatee is a wholly aquatic mammal, manatees can't get up on the land and go anywhere. They always stay in the water. And if they always stayed in the one water body that you are concerned about, then that's a correct use of that default equation. The manatee is there its whole life. It never goes anywhere else. We don't have any mammals like that in Illinois. So you'd automatically want to change that model to express that difference.

I said: Am I understanding that right. And he said: Yeah; that's a good example of the default, one of the aspects of the default model.

So from what I gather, using the

default is inappropriate for what we're doing today. Almost certainly that model correctly applied for Illinois conditions in streams is going to give us a much higher value. And that value, I believe, would be higher than any realistic case we could ever have due to the source of high radium groundwater in Northern Illinois.

MS. WILLIAMS: Can you get into a little bit why, assuming a 7 Q 10 stream, 7 Q 10 zero flow stream?

MR. MOSHER: Yes. The Illinois state water survey has calculated 7 Q 10 stream flow for all the streams in Illinois. And 7 Q 10 stream flow is the average low stream flow suspected in a seven-day period with a ten-year recurrence interval. That is a very rare stream flow event. So if I say I have a stream with a 7 Q 10 value of one CFS, that stream experiences seven days continuously averaging one CFS once every ten years.

HEARING OFFICER ANTONIOLLI: Can you explain what a CFS is?

MR. MOSHER: Cubic foot per second.

It's a very rare drought event. When we say we have a 7 Q 10 of zero in a stream, that means a variety of conditions. In the larger 7 Q 10 zero streams, it means that only for one week about every ten years does it get to zero flow, no flow.

As we go up in the water shed to smaller and smaller streams, smaller and smaller water sheds, that period that that stream is at zero flow is longer and longer. Some very, very small drainage ditches with very small water shed, maybe like a square mile of water shed are zero for maybe three or four months out of the year. They just don't have all the inputs of water that bigger streams have. So to say a stream is 7 Q 10 zero means a real wide variety. But every once in a while, under extreme drought, at least, they're all going to be no flow.

This is a concept built into the Board's regulations that drives lots of things that the Agency does. We set mixing zones based on 7 Q ten flow. It's a worst case condition that we use in establishing permit

limits. If it's a zero flow stream that receives an effluent, there can be no mixing zone, so you must regulate at the water quality standard because some of the time the water in that stream will be only effluent and you'd have to eliminate the water quality standard.

If we think about exposure to radium to mammals using the streams in Northern Illinois, it is only going to be pure effluent in that stream some of the time. In some of those zero flow streams, it's going to be extremely small portion of the time that it's a full dose of what the effluent had in it, whether that be ten picoCuries per liter or something else. We're on record as saying that we think the worst case in Illinois in a sewage plant discharge is going to be about ten picoCuries per liter of radium.

If that's 15, okay. We're estimating based on what the groundwater had in it to start with. And that treatment removes some of that and so forth.

So in the very worst case, that

raccoon in that stream in Northern Illinois is just going to receive the dosage we're talking about for a small period of the year. That's an extremely big factor in that DOE model we've been talking about. The DOE model could be talking about manatees in Florida when they're always in that stream or lake or estuary or whatever they're in, and the radium might always be at a high level there. But in Northern Illinois, that is far from what's going to happen and far from the exposure that our organisms get.

MS. WILLIAMS: So if you were going to try and use this model for setting a water quality standard in Illinois, can you explain how you would go about doing that, or if you're going to use it, at least to give some guidance on where we should go?

MR. MOSHER: Well, I'm convinced that given our conditions in Illinois, we don't have to go any further; that knowing this about this model, we know that it's going to be an order of magnitude or two orders of magnitude over that default level. And I

don't see a need to go any further and gather site-specific data to plug into that model.

If you wanted to go with that model and plug in that data, you'd have to go collect it first. You'd have to collect sediment sample from the stream. You'd have to collect water samples from that stream, do flesh analysis from fish, crayfish, mussels that live in that stream. And you'd have lots of site-specific data for Northern Illinois. I'm not implying that it has to be done in every single stream we're interested in, but you do it for Northern Illinois. You make it site-specific for that region.

There's another interesting, I think, facet of all this is the sediment exposure facet. We've been given an example from a lake in Florida where radium comes into the system and radium doesn't go out of the system because that lake is a sink without a drain in it. It's like a big filter. Every bit of radium they pump into that lake stays in that lake either in organisms or in the sediment.

MS. WILLIAMS: Bob, are you referring

to the study on Round Lake in Florida that was submitted with the testimony?

MR. MOSHER: Yes, I am.

Illinois streams don't behave like that. They're not lakes. We don't have dischargers into lakes in Northern Illinois. Sediment in those streams mixes. It flushes out. It goes along with the water.

When that zero flow stream is at zero flow, yes, there's sediment deposition in the bottom of that stream. When that zero flow stream is at 100 CFS of flow when it rains a lot, then that sediment that used to be there is going downstream and is no longer part of the exposure equation to those raccoons or whatever mammals we're talking about.

MS. WILLIAMS: Can you explain more what you said? You said kind of off the cuff we don't have dischargers to lakes in Northern Illinois. Can you maybe flesh that out a little bit more?

MR. MOSHER: Sewage treatment plant effluents are discouraged in lakes. We don't want that situation to happen where whatever

is in that effluent builds up, whether that's nutrients or radium or ammonia or anything else that might be in that sewage treatment plant effluent.

I don't know one of these effluents that goes to a lake. I doubt that any of them do. I believe they're all to streams of various sizes.

And, of course, we keep talking about zero flow streams because if these effluents go to larger streams, then dilution dilutes that radium, mixing dilutes that radium immediately, and it's no longer of a level of concern.

MS. WILLIAMS: I believe there was some discussion about the possibility of being -- there being other sources of radium in Illinois beyond the use of the groundwater. Did you look at all into the example presented by WRT of the LaSalle power station as far as the source of the water they use?

MR. MOSHER: Right. LaSalle -- I spoke to an individual at LaSalle power station. I asked him where the makeup water

for the power plant comes from. He said groundwater.

LaSalle is located in the Illinois radium belt. And while he didn't give me details on the depth of his wells or whatever, it's very likely that he's getting water from the same places all these communities are getting water, and that's where the radium is showing up.

HEARING OFFICER ANTONIOLLI: And the LaSalle County station you're referring to is Exhibit I of Ted Adams' testimony, Exhibit 14?

MS. WILLIAMS: That's correct.

I think yesterday we had a questions from Board Member Girard about other states, and I think there probably have been some -- lots of different places in the record we've talked about other states. Maybe you can summarize some of that for us or tell us about other states that you've looked at since the initial testimony was filed.

MR. MOSHER: One of the important proofs that we look to when we're establishing water quality standards is what other states

are doing. Of course, all the other states are subject to USEPA oversight, guidance, research. And we've already established that USEPA is silent on the matter of radium impacting aquatic life or riparian mammals.

The other states that I contacted -- and I imagine that is about 15 or so at this point -- none of them had radium water quality standards for any other reason than to protect human drinking water. In every case, these were standards adopted in the '70s.

We mentioned that Oklahoma has exactly the standard that we would propose the Board change, and that is five picoCuries per liter at the point of intake for public or food processing water supply. There is no standard that exists elsewhere in Oklahoma waters.

Iowa is a state I recently contacted. I chose to contact Iowa, Missouri, and Wisconsin because they are also part of this radium groundwater belt. I thought that would be interesting to see specifically what they were doing.

Iowa has the exact same standard as Oklahoma, the exact same standard that we would like to propose. I asked my counterpart in Iowa what are you doing to address the groundwater problems communities are having. She said well, she's aware of that, but there's no specific way that they are dealing with that. They're not regulating there like Illinois has been. They're not putting permit limits on the sewage treatment plants.

I asked my counterpart in Missouri the same question, and in Missouri the standard is five picoCuries per liter in all waters of the state, the reason being if the theory in the '70s that we've gone over if you're protecting humans, you're protecting everything, so Missouri gets its statewide radium standard from that; again, back in the 1970s.

Wisconsin, I talked to one of my counterparts in their water quality standards unit. He wasn't aware of what their radium standard was. That's fairly common in that this just doesn't come up very often. And

he's where I was four years ago. I would have had to go and look it up and tell him, if he asked me that four years ago, what our radium standard was.

He referred me to someone in their groundwater unit. I haven't been able to contact that person yet, but we can report on that later.

MS. WILLIAMS: And maybe you can explain what format you're thinking of.

MR. MOSHER: We can summarize what we found from the other states on a spreadsheet like Dr. Girard suggested.

I think our hesitation, when he asked for that, was that surveying all 50 states was going to be quite a job, and we didn't know if we were prepared to do that yet, but we will summarize the states we have surveyed.

MS. WILLIAMS: And it will be all the states that you talked to, right, not just states that agree with our proposal, right? We will not leave any out?

MR. MOSHER: The first time I did the survey, I specifically asked: Do you have a

radium water quality standard that specifically addresses anything but human health from drinking water concerns. None of them did.

MS. WILLIAMS: Do you know, Bob, if we have a standard for gross beta?

MR. MOSHER: Yes, we do. It's in part 302. It's, if I'm remembering right, 100 picoCuries per liter. That's correct.

MS. WILLIAMS: Do you agree with the conclusion in the testimony yesterday that the Board adopted the one picoCurie per liter standard as a representation of background levels?

MR. MOSHER: No, I don't. We researched that as best we could. That appears in our original testimony. No offense, but I think the Board made a mistake back in 1972, and they twisted some information that they got from documents available at that time. I don't think background had anything to do with why they adopted one picoCurie per liter.

MS. WILLIAMS: And was that the basis

for formulating this proposal? Can you explain what you see as the reason we came forward with this proposal at this time to the Board?

MR. MOSHER: We have a general use water quality standard right now that I think is inappropriately overly stringent. Because of the existence of that standard, many dischargers who are obligated to use a groundwater source for drinking water are put in a position of not meeting that inappropriate standard.

MS. WILLIAMS: I think that's all I have for Bob. If you'd like us to -- there's something else. Is there anything else you'd like to add, Bob? Oh, I'm sorry. I think Bob has suggested that maybe we should explain a little bit again for everyone about the outreach that we conducted as a part of this rulemaking development. We usually do talk about it. I think we talked about it at the first hearing.

HEARING OFFICER ANTONIOLLI: That was in your statement of reasons?

MS. WILLIAMS: I think it was like a paragraph in the statement of reasons. Do you want to maybe expand upon that at all?

MR. MOSHER: Yes. We do an outreach. We call it stakeholders' outreach. We invite everyone we can think of to Springfield who might be a stakeholder in the water quality standard rulemaking. Usually it's the same group of people.

In the case of radium, we invited Illinois Department of Natural Resources. We invited environmental groups like the Sierra Club, Prairie Rivers Network. We invited Municipal Water Supply Association. I'm probably giving you the wrong name, but people we know are going to be interested in the rulemaking.

We do this before we file with the Board. We've done this for other rulemakings also. We mail them a draft of our justification. In this case, it was identical to what we submitted to the Board. And we put a cover letter and said: Would you please meet with us in Springfield on such and such a

date; we'd like to discuss what we're planning to do; we'd like to know if you have any comments, suggestions.

We had that meeting. Illinois Department of Natural Resources didn't show up. The environmental group representatives didn't show up.

(Brief pause.)

MR. MOSHER: I'm told Beth Wentzel from Prairie Rivers did show up. I have a sign-up sheet. We can provide that to the Board, and you can see who showed up if we're wrong here.

But in any case, Illinois Department of Natural Resources didn't show up, and we take that to mean that they had little interest in this matter.

We also outreach, so to speak, to USEPA. By the Clean Water Act, USEPA has to approve any water quality standards that the Board adopts. That puts the Agency in an awkward position. We have to propose something to the Board. The Board has to adopt it, and then USEPA has to approve it.

The Board can change whatever we propose, but we do the best we can.

When we're ready to go to a filing with the Board, we provide the justification packet, the proposed rulemaking to USEPA. My standards coordinator here in Chicago, USEPA region five is Dave Pfeiffer.

Dave and his staff look through that package for the purposes of giving me a verbal go ahead. In other words, they look at it and say: Well, Bob we don't know what the Board might do to it; we'll have to look at this in detail after the Board adopts it. Of course, that's a year from now, more or less. But from what we see right now, we either don't like what you're doing, or we think it's okay.

If they don't like what we're doing, we negotiate. We sit down. We ask them: Why; what's wrong; how can we make it better; we need your federal approval. We don't ever want to go to the Board with something that you can't approve.

In this case, his response to me was: It's okay with us; go ahead. So that's a very

important type of outreach to get: What our USEPA counterparts think of one of our proposals.

MS. WILLIAMS: We have three other staff, each of whom maybe there's just one or two questions that would probably just take maybe ten minutes at the most to go through. So if that's okay with you, we can do that real quick, too.

HEARING OFFICER ANTONIOLLI: I just think Mr. Fort might have some questions for Mr. Mosher. And if that -- would you --

MS. WILLIAMS: I guess my suggestion, if it's okay with you, maybe do a panel type of thing and then let them all go real quick, and then whichever question goes to which person

MEMBER MELAS: There is a question in the back of the room.

HEARING OFFICER ANTONIOLLI: Mr. Dobmeyer.

MR. DOBMEYER: Don Dobmeyer. I have a couple questions of Mosher. And also, I have some comments that I want to make. So

when they're done, I'd like to be able to do that.

HEARING OFFICER ANTONIOLLI: Okay. Very good. We can hear your comments then.

MEMBER MELAS: You can ask them when they have the panel up.

MR. HARSCH: I'm sorry, but I'd like to conclude with the Agency witnesses and then have testimony of Mr. Duffield and, if there's time, have provisions for additional comments if we have time.

MEMBER MELAS: We'll make time.

MR. HARSCH: I hope Mr. Duffield will be able to testify.

HEARING OFFICER ANTONIOLLI: Sure. We'll have time. I think he has a question specifically for the Agency, but we'll be able to address each in turn.

So you can go ahead with your other questions.

MS. WILLIAMS: Stefanie is going to be handling the others.

MS. DIERS: First of all, my name is Stefanie Diers, and I'm with Illinois EPA.

I'm first going to ask a couple questions of our technical staff beginning with Jeff Hutton.

Jeff, do you know if the Illinois EPA is in the process --

MEMBER MELAS: Swear them in.

(The witnesses were duly sworn.)

MS. DIERS: Jeff, do you know if the Illinois EPA is currently in the process of gathering sludge data?

MR. HUTTON: Yes, we are. We have -- mid March when we realized that the issue of radium and sludge was coming up, we reviewed our records and found 59 generators; that is, a community that has a sewage treatment plant. And we found 59 generators that had potential for radium in their sludge.

We sent them letters requesting that they analyze their sludge to determine the concentrations of radium 226 and 228. We have received back responses from 23 of those -- pardon me. Let me back up.

Of those 59 generators, eight of those generators have since either switched to different source water so that they no longer

have radium intake into their plants, or they switched to a program that's going solely to a landfill, and they no longer land apply the material.

Of the 51 remaining generators, we received responses from 23 of them. Those responses covered 30 different publicly-owned treatment works. The range of concentrations -- and we're talking total radium here, both radium 226 and 228 -- ranged from 47 down to 1.3. There was quite a variety.

MR. RAO: In what units?

MR. HUTTON: PicoCuries per gram. I'm sorry.

We are preparing another mailing to the remaining facilities which haven't responded to request their cooperation and ask --

HEARING OFFICER ANTONIOLLI: Could you speak up a little bit?

MR. HUTTON: We're going to be preparing a mailing to the remaining facilities that haven't responded and request that they analyze their sludge for radium 226

and 228. At this time we're simply requesting that. We haven't required it from them yet.

MS. DIERS: And, Jeff, when you say in March, are you referring to March 2004 when we began this process?

MR. HUTTON: Yes, I am.

MS. DIERS: And do you know if the Agency will be able to compile this information and provide it to the Board to posthearing comments?

MR. HUTTON: Yes, we can.

MS. DIERS: Jeff, do you know if the units are in dry weight or liquid?

MR. HUTTON: Those are dry weight measures.

MS. DIERS: Next, I want to ask just a few questions of Jerry Kuhn.

Jerry, do you know if radium containing sludge in Illinois is acceptable in Illinois landfills?

MR. KUHN: I had discussions with our Bureau of Land who regulates the landfills in Illinois, and what they indicated to me is they're consistent with our memorandum of

understanding with nuclear safety. Anything under five picoCuries is acceptable in Illinois -- in an Illinois permitted landfill. And anything between five and 15 picoCuries per gram is still acceptable as long as there's ten feet of overburden -- uncontaminated overburden.

MS. DIERS: And by memorandum of understanding, is this something the Board had seen before?

MS. WILLIAMS: I don't know the number, but it's an exhibit.

HEARING OFFICER ANTONIOLLI: I think it's in the record.

MR. FORT: I think it's part of an attachment to Charlie Williams' testimony when we were down in Springfield. I forget which attachment.

HEARING OFFICER ANTONIOLLI: Which would be Exhibit 5 for the August 25th hearing?

MR. FORT: That sounds like it.

MS. WILLIAMS: 1984. There's only one version.

HEARING OFFICER ANTONIOLLI: Okay.

MS. DIERS: Jerry, I want to draw your attention to the pre-filed testimony that you filed I believe back on March 19th of 2004 with the Board. And on page 3 of that testimony, you stated that anywhere from 5 to 25 percent of the water obtained from well sources and treated by one of the radium removal technology ends up as wastewater containing radio nuclides removed from the source water and discharged to local wastewater treatment plants.

Does that sound right?

MR. KUHN: Yes.

MS. DIERS: Where might we see the 25 percent in Illinois?

MR. KUHN: Okay. Again, that's a general range. But the only process that would remove radium that would generate that amount would be the reverse osmosis process. The technology that's most commonly applied to for radium removal purposes would be the ion exchange, and that would be down on the low end of the spectrum which would be 5 percent

or less.

MS. DIERS: And do we see a lot of reverse osmosis in Illinois?

MR. KUHN: There are some, but generally they're installed because of other concerns to have other constituents that are in the source water. I think there are a few places that may have installed it on radium only, but generally, the reverse osmosis process would be installed if there's other contaminant concerns.

MS. DIERS: And then I just have a couple more questions for Mr. Blaine Kinsley.

Blaine, did you look at whether there would be an impact of radium levels in nuclear power plants?

MR. KINSLEY: Well, we did check at least one other nuclear power plant with regard to their radium concentrations. And in general, I'd like to back up and say that I spoke to people at the power plants or with the companies that run them just to see if that was -- because I wouldn't have expected radium to be -- if you look at those form

2-Cs, you either have it believed present and a concentration given or believed absent. And they weren't required to test for a lot of the parameters. So radium wouldn't strike me as something that they would test for normally.

But I called them to make sure, and they said at least in this round, the company decided that the stations in general would test for that anyway. And the one that we did verify -- and we're checking the others, but this was a surface water source of cooling, and the radium levels were less than -- reported at less than one picoCurie per liter.

MS. DIERS: Can you tell us which power plant you looked at?

MR. KINSLEY: I believe that was Braidwood.

MS. WILLIAMS: I'd like to ask him just a couple questions real quick.

Blaine, did you have a chance to look at the study presented by WRT on Round Lake and some related studies on Round Lake?

MR. KINSLEY: Yes, I did. There was -- the main study that was listed in the

attachments was for the Florida study. And then there were some references that we looked up and that I read, one specifically pertaining to Round Lake. And then there was another one for Rowell Lake where they were talking about the disequilibrium between radium and lead.

Anyway, my basic understanding of the studies was, and as Bob alluded to earlier, that in the case of Round Lake, when you look at the reference study, this lake is probably the most augmented lake that they studied. And, in fact, in 1997 a volume equal to the volume of lake -- of the lake was pumped into the lake in a six-month period, so that's an incredible amount of water being pumped into that lake.

MS. WILLIAMS: So you're saying within a six-month period, the lake would have emptied itself?

MR. KINSLEY: Pretty much, yeah. That was the summation of the article.

Anyway, so what I understood from reading, that amount of augmentation and you

have the concentration of the groundwater being pumped from the -- I believe it's the Florida aquifer, so that comes up -- and that's -- I believe it was three point something picoCuries per liter.

And there was some surface water samples taken. Those were in the -- below 2.

And then they talked about the sediment that was collected at the bottom of Round Lake and how that affected the mussels and that.

But my -- I know Dennis alluded to earlier that maybe that -- that was caused by evaporation. And there was some discussion about the rainfall amounts in Florida. And I think that that's correct that the rainfall would exceed the evaporation.

So the only conclusion I could draw then is that that lake, the bottom of it is leaking to the formations below. I mean, that would be the only thing that would really explain it.

So as Bob mentioned, I think that that particular lake is being used as a filter

so that you would get all that loading of radium that may -- you know, and I don't know the exact mechanism that the radium transfers to the sediments, but it could absorb to particles in the lake and then settle out. So that would be an enormous loading of continual flow into that lake, which, in my opinion, would -- you wouldn't find that in the state of Illinois.

MS. WILLIAMS: That's all I have. I think we're done.

HEARING OFFICER ANTONIOLLI: Okay. Now, are there any other questions at this time for the Agency? Go ahead.

MR. FORT: Yes.

HEARING OFFICER ANTONIOLLI: Yes.

MR. DUFFIELD: I have probably less than Mr. Fort.

HEARING OFFICER ANTONIOLLI: Let's let Mr. Fort go, and then we'll just turn over to you for a few questions because I know that the Agency was responding to specific studies that were entered by WRT Environmental. So why don't you go ahead and respond to those

comments?

MR. FORT: Okay. Thank you. I'll go ahead ask questions on the comments

HEARING OFFICER ANTONIOLLI: You can do that, too.

MR. FORT: My witnesses may have comments beyond that. In fact, I'm sure they do.

Let me start with Mr. Kinsley, your analysis of the Florida phenomenon. I believe you just said that you weren't sure the mechanism of how the uptake was occurring in the most.

MR. KINSLEY: I didn't say the uptake, no. I said I wasn't sure of the mechanism that the radium was being transferred to the sediment. That word was what I said.

MR. FORT: Clearly the radium was getting transferred in the sediment?

MR. KINGSLEY: Yes. That's my understanding.

MR. FORT: Now, in terms of the water, though, the water that was impacting the sediment, and the same water I think

Mr. Mosher was talking earlier today was impacting the molluscs, had a concentration -- do you remember the numbers -- of about two picoCuries per liter or something like that?

MR. KINSLEY: You're talking about augmentation water that was pumped from the Florida aquifer. I'm not sure. I'd have to look it up, but I think it was more than two. I think it was more like three something.

MR. FORT: Well, anyway, whatever the number is, the document has it, we can go with that.

It's your understanding is if the water being pumped in, you believe that the water was leaking out the bottom, and then the water is getting pumped in again, correct?

MR. KINSLEY: I'm not saying that the same water. I'm saying that the water from the Florida aquifer is being pumped to that, and then that water from the bottom of the lake is going into a formation that may be above -- it may not be hydraulically connected to the Florida aquifer.

MR. FORT: Well, we don't know if the

water that was seeping out the bottom of this lake was going into the same place that they were getting the water from to augment, do we, or do we?

MR. KINSLEY: I don't believe that was said in the report, so...

MR. FORT: And you didn't talk to the preparers of the report to get any information, right?

MR. KINSLEY: No, no, I didn't.

MR. FORT: So in terms of this water that is going through this lake system, you said it was being replenished, at least in one situation, every six months, the whole volume was turning over and it was coming through again?

MR. KINSLEY: Yes. That was what the supplemental report said.

MR. FORT: Okay. So this is not the same water sitting there for a whole year; this is water that's turning over? It's really flowing through the lake bottom, isn't it?

MR. KINSLEY: What I said was that,

yes, it would be flowing out the bottom of the lake.

MR. FORT: So this is a system that with the molluscs and the sediment has water at the concentration, whatever that concentration is, going through it; perhaps very slow, but it is going through it, correct?

MR. KINSLEY: But what's interesting about that report --

MR. FORT: Can you answer that part? Then you can say what else you want to say.

MR. KINSLEY: I believe I did answer that in saying that I did agree that it was flowing out the bottom and that there was no information in the report itself that said that it was coming directly back into from the water.

MR. FORT: So in a sense, a real slow flow, but did have a flow to that lake; it wasn't a stagnant water body?

MR. KINSLEY: Well, if you're saying that -- I'm not sure what you mean by stagnant. Okay. If you're saying that if it

was a bowl with water sitting there, no.

MR. FORT: I think we agree on that. Okay.

I guess a question to Mr. Hutton on the gathering of the sludge data. Is this sludge data something that exists only in the Agency files because of the request you've just made in March, or is there historical data that would go back in time?

MR. HUTTON: This is only since March, since the changes were going to be made in the water quality standard.

MR. FORT: And this is not something that you've been collecting pursuant to the memorandum agreement with then the Department of Nuclear Safety, now IEMA?

MR. HUTTON: That's correct.

MR. FORT: And there were 59 POTWs that serviced communities that were receiving well water with elevated radium levels; is that right?

MR. HUTTON: Well, I would phrase it slightly differently. There's 59 generators. A generator may be a community. It may be

Lake County Department of Public Works. A generator may have more than one facility. Joliet has two sewage treatment works. Lake County submitted information on three, so...

MR. FORT: This is generating waste for landfilling?

MR. HUTTON: That is -- they are treating wastewater. These are facilities which have permits to land apply sludge.

MR. FORT: These are land application permits?

MR. HUTTON: That's correct.

MR. FORT: And they have not been collecting any data on radium in that sludge before now?

MR. HUTTON: That's correct.

MR. FORT: And do they have a permit condition now that requires them to collect that sludge, or is this a one-time request that you made?

MR. HUTTON: At this time it's a one-time request. As these facilities come up for permit renewal, we are addressing the need to require monitoring for radium. And in the

facilities that have come up for renewal, within the last six months, we have required radium monitoring.

MR. FORT: How many of those permits have been issued?

MR. HUTTON: Two.

MR. FORT: Two. Okay.

And when were they issued?

MR. HUTTON: I don't have that information off the top of my head.

MR. FORT: Last 30 days or so?

MR. HUTTON: Within the last six months.

MR. FORT: How long are these permits?

MR. HUTTON: In the case, one facility the permit is five years. Reissuance of an existing permit lasts for five years. The other facility was a supplemental permit, and that condition will last until the expiration of that permit. And I don't recall what the expiration date was.

MR. FORT: Of these 59 permittees that you have, there may be fewer now because

they're deciding not to bother with land applying anymore, correct?

MR. HUTTON: Yes.

MR. FORT: So it's 59 less whatever that group is. They have permits that last into the future?

MR. HUTTON: Yes.

MR. FORT: And they're not going to be coming up for renewal, so it won't be very easy to put those conditions into those permits?

MR. HUTTON: That I am not sure how we do do that. In theory, I believe we could require monitoring, but that is a discussion for our legal counsel as to whether we have the authority to make that requirement or not.

MR. RAO: Just as follow-up, Mr. Hutton, do all these facilities receive radium ffrom their backwash?

MR. HUTTON: I don't know how they're receiving the radium. They had radium in their raw wastewater, and they had a violation of the drinking water standard in their raw wastewater.

MR. FORT: So these facilities just have raw water over five; is that correct?

MR. HUTTON: That's correct.

MR. FORT: And do you know if any of them have put in a drinking water treatment plant or done anything else to comply with the federal standard?

MR. HUTTON: No, I don't.

MR. FORT: Could we have a list of who's responded and who are the permittees?

MR. HUTTON: We will prepare that for this.

MR. FORT: Is it going to be possible to get that before the last day of filing?

MR. HUTTON: Yes.

MS. WILLIAMS: Well, our intentions have been to submit whatever we have as up to date as what we have in our post-hearing comments. That's our plan.

MR. FORT: It would be helpful if you had -- since it's one of your jobs to do it and collect it and we asked you for this at one point in time, I think it would be helpful to have it sooner rather than waiting until

the last moment.

HEARING OFFICER ANTONIOLLI: What we'll do is we'll address scheduling as far as post-hearing comments closer to the end when we're closer to adjourn today.

MR. FORT: Great. Thank you.

You had several questions earlier today by Ms. Williams about the reliability of radium sampling. Do you have any experience with the laboratory requirements that you imposed for this sludge sampling that you requested back in March?

MR. HUTTON: I personally don't. The requirement that we -- what we required them to do was to sample it in accordance with the USEPA regulations according to their requirements and by a lab that was certified by USEPA as being capable of carrying out that type of analysis.

MR. FORT: You were specific when you requested the data to make that requirement?

MR. HUTTON: Yes. And we required that it be reported on a dry weight basis rather than in a wet weight basis.

MR. FORT: Okay. And is that because that's how USEPA wants it to do, or is that to make it easier for other comparisons?

MR. HUTTON: That's to make it easier for us to compare the sludge quantities that one generated because we require them to be recorded on a dry weight basis.

MR. FORT: Is this the first time, to your knowledge, the Agency has ever requested radium level in sludges?

MR. HUTTON: To my knowledge, it is.

MR. FORT: Do you know why it hasn't been done before?

MR. HUTTON: The -- I was not hired by the Agency in 1984 when the initial agreement was made. That agreement assigned -- my understanding was that at the time that that agreement was signed, there was some question as to whether we had authority over radium or whether the authority to regulate radium resided with the Nuclear Regulatory Commission.

Because of that question, we did not begin requiring the monitoring of radium, and

that got delayed until the drinking water standard came into effect and the question of radium and sludge began to be renewed.

MR. FORT: So basically because of uncertainty on authority, the Agency hasn't done anything until fairly recently?

MR. HUTTON: That's correct.

MR. FORT: Do you have any idea of how much it's going to take these other -- I guess it's over half -- facilities to provide you the data?

MR. HUTTON: How much?

MR. FORT: To respond to your question, you said you had 23 responses that covered 30 POTWs, and it sounded like you had 59 or a little bit less. About half that are still outstanding, correct?

MR. HUTTON: Yes.

MR. FORT: Do you have any idea how long it's going to take to get that information?

MR. HUTTON: No, I don't.

MR. FORT: Do you have a list of who hasn't responded?

MR. HUTTON: Yes, I do.

MS. CROWLEY: Counsel, can I jump in with one quick question?

Is it a laborious testing process? Is it a limited number of labs? Is it a big deal? Have they just not gotten around to it? Is there a lab backup? Whatever you can speculate. Some people are speculating. I'm not holding you to it.

MR. HUTTON: Given the amount of time -- lead time they've had to get their samples done, I think that the ones who haven't responded have chose not to. The ones that were willing to respond have done their samples and have sent us the information. And the others are waiting for us to require it. They may feel that we are potential adversaries.

MS. CROWLEY: I understand.

MR. WILLIAMS: Just to answer your question, radium analyses are not easy. Lab time is at least three weeks.

MS. CROWLEY: Thank you.

MR. FORT: You said there were 59

that were land applying sludges?

MR. HUTTON: Yes, sir.

MR. FORT: And this was in the area that had radium over five in the raw water supply?

MR. HUTTON: That's correct.

MR. FORT: And of those 59, everyone also had generator numbers, or you started with the generators and then looked at the -- generator list and then looked at who was in the radium hot belt, if we can call it that?

MR. HUTTON: Anybody that had a violation received a letter. Now, whether they are in the radium -- I don't know where the radium belt extends to.

MR. FORT: The violation being they had levels over the five picoCuries combined?

MR. HUTTON: That's correct.

MR. FORT: And how many entities got that notice of violation?

MR. HUTTON: Well, there were 59 entries. Well, pardon me. In terms of the violation, you'd have to ask Jerry from public water supply.

Of those people that had violations, I went through and examined them. A number of them were, for example, people that were going solely to landfills, in which case we didn't request the information from them. A number of them were very small communities that were septic tank systems where we had no information to be collected from them.

And beyond that, if we could track down where that community went, where it sent its waste, that receiving body got a letter that said: Please sample your radium.

MS. WILLIAMS: Is it possible that there might be two separate communities that then go to the same POTWs?

MR. HUTTON: Yes. In the case of, for example, the Lake County Department of Public Works Des Plaines plant, they receive water from the Lake Michigan system. They receive water from the Lake Zurich area, which comes from deep wells. I'm sure they receive a portion of water from individual wells located in Lake County. We did not have the ability to separate those numbers, how much

was coming from the different sources.

MR. FORT: I'm more asking the questions on who are the POTWs that got this request. And that's the 59?

MR. HUTTON: Fifty-nine.

MR. FORT: Now, I don't know if this is you or Jerry, but can you break out how many of these communities had problems with the five and, therefore, are the -- I'm trying to get -- we've talked about hundreds, and now we're talking about 59. If you can sort out the different categories of facilities, I think it would be helpful to clarify.

MR. KUHN: I'll clarify the list that I sent to Jeff, and then he used that to determine what the 59 were. The list that was sent to Jeff was of the communities that were over the five picoCuries per liter limit.

MR. FORT: That's the couple hundred number we've heard about?

MR. KUHN: No. That was the 100 communities that were -- currently they're running -- annual averages were in violation of five picoCuries per liter.

MR. FORT: And that was about 100?
MR. KUHN: More or less.
MR. FORT: And these roughly 100 end up at 59 different POTWs?
MR. HUTTON: That's correct. Fifty-nine different permitted bodies.
MR. FORT: Thank you.
MR. HUTTON: The individual permittee may have multiple plants.
MR. FORT: Okay. Are there any in this list of about 100 that you didn't send requests to because you knew that they were going to landfills already?
MR. HUTTON: Yes. If we had a facility in that 100 that did not have a permit to land apply sludge, we did not send any. Many of those communities, if they were larger communities, are probably using the disposal in the landfill as their method of disposal of sludge. We have no incinerator -- sludge incinerators in the state of Illinois, and the sludge is either disposed of by sending it to a landfill or land applying it on farm ground or some mixture of those two

methods. Some people use both methods.

MR. FORT: Again, Ms. Crowley asked you the question of is this a long list. How difficult would it be to give us the list that you have of the POTWs? And I guess you know what receiving stream they go to off of that, right?

MR. HUTTON: We could get you the list. If I have to get the receiving stream, it will take longer because the only thing I looked at was their sludge data and POTW.

MR. FORT: I'm just saying it shows the POTWs. So therefore, if we looked at a 7 Q 10 receiving stream, we could figure out if they were on that or not?

MR. HUTTON: Yeah. I can give you the list of receiving streams. I'm just saying it's going to take longer to generate that information than to just send you the information on the sludge facilities.

HEARING OFFICER ANTONIOLLI: And again, let's talk about those time frames on a break that we'll take shortly.

MR. FORT: Fine.

In going through these, no one made a distinction between whether this was just radium and sludge or if it was technically enhanced radium, the TENORM that we've talked about?

MR. HUTTON: I did not make that distinction. It was simply all assumed to be TENORM.

MR. FORT: You were assuming it was TENORM?

MR. HUTTON: I'm assuming it was TENORM.

MR. FORT: What's your understanding of TENORM, just to make sure we've got the same understanding?

MR. HUTTON: It's naturally-occurring radium in the groundwater.

HEARING OFFICER ANTONIOLLI: Can you explain also what TENORM stands for?

MR. FORT: I think it's technically enhanced natural-occurring radioactive material.

MR. HUTTON: I believe that's correct, yes.

HEARING OFFICER ANTONIOLLI: I just wanted to get that on the record. TENORM, the term itself, represents technologically enhanced --

MR. FORT: I just wanted to see if we had a misunderstanding here. Maybe we do, but we're not going to take time right now.

MR. KUHN: I wanted to clarify that because the communities I sent to him, they aren't in compliance now, so that means they're not treating for radium.

MR. FORT: So they're really not TENORM?

MR. KUHN: So they're not TENORM, right.

MR. FORT: Because they haven't gone through that process of filtering out the radium from everything else?

MR. KUHN: Right. It's natural-occurring.

MR. FORT: It's natural-occurring. It's mixed in with all the other stuff that goes into the sludge.

MR. KUHN: That's right.

MR. FORT: So it is NORM? These guys think it's NORM. And you tend to agree?

MR. KUHN: It's NORM.

MR. FORT: It's not the TENORM which is what's going to happen when they start treating the groundwater to meet the federal standard?

MR. KUHN: The 59, right.

MR. FORT: Okay.

MR. RAO: If it's TENORM, do you expect the sludge radium levels to be higher than what you're finding now?

MR. HUTTON: I don't have an answer for that. The -- you know, I don't have an adequate amount of information to be able to project what the sludge quantity is going to be based on what the naturally-occurring -- or what the radium in the well water is. I don't have an answer.

MR. FORT: Let me ask a question to Jerry. You're permitting these facilities, correct?

MR. KUHN: The water treatment facilities.

MR. FORT: Water treatment facilities.

MR. KUHN: Not the wastewater plants.

MR. FORT: I'm sorry. You're permitting the water treatment facilities that are going to remove the radium so we have compliant drinking water?

MR. KUHN: Right.

MR. FORT: And you are familiar with the concept of TENORM obviously?

MR. KUHN: Yes.

MR. FORT: What makes TENORM different than NORM?

MR. KUHN: Well, it's been -- you're pulling the radium out of the water, and then you're sending it to a sewage treatment plant. You've got a waste stream from the water plant.

MR. FORT: And that waste stream has these concentrated materials, particles that have bound up the radium?

MR. KUHN: Yes.

MR. FORT: So it's not homogenous? The filtrate from the water treatment plant

residuals is not homogenous; it's not even; there are globules in it of TENORM?

MR. HARSCH: I'm going to object to this question. It's way beyond the scope of the very limited testimony that was presented today by Jerry.

MR. FORT: It's not your witness, and we're trying to --

MR. HARSCH: I'm trying to protect the time.

HEARING OFFICER ANTONIOLLI: Maybe you need to rephrase the question, or is that exactly what you're...

MR. FORT: I was trying to see if he was going to be able to tell me what, in his understanding, a TENORM material was and how it would appear in the filtrate from a drinking water treatment plant.

MR. KUHN: With my limited understanding, it's just the residual from the treatment of NORM.

MR. FORT: Okay. Mr. Mosher, when you were talking to your colleagues in the other states, I think you said that you found

there was a lack of awareness about radium?

MR. MOSHER: Several of my counterparts weren't immediately aware of what their standard was.

MR. FORT: So radium had not become an issue in those states the way it has apparently in Illinois?

MR. MOSHER: Apparently not.

MR. FORT: Do you know if Iowa had a standard adopted in the '70s that they removed?

MR. MOSHER: I don't believe I asked my counterpart in Iowa that specific question.

MR. FORT: Did you ask that question of your counterpart in Oklahoma?

MR. MOSHER: Probably not. I don't remember, in any case.

MR. FORT: And we don't have really -- Missouri, you said they've had a five picoCuries in all waters of the state?

MR. MOSHER: Yes.

MR. FORT: And Wisconsin, you don't have an answer back there yet either?

MR. MOSHER: Well, I surveyed them

three years ago, tried to refresh that last week, and haven't gotten back -- they haven't gotten back to me yet.

MR. FORT: Now, I believe in the statement of reasons that the Agency indicated that both Ohio and Indiana have some sort of a water quality standard for radium, correct?

MR. MOSHER: Ohio does not. They turned over that regulatory function to another state agency, I believe.

MR. FORT: Okay. So Ohio EPA does not have it; somebody else may?

MR. MOSHER: It was my understanding that it wasn't a water quality standard that applied to Ohio surface waters but some other type of way to regulate radium.

MR. FORT: Indiana, though, has a water quality standard?

MR. MOSHER: Yes.

MR. FORT: And I believe you looked at the Florida information. Florida has a standard?

MR. MOSHER: Yes. As I understand it, it's identical to Missouri's.

MR. FORT: And you're not aware of any other states at this time?

MR. MOSHER: I surveyed other states. Somewhere in my notes, I have that record, which I promise to reproduce for the Board.

MR. FORT: Now, you're aware that radium is a degradation product from things like thorium and uranium?

MR. MOSHER: Yes.

MR. FORT: Did you attempt to survey any other of those kind of sources in Illinois?

MR. MOSHER: Personally I'm unaware of any of those kind of sources in Illinois. I did, when I surveyed states, try to contact states where I knew there had been radium or uranium mining for their standards and their input.

MR. FORT: Now, I think you had some conversations further about Florida, the manatee because the manatee lives in the water all the time. Do you recall that testimony?

MR. MOSHER: Yes.

MR. FORT: Now, isn't it true that

mammals -- riparian mammals such as muskrats and otters essentially live on the stream bed all the time?

MR. MOSHER: I wouldn't say all the time, no. I believe there's quite a bit of scampering back and forth between different bodies of water.

MR. FORT: How far apart are your bodies of water you're thinking about here?

MR. MOSHER: I've got muskrats in my pond at home. They have a trail down to the creek. So there's times when they're not in either the pond or the creek.

MR. FORT: And there are muskrats that say in the riparian zone, aren't there, or do you have any data?

MR. MOSHER: Muskrats that stay in the riparian zone; what does that mean?

MR. FORT: You don't know what the riparian zone means?

MR. MOSHER: Well, yeah. But you say stay in it. Do you mean live there 24 hours a day their whole life?

MR. FORT: Yes. I'll take that.

MR. MOSHER: I just said that some muskrats, at least that I'm aware of, go to a pond. Ponds aren't -- they're aquatic habitats, but they're not riparian zones.

MR. FORT: Okay. So you're not a muskrat expert in terms of -- or a natural environment expert in terms of behavior of these kind of riparian animals?

MR. MOSHER: Well, I think I have a certain degree and knowledge from my training as a zoologist.

MR. FORT: Are you testifying that no such animal exists or no such population exists?

MR. MOSHER: I'm testifying that we don't have anything in Illinois like a manatee that is an obligate mammal that can't get out of the water.

MR. FORT: Have you actually done any calculations using the bio dose approach?

MR. MOSHER: No, I have not.

MR. FORT: Did you verify the calculations that -- I'm sorry.

Who's the gentleman, Mr. Olson, that

did the calculation here in Exhibit 10?

MR. MOSHER: That's correct, Dr. Olson

MR. FORT: And he's no longer with the Agency?

MR. MOSHER: That's correct.

MR. FORT: Did you verify his calculations?

MR. MOSHER: No, I didn't.

My attorney said I should explain why not. I don't have the skills Dr. Olson had to be able to check his work.

MR. FORT: When you were talking to these people from DOE that you referred to, these conversations, what did you tell them?

MR. MOSHER: I said we were in the midst of a water quality standards rulemaking and that one of the participants in that rulemaking suggested their model as a way to establish a water quality standard in Illinois. I wished to find out about that model and get their opinions on that model.

MR. FORT: Are you aware that this model is used by DOE to regulate things like

water discharges?

MR. MOSHER: No, I'm not.

MR. FORT: Why do you think they have factors on what aquatic organisms can stand with respect to various isotopes, radio isotopes?

Counsel, if you're going to testify, I'd be glad to listen to you. I'd be glad to have your testimony, but I'd like to let me Mr. Mosher talk.

MS. WILLIAMS: I wasn't trying to testify.

MR. FORT: Well, I mean, I'll withdraw the question. Let's try it again.

Were you aware -- you said you were not aware that the DOE model could be used to define what is an acceptable runoff of water from a DOE site. Is that your testimony?

MR. MOSHER: Well, I'll say it again as I understand it.

DOE saw the need to characterize their sites for safety not only to human as they had been doing for years and years but to expand that for aquatic life, terrestrial

wildlife, plants, other things. They developed this model to use at their sites to tell them when they should be satisfied with those risks and when they should investigate further.

MR. FORT: But some of the risks that they're dealing with is runoff from these sites, isn't it, or do you know?

MR. MOSHER: Well, yeah, I assume that they're terrestrial sites that have some sort of input to waters.

MR. FORT: Maybe a waste pile or some debris or something like that and rainfalls and it runs off and goes into a stream, correct?

MR. MOSHER: Yes.

MR. FORT: So this does -- this model is used by DOE to regulate what they're discharging into the environment, correct?

MR. MOSHER: I don't know that. I think that's another step of inference, and I just don't know that.

MR. FORT: Okay. When you were doing -- you made some points earlier saying

that there were no -- it wasn't difficult to do radon experiments -- I'm sorry -- experiments with radium. Is that your testimony?

MR. MOSHER: Yes.

MR. FORT: Have you ever done an experiment on radium in order to satisfy any of these?

MR. MOSHER: No, but I've done aquatic toxicity tests in laboratories. And I don't see anything impossible about testing radium in that way.

MR. FORT: Wouldn't information on the radioactivity elements, the particles, alpha, beta, and gamma be for another metal, whatever it is, cobalt, uranium, also be applicable for the radioactivity associated with radium?

MR. MOSHER: Yes. And I think the level of dosing is important here. And when I said I didn't agree with Dr. Anderson about the safety issue, that was in reference to the dose. We're interested in maybe 20, 15, ten picoCuries per liter of radium. I believe

that's possible to do in a laboratory with human safety in mind.

MR. FORT: Okay. Have you inquired of anybody as to why there isn't those kind of studies?

MR. MOSHER: Well, I've been looking for those kind of studies, and I looked to USEPA as a research body. Our Agency is not a research body. USEPA is. They haven't pursued that route. One reason that I have for them not pursuing that route is they don't find it of importance enough to use up their research resources.

MR. FORT: Well, USEPA is mostly concerned with chemicals, aren't they, as opposed to radioactive materials, chemical contaminants?

MR. MOSHER: Well, USEPA has a drinking water criteria for radium.

MR. FORT: Aren't they mostly focused on chemicals when they're doing these toxicity tests.

MR. MOSHER: Yeah. I think there's more chemicals that aren't radioactive than

are.

MR. FORT: And the Ecotox database only deals with chemical, doesn't it?

MR. MOSHER: When I inquired at USEPA, no one told me that radium was excluded from that database; just that there wasn't anything in the database for radium. So I guess I can't really answer that question. Maybe somebody at USEPA could.

HEARING OFFICER ANTONIOLLI: I'm catching you all on a pause here, and I think it's about time that we take a break this afternoon. And then I will be happy to let you continue your questioning when we come back, Mr. Fort.

MR. FORT: Thank you.

HEARING OFFICER ANTONIOLLI: But before we do take a break, I do see a question by Mr. Dobmeyer. Did you have one a question for the Agency before we break?

MR. DOBMEYER: I have about ten minutes' worth. I want to make sure that the gentleman from Joliet --

HEARING OFFICER ANTONIOLLI: Why

don't we take a break and then have your questions as soon as we return?

MR. DOBMEYER: Sure.

HEARING OFFICER ANTONIOLLI: It's about five minutes to 3:00 right now. Why don't we come back at five after 3:00?

(A recess was taken.)

HEARING OFFICER ANTONIOLLI: We're back on the record here, and it's about ten after 3:00. And we, before the break, said that we would hear a question or two from Mr. Dobmeyer and then continue questions with Mr. Fort.

MR. DOBMEYER: Thank you.

First of all, I wanted to say that today has been a day of science.

HEARING OFFICER ANTONIOLLI: Could I have you introduce yourself again?

MR. DOBMEYER: I'm sorry. I'm Doug Dobmeyer with Clean Water-Illinois. And the court reporter has my name.

Today has been a day of science. And that's good and it's bad. It's good in the sense that I think good science has been presented probably on both sides. It's bad in

the sense it may have raised more questions, which is not uncommon with precise, technical data, but I wanted to present something that is a spin-off of what I said yesterday, and it won't take too much of your time. And then I have a question for EPA.

I want to make sure that everyone in this room understands that this is an issue that the state of Illinois, the people of the state of Illinois are looking to you for leadership on, to understand that if you give up a strict system that's been in place for over 30 years, you're giving up something you will never get back.

I wanted to give you two quotes that were published in a press release. And I'll be happy to give you a copy if you want it for your official record.

One is from Marilyn F. Campbell, executive director of the Illinois Audubon Society in Springfield said, quote: The Illinois Audubon Society is opposed to lessening the standards of any kind of pollutant of air or water, opposed to

discharge of such agents into the environment.

The Society is concerned with the attempted rollback of regulations by both state and federal agencies which has the potential to negatively affect our environment for both wildlife and human kind, unquote.

The second person I wanted to quote is from Will County. It's Ellen Rendulich who's the director of Citizens Against Ruining the Environment Care. She has -- they have submitted a letter to the Pollution Control Board as an official statement, but she also wanted to give you an additional quote which I will read you.

Quote: Until questions regarding the safety of radium water discharge into Illinois waterways has been completely investigated and deemed safe, we should not even be considering lowering the current standards that have been implemented, unquote.

And I think that she raises an important issue is that it's clear from the discussion from EPA that they have not done all that can be done. For instance, going out and doing

the site-specific testing is something that would make a lot of sense. They've only been doing sludge testing since March, and I'm unsure if that's going to continue. I think that's very problematic.

The department said -- Mr. Mosher said that when he did his call-arounds, he found that in Wisconsin that -- was not aware of radium in -- was not aware of any radium standards in Wisconsin. I would tell you that if you went to Google on the Internet and you typed in radium in water, you would come up with one of the biggest problems in the Midwest. It's in the town of Wauwatosa, which is a suburb of Milwaukee. They have a huge radium problem there, and it's been in the newspapers. It's caused a study to be done by DNR in the state of Wisconsin, which unfortunately I don't have a copy of because they haven't sent it to me, just as the same problem you have getting the stuff from Wisconsin.

But the point is that study has been done and a study does exist around the

problems in Wauwatosa. And I would think that, just as the problem in Round Lake in Florida, is something that the state of Illinois should be looking at with great care.

I also talked to the Illinois State Geological Survey in which Rich Cahill said to me, quote: First I looked at the land application rules for water plant sludge, but most of the plants do not use lime to remove radium but an ion exchange or reverse osmosis approach. In this case the radium could end up going to wastewater plant and potentially end up in sludge -- sewage sludge. Not all ion exchange processes are the same, so some processes may accumulate or retain enough radium that they would have to be shipped to a special facility. Use of land application is popular in many states, and the limits of radium are quite low.

I talked to someone else, Robert Kay from the Illinois State Geological Society, who told me that there had been surveys done by the U.S. Geological Survey of Northeastern Illinois, Northwestern Indiana,

Southwestern Wisconsin in low level wells, not the deep wells, on the levels of radium. So while there was not great conclusions from that, the point is there's more evidence out there that needs to be brought in.

And that gets me to my point which I want to make sure that people understand very carefully what Clean Water-Illinois is saying and what other people are saying is the concern of Illinois residents that they want protection from bone cancer and they want protection for the environment before we go making changes. And what I've heard today does not point to making a change. What I've heard today is: Well, we really don't know or we have some -- we have some indications, but we really don't know. And if you really don't know, you shouldn't be making changes. I think that's the bottom line what I've understood today.

Now, that's the informal way of saying what all the lawyers have been saying, and so I would just leave that with you as one potential thing and I think that -- I hope the

Board will consider in the whole process.

When you tell us how long a comment period we have, I will be writing some more formal comments on this, but I do want to make those clear to you today. If there's any questions, I'd be happy to take them.

HEARING OFFICER ANTONIOLLI: Thank you. And we'd be happy to hear -- did you say you had a question specifically for any of the Agency experts?

MR. DOBMEYER: Well, I guess a specific question I have for the EPA was it just doesn't seem like there's been a very thorough delving of things on radium that we could use in this hearing. And that is a great, great concern.

Now, I don't want to -- I'm not trying to put anybody on the spot or embarrass anyone, but the point is it just seems to me that a lot more could have been done. And I guess the question I would have to the EPA is do you really feel that you've done the kind of search that you should -- that needs to be done?

MR. MOSHER: Well, I mentioned a while ago that IEPA is not a research agency. We don't have laboratories like USEPA or scientists working on those kinds of problems. I wish this had originally gone to USEPA. I wish WRT would, instead of dealing with one state at a time, go national and let EPA consider this.

What we do have in place is a triannual review of water quality standards -- that's a function of the Clean Water Act -- so that when USEPA does come forth with recommendations, we are obligated to put those into effect as state standards.

So there is a system that if new information becomes available or a national criteria for wildlife radium standard is developed, we're obligated to address that again. We have to open up the radium issue again.

MR. DOBMEYER: But you understand that people in this state are concerned about changing rules when they don't think that enough information is available?

MR. MOSHER: Well, we wouldn't be before the Board taking up our time and theirs if we didn't think we had a good case to change the standard. We're on record to say we think we know enough about this to change the standard.

MR. DOBMEYER: Maybe some of the science that's been presented, the Florida study and so forth, would indicate that maybe there needs to be some more work done on it. And that wouldn't be such a bad thing if they were to end this with saying: We're going to go back and look at this and come back and look at another time. There's nothing wrong with that.

Anything else? Thank you.

HEARING OFFICER ANTONIOLLI: Thank you.

MR. FORT: Mr. Mosher, you've talked about how you went to EPA and they didn't say anything about radium and no data on radium. Are you familiar with what the Agency for Toxic Substances and Disease Registry is?

MR. MOSHER: The Agency?

MR. FORT: Right.

MR. MOSHER: No, I'm not.

MR. FORT: Well, they've published a document called Toxicological Profile for Radius. It's dated December 9th. It's from the Agency of Toxic Substance and Disease Registry, U.S. Public Health Service in collaboration with the USEPA. And this is something that you talk about the DOE clean up criteria. This is a document that those of us who do those clean up things work in all the time. How did this not come to your attention?

Let me just mark it probably and I'll show one to him. It's actually referenced in Mr. Anderson's testimony. I've just given you sort of the selected, relevant pages. If you want the whole document, it's much thicker, but...

HEARING OFFICER ANTONIOLLI: And this is what you're proposing for an exhibit, Exhibit 16?

MR. FORT: Yes.

HEARING OFFICER ANTONIOLLI: Are

there any objections to entering this document Toxicological Profile for Radium? Selected parts of that document?

MR. FORT: Yes. Principally it's sections 4 and 5 of that document together with the references. And the main section is Potential for Human Exposure, which actually as part of it has in it bio accumulation and things of that nature.

HEARING OFFICER ANTONIOLLI: As Exhibit 16 dated December 1990. And it's a U.S. Environmental Protection Agency document in collaboration with the U.S. Environmental Protection Agency.

Seeing no objections then, we'll go ahead and enter it as Exhibit 16.

(Exhibit No. 16 entered into evidence.)

MR. FORT: Thank you.

MR. FORT: Mr. Mosher, did you prepare Exhibit 12, or is that -- which has this 22,000 picoCurie number in it which does not make reference --

MR. MOSHER: I'm sorry. I don't think I answered your previous question.

MR. FORT: I'm sorry.

MR. MOSHER: I don't know why USEPA didn't make me aware of their document when I consulted them.

MR. FORT: Fine. Thank you.

When Exhibit 12 was prepared, Mr. Mosher, did you have involvement in preparing any of that document?

MR. MOSHER: Yes, I did.

MR. FORT: What parts of it did you have involvement with?

MR. MOSHER: Questions 1 through 5.

MR. FORT: And that document references the eco -- I think it's question number 2 references the eco toxicity database.

MR. MOSHER: I know 5 does.

MR. FORT: It appears in answer to number 5.

MR. MOSHER: Yes.

MR. FORT: I didn't have it in front of me. I'm sorry.

You did not look at the radiological database that Dr. Anderson was talking about the other day, correct?

MR. MOSHER: No, we didn't. We didn't find anything. We didn't see those.

MR. FORT: You didn't at that point look at the Biota Dose Assessment Committee document procedures or its references either, right?

MR. MOSHER: That's correct.

MR. FORT: In the interest of getting through today, I'm going to try to do three here, so hopefully we can get through this.

Mr. Mosher, the Agency has brought this forward as a proposal to delete any water quality standard for radium in general use waters, correct?

MR. MOSHER: Correct.

MR. FORT: But the reason that you are doing it from an injury standpoint or an impact is because of these POTWs who receive water in communities with deep wells that have elevated radium levels, correct?

MR. MOSHER: We don't like any water quality standards that are outdated, outmoded. There's a lot of those from 1972. Radium was one of them. Yes, we see what you call

injuries if we were to be directed to implement or enforce that water quality standard.

MR. FORT: Now, when you were looking at preparing this proposal, though, you did not concern yourself with what was going to happen in the sludge or the filtrate from those water treatment plants, correct?

MR. MOSHER: That's correct.

MR. FORT: And you didn't look at what the impact was going to be of that sludge material if it were applied to cropland, correct?

MR. MOSHER: That's correct. I personally didn't.

MR. FORT: And to your knowledge, nobody at the Agency looked at that information before this proposal was presented?

MS. WILLIAMS: I think we should -- I mean, we've already talked about this a little on the record, and I don't necessarily consider it testimony to clarify what you said at the last hearing, which was the Agency

publishes a regulatory agenda on which -- so to the extent Bob answers at this rulemaking, that's fine, but in which we are preparing a sludge rulemaking, so there are people, not Bob, working on other rulemaking proposals.

MR. FORT: The question is this rulemaking and the impact of this rulemaking.

MS. WILLIAMS: Okay. I just wanted to make sure you understood that. That's fine.

MR. FORT: Well, you can testify if you want to resurrect or rehabilitate, but the reality is is that you did not look at the impact upon sludge on sludge workers or on the impact upon the farmland in preparing this ruling?

MR. MOSHER: Correct, because it wasn't a part of the water quality standard.

MR. FORT: And you were following what USEPA said: If you want to revise your water quality standard, here's the Bible; here's the guidance, correct?

MR. MOSHER: You're using the word Bible in a way that --

MR. FORT: Let me go again. Let me back off of that.

When you were evaluating this proposal for water quality issues, the issues you looked at were those that USEPA specified in this 1986 guidance document and in another document. I forget the date. Correct?

MR. MOSHER: That -- yeah. I testified that that's our way of doing water quality standards.

MR. FORT: And that way of doing water quality standards does not take into account other effects that might be associated with what you're doing, correct?

MR. MOSHER: I think our Agency looks at social factors when we do these types of rulemakings. I think there are other factors.

MR. FORT: But you didn't look at the impact upon the sludge or the impact upon cropland, correct, the application of sludge?

MR. MOSHER: You know, I don't see any impact. I don't see that there is going to be any impact in this rulemaking on sludge in cropland.

MR. FORT: Did you look at that issue before this rule was proposed, or is that your opinion after the hearing has gotten underway?

MR. MOSHER: I work with these people on a daily basis. I remember years ago meetings. It's hard for me to divorce what they do, what they tell me, when I talk with them on a daily basis from putting together a rulemaking.

MR. FORT: Well, but I think Mr. Hutton just testified that the Agency didn't have any data on the sludge and radium levels in sludge even before this enhanced material was going to be discharged from the water treatment plants. So how could he have told you something that he still hasn't heard from half of the POTWs?

MR. MOSHER: There's been sludge memorandum of agreement for many years. There's other things besides that data. And all I'm trying to tell you is that when we were putting this rulemaking together, it wasn't just me. It was others at the Agency. No one said: Stop; don't do this terrible

thing. They were in general agreement.

MR. FORT: You consulted with the Agency, but it appears that the Agency didn't have all the information that the Agency is now gathering through various efforts?

MR. MOSHER: No. We didn't have information two years ago that we collected six months ago, that's true.

HEARING OFFICER ANTONIOLLI: And just on that point, is the Agency now investigating rulemaking for possibly the land application of sludge for future introduction possibly in that maybe another area where this topic is being investigated?

MS. DIERS: That is correct. We are in the process of putting together a filing of the sludge rulemaking. We were looking to have it by the end of the year. I think realistically it's going to probably be more in the first of year, but we are in the process of putting that together.

HEARING OFFICER ANTONIOLLI: Okay.

MR. FORT: Mr. Mosher, you talked about the POTWs that are impacted by a result

of having to receive filtrate material or backwash material from drinking water plants. Are you familiar with that phenomenon?

MR. MOSHER: Yes.

MR. FORT: Have you looked at what the levels that those POTWs are now discharging for radium?

MR. MOSHER: Only by inference; only by taking what's in the groundwater they start with and what the range of removal percentage is in the sludge. No direct measurement.

MR. FORT: Do you know what the removal percentage is in the sludge or the range?

MR. MOSHER: Yeah. I know it's in one of our testimonies. Blaine I think put that together for me.

MR. FORT: So is every POTW in Northern Illinois going to violate the radium standard, or is it going to be more site-specific as to which is going to be affected and which will not if the present regulation is maintained?

MR. MOSHER: You're talking violating

the radium standard in their sewage treatment plant discharge?

MR. FORT: Yes.

MR. MOSHER: Rather than the drinking water discharge?

Is every facility in Northern Illinois, no.

MR. FORT: Do you have any sense of what percentage would be in that potential violation category if this rule is not adopted?

MR. MOSHER: I think we've testified as to the type of facility that that would be. It's not going to be a facility on a big river. It's not going to be a facility that doesn't start out in the community with high radium groundwater. It's going to be facilities that are on small, zero or low 7 Q 10 stream flow.

MR. FORT: Okay. Do you have any understanding of the concentration of radium that will be in this filtrate from the water treatment plants, I guess what we've called the TENORM?

MR. MOSHER: That's a better question for some of our other witnesses.

MS. WILLIAMS: I mean, do you want -- I anticipate that we'd do a panel format. That's something that would be within Jerry or --

MR. FORT: I'm perfectly happy if one of the other gentlemen can answer that question.

MS. WILLIAMS: Would you repeat it? Would you mind reading it back?

(Record read.)

MR. KUHN: I have an understanding that it's going to be concentrated. In terms of what the actual numbers are, no. I don't know.

MR. FORT: Clearly if that filtrate were kept out of the discharge to the POTW, the resulting amount in the sludge would be less? Would you agree with that?

MR. KUHN: If it was kept out of the sewage treatment plant stream?

MR. FORT: Yes.

MR. KUHN: Yes.

MR. FORT: And if it were kept out of the sewage treatment plant stream, that would also lower the level of discharge going into the receiving water?

MR. KUHN: I wouldn't know because I don't know what the efficiency of the plant removal would be if that waste treatment was done. I don't know whether the efficiency would stay the same, decrease, or what it would be.

MR. FORT: So you think that it's possible that discharging this --

MR. KUHN: I just said I can't answer it.

MR. FORT: But is it possible that discharging the TENORM might have an adverse effect on the efficiency of the treatment plant process itself?

MR. KUHN: Okay. I'm answering a wastewater question.

MR. FORT: I understand.

MR. KUHN: I'm a treatment water guy, so your question --

MS. WILLIAMS: Blaine can address that

if he knows the answer.

MR. KINSLEY: You're asking me if TENORM affects the efficiency of a POTW wastewater treatment system. I'm not aware of any studies that have indicated that, no.

MR. FORT: Do you think it's possible or would you go as far as to say it's unlikely?

MR. KINSLEY: I think that there's -- I think there's a lot of different scenarios out there that could affect that answer. And I really can't answer that.

MR. FORT: So there is a range from unlikely to possible, and we just can't say where it -- it could be true in one instance and not true in another?

MR. KINSLEY: I just think it's too -- that would be depend on the situation.

MR. FORT: Okay. In terms of applying sludge that has radium in it to a field, is that radium going to stay on those particles, or is there a chance the radium is going to leach into the upper groundwater?

MR. HUTTON: I don't know that we

have any specific studies that would indicate that it's going to be immobilized in the sludge profile. The other metals that are present in sludge tend to wind up in other immobilizing soil to a large extent unless you're drastically loading the site; for example, a coal mine reclamation site or something like that.

In agricultural usage, which is a limited usage based on the nitrogen demands of the crop that's being grown, the metals do not migrate down. And that's based on the information we have from -- we have groundwater wells at the city of Galesburg and a sod farm where we were doing monitoring their application range to see if there was any movement of metals. And we found no movement of metals in the groundwater in that situation.

MR. FORT: Based on your training or experience, do you know whether or not this TENORM material of radium would behave in the same manner as the metals that you've tested at Galesburg?

MR. HUTTON: No, I do not.
MR. FORT: Okay. That's all I have. Thank you. Thank you very much.
HEARING OFFICER ANTONIOLLI: Okay. Further questions for the Agency?
MR. HARSCH: Just a few. Roy Harsh on behalf of the city of Joliet.
Mr. Mosher, there's been a lot said about the Florida study and the bio accumulation of the radium material. Were there any observed apparent impacts on those mussels at the high level of radium content that you're aware of in the studies?
MR. MOSHER: As far as the mussel population itself, what I gathered from reading that paper was that the mussels were doing fine in that lake. I say that because that activity had been going on for 40 years and there was still a mussel population in that lake.
MR. HARSCH: We're through. Thank you.
HEARING OFFICER ANTONIOLLI: Okay.
MR. FORT: Can I clarify one thing?

HEARING OFFICER ANTONIOLLI: Go ahead.

MR. FORT: Do you have any information on what the diversity of mussels were historically in that lake?

MR. MOSHER: No.

MR. FORT: So all we know is that there was a species that was able to stand, correct?

MR. MOSHER: I guess you'd have to conclude that.

MR. FORT: Okay. Thank you.

MR. MOSHER: We're getting deep into things we should be talking to the people in Florida about, I think.

MR. FORT: For the record, but for a scheduling conflict, we would have brought them here, but we just couldn't. They had other commitments, so...

HEARING OFFICER ANTONIOLLI: Well, thank you. I think that concludes the questions -- oh, we have more questions.

MS. LIU: Just one, actually.

Mr. Mosher, in light of the lack of

controlled experiments on radium to compare to the observational studies that were discussed, what does the state of Illinois need to do to prod someone, the Department of Natural Resources or a university, to take on studies like this?

MR. MOSHER: I can answer that a couple ways.

I can think of a lot of water issues that need prodding more than this one does. We've testified that we don't think the levels in our Northern Illinois streams are a problem. I can think of -- you know, go on and on with things that are higher priority problems, in my opinion. But on the other hand, USEPA has funds. They have the people. I'd like to see them do it anyway. I mean, here's the issue. It's here. Instead of doing this one state at a time, they can do it for the whole country. And that's their job.

And so sure, I don't think it would be a big, huge project. I think it would be doable by USEPA certainly; just, you know, kind of demonstrate what's going on in the

Midwestern streams.

HEARING OFFICER ANTONIOLLI: Okay. Board, do we have any more questions?

(No audible response.)

HEARING OFFICER ANTONIOLLI: Agency? And I know that Mr. Duffield would like to testify. Would you like to do that at this time?

MR. HARSCH: Yes. Again, I'm Roy Harsch from Gardner, Carton, & Douglas on behalf of the city of Joliet. And at this point in time, I'd like to call Mr. Duffield as a witness.

MR. DUFFIELD: Thank you, Mr. Harsch.

MR. HARSCH: You were previously sworn in, correct?

HEARING OFFICER ANTONIOLLI: Yes. We'll remind you for the record that you've been sworn in yesterday.

MR. DUFFIELD: Yes. I was sworn in this morning.

HEARING OFFICER ANTONIOLLI: Or this morning. It seems like yesterday, doesn't it?

MR. DUFFIELD: It does seem like

yesterday.

As I try to get my notes up here, Mr. Dobmeyer just recently commented that there's nothing wrong with delaying this rulemaking and doing additional studying. And I guess I would take objection to that.

There is something wrong with it. The communities in Northeastern Illinois are being required to comply with the drinking water standard. As a part of that compliance, they have to select a treatment method. And to delay that selection will result in violation of compliance commitments and consent decrees with the Illinois EPA and result in fines and the continued drinking of water by people that exceeds the drinking water standard.

The original intent of the drinking water standard program was to get people better water, and now we've come up -- we've got to take a look at what happens on the wastewater side, but that doesn't have near the impact on people that we've had with the drinking water side. And I guess that's the

way I've always started out in the water works business is that people are first. And we'll go from there. I will be with you in just a second.

(Brief pause.)

MR. DUFFIELD: I'd like to start out my name is Dennis Duffield. I'm the director of public works and utilities for the city of Joliet. I am a registered professional engineer in Illinois. I was granted a bachelor of science in civil engineering by Bradley University in 1972. I have 34 years' experience in the water supply and wastewater treatment field, and I've been involved with the radium issue in Illinois since 1985.

I've chosen to testify today after participating in the last two hearings. I'm concerned about the tangental issues that have been brought in and used to cloud the review of the proposed water quality standard.

The approximately 100 water supplies that are currently out of compliance in Illinois with the five picoCuries per liter standard for drinking water and the wastewater

treatment plants that serve those communities need a decision so that scheduled compliance can occur.

Joliet has committed to compliance with the drinking water standard by December 31st, 2007. Equipment cannot be specified until this rulemaking is completed as different treatment methods result in different discharge methods to the waters of Illinois.

Since Joliet is constructing ten treatment plants that will use identical treatment methods, the purchase of equipment must proceed in early 2005 to allow time for the equipment to be manufactured and provided for installation in the plants.

I would like to discuss four technical issues and one public policy issue for consideration by the Board. I hope that I'm able to clarify a few issues and offer a workable solution to the issues that have been raised.

I would first like to point out radium has been discharged in the streams of

Illinois for decades because deep well water has been the preferred source of much of Northern Illinois. As Bob Mosher explained yesterday in response to the question from the lady, a proposal to modify the water quality standard is just recognition of the ongoing situation.

No one is proposing to encourage the discharge of radio nuclides in sanitary sewers or receiving streams but to recognize that nationally-occurred radium has been discharged for many years.

Joliet has deep wells that date back 80 years. Major water system improvements were made in the early '50s that added deep wells and a wastewater treatment plant. These facilities have been in service for almost 50 years.

By proposing the rule change, the IEPA is not proposing that additional radium be discharged to waters of Illinois, but the regulations recognize that the existing discharges of radium -- recognize the existing discharges and that communities be allowed to

legally continue a practice that's been in existence for many years.

The news media Reportingg about these hearings has been encouraged to report on the EPA's proposal to increase the radium standards as an increase in discharge. This has been an improper characterization.

The separation and recombining of the radium with the water does not alter the impact on the environment but meets a major objective of those in the water supply field which is to protect the health of the water consumer. We should not lose sight of this major responsibility.

The impact on aquatic life is not altered by the use of water treatment processes that separate and recombine the radium with the water. New impacts to aquatic life should result from the continuation of discharges that have been in place for many years.

A second issue I'd like to talk about is worker safety. Worker safety has been raised as an issue without any real study of

the operations of wastewater treatment plants in Illinois.

The ISCORS study that was referred to by Mr. Adams points out in the conclusions that worker safety issues can be easily mitigated by proper ventilation as radon is the primary risk. The ISCORS study, like the Department of Energy model we've been talking about today, used conservative values called default values. This methodology is very conservative and is based on situations that do not occur in the real world and specifically not in Northern Illinois.

HEARING OFFICER ANTONIOLLI: Can you slow down a little bit for the court reporter?

MR. DUFFIELD: Well, my time has been eaten up all day today. I'm trying to -- I know a lot of people want to have dinner Springfield.

HEARING OFFICER ANTONIOLLI: You're right probably.

MR. DUFFIELD: Because the studies provided a worst case scenario for consideration, I determined that it was

necessary to perform additional work related to radium and sludge.

Worker safety was a primary concern, so the city of Joliet contracted with RSSI, a consulting health physics firm from Morton Grove, Illinois, to visit our west side wastewater treatment plant and determine the areas where worker safety was a concern.

Since the sludge at this plant is collected as a liquid, contained in pipes and tanks during sludge treatment, and is not open to the air until truck loading, Eli Port of RSSI concluded that worker safety is not an issue in the plant. The truck loading takes place outdoors in the open air, so the concentration cannot build up -- of radon cannot build up as it would in a building.

Mr. Port did recommend that we place radon monitors inside other rooms in the plant that are more confined spaces and may receive radon from cracks in the foundation coming in from the ground as Northern Illinois -- as our county is known from having radon from other sources and then, based on the results of this

sampling, adjust our ventilation.

Mr. Port brought portable measuring equipment and measured the radiation emitting from the sludge storage tanks and found it to be below background radiation as a result of the extremely low concentration of radium in the sludge and the screening provided the tank construction materials.

Joliet handles sludge in our treatment plant as a liquid. The sludge at the plant is not exposed to air except during truck loading. The sludge at our east side wastewater treatment plant is only exposed to air on the gravity belt thickners and during truck loading.

The building housing the gravity belt thickners is well ventilated as our primary concern at that facility is hydrogen sulfide gas buildup.

No workers are allowed in the area where the sludge is exposed to air. That's in a separate room in the building. And no workers are allowed in there at any time that the facility is operating.

It would appear that the conclusions pointed out in the ISCORS study that easy mitigation of concerns was confirmed by our consultant's review.

Another issue that's been raised has been the land application of bio solids, or as it's commonly known sewage sludge, and the hazards potentially associated with it. The ISCORS study included land application scenarios that implied risk to future occupants of homes constructed on land that received sludge applications. The ISCORS study default values included with the assumptions were inconsistent with actual practice in Illinois.

Since the Joliet west side wastewater treatment plant has one of the highest concentration of radium and sludge in Illinois, I reacted to concerns expressed in these proceedings by again employing RSSI to use actual radium concentrations from sludge and entered the data for actual practice in Northern Illinois into the model called RESRAD that was used by the ISCORS study included in

Mr. Adams' testimony.

The result of the modeling indicates that a future resident of a home constructed on land that has received nine applications of sludge over a 22-year period receives less than ten millirems per year. Ten millirems per year was the screening number used in the ISCORS study to determine if additional work was necessary.

RSSI also provided me with information to put this in some kind of a perspective. In 1995 the U.S. Nuclear Regulatory Commission estimated that the cost to society for radiation exposure was $2,000 per person rem. That would be for each person exposed to one rem. If I equate that to today's dollars, that's about $2500. If I apply that to the residents that would receive sludge at the historic application rates that we used, that would be 1100 person rems or a cost to society of about 1.28 million.

Now, to put that into a little perspective, that was the only work that we undertook. Joliet requested Clark-Dietz, Inc.,

a consulting engineering firm with offices in Chicago and Champaign/Urbana, to estimate the cost of eliminating the land application of sludge and depositing the sludge in a landfill. The cost increase to Joliet to landfill sludge over a 20-year period was $17.6 million.

When the cost to the public of 17.6 is used in a cost benefit risk ratio type formula with the 1.28 million, the benefits to the procedure are -- the ratio is 13.75, which would indicate that Joliet should still continue to look at land application.

Previous testimony in this proceeding has indicated that this type of cost comparison is discussed in the ISCORS study and is one approach.

The Agency has just recently testified to water quality standards in surrounding states. I've looked into Wisconsin, and I believe that their standard -- my interpretation of their standard is in the -- not in the range of 3.75 but much closer to the range of 37.5. It's

more -- they divide their radium concentrations by 60 in the information I was able to find on the Internet. I've not spoken to any individuals there. This is something that someone else would have to confirm.

The information I did find on the Internet about Iowa is the five picoCuries for public water supply sources, the same thing that is being proposed here.

I have another point that's not quite as technical but an issue that has been troubling me for some time. I've been a participant at Board and USEPA proceedings concerning radium since 1985. It has been a long and confused path that has brought us to this pending proposal.

As we have approached the end of the path, I'm troubled that the proceedings have been used by a supplier of treatment equipment to force a treatment technique on water supplies. WRT is known to me as a supplier of a black box treatment system. I don't know what's inside it. It comes in a box. You put water in. You take water out.

We're currently pilot testing their system in a deep well in Joliet, along with other manufacturers' equipment. WRT has indicated that they would like to see Joliet use their equipment, and yet they've used their best efforts to delay and confuse the pending matter.

Joliet has had to expend public funds to respond to issues raised by an equipment provider. IEPA and the Illinois Pollution Control Board have had to expend funds to participate in additional hearings that have not clarified the record.

In the past the IEPA and the Illinois Pollution Control Board have not used rulemakings to specify specific treatment equipment for any other constituent in water or wastewater. Scientific criteria has been established, and the system owner has been free to design and construct facilities to meet the requirements.

WRT has indicated in these proceedings that their process is competitive in cost with other methods. Will this be true

if water quality standards are implemented that only allow one treatment technique?

I've looked over their standard agreement at least for their facilities. They don't require that WRT operate the facility in compliance. If it fails to comply, they have the option to remove the facility -- their equipment at no cost to the owner. This is not a solution. System owners need to select equipment to provide reliable compliance. Owners need to be free from state regulations so that the water works professionals can use their expertise to select the appropriate treatment system for each community. WRT should be willing, as are the regular water equipment manufacturers, to allow the owners to evaluate systems and make their best decision without using this process to specify equipment.

The IEPA and the Illinois Pollution Control Board do not belong in the equipment selection process, only the protection of the health and safety of the residents of Illinois.

As I conclude my presentation today, I guess I'm reaching a dilemma. The current proposal does not establish a numeric limit. I've heard testimony today from the Agency about the reasons that it doesn't include a numeric limit. I've given thought to a numeric limit, but I'm not sure if that's what the Board wants. It would eliminate the confusion that seems to be out there where people are characterizing this rulemaking as encouraging additional pollution.

And if that's the case, then I can suggest a number today. If the Board is not interested in that number, that's fine. But I guess I'm concerned about the public perception of a rulemaking related to radium that is -- that is that we're allowing more pollution. And that seems to be what I've been reading in the news media. And I think that the other states have addressed it with -- the five picoCuries addresses it. I think if we have to to have an absolute number, the number needs to be somewhere between 15 and 30. I think that's -- and that

would be picoCuries per liter in the stream.

And I'm just suggesting that we'd be willing to work with the Agency to develop that further, but I'm not sure what the pleasure of the Board is in those areas. But that's what I have to offer today. I appreciate the opportunity to provide my testimony today, and I'm available for questions.

HEARING OFFICER ANTONIOLLI: Okay. I see a question here by Mr. Dobmeyer.

MR. DOBMEYER: Well, since my name was mentioned, I think I should respond to this.

This is not an issue of the city of Joliet. This is an issue of the state of Illinois. The fact that Joliet has not been in compliance with regulations that have been on board, shame on you. Shame on all the cities that have not been in compliance. We in Illinois want protection for ourselves and for the environment, and if you can't provide that, then you should be made forced to provide it.

Now, the fact that you -- there's been a proposal by the EPA that supposedly will get decided sometime yet this year and you want to buy equipment in '05, that's good. That's nice. You may not -- you may have to buy the equipment that meets today's standard as opposed to some standard that EPA is providing. They have not met the test of explaining why we should move the standard.

You talk about the news media -- twice you've mentioned it -- that they're confusing the public. Well, I think their stories have been right on the mark. There is going to be more pollution in the state if that kind of standard goes through. And if you disagree with that, then I think that you're just trying to fool everyone.

The point is there is going to be more pollution, and people need to realize that. People need to be protected from it. That's my comment to you.

HEARING OFFICER ANTONIOLLI: Okay. Do we have any further comments or questions for Mr. Duffield?

MR. FORT: Yes, if I may.
MR. HARSCH: Can we go off the record? I had a couple clarifying questions I would have liked to have been able to ask normally.
HEARING OFFICER ANTONIOLLI: Let's go off the record for a moment.
(Discussion had off the record.)
HEARING OFFICER ANTONIOLLI: Let's go on the record.
MR. HARSCH: I have a few questions, and then I would gladly turn the witness over to you.
Do you have an experience with what you would expect the normal use of water in alternate treatment technologies are in terms of recirculation I think it's been referred to today?
MR. DUFFIELD: Yes. I inquired this week of the village of Channahon who has recently installed a hydrous manganese filtration system. And their experience since their plant has gone into service has been that they recycle -- that they discharge

1.4 percent of the throughput through their system.

MR. HARSCH: And when you talk about handling sludge wet or sludge dry, can you give the moisture -- or solids percentages?

MR. DUFFIELD: Wet is still pumpable, and so we talk in terms of 4 to 8 percent. Dry could go in the range of 20 percent solid -- 20 percent -- it's a dry sludge in most cases in Northeastern Illinois. It comes off a filter press as a cake, but if you hauled it in a truck with a belt on the back, when it fell off, it would still plop.

MR. HARSCH: And is it normally -- have you ever observed dust from the loading of either wet or dry sludge you referred to?

MR. DUFFIELD: Not from that type of a facility. I have from old drying beds when they've been on there for a long time and was put on in a thin application.

MR. HARSCH: No further questions.

HEARING OFFICER ANTONIOLLI: Okay. Mr. Fort.

MR. FORT: Thank you.

Mr. Duffield, you just said that you had seen -- had not seen any wet or dry sludge handled in the manner that you handle sludge in a dusty condition. Is that what I just heard you say?

MR. DUFFIELD: No, sir, not even close.

What I said was of old drying beds, which is not the method that we used, I have seen it handled.

MR. FORT: Actually, that was going to be my next question. I just wanted to confirm that you said that you had not seen that for your kind of operation.

MR. DUFFIELD: That's correct.

MR. FORT: But you had seen it in drying beds where there was a thin application?

MR. DUFFIELD: Yes, sir.

MR. FORT: Does that kind of phenomenon happen when you apply your sludge to cropland?

MR. DUFFIELD: No.

MR. FORT: Why not?

MR. DUFFIELD: Because we apply it wet.

MR. FORT: But then what happens to it? Doesn't it dry?

MR. DUFFIELD: It is injected below the ground surface according to Jeff's rules.

MR. FORT: How far below ground surface?

MR. DUFFIELD: About six inches.

MR. FORT: And how long has the Channahon HMO facility been operating?

MR. DUFFIELD: I'd still measure it in months. It's not a year. It went in service in this calendar year.

MR. FORT: And does that facility meet the one picoCurie gram per limit for general water quality standard, to your knowledge?

MR. DUFFIELD: I was discussing the Channahon water treatment plant recycle rate, and I don't know about the Channahon wastewater plant.

MR. FORT: But that's where their material goes is to the wastewater plant?

MR. DUFFIELD: I believe so; that their material from this plant would go to the Channahon plant.

MR. FORT: So you have collected, if I have got my notes right, basically three different engineering studies of various technical questions. You had the evaluation on the west plant looking at worker safety, correct?

MR. DUFFIELD: That's correct.

MR. FORT: And they had some specific recommendations in some of the confined areas and cracks and things like that?

MR. DUFFIELD: That's correct.

MR. FORT: And the east side plant, was there a study there or not?

MR. DUFFIELD: There was no study on the worker safety.

MR. FORT: No study on worker safety. Okay.

Then you had RSSI do another study on the future homes scenario in lands built on cropland that had soil treated with radium sludge?

MR. DUFFIELD: Yes, sir.

MR. FORT: Did they actually look at actual fields that had been land applied, or were they doing a model?

MR. DUFFIELD: They operated the RESRAD model, which was the same model that was used in the ISCORS study.

MR. FORT: And you said something about the actual practices, and I don't really understand what you meant by that they didn't consider actual practices.

MR. DUFFIELD: The default values in the RESRAD study indicate that when sludge is applied, it's applied in the upper six inches in the topsoil. They did not indicate -- they assumed that that contaminated soil was under -- directly under the house. Well, in Northeastern Illinois, the standard development practice is to first strip the topsoil and set it in a stockpile. Then you excavate the basement, which is well below the six-inch level. It's more down about 48 inches in our community, 42 to 48 inches. And then the topsoil is reapplied around the house

but not under the house. And so that's the practice that impacts the results of this RESRAD analysis.

MR. FORT: Now, is that practice something that's a local choice on the contractor, or is that a municipal code requirement? Is that a state statute to strip the topsoil off and, as you've described, put in the basement?

MR. DUFFIELD: Well, it's generally a good building practice because top soil makes very poor building material. And so you excavate it. Any home with a basement, it's automatically excavated because you're going to excavate much deeper than the topsoil depth.

MR. FORT: But there are some kinds of homes that don't have a basement, correct?

MR. DUFFIELD: Right, but even --

MR. FORT: And for those, you are putting the activity or the home right on top of the topsoil?

MR. DUFFIELD: No, sir.

MR. FORT: No? You're sure of that?

MR. DUFFIELD: Homes on slabs are not typically built on top soil because top soil is a very poor material for supporting construction.

MR. FORT: And you have personal experience on this?

MR. DUFFIELD: Yes, sir.

MR. FORT: You've built the houses?

MR. DUFFIELD: As a part of my job at the city of Joliet, I've been involved in the development of thousands of houses, sir.

MR. FORT: Okay. And you've watched what was done?

MR. DUFFIELD: Yes, sir.

MR. FORT: And how much did they excavate when they are putting it down on a slab?

MR. DUFFIELD: I would say they have to put a foundation down to 42 inches on the edges, and then the slab is poured over the top, but they excavate all the topsoil.

MR. FORT: Okay. And that happens in every community in Northern Illinois?

MR. DUFFIELD: I won't testify to

every community, but I would tell you that it's a general practice.

MR. FORT: Are you aware the ISCORS study is looking -- your testimony is that that study looked only at upward migration and not any lateral movement?

MR. DUFFIELD: No, sir.

MR. FORT: So it did include lateral movement?

MR. DUFFIELD: My statement is that we used the same model and adjusted the inputs, and the answer we got is substantially different from the answer that they got.

MR. FORT: Do you have this calculation on paper someplace?

MR. DUFFIELD: Yes, sir, I do.

MR. FORT: How long have you had it on paper or even in your computer?

MR. DUFFIELD: I -- a couple weeks probably.

MR. FORT: I would object to this testimony and, you know, the last minute, last -- almost the last witness. We have something that's pretty technical. I'm at a

real disadvantage with the pre-filed testimony order, so...

HEARING OFFICER ANTONIOLLI: So you object to his testimony. I'll note your objection and let him answer -- we'll, he has answered.

MR. FORT: He's already testified. That's why -- you know, I probably could have jumped up and down at the beginning of this to say: How long have you had this opinion. It only become significant as he sort of talked about everything that he'd done, but...

HEARING OFFICER ANTONIOLLI: Okay.

MR. FORT: Okay. Can we get a copy of your calculations?

MR. DUFFIELD: I will be submitting them to the Board.

MR. FORT: You have them now, right?

MR. DUFFIELD: No, I don't. I don't have them with me.

MR. FORT: You don't have them with you, but you have them back at your office?

MR. DUFFIELD: I'm waiting for the final report. I have the draft. I don't have

the final.

MR. FORT: Oh. These calculations are not yours; they're somebody else's?

MR. DUFFIELD: Yes, sir. I'm not a health physicist.

MR. FORT: Okay. You have the draft, but you don't have the final?

MR. DUFFIELD: Yes, sir.

MR. FORT: And when are you going to get the final?

MR. DUFFIELD: I've been trying to get my hands on it.

MR. FORT: We'd like to have whatever you can share as soon as you can share it. And I kind of doubt if -- well, I'll be interested, I guess, if they make a significant change in their calculations because that will then affect what you've sworn to here.

MR. DUFFIELD: I doubt if they'd make those changes.

MR. FORT: I kind of thought that, too, so that's why I'd like to have it sooner.

HEARING OFFICER ANTONIOLLI: Well, we'll

go ahead and set those deadlines for information to be submitted shortly.

MR. FORT: Thank you.

So you have those two studies. And then the third one by Clark-Dietz was this taking the cost number from NRC and comparing it to the cost that you calculate of landfilling instead of land farming, correct?

MR. DUFFIELD: The Clark-Dietz study was the cost of the landfilling. They did not do the NRC -- comparison with the NRC calculation. I performed that myself.

MR. FORT: You just got that out of the NRC report?

MR. DUFFIELD: Yes. It was pointed out to me by Dr. Port at RSSI that that was an available number.

MR. FORT: Do you have a citation to that document?

MR. DUFFIELD: I don't have it with me now, but I could get it to you.

MR. FORT: If you could sent us that citation, it would be helpful.

You don't know what went into those

costs?

MR. DUFFIELD: No. And all I know is that that's a published number. And how good it is or how bad it is, I'm not making any claim.

MR. FORT: Okay. Thank you.

MR. DUFFIELD: It's just a number.

MR. FORT: Okay. So you've gone through -- gone to the effort here to look at the radon and radium effect on your workers from having basically a water supply that comes from deep wells that have elevated radium levels, correct?

MR. DUFFIELD: That's correct.

MR. FORT: And how many other treatment plants have done that, to your knowledge?

MR. DUFFIELD: I'm not aware of any others, not in Illinois.

MR. FORT: Okay. And do you recommend that as something that would be a prudent thing for a publicly-owned treatment works operator in this radium belt to do?

MR. DUFFIELD: At this point I don't.

And the reason that I don't is because I'm reported to be one of the highest levels of radium and sludge in Illinois. And if I do the calculations and I don't have a problem, it will probably indicate to many of these small communities with 300 customers or less that they have a reasonable assurance that their facility is safe because they don't have the funds to invest in this type of study.

MR. FORT: Because these are expensive studies to do?

MR. DUFFIELD: Relatively, yes, sir.

MR. FORT: But wasn't the key of your testimony of why you didn't have a problem was that you handled your sludge wet?

MR. DUFFIELD: Yes.

MR. FORT: And you kept it in pipes and you kept it from having any exposure to the workers until it went into the truck; the west side plant, correct?

MR. DUFFIELD: Yes, sir.

MR. FORT: Okay. And how many of those facilities are there like that in Northern Illinois?

MR. DUFFIELD: I'm not that familiar with the wastewater treatment facilities that I could say how many.

I would say that I'm not concerned because the difference between when you take wet sludge -- when Jeff reports a number of 47 picoCuries per gram dry and that came out of a sludge that was 4 to 8 percent -- if it was 4 percent solids, you could put multiply that -- divide that number by 25 to get the concentration that would occur in the liquid sludge because a gram -- and so you divide 25 into 47. You get about a 2, and you're back down to drinking water levels in the liquid sludge.

MR. FORT: In the liquid sludge. What kind of radon levels did you get in -- or radium levels did you get in these other areas that your consultant was concerned about?

MR. DUFFIELD: We didn't measure radium. We measured the radiation coming off of the tank.

MR. FORT: You mean alpha radiation or radon, or what did you measure?

MR. DUFFIELD: He brought a counter-type device.

MR. FORT: Okay. So this was an indicator if it was hot or not?

MR. DUFFIELD: Yes, sir.

MR. FORT: And you don't know what those levels were?

MR. DUFFIELD: I don't have his written report yet with the numbers in them.

MR. FORT: You don't have the report yet?

MR. DUFFIELD: I have the discussion with him.

MR. FORT: So the things you've testified to --

MR. DUFFIELD: About worker safety.

MR. FORT: -- about worker safety are based on what your expert told you?

MR. DUFFIELD: Yes, sir.

MR. FORT: The guy you hired told you?

MR. DUFFIELD: My expert, that's correct.

MR. FORT: Was it near background?

MR. DUFFIELD: Yes. It was near background.

MR. FORT: Where was near background? I thought -- you were talking about that in the loading operation, wasn't it?

MR. DUFFIELD: Adjacent to the sludge -- when you measured adjacent to the sludge tanks, the radiation was near background.

MR. FORT: Okay. He didn't tell you anything about millirems or anything like that?

MR. DUFFIELD: He had numbers, but I can't -- I didn't have them in my notes.

MR. FORT: Okay. And he hasn't given you any paper yet?

MR. DUFFIELD: No. It was supposed to be here Wednesday, so...

MR. FORT: Okay. Are you familiar with the concept of TENORM?

MR. DUFFIELD: No, sir.

MR. FORT: You don't know what TENORM is?

MR. DUFFIELD: I understand that it's been in these reports about radium that other

people have written, but it's not a concept that I use in my business.

MR. FORT: You're not familiar with what happens in one of these treatment plants to extract the radium and get it out of the water?

MR. DUFFIELD: I understand the treatment processes that are available, but I don't understand what TENORM means.

MR. FORT: You don't know what a TENORM radioactive particle really is?

MR. DUFFIELD: No.

MR. FORT: Or its appearance?

MR. DUFFIELD: All I know is that I have radium; I have to take it out. That's what I understand.

MR. FORT: Okay. And you don't know what it looks like or its physical appearance even when it's taken out?

MR. DUFFIELD: When it's removed by various processes, it has a different appearance. But in an HMO process, it's part of a manganese block.

MR. FORT: You brought up your pilot

testing. How many technologies are you testing right now in the pilot scale testing?

MR. DUFFIELD: We're testing manganese oxide filtration. We're testing the WRT system. And we're testing the Layne Christianson Dow Radium Select P -- Radium Select Complex P, official title.

MR. FORT: And that is like WRT, something that does not have a backwash to the POTW, correct?

MR. DUFFIELD: That's correct.

MR. FORT: But HMO does?

MR. DUFFIELD: Yes, that's correct.

MR. FORT: Are there other technologies that have a backwash to the sewer?

MR. DUFFIELD: There are that I'm aware of, yes.

MR. FORT: Why aren't you testing an ion exchange?

MR. DUFFIELD: Because we ruled ion exchange out in our preliminary study.

MR. FORT: Why was that?

MR. DUFFIELD: Because of the

tremendous quantities of salt that I would have to handle.

MR. FORT: How much testing do you have of your sludge?

MR. DUFFIELD: I have a handful of sample results.

MR. FORT: Meaning like five?

MR. DUFFIELD: Yeah. That would be a high number.

MR. FORT: And over what period of time have you been testing sludge?

MR. DUFFIELD: It was all in late '03 and '04.

MR. FORT: And what kind of levels were you finding?

MR. DUFFIELD: I would have to look. It's in my previous testimony.

MR. FORT: Okay. I didn't have sludge levels being in your testimony, but can you remember a range?

MR. DUFFIELD: The number reported to the Agency as combined radium 226 and 228 for the west side plant is about 47.

MR. FORT: Okay. Thank you.

MR. DUFFIELD: And the east side plant is less.

MR. HUTTON: The east side plant is 18.8 picoCuries per liter -- per gram.

MR. DUFFIELD: Per gram.

MR. FORT: Do you know what the concentration is on a dry weight basis of the radium in the HMO process?

MR. DUFFIELD: Not in dry weight, no.

MR. FORT: Wet weight?

MR. DUFFIELD: Well, wet, if you're recycling, about 1.4 percent. You're taking all the radium -- the radium out of the system and then concentrating it in 1.4 percent of the water. Whatever that calculates out to be.

MR. FORT: So if you have a lot of radium and you're really concentrating, you got a real rich thing, right?

MR. DUFFIELD: Yeah.

MR. FORT: It would be a lot richer than what you're getting right now in your treatment plant, right?

MR. DUFFIELD: There will be no change

at the treatment plant.

MR. FORT: But you're going to get a concentrated material coming from the water treatment process to your treatment plant, aren't you?

MR. DUFFIELD: Not my expectation, no.

MR. FORT: Why not?

MR. DUFFIELD: We will operate ten facilities with 22 filters. The filters will backwash at different times. The backwash will be discharged over a long period of time and mix with the same sewage that it's been -- that the radium has been mixed with all along. And by the time it reaches to the plant, it will be of the same concentration that we're receiving now.

MR. FORT: Well, the same concentration on a gross daily average, weekly average basis, correct?

MR. DUFFIELD: No, on -- we won't be expecting slug loads.

MR. FORT: I guess we get back to the difference of a TENORM versus sludge material, but...

HEARING OFFICER ANTONIOLLI: Can you explain what a slug load is?

MR. DUFFIELD: Slug load would be where you had a material in a tank and you dumped it all over a 20-minute period and it all got to the plant at the same time as opposed to something that is metered out over a longer period of time so that it has time to mix with the regular operations of the rest of the system.

HEARING OFFICER ANTONIOLLI: Okay.

MR. FORT: Do you expect the Channahon experience to be representative of your operation going forward?

MR. DUFFIELD: I would think we'd be able to do a little bit better than they're doing because they only operate their deep well eight hours a day and we operate our 24 hours a day. So I think we'd be able to do a little bit better.

MR. FORT: And so you've already collected this radium material on a filter, and then you're cleaning off the filter, as it were, to dump it back down the sewer, correct,

in your backwashing activity?

MR. DUFFIELD: That's what a hydrous manganese oxide does, that's correct.

MR. FORT: So you have the material on a filter, and then the choice is made to send it down the sewer, correct? Or the design is to send it down the sewer?

MR. DUFFIELD: That's the current method of operation, that's correct.

MR. FORT: But you've already collected it and the real question is whether or not you flush it down the sewer or you do something else with it, correct?

MR. DUFFIELD: Yeah. You would have an option to do something else.

MR. FORT: Why wouldn't you go ahead and handle that material either land application or landfill?

MR. DUFFIELD: That material, I'm not sure what is the best approach to handling it. But why would I take that material and handle it at all those different locations when it comes to the sewage treatment plant and I can gather it there? I'm not sure what that

material would look like, what the numbers would be relative to that material, and where would be an appropriate place for it to be disposed of, what the concentrations would be.

MR. FORT: Would anybody mind if Mr. Williams asks a couple of questions? It would probably move it along quicker.

HEARING OFFICER ANTONIOLLI: Go ahead.

MR. WILLIAMS: It's really very simple, Dennis. If I understand what you're saying, you've got about 11.2 in your water, right?

MR. DUFFIELD: Yeah, 11.12 somewhere in there, that result.

MR. WILLIAMS: And you get -- basically 1 percent of that has your radium in it, so you're about 100 in the wet weight going to the sludge into the sewage treatment plant?

MR. DUFFIELD: That would be right.

MR. WILLIAMS: And what percentage of the water that goes to the sewage treatment plant are solid particulates?

MR. DUFFIELD: Solids are about 180

parts per million.

MR. WILLIAMS: Parts per million?

MR. DUFFIELD: Yes.

MR. WILLIAMS: So if it's 180 parts per million, I can't do the math in my head, but that's a substantial increase. The radium is actually in a much more concentrated part of that water, isn't it? It's not in the water itself? It's actually on the particles in the water?

MR. DUFFIELD: Radium will be attached to particles. We agree there.

MR. WILLIAMS: That's right.

And the concentration of the particles is actually quite important because several reasons. First of all, since it's a particulate, if you had your license, isn't it true that you wouldn't be able to discharge particulates to the sewer?

MR. DUFFIELD: I'm not familiar with the licensing requirements.

MR. WILLIAMS: The rule in Illinois is license --

MR. HARSCH: He's already answered

your question.

MR. WILLIAMS: Would you find it strange to know that the rule in Illinois is that radioactive solids may not be discharged down to the sewer if you are a licensee?

MR. DUFFIELD: Licensees cannot do it, that's correct.

MR. WILLIAMS: A licensee cannot do it.

Now, would you say that the material that you're putting down the sewer is radioactive?

MR. DUFFIELD: I guess I have to say that because it's -- I would say that in my system, my wastewater treatment system, my sewer use ordinance allows the discharge of HMO waste to the sanitary sewer. The sewer use ordinance that controls the discharge to our facility allows the discharge of HMO waste, and my sewer use ordinance resulted from taking federal money as a part of the grant program many years ago and, therefore, has met review by the Illinois EPA. And so what I would use to determine whether or not a discharge could be made is in place, and that

determination is that the discharge can be made.

MR. WILLIAMS: But you've never had your license through the INDS, have you?

MR. DUFFIELD: No. At this point I haven't seen any reason to have one.

MR. WILLIAMS: Let's go back to the 180 parts per million. If I'm doing the math right, that would be .18 percent; is that right?

MR. DUFFIELD: No.

MR. FORT: Eighteen percent.

MR. WILLIAMS: Eighteen percent.

MR. DUFFIELD: No.

MEMBER MELAS: 1.8

MR. WILLIAMS: 1.8. Thank you.

So in other words, if it is 1.8, that would be another 50 times increase over 100?

MR. DUFFIELD: I'm lost. We have to start over.

MR. WILLIAMS: Okay. I mean, what I understood is -- and correct -- I'm asking a question here. I'm saying am I correct in saying that if you're looking at the liquid

constituents, you're looking at somewhere around 100 parts per million -- I mean, 100 picoCuries, 11 --

MR. DUFFIELD: The liquid constituent where?

MR. WILLIAMS: I'm sorry. That's not right, is it? We'll do this math, but if you have 11 times 100, which is the initial concentration ratio to the liquid, you're at 1,100; is that correct?

MR. DUFFIELD: I'm not thinking this afternoon.

MR. WILLIAMS: I'm having trouble, too.

MR. DUFFIELD: This is not something I'm going to be able to do today sitting here at the desk.

MR. WILLIAMS: The point is would you be surprised to know that your concentration on those particles are so high they could only be disposed of in a low level radioactive waste disposal site?

MR. DUFFIELD: I've been told that in the past, but it's always been my position

that if I don't dewater that they don't occur as just solids. They occur as a part of the slurry and -- that comes out of the backwash process, and so as long as I don't separate them, I have not created that situation.

MR. WILLIAMS: Now, so when you take that liquid with the radioactive particles that are quite high and you put it on the ground in a sludge situation, what happens to the water?

MR. DUFFIELD: The water evaporates or moves through the system.

MR. WILLIAMS: Does that not leave very high concentrated particles of hydrous manganese oxide plus radium distributed over the soil?

MR. DUFFIELD: Distributed in the soil I could say.

MR. WILLIAMS: Or in the soil.

MR. DUFFIELD: There will be particles in the soil. That's a fact.

MR. WILLIAMS: And they may be so -- I mean, quite high. I mean, 10,000 picoCuries per gram is not an uncommon number, is it, for

HMO particles?

MR. DUFFIELD: I have no knowledge of that.

MR. FORT: So it's injected into the top six inches of the soil?

MR. DUFFIELD: Yes, sir.

MR. FORT: And it's there. And the reason the IEPA specifies six inches into the soil is two-fold, I believe; one, so it's not on top of it and doesn't get blown away; and number two, it's available to be used in the crops because that's where you need the fertilizer.

MR. DUFFIELD: That's correct.

MR. FORT: In the plowing zone?

MR. DUFFIELD: That's correct.

MR. FORT: So as you go through the seeds and you go through the plowing, you're going to move that material around through this zone so it's there for the crops?

MR. DUFFIELD: That's correct.

MR. FORT: Including this material that is otherwise so hot that it -- if it were separated in your process, could only go to a

low level nuclear waste facility?

MR. DUFFIELD: I guess. I'm having trouble understanding what size particle we're talking about.

MR. WILLIAMS: Well, it's HMO particles, the flocks that you're seeing.

MR. DUFFIELD: What size are you -- are you talking about, Mr. Williams, I guess?

MR. FORT: I think we were just looking at your example, went through your scenario, and you were explaining how -- your process and how you intended to use your process so that it didn't get caught up in the nuclear waste regulatory field. I think that's what we're talking about.

We don't have anything more.

HEARING OFFICER ANTONIOLLI: Okay. We may have some questions from the Board.

MEMBER MELAS: Mr. Duffield, thank you for your testimony. I appreciate that. I congratulate you on trying to get this thing moving.

One little question struck my mind. You and your people have been drinking this

particular water from this deep well for some time?

MR. DUFFIELD: Yes, sir.

MEMBER MELAS: And you say it's been discharged in the sewage and through the sewage treatment plant and into the environment. I'm going back to the question that Mr. Ettinger raised. What effect does this have on aquatic life? And your comment was that after you get through with your process in which you remove most of the radium from your drinking water and send it out, it would still be the same amount of radium that's going into the water before your whole treatment operation as it is after?

MR. DUFFIELD: Yes, sir. And I guess not to the waters, but let me step through the process.

The water comes out of the ground. We'll pick a number. Let's say it has 15 just for a number. We will treat that down to where the water that goes to the --

MEMBER MELAS: Consumer

MR. DUFFIELD: -- consumer meets the

five.

MEMBER MELAS: Right.

MR. DUFFIELD: We will -- after the consumer uses that water, it goes back in the sewer.

MEMBER MELAS: Right.

MR. DUFFIELD: The water that we separate -- the material we separated we're going to dump back to the sewer. So now we go back to the sewer. And since we're using a simplistic item, we started with 15; we've still got 15.

MEMBER MELAS: Right.

MR. DUFFIELD: It goes into the wastewater plant at 15. If we use a number that's been used before here today, 50 percent, just because it's a number, not because it's right, we would discharge seven and a half to the stream, and the remainder would go into the sludge.

Now, if we were on a low-flow stream, which we're not, but if we were on a low-flow stream, a zero Q 7 10 as Bob would have me say, then at sometimes the concentration of

the stream would be a seven or seven and a half for discussion purposes. So that's what I think would be the numbers through the process. Now, that wouldn't be perfectly that's way, but that's an example to consider.

MEMBER MELAS: But it wouldn't be more concentrated after your process than the normal process where some comes from human beings, some, you know --

MR. DUFFIELD: No, particularly --

MEMBER MELAS: It's all -- there were 15 to start out with. There's got to be 15 to end up with.

MR. DUFFIELD: Nothing goes away.

MEMBER MELAS: Nothing goes away. But will it not be in a more concentrated form when it's coming out of the sewage treatment plant because your influent from your water treatment plant is now more concentrated than it was before?

MR. DUFFIELD: I don't think it will be more concentrated in the portion that goes to the river because most of the particles -- most of the particles will be settled. If

they -- if they remain particles throughout the collection system and throughout the treatment process, they would be things that would settle more readily.

MEMBER MELAS: And they would be in the sludge?

MR. DUFFIELD: And they'd end up in the sludge. And I haven't -- I'm not aware of enough information of HMO facilities and what's happened with sludge over the years. HMO is a relatively new process as well, and so I'm not sure how many facilities are really operating and what the impact is, if anybody has ever looked at what happens in the treatment -- wastewater plant or the sludge.

MEMBER MELAS: So would I be going too far if I said that after you've done your work, you ever built your plant, processed it, you're getting the drinking water to the people according to the proper standard, and then the remainder is being split now: Some going in the stream, some going on land --

MR. DUFFIELD: Yes, sir.

MEMBER MELAS: -- that there will be

less radium going into that particular receiving stream from the sewage treatment plant?

MR. DUFFIELD: I'm not ready to make that jump, but you may be correct. I just don't have enough experience or knowledge to make that conclusion. I would be very comfortable in saying there won't be more, but I'm not ready to say there's less.

MEMBER MELAS: Thank you.

HEARING OFFICER ANTONIOLLI: Okay. Anand and Alisa, questions from you?

(No audible response.)

HEARING OFFICER ANTONIOLLI: Any further questions for Mr. Duffield?

MR. FORT: I have one question. Maybe the Agency has an answer, but is there anything -- when I hear hydrous manganese, m-a-n-g-a-n-e-s-e -- right? What is the characteristic of that material in a sludge in crop application? I mean, does that have other things in it that would complicate the rate that it needs to be spread?

HEARING OFFICER ANTONIOLLI: Anyone from

the Agency like to comment?

MR. FORT: Do we know I guess is the question.

MR. HUTTON: I don't believe it would have an impact. Manganese -- hydrous manganese, we -- I don't believe so. Manganese is not considered a problem metal under part 503 of the federal regulations. I don't anticipate it would be a problem.

MR. KUHN: And also, you ask that -- it still would be a fairly small contribution to the overall sludge in the wastewater plant, too.

HEARING OFFICER ANTONIOLLI: Okay. With that, let's go --

MEMBER MELAS: A quick follow-up.

What's the comparison between, let's say, cadmium and hydrous manganese? Are they similar in the fact -- in the sludge, or are they completely different, if you know?

MR. HUTTON: I really don't know.

MEMBER MELAS: I'm just trying to get a point of reference. It's not that important.

MR. HARSCH: I have several.

MR. RAO: I have one question for Mr. Duffield. In your attempt to kind of resolve this big issue facing the Board, you mentioned that you may, you know, be able to propose this number of 15 -- I think you said between 15 and 40 picoCuries per liter?

HEARING OFFICER ANTONIOLLI: Was it 15 and 40 or 15 and 30 --

MR. DUFFIELD: I think 20 is what I said.

MR. RAO: Or 30. Okay. In that range.

Just one thing that came up on with that range. Is it based on aquatic life protection, or is it treatability or...

MR. DUFFIELD: In my notes I have a bunch of steps I went through to figure out what it is. One of the main considerations is the highest radium well I've been able to find in Illinois is about a 37. And my intent was to allow people to continue to do what they've been doing because I firmly believe that the impact from the discharge of radium has

already occurred, and we can't turn the clock back. And we need to be able to allow -- at least based on the information available now, to allow communities that are expending a lot of money to comply with the drinking water standard to continue to operate their wastewater plants.

HEARING OFFICER ANTONIOLLI: Now, in response to that, I know that you're saying that the impact from radium has already occurred, but by expand -- by creating more wells -- and I know that the deep water wells have been around for a long time, but with a greater population and use of these wells and the water from these underground wells is what contains more radium than the surface water. So are we, by bringing that water up and using it as drinking water and treating it, causing more radium to be released into the surface water?

MR. DUFFIELD: If I understand your question, yes. There would be a incremental increase with additional pumpage, but there's no additional increase as a result of the

implementation of the treatment method.

MEMBER MELAS: Just more people

MR. DUFFIELD: Just more people. Can't do much about it.

MR. HARSCH: I just have several follow-up questions, if I might.

In response to I guess the question regarding TENORM, based on your 25 years' experience, you are thoroughly familiar with the chemistry of the various treatment technologies -- alternate treatment technologies with the exception of the WRT black box; is that correct?

MR. DUFFIELD: That's correct.

MR. HARSCH: Under your scenario you've testified, you would be discharging the HMO wastewater to a sewer?

MR. DUFFIELD: Yes, to a sanitary sewer.

MR. HARSCH: And you would expect dilution to occur in a sanitary sewer?

MR. DUFFIELD: Absolutely.

MR. HARSCH: And mixing?

MR. DUFFIELD: And mixing.

MR. HARSCH: The solids that are removed in a normal POTW, those solids then ultimately go through digestion?

MR. DUFFIELD: That's correct. In both our plants, we operate anaerobic digestion and -- before we store the liquid and haul it to the fields.

MR. HARSCH: And there was some confusion, I think, in a question. Your radiation expert's caution regarding the cracks in the structure were the same type of cautions that he would provide anyone regarding basement cracks that might allow radon gas to enter the structure; is that correct?

MR. DUFFIELD: That's correct. And he left us with radon monitors to put in the space so we can determine whether there's a hazard there or not.

MR. HARSCH: That has nothing to do with the sludge?

MR. DUFFIELD: No. He was not concerned about it from a wastewater treatment plant operation standpoint, just from a normal

problem with confined spaces.

MR. HARSCH: No further questions.

HEARING OFFICER ANTONIOLLI: Okay. Does anyone have any further questions?

MR. HUTTON: I would like to make a clarification about manganese, the question that Mr. Melas asked.

HEARING OFFICER ANTONIOLLI: Okay.

MR. HUTTON: In our existing sludge regulations, part 391 of the Illinois administrative code, there is a limit on sludge application of manganese. The federal regulations part 503 that were issued I believe in 1993 did not contain any restrictions on manganese in land application. And essentially what happened was when we wrote the regulations in 1984 -- rather, when my boss, Al Keller, wrote the regulations in 1984, we did not have as good of data on the effect of manganese in the environment as we do now.

And when they did part 503 for the federal -- for federal -- USEPA, they did an extensive analysis of metals in the soil, and

at that point they decided that manganese was not a problem in a land application sludge.

In one of the proposals, we've talked about the potential for rewriting our land application rules in Illinois. One of the potential changes would be to remove manganese from our state rules so that they are in compliance -- they match the federal reg- -- the rules in the federal registry.

HEARING OFFICER ANTONIOLLI: Okay. Thanks for the clarification.

MR. FORT: Can I ask one clarification question?

HEARING OFFICER ANTONIOLLI: Okay.

MR. FORT: Thank you.

Your studies that you did on the wastewater treatment plant safety where you measured for radon, et cetera, that was the existing plant. Have you done any analysis for the new treatment activities that are going to have this removal of the radium and the concentrated particles that you were just testifying to? Have you done any safety analysis on that activity?

MR. DUFFIELD: Inside the proposed water treatment plants?

MR. FORT: Yes.

MR. DUFFIELD: We have looked at it, and we understand what we have to do to eliminate the buildup of radium in the building because the radon will derive from the decay of the radium. And we keep -- under the HMO process, you keep much less radium in the building than we do under the WRT process.

MR. FORT: And how do you do that?

MR. DUFFIELD: Well, because we're going to backwash daily. And when you backwash, you take that bunch of radium, and it leaves the building. And then by tomorrow, there's more radium, and you take it out again tomorrow.

MR. FORT: So you're designing this to avoid the radon problem?

MR. DUFFIELD: That's the normal process.

HEARING OFFICER ANTONIOLLI: Okay. All right. Any further comments?

(No audible response.)

HEARING OFFICER ANTONIOLLI: And let's go off the record for a minute.

(Discussion had off the record.)

HEARING OFFICER ANTONIOLLI: We're back on the record now. It's about quarter to 5:00 now.

MR. FORT: I had wanted to ask two questions of Mr. Khalique, if I could.

HEARING OFFICER ANTONIOLLI: Dr. Khalique.

MR. FORT: Dr. Khalique. Sorry.

HEARING OFFICER ANTONIOLLI: Sure. Go ahead. Why don't you do that before we go back into the procedural items?

MR. FORT: Okay. Good.

Doctor, your position with the Metropolitan Water Reclamation District is research chemist?

DR. KHALIQUE: Radiation chemist.

MR. FORT: Radiation chemist. Okay.

Is there a problem with radiation for the MSD?

DR. KHALIQUE: When you say problem, what do you mean by that?

MR. FORT: I'm sorry. That's a loaded question.

Well, what kind of issues do you deal with as a radiation chemist for the Metropolitan Water District?

DR. KHALIQUE: We analyze raw sewage, effluent, and sludge.

MR. FORT: So you're conducting monitoring for things like radium?

DR. KHALIQUE: Radium, gross alpha, beta radioactivity in raw sewage.

MR. FORT: I'm sorry. Gross alpha activity.

DR. KHALIQUE: And gross beta activity.

MR. FORT: And beta. Okay. Not gamma?

DR. KHALIQUE: Not gamma, yeah, on the raw sewage and effluent.

MR. FORT: And your district has seven plants?

DR. KHALIQUE: That's correct.

MR. FORT: How many of them have trouble meeting the current standard for

radium of one picoCurie per liter?

DR. KHALIQUE: We don't do radium on the raw sewage and effluent.

MR. FORT: But you do collect the alpha information and the beta information?

DR. KHALIQUE: That's correct.

MR. FORT: And is it possible to figure out whether or not you're complying with the one standard by looking at those two parameters?

DR. KHALIQUE: No.

MR. FORT: Because there's lots of other parameters that are radioactive?

DR. KHALIQUE: That's correct.

MR. FORT: Do you have a sense of the kinds of sources that are putting that alpha and beta emitters into your treatment system?

DR. KHALIQUE: Natural-occurring radium.

MR. FORT: Is that the only thing that's going into your system?

DR. KHALIQUE: Best of my knowledge.

MR. FORT: Nothing from medical activity?

DR. KHALIQUE: We don't see any man-made radium nuclide in the sludge except for cesium 137, which I think comes from the atmospheric fallout.

MR. FORT: How did you determine that that material was present? Did you actually analyze for it specifically?

DR. KHALIQUE: Cesium?

MR. FORT: Yes.

DR. KHALIQUE: Yes.

MR. FORT: And that's a gamma emitter?

DR. KHALIQUE: Right.

DR. FORT: Not an alpha or beta emitter?

DR. KHALIQUE: No. We do gamma analysis on the sludge.

DR. FORT: You only do gamma on the sludge?

DR. KHALIQUE: Yes.

MR. FORT: Okay. And the radium is coming from a water -- a drinking water treatment plant? I'm thinking of the sources of water supply for most of your district is

really surface waters as opposed to deep well. I know you have some deep well areas, but...

DR. KHALIQUE: Yes, but you may find minor amount of naturally-occurring radium in surface water, too.

MR. FORT: Have you done a matched balance across your treatment plants to see if you have as much going out as coming in?

DR. KHALIQUE: No.

MR. FORT: Based upon your experience, do you believe that if there were a restriction on radioactive particles entering your system, if it were legal for that to occur, would that improve the overall situation for the district?

DR. KHALIQUE: I don't know how can you find out that radioactive particle in the system because when you analyze the sludge, you take samples of sludge according to EPA manual that you have bunch of sludge, and then you grind it, and you sieve it, and take a sifted amount and analyze it for the activity. So you cannot say that there's one particle or not. I can say in this sample that it's so

much radioactivity.

MR. FORT: Okay. Do you know what the sludge content is in -- do you know what the content of alpha particles or beta particles are in your sludge?

DR. KHALIQUE: It depends.

MR. FORT: Okay.

DR. KHALIQUE: Which sludge you're talking about.

MR. FORT: Well, give me the range then or the highest or the lowest, whatever you can remember, because I know you don't have your documents with you.

DR. KHALIQUE: In the bio solid, the dry sludge, when we send it to the drying site, the gross alpha activity is from maybe two to ten picoCuries per gram dry weight. Don't quote me on this. I'm just giving the number from my head, top of my head.

And gross beta activity, most of that sludge is -- or bio solid we call it, from 20 to 30 picoCuries per gram dry weight.

MR. FORT: You've heard Mr. Duffield --

DR. KHALIQUE: Except for one plant.

Sorry.

MR. FORT: Except for one plant.

DR. KHALIQUE: That's has -- that's Lemont.

MR. FORT: And what are its levels?

DR. KHALIQUE: Its gross alpha activity is much higher. It might be 50 to 100 range.

MR. FORT: You heard Mr. Duffield talk about the process that he uses at his west plant. Is that process like what you use at Lemont? Do you have a different kind of sludge treatment process there?

DR. KHALIQUE: I cannot answer that question.

MR. FORT: Okay. Thank you very much. I appreciate it. I apologize for asking you all those specific questions that you probably hadn't looked at for a while.

Before we close the substance part, I'd like to mark this. And this is the permit application that WRT has filed with the Illinois Department of -- I'm sorry -- Illinois Environmental Management -- Management Agency, formal DNS, for approval

concerning the Oswego operations. And I will be glad to make copies. I don't have extra copies today for Mr. Harsh and Ms. Williams.

So if I can mark this as the next one...

HEARING OFFICER ANTONIOLLI: Would you like to take a look at it?

MS. WILLIAMS: That's fine. No.

MR. FORT: It's in three parts.

HEARING OFFICER ANTONIOLLI: Okay. If there are no objections, I will mark this Illinois Department of Nuclear Safety application form for nonmedical radioactive material license for RMD operations.

MR. FORT: Yes.

HEARING OFFICER ANTONIOLLI: Okay. As Exhibit 17.

MR. FORT: Thank you.

HEARING OFFICER ANTONIOLLI: I'll enter that as Exhibit 17.

(Exhibit No. 17 entered into evidence.)

MEMBER MELAS: We just did 16 a little while ago.

MR. FORT: Thank you.

HEARING OFFICER ANTONIOLLI: On the break we just took, we were just discussing final deadlines such as the public comment period. We should be getting the transcripts back from yesterday's and today's hearing within about eight business days, which, as we discussed, puts us at about November 3rd.

Any information that the parties would like to submit to the Board should be into us by November 24th. And the deadline for the public comment period then will be December 8th.

So with that, I'll also note that the post first notice public comment period began when the rulemaking appeared in the Illinois Register. And that was on August 6th, 2004.

And I'd also like to note that the Board will accept any public comment up until the deadline of December 8th.

During the second notice period, the Board will accept comments only from the Joint Commission on administrative rules. There will be no additional public comment period.

Today's hearing concludes the

hearings that were scheduled by the Board in this matter, but anyone -- any party also may request an additional hearing pursuant to section 102.412 B of the Board's procedural rules.

And if there's nothing further, I want to thank everyone for being here and forming a very complete record for us. Thank you. This hearing is adjourned.

(The hearing was adjourned at 4:55 p.m.)

STATE OF ILLINOIS)
) SS.
COUNTY OF COOK)

I, CARYL L. HARDY, a Notary Public in and for the County of Cook, State of Illinois, DO HEREBY CERTIFY that the foregoing 315 pages comprise a true, complete, and correct transcript of the proceedings held on October 22, 2004, at the offices of the Illinois Pollution Control Board, 100 West Randolph Street, Room 2-025, Chicago, Illinois, in the case of Revisions to Radium Water Quality Standards: Proposed New Ill. Adm. Code 302.307 and Amendments to 35 Ill. Adm. Code 302.207 and 302-525, in proceedings held before Hearing Officer Amy C. Antoniolli, and recorded in machine shorthand by me.

IN WITNESS WHEREOF I have hereunto set my hand and affixed by Notarial Seal this 3rd day of November, A.D. 2004.

Caryl L. Hardy
Notary Public and
Certified Shorthand Reporter and

Registered Professional Reporter

CSR No. 084-003896